Strategic Financial Management

Study Text

The Institute of Chartered Accountants of Nigeria

ICAN

Strategic financial management

The Institute of Chartered Accountants of Nigeria (ICAN)

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Syllabus

PROFESSIONAL LEVEL

STRATEGIC FINANCIAL MANAGEMENT

Aim
Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Linkage with other subjects
This diagram depicts the relationship between this subject and other subjects.
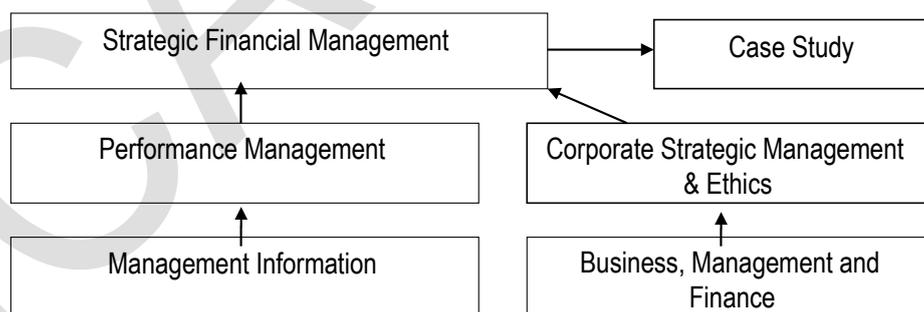
Main competencies
On successful completion of this paper, candidates should be able to:
Explain the purpose of financial management and evaluate the impact of macroeconomic environment on it;
Assess and advise on dividend decisions;
Evaluate and assess investment alternatives and the value of business;
Evaluate alternative sources of finance;
Assess and plan alternative growth strategies and corporate re-organisation strategies; and
Evaluate and apply alternative treasury and risk management techniques.

Linkage of main competencies
This diagram illustrates the linkage between the main competencies of this subject and is to assist candidates in studying for the examination.
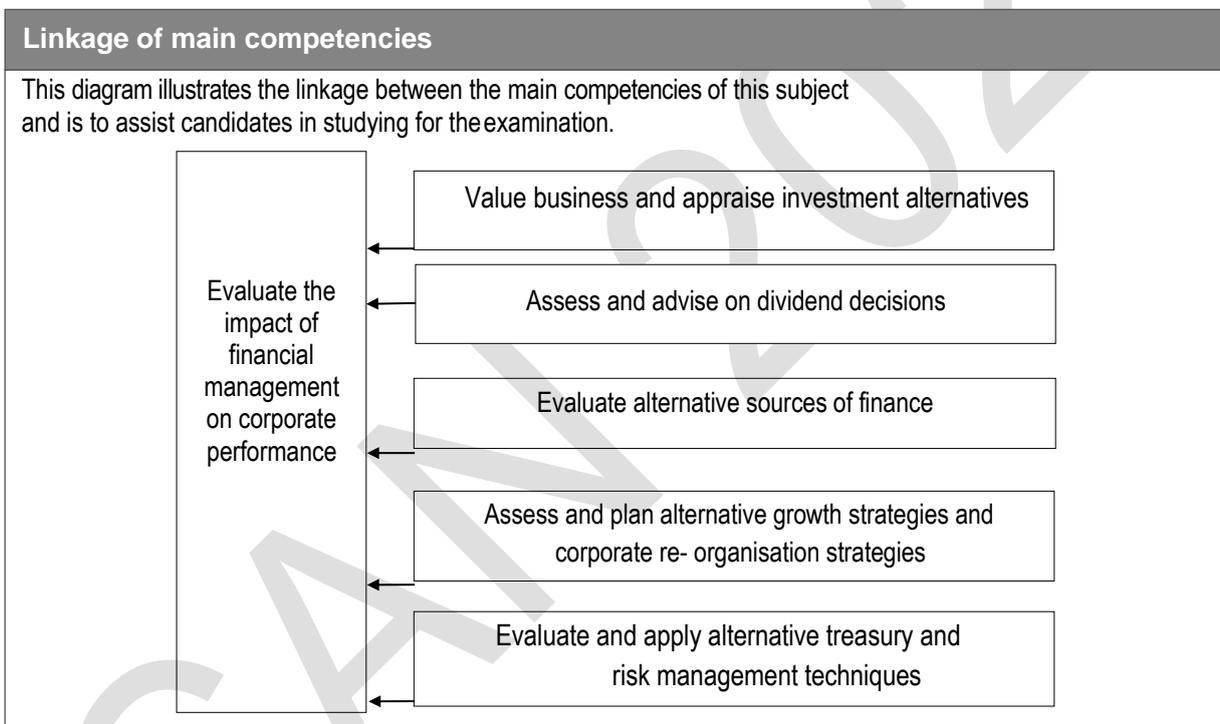
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E	Management of financial risks	15
Total		**100**

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		b	Identify key stakeholders of organisations and advise on their interests.	1
		c	Evaluate the impact of macroeconomic environment and the role of international financial institutions in strategic financial management.	3
		d	Evaluate and apply the concept of corporate social responsibility and its relationship with the objective of maximising shareholders' wealth.	1
		e	Assess and advise on agency theory and its relevance to financial management.	1
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Detailed syllabus				Chapter
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Detailed syllabus					Chapter
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Detailed syllabus				Chapter
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Detailed syllabus						Chapter
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Detailed syllabus				Chapter
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Detailed syllabus				Chapter
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Detailed syllabus				Chapter
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Foreword

The business environment has been undergoing rapid changes caused, by globalisation and advancement in Information Technology. The impact of these changes on the finance function and the skills set needed by professional accountants to perform their various tasks have been profound. These developments have made it inevitable for the Institute's syllabus and training curriculum to be reviewed to align its contents with current trends and future needs of users of accounting services.

The Institute of Chartered Accountants of Nigeria (ICAN) reviews its syllabus and training curriculum every three years, however, the syllabus is updated annually to take cognisance of new developments in the national environment and global accountancy profession. The Syllabus Review, Professional Examination and Students' Affairs Committees worked assiduously to produce a 3-level, 15-subject ICAN syllabus. As approved by the Council, examinations under the new syllabus will commence with the November 2021 diet.

It is instructive to note that the last four syllabus review exercises were accompanied with the publication of Study Texts. Indeed, when the first four editions of Study Texts were produced, the performances of professional examination candidates significantly improved. In an effort to consolidate on these gains and to further enhance the success rates of students in its qualifying examinations, the Council approved that a new set of learning materials (Study Texts) be developed for each of the subjects. Although, these learning materials may be regarded as the fifth edition, they have been updated to include IT and soft skills in relevant subjects, thereby improving the contents, innovation, and quality.

Ten of the new learning materials were originally contracted to Emile Woolf International (EWI), UK. However, these materials were reviewed and updated to take care of new developments and introduced IT and soft skills in relevant subjects. Also, renowned writers and reviewers which comprised eminent scholars and practitioners with tremendous experiences in their areas of specialisation, were sourced locally to develop learning materials for five of the subjects because of their local contents. The 15 subjects are as follows:

Foundation Level		
1.	Business, Management and Finance	EWI/ICAN
2.	Financial Accounting	EWI/ICAN
3.	Management Information	EWI/ICAN
4.	Business Law	ICAN

Skills Level		
5	Financial Reporting	EWI/ICAN
6	Audit and Assurance	EWI/ICAN
7.	Taxation	ICAN
8.	Corporate Strategic Management and Ethics	EWI/ICAN
9.	Performance Management	EWI/ICAN
10.	Public Sector Accounting and Finance	ICAN

Professional Level		
11.	Corporate Reporting	EWI/ICAN
12.	Advanced Audit and Assurance	EWI/ICAN
13.	Strategic Financial Management	EWI/ICAN
14.	Advanced Taxation	ICAN
15.	Case Study	ICAN

As part of the quality control measures, the output of the writers and reviewers were subjected to further comprehensive review by the Study Texts Review Committee.

Although the Study Texts were specially produced to assist candidates preparing for the Institute's Professional Examination, we are persuaded that students of other professional bodies and tertiary institutions will find them very useful in the course of their studies.

Haruna Nma Yahaya (Mallam), mni, BSc, MBA, MNIM, FCA
Chairman, Study Texts Review Committee

Acknowledgement

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Taxation		
1.	Enigbokan, Richard Olufemi	Reviewer
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Business Law		
1.	Oladele, Olayiwola.O	Writer/Reviewer
2.	Adekanola, Joel .O	Writer

Public Sector Accounting and Finance		
1.	Osho, Bolaji	Writer/Reviewer
1.	Biodun, Jimoh	Reviewer
2.	Osonuga, Timothy	Writer
3.	Ashogbon, Bode	Writer

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	Adesina, Julius Babatunde	Writer/Reviewer

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1.   Omolehinwa, Ademola

The Institute also appreciates the services of the following:

STUDY TEXTS REVIEW COMMITTEE

Members	
Haruna Nma Yahaya (Mallam), mni, BSc, MBA, ANIM, FCA	Chairman
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Anifowose, Isaac, B.Sc., MMP	Manager, Students' Affairs
Evbuomwan, Yewande, B.Sc. (Ed.), M.Ed., ACIS	Asst. Manager, Students' Affairs

Ahmed M. Kumshe, (Prof.), FCA
Registrar/Chief Executive

Professional level
Strategic Financial Management

An introduction to strategic financial management

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

A	Financial environment and role of financial manager and money market institutions		
	1	Financial environment and role of financial manager	
		a	Evaluate financial objectives within the strategic planning process of an organisation.
		b	Identify key stakeholders of organisations and advise on their interests.
		d	Evaluate and apply the concept of corporate social responsibility and its relationship with the objective of maximising shareholders' wealth.
		e	Assess and advise on agency theory and its relevance to financial management.
		g	Evaluate and communicate the key activities undertaken by treasury managers.
		h	Analyse and evaluate centralised and decentralised treasury management and the arguments for and against each.
		i	Identify and assess the impact of emerging issues in strategic financial management.
		j	Discuss ethical issues in strategic financial management.

Exam context

This chapter provides a broad introduction to aspects of financial management. It defines strategy in order to provide a foundation for what follows. The chapter explains the impact and interaction of financial management objectives.   It continues by explaining the treasury function of large organisations and continues with a discussion of stakeholders. It concludes by talking about corporate social responsibility.

By the end of this chapter, you should be able to:

■ Explain the meaning of financial strategy and strategic financial management.

■ Explain the formulation of corporate objectives and identify the primary corporate objective

■ Explain how other objectives (both financial and non-financial) link to the primary corporate objective

■ Explain the treasury function

■ Define and list stakeholders and identify their interest in an organisation

■ Define corporate social responsibility and explain how it links corporate objectives to stakeholder requirements

1 STRATEGIC FINANCIAL MANAGEMENT

Section overview

■ Definitions of strategy
■ The nature of financial management

1.1 Definitions of strategy

There is no single definition of corporate strategy.

Definitions: **Strategy**

Chandler

The determination of the basic long-term goals, the objectives of an enterprise, the adoption of courses of action and the allocation of resources necessary for carrying out these goals.

Drucker

Strategy is a pattern of activities that seek to achieve the objectives of the organisation and adapt its scope, resources and operations to environmental changes in the long term.

Johnson, Scholes and Whittington

Strategy is the direction and scope of an organisation over the long term, which achieves advantage in a changing environment through its configuration of resources and competencies with the aim of fulfilling stakeholder expectations.

Each of the above definitions has a different focus but all refer to actions (courses of action, pattern of activities, configuration of resources and competencies) undertaken to achieve the objectives (aim) of an organisation.

In other words:

❑ a strategy consists of organised activities; and
❑ the purpose of these activities (the strategy) is to achieve an objective.

Strategy is long-term. Formal strategic planning by large companies, for example, might cover five years or ten years or longer into the future.

The strategic choices that an enterprise makes are strongly influenced by the environment in which the enterprise exists. The environment is continually changing, which means that strategies cannot be rigid and unchanging.

Strategies involve an enterprise in doing different things with different resources over time, as it is forced to adapt to changes in its environment.

Financial strategy

Financial strategy is a component of the overall corporate strategy of an organisation.

Business strategies and action plans include financial strategies and plans.

1.2 The nature of financial management

Financial management refers to that aspect of management which involves planning and controlling the financial affairs of an organisation, to ensure that the organisation achieves its objectives (particularly its financial objectives).

This involves decisions about:

❑ how much finance the business needs for its day-to-day operations and for longer-term investment projects;

❑ where the finance should be obtained from (debt or equity) and whether it should be long term (long-term debt r equity) or short term (trade suppliers and bank overdrafts);

❑ how to manage short term cash surpluses and short term cash deficits;

❑ amounts to be paid out as dividends; and

❑ how to protect the organisation against financial risks.

Strategic financial management

Strategic financial management refers to financial management on a bigger scale and with a longer time frame.

Strategic financial management is concerned with bigger decisions than financial management and those decisions might have a profound effect on the organisation.

Strategic financial management encompasses the full range of a company's finances including:

❑ setting out objectives;

❑ identifying resources;

❑ analysing data;

❑ making financial decisions; and

❑ monitoring performance to identify problems.

2   FINANCIAL OBJECTIVES

Section overview

- Financial objectives and corporate strategy
- The primary corporate objective
- Wealth maximisation
- Maximising profits
- Growth in earnings per share
- Measuring the achievement of financial objectives
- Financial objectives: conclusion
- Other objectives
- Role of the financial manager: Three decisions

2.1   Financial objectives and corporate strategy

Every organisation exists for a purpose. For example, an organisation might exist to manufacture electronic equipment, manufacture chemicals, provide a transport service or provide an education to children.

Within this overall purpose, an organisation should have a primary objective.

- ❏   the main objective of a company might be to maximise the wealth of the company's owners, its equity shareholders;

- ❏   the main objective of a state-owned organisation might be stated in terms of providing a certain standard of public service;

- ❏   the main objective of a charity would be to fulfil its charitable purpose (for example, provide maximum aid or support for a particular group of people).

When the main objective of an organisation is not a financial objective, there is always a financial constraint on its objective, such as providing the highest quality of public service with the available finance.

The identification of a primary objective is a starting point for the formulation of a strategy to achieve that objective.

The process can be shown as follows:

Illustration: Strategic process	
Step 1:	Identify corporate objective (usually a financial objective) Establish
Step 2:	targets for the financial objective
Step 3:	Develop business strategies for achieving the financial objective/targets
Step 4:	Convert strategies into action plans
Step 5:	Monitor performance

2.2 The primary corporate objective

For companies, the primary corporate objective is often stated as maximising the wealth of its owners (equity shareholders). This means maximising the market value of the company.

❑ Many of financial management models covered later in this text test a proposed course of action in terms of its impact on the value of the company;

❑ The objective is not just a theoretical one. In practice, surveys have shown that most chief executives view increasing the market value of the company which they control as their main responsibility.

The primary objective is directed to the benefit of a single stakeholder group (the owners). In reality, the wealth maximisation objective must be pursued within the boundaries of the needs of other stakeholders. For example, cocaine smuggling or money laundering might lead to large positive cash flows for a company but one of the company's stakeholders (the government) prohibits these activities.

Corporate social responsibility (CSR)

Corporate social responsibility is a term to describe the view that a company should pursue objectives that are in the interests of stakeholder groups other than shareholders, such as employees and society as a whole (the 'public'). This is discussed in more detail later in this chapter.

2.3 Wealth maximisation

The main corporate objective is the maximisation of shareholder wealth and this is taken as maximising the market value of the company.

Shareholder wealth is increased by dividend payments and a higher share price. Corporate strategies are therefore desirable if they result in higher dividends, a higher share price, or both.

There are practical problems with using this objective:

❑ What should be the time period for setting targets for wealth maximisation?

❑ How will wealth creation be measured, and how can targets be divided into targets for dividend payments and targets for share price growth?

❑ Share prices are often affected by general stock market sentiment, and short-term increases or falls in a share price might be caused by investor attitudes rather than any real success or failing of the company itself.

The objective of maximising shareholder wealth is generally accepted as a sound basis for financial planning, but is not practical in terms of actually setting financial performance targets and measuring actual performance against the target. Other financial objectives might therefore be used instead, in the expectation that if these objectives are achieved, shareholder wealth will be increased by an optimal amount.

These include:

❑ maximising profits; and

❑ achieving growth in earnings per share.

2.4 Maximising profits

A company might express its main financial objectives in terms of profit maximisation, and targets can be set for profit growth over a strategic planning period.

Profit growth objectives have the advantage of simplicity. When a company states that its aim is to increase profits by 20% per year for the next three years, the intention is quite clear and easily understood – by managers, investors and others.

The main problem with an objective of maximising profits is to decide the time period over which profit performance should be measured.

❑ Short-term profits might be increased only by taking action that will have a harmful effect on profits in the longer term. For example, a company might avoid replacing ageing equipment in order to avoid higher depreciation and interest charges, or might avoid investing in new projects if they will make losses initially – regardless of how profitable they might be in the longer term.

❑ It is often necessary to invest now to improve profits over the longer term. Innovation and taking business risks are often essential for long-term success. However, longer-term success is usually only achieved by making some sacrifices in the short term.

In practice, managers often focus on short-term profitability, and give insufficient thought to the longer term:

❑ Partly because much of their remuneration might depend on meeting annual performance targets. Annual cash bonuses, for example, might be dependent on making a minimum amount of profit for the year.

❑ Partly because managers often do not expect to remain in the same job for more than a few years; therefore short-term achievements might mean more to them than longer-term benefits after they have moved on to a different position or job.

Another problem with an objective of profit maximisation is that profits can be increased by raising and investing more capital. When share capital is increased, total profits might increase due to the bigger investment, but the profit per share might fall. This is why a company's financial objective might be expressed in terms of profit per share or growth in profit per share.

2.5 Growth in earnings per share

The most common measure of profit per share is earnings per share or EPS. A financial objective might be to increase the earnings per share each year, and possibly to grow EPS by a target amount each year for the next few years. If there is growth in EPS, there will be more profits to pay out in dividends per share, or there will be more retained profits to reinvest with the intention of increasing earnings per share even more in the future. EPS growth should therefore result in growth in shareholder wealth over the long term.

However, there are some problems with using EPS growth as a financial objective. It might be possible to increase EPS through borrowing and debt capital. If a company needs more capital to expand its operations, it can raise the money by borrowing. Tax relief is available on the interest charges, and this reduces the effective cost of borrowing. Shareholders benefit from any growth in profits after interest, allowing for tax relief on the interest, and EPS increases.

However, higher financial gearing (the ratio of debt capital to total capital) can expose shareholders to greater financial risk. As a consequence of higher gearing, the share price might fall even when EPS increases.

2.6 Measuring the achievement of financial objectives

When a financial objective is established, actual performance should be measured against the objective.

This requires the calculation of one or more suitable performance measurements.

Financial objectives are commonly measured using ratio analysis. Financial ratios can be used to make comparisons. These might be:

❑ Comparisons over a number of years. By looking at the ratios of a company over a number of years, it might be possible to detect improvements or deterioration in the financial performance or financial position of the entity. Ratios can therefore be used to make comparisons over time, and to identify changes or trends

❑ Comparisons with the similar ratios of other, similar companies for the same period.

❑ Comparisons with 'industry average' ratios.

Return on capital employed (ROCE)

Profit-making companies should try to make a profit that is large enough in relation to the amount of money or capital invested in the business. The most important profitability ratio is return on capital employed or ROCE.

For a single company:
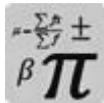
Formula:

$$\text{ROCE} = \frac{\text{Profit before interest and taxation}}{(\text{Share capital and reserves} + \text{long-term debt capital} + \text{preference share capital})} \times 100\%$$

The capital employed is the share capital and reserves, plus long-term debt capital such as bank loans, bonds and loan stock.

Where possible, use the average capital employed during the year. This is usually the average of the capital employed at the beginning of the year and end of the year.

Example: Return on capital employed

The following figures relate to Company X for Year 1.

	1 January Year 1	31 December Year 1
	₦	₦
Share capital (₦1 shares)	200,000	200,000
Share premium	100,000	100,000
Retained earnings	500,000	600,000
Bank loans	200,000	500,000
	1,000,000	1,400,000

	₦
Profit before tax	210,000
Income tax expense	(65,000)
Profit after tax	145,000

Interest charges on bank loans were ₦30,000.

ROCE is calculated as follows:

ROCE = 240,000 **(W1)**/1,200,000 **(W2)** ⮕ 100 = 20%

W1	**Profit before interest and tax**	₦
	Profit before tax	210,000
	Add back interest deducted	30,000
	Profit before interest and tax	240,000

W2	**Capital employed**	₦
	Capital employed at the beginning of the year	1,000,000
	Capital employed at the end of the year	1,400,000
		2,400,000
		÷2
	Average capital employed	1,200,000

This ROCE figure can be compared with the ROCE achieved by the company in previous years, and with the ROCE achieved by other companies, particularly competitors.

Return on shareholder capital

Return on shareholder capital (ROSC) measures the return on investment that the shareholders of the company have made. This ratio normally uses the values of the shareholders' investment as shown in the statement of financial position (rather than market values of the shares).
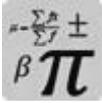
Formula: Return on shareholder capital

$$\text{ROSC} = \frac{\text{Profit after taxation and preference dividend}}{\text{Share capital and reserves}} \times 100$$

The average value of shareholder capital should be used if possible. This is the average of the shareholder capital at the beginning and the end of the year.

Profit after tax is used as the most suitable measure of return for the shareholders, since this is a measure of earnings (available for payment as dividends or for reinvestment in the business).

Example: Return on shareholder capital

The following figures relate to Company X for Year 1.

	1 January Year 1	31 December Year 1
	₦	₦
Share capital (₦1 shares)	200,000	200,000
Share premium	100,000	100,000
Retained earnings	500,000	600,000
Shareholder capital	800,000	900,000
Bank loans	200,000	500,000
	1,000,000	1,400,000

	₦
Profit before tax	210,000
Income tax expense	(65,000)
Profit after tax	145,000

Interest charges on bank loans were ₦30,000.

ROSC is calculated as follows:

ROSC = 145,000/850,000 **(W2)** ⬚ 100 = 17.06%

W1	**Shareholder capital**	₦
	Shareholder capital at the beginning of the year	800,000
	Shareholder capital at the end of the year	900,000
		1,700,000
		÷2
	Average shareholder capital	850,000

Note that the return on shareholder's capital is not directly comparable with ROCE because ROCE is a before-tax measure of return whereas return on equity is measured after tax.

Earnings per share and dividend per share
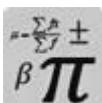
> **Formula: Basic EPS**
>
> Net profit (or loss) attributable to ordinary shareholders during a period weighted
>
> average number of shares in issue during the period

The earnings per share (EPS) is a measure of the profit after taxation (and preference share dividend, if any) per equity share, during the course of a financial year. The EPS might be:

❑ a historical EPS, as reported in the company's financial statements, or

❑ a forward-looking EPS, which is the EPS that the company will expect to achieve in the future, usually in the next financial year.

Dividend per share may be important for shareholders who are seeking income from shares rather than capital growth. The company may have a dividend policy which aims for steady growth of dividend per share.

> **Example: Earnings per share**
>
> Using the figures in the previous example:
>
> EPS = profit after tax/Number of ordinary shares = ₦145,000/200,000 = 0.725 per share

Changes in share price and dividend

Financial performance can also be measured by the return provided to shareholders over a period of time such as a financial year. The total return consists of dividend payments plus the increase in the share price during the period (or minus the fall in the share price).

This total return, often called the *Total Shareholder Return* or **TSR**, can be expressed as a percentage of the value of the shares at the beginning of the period.

> **Example: Total Shareholder Return**
>
> At 1 January the market value of a company's shares was ₦840 per share.
>
> During the year dividends of ₦45 per share were paid and at 31 December the share price was ₦900.
>
> The share price has risen by ₦60; therefore TSR = ₦(60 + 45)/₦840 = 0.125 ₫2.5%.

2.7 Financial objectives: conclusion

It is generally accepted that the main financial objective of a company should be to maximise (or at least increase) shareholder wealth.

There are practical difficulties in selecting a suitable measurement for growth in shareholder wealth. Financial targets such as profit maximisation and growth in EPS might be used, but no financial target on its own is ideal.

Financial performance is therefore assessed in a variety of ways: by the actual or expected increase in the share price, growth in profits, growth in EPS, and so on.

In practice, companies might have other stated objectives but these can usually be justified in terms of the pursuit of wealth maximisation.

Stated objective	Link to wealth maximisation
To maximise profits	This would lead to the ability to pay out bigger dividends and to the ability to take advantage of favourable investment opportunities.
	This should lead to increased market value
To increase earnings per share year on year.	This would lead to a positive perception in the market place which in turn should lead to a higher demand for the shares thus increasing market value.

2.8   Non-financial objectives

A company may have important non-financial objectives, which limit the achievement of financial objectives. Examples of non-financial objectives are as follows:

(a)   **The welfare of employees**

A company might try to provide good wages and salaries, comfortable and safe working conditions, good training and career development, and good pensions. If redundancies are necessary, many companies will provide generous redundancy payments, or spend money trying to find alternative employment for redundant staff.

(b)   **The welfare of management**

Managers will often take decisions to improve their own circumstances, even though their decisions will incur expenditure and so reduce profits. High salaries, company cars and other perks are all examples of managers promoting their own interests.

(c)   **The provision of a service**

The major objectives of some companies will include fulfilment of a responsibility to provide a service to the public. Example is the privatised Power Holding Company of Nigeria. Providing a service is of course a key responsibility of government departments and local authorities.

(d)   **The fulfilment of responsibilities towards customers**

Responsibilities towards customers include providing in good time a product or service of a quality that customers expect, and dealing honestly and fairly with customers. Reliable supply arrangements, also after-sales service arrangements, are important.

(e)   **The fulfilment of responsibilities towards suppliers**

Responsibilities towards suppliers are expressed mainly in terms of trading relationships. A company's size could give it considerable power as a buyer. The company should not use its power unscrupulously. Suppliers might rely on getting prompt payment, in accordance with the agreed terms of trade.

(f)   **The welfare of society as a whole**

The management of some companies is aware of the role that their companies have to play in exercising corporate social responsibility. This includes compliance with applicable laws and regulations but is wider than that. Companies may be aware of their responsibility to minimise pollution and other harmful externalities (such as excessive traffic) which their activities generate. In delivering green environmental policies, a company may improve its corporate image as well as reducing harmful externality effects. Companies also may consider their positive responsibilities, for example to make a contribution to the community by local sponsorship.

Other non-financial objectives are growth, diversification and leadership in research and development.

Non-financial objectives do not negate financial objectives. However, they do suggest that the simple theory of company finance, which is that the objective of a firm is to maximise the wealth of ordinary shareholders, is too simplistic. Sometimes, financial objectives may have to be compromised in order to satisfy non-financial objectives.

2.9   Role of the financial manager: Three decisions

A large part of the role of the senior financial manager is advisory, providing advice on financial strategy and policies.

In order to achieve its corporate objectives, a company must develop strategies. To achieve an objective of maximising shareholder wealth, financial strategies should be formulated by the board of directors. Financial strategy is often (but not always) targeted towards achieving growth in

annual earnings and achieving a return on investment in excess of the cost of the funds used to make the investment.

Financial managers provide advice concerned with three fundamental decisions:

- ❑ **Investment decisions** – Which investments should be undertaken using capital resources
- ❑ **Financing decisions** – How finance should be raised in order to minimise cost of capital
- ❑ **Dividend decisions** – What the balance should be between the amount of profit distributed and that held back for reinvestment in the business.

Further responsibilities would include advice on:

- ❑ communicating financial policy to internal and external stakeholders
- ❑ financial planning and control
- ❑ management of risk.

These are covered in more detail later in this text.

3 THE TREASURY FUNCTION

Section overview

- Role of the treasury function
- Cash flow forecasting and cash management
- Financing long-term and short-term investments
- Sources of short-term finance
- Financial risk management
- Possible risks of operating a treasury department
- Treasury department as a profit centre

3.1 Role of the treasury function

Cash management in a large organisation is often handled by a specialist department, known as the treasury department.

The central treasury department is responsible for making sure that cash is available in the right amounts, at the right time and in the right place. To do this, it must:

- ❑ produce regular cash flow forecasts to predict surpluses and shortfalls;
- ❑ arrange short-term borrowing and investment when necessary;
- ❑ deal with the entity's banks;
- ❑ finance the business on a day-to-day basis, for example by arranging facilities with a bank;
- ❑ advise senior management on long-term financing requirements;
- ❑ arrange to purchase foreign currency when needed, and arrange to sell foreign currency cash receipts;
- ❑ protect the business against the risk of adverse movements in foreign exchange rates, when the business has receipts and payments, or loans and investments.

Some of these are discussed in more detail below.

3.2 Cash flow forecasting and cash management

A role of the treasury department is to centralise the control of cash, to make sure that:

- ❑ cash is used as efficiently as possible;
- ❑ surpluses in one part of the business (for example, in one profit centre) are used to fund shortfalls elsewhere in the business, and
- ❑ surpluses are suitably invested and mature when the cash is needed.

Cash flow forecasting

Cash flow forecasting is an important aspect of treasury management. A company must have enough cash (or access to borrowing, such as a bank overdraft facility) to meet its payment obligations. Cash forecasts are therefore

made and revised regularly, to establish whether the organisation expects to have a cash surplus or to be short of cash.

❑ If a cash deficit is forecast, measures should be taken to ensure that cash will be available. It might be necessary to ask a bank for more finance. Some expenditure might be deferred. Alternatively, measures might be taken to speed up receipts from customers.

❑ If a cash surplus is forecast, the treasury department will consider how the surplus funds should be used. For example, if the surplus is expected to be temporary, how long will the surplus last and what is the most profitable method of investing the money (without risk) for that period?

Short-term cash forecasts can be prepared using receipts and payments cash budgets. Longer-term cash forecasts can be made by preparing an expected cash flow statement for the forecast period.

Larger businesses find it much easier than smaller businesses to raise cash when they are expecting a cash shortfall. Similarly, when they have a cash surplus, they find it easier to invest the cash.

Cash management

A centralised treasury department is able to manage the cash position of the group as a whole. It can manage total cash receipts, total cash payments and total net cash balances.

One technique for doing this is to pool bank accounts. All the bank accounts throughout the group for a particular currency might be pooled. At the end of each day, the balances in each account are transferred to a centralised cash account. (The cash is 'pooled'). The cash deficits in some accounts and cash surpluses in other accounts are therefore netted. In this way, the company can avoid interest charges on accounts that are in deficit, and transfer cash between accounts as required.

Pooling and netting of cash flows therefore improves cash management. However, for pooling and netting to be effective, the cash has to be managed by a central treasury department.

Advantages

Making the management of cash the responsibility of a centralised treasury department has significant advantages.

❑ Cash is managed by specialist staff – improving cash management efficiency.

❑ All the cash surpluses and deficits from different bank accounts used by the entity can be 'pooled' together into a central bank account. This means that cash can be channelled to where it is needed, and overdraft interest charges can be minimised.

❑ Central control over cash lowers the total amount of cash that needs to be kept for precautionary reasons. If individual units had to hold their own 'safety stock' of cash, then the total amount of surplus cash would be higher (when added together) than if cash management is handled by one department.

❑ Putting all the cash resources into one place increases the negotiating power of the treasury department to get the best deals from the banks.

3.3 Financing long-term and short-term investments

A company must be able to finance its planned long-term and short-term investments (including any proposed takeovers). Preference share capital is rare, and the options available to companies are therefore as follows:

❑ For long-term investments, there should be long-term finance. Long-term finance is either equity or debt. Bank loans might be classified as long-term debt, provided that it is a fixed loan or a revolving credit facility for several years. However, bank loans are typically for up to about seven years.

❑ Short-term investments might be defined as working capital assets. Inventory and receivables should normally be financed by a combination of long-term finance and short-term liabilities (such as trade payables).

Sources of equity

For many companies, the main source of new equity finance is retained profits. Profits are retained and reinvested to finance new investments and further growth.

Occasionally, a company might wish to raise extra capital by issuing new shares for cash. However, it is difficult for a small company to raise new finance in this way if its shares are not traded on a stock market and it has only a small number of individual shareholders.

A company whose shares are traded on the stock market might wish to issue new shares for cash. In some countries (such as the UK), it is a legal requirement for companies issuing new shares for cash to offer the shares to the existing shareholders in proportion to their existing shareholding. (The shareholders might agree to waive this right in certain circumstances and within certain limits).

A company will only be able to issue new shares for cash in this way if it has the confidence and support of its shareholders and other institutions in the stock market.

In a takeover bid, the shareholders in the target company might be offered new shares in the bidding company as the purchase consideration.

In some cases, a company whose shares are not traded on the stock market might be able to raise new capital by issuing shares, when the new equity finance is provided by specialist 'venture capital' organisations.

Sources of debt

For most companies, the main source of debt capital is their bank or banks. Large companies, however, are able to raise debt capital by issuing bonds in the bond markets.

Trade finance

When the company needs finance to support its foreign trade, the treasury function might be responsible for arranging the financing.

3.4 Sources of short-term finance

Companies obtain short-term finance mainly from trade credit and bank lending. Large companies might have access to other sources of short-term borrowing, such as:

❑ commercial paper programmes (CP), or

❑ bankers' acceptance facilities (BA acceptances).

Commercial paper

Commercial paper is an unsecured, short-term debt instrument with a fixed maturity of 9 months (270 days) or less.

Commercial paper is a money-market security issued (sold) by large corporations to obtain funds to meet short-term obligations.

Commercial paper is backed by a bank or the issuing company. Only companies with excellent credit ratings can issue paper at a reasonable price or indeed find buyers.

Commercial paper I issued in large denominations (typically $100,000 or more) and sold at a discount to its par value. The company then redeems the paper for par at maturity, the difference between the amount borrowed and the amount paid being interest.

Bankers' acceptance facilities

A banker's acceptance (BA) is a short term negotiable instrument issued by a company (known as the drawer) and guaranteed (accepted) by a commercial bank.

A banker's acceptance is a legally binding obligation by the accepting bank to pay the stated amount at the maturity date of the time draft. It can have maturity dates ranging from 30 to 180 days.

A banker's acceptance can facilitate trade transactions between two parties when they do not have an established credit relationship.

Example: Banker's acceptance

X Limited wishes to import goods from a US supplier. The goods will reach the country in 3 months.

X Limited issues a banker's acceptance for $500,000 (X Limited is said to be a drawer of the BA) which is guaranteed by X Limited's bank.

The BA promises to pay the holder $500,000 at a specified date in the future (in 3m).

The BA is guaranteed by the bank thus reducing the risk of non-payment faced by the US supplier.

The US supplier can hold the BA to maturity at which time the accepting bank will pay $500,000 to the supplier (as the holder).

Alternatively, the US supplier could sell the BA for a discount on the market. The discount would fall as the BA approached maturity. Whoever holds the BA on maturity will collect $500,000 from the accepting bank.

When the accepting bank pays the $500,000 it collects $500,000 from X Limited's account. (As far as X Limited is concerned, the BA is like a post-dated cheque).

A banker's acceptance is a money market instrument and, like most money markets, it is relatively safe and liquid, particularly when the paying bank enjoys a strong credit rating. Banks that provide acceptances tend to be well known, highly rated institutions.

3.5 Financial risk management

The treasury department is usually responsible for the management of financial risk. The main financial risks facing companies are:

❑ foreign exchange risk or currency risk;

❑ interest rate risk;

❑ credit risk;

❑ market risk, where companies hold large quantities of market securities (such as shares and bonds) as assets. Market risk is the risk of an adverse movement in the market price of these assets.

Foreign exchange risk and interest rate risk are described in later chapters.

Credit risk

Credit risk is the risk that a debt will not be paid and will become a bad debt, or that a customer will make debt payments later than scheduled. Credit control and credit risk management are aspects of day-to-day financial management, and you should already be familiar with credit management and debt collection systems.

Companies that borrow from banks are a credit risk to the bank, and a function of the treasury department in large companies might be to monitor the perceived credit risk of the company. Large companies might have a formal credit rating from one of the credit rating agencies (such as Moody's and Standard & Poor's). The cost of borrowing for these companies depends on their credit rating.

❑ Banks will charge a higher 'spread' over the risk-free rate on loans to companies with a lower credit rating.

❑ If a company wants to issue new bonds, the interest payable on the bonds will depend on the credit rating attached to them.

The treasury management of a company that has debt with a credit rating might therefore be required to monitor the rating and maintain a dialogue with the credit rating agencies.

The link between credit ratings spreads over the risk-free rate and the cost of borrowing is explained in a later chapter.

3.6 Possible risks of operating a treasury department

The main risks in treasury operations, for a large Treasury department, may be as follows.

❑ There is a risk that the treasury department will raise finance for the entity in an inefficient or inappropriate way. For example, interest rates on borrowing may be higher than necessary. There may be too much short- term borrowing and not enough longer-term borrowing (or not enough short-term borrowing and too much long-term borrowing). The balance between equity finance and debt may be inappropriate, resulting in a high cost of capital for the entity.

❑ The treasury department may fail to manage the financial risks of the entity sufficiently. For example, it might make insufficient use of forward contracts (for foreign exchange) and may fail to manage interest rate risk using derivatives such as swaps.

❑ The treasury department may employ 'dealers' for foreign exchange or investing surplus funds. Dealers may exceed their trading limits. They may make mistakes when dealing, such as buying when they ought to sell, or making a mistake when agreeing the price or the quantity for a transaction. Dealers may also fail to record/document their transactions properly.

❑ The treasury department may earn only a low return on their investment of surplus funds.

3.7 Treasury department as a profit centre

A treasury department might be run as a cost centre or as a profit centre. The aim of establishing a treasury department as a profit centre is to motivate management (both in treasury and in its customers in the other parts of the organisation) to deal on a market priced basis.

Advantages of running treasury department as a profit centre

❑ potential for additional profits;

❑ the department is motivated to operate efficiently; and

❑ transfer costs to the business units would be realistic as they should be at the market value of services received.

Disadvantages of running treasury department as a profit centre

❑ potential for huge losses due to speculative deals;

❑ additional administrative costs in running a profit centre; and

❑ the additional cost of management time in terms of negotiating transfer prices.

4 STAKEHOLDERS

Section overview

- Stakeholders and their objectives
- Conflicts between different stakeholder objectives
- Agency theory
- Incentive schemes (management reward schemes)

4.1 Stakeholders and their objectives

Although the theoretical objective of a private sector company might be to maximise the wealth of its owners, other individuals and groups have an interest in what a company does and they might be able to influence its corporate objectives. Anyone with an interest in the activities or performance of a company are 'stakeholders' because they have a stake or interest in what happens.

It is usual to group stakeholders into categories, with each category having its own interests and concerns. The main categories of stakeholder group in a company are usually the following.

❑ **Shareholders** - The shareholders themselves are a stakeholder group. Their interest is to obtain a suitable return from their investment and to 'maximise their wealth'. However there might be different types of shareholder in a company: some shareholders are long-term investors who have an interest in longer-term share price growth as well as short-term dividends and gains. Other shareholders might be short-term investors, hoping for a quick capital gain and /or high short-term profits and dividends.

❑ **Directors and senior managers** - An organisation is led by its board of directors and senior executive management. These are individuals whose careers, income and personal wealth might depend on the company they work for.

❑ **Other employees** - Similarly other employees in a company have a personal interest in what the company does. They receive their salary or wages from the company, and the company might also offer them job security or career prospects. However, unlike directors and senior executives, other employees might have less influence on what the company does, unless they have strong trade union representation or have some other source of 'power' and influence, such as specialist skills that the company needs and relies on.

❑ **Lenders** - When a company borrows money, the lender or lenders are stakeholders. Lenders might be banks or investors in the company's bonds. The main concern for lenders is to protect their investment. If the company is heavily in debt, credit risk might be a problem, and lenders might be concerned about the ability of the company to meet its interest and principal repayment obligations. They might also want to ensure that the company does not continue to borrow even more money, so that the credit risk increases further.

❑ **The government** - The government also has an interest in companies, especially large companies, for a variety of reasons.

  • The government regulates commercial and industrial activity; therefore it has an interest in companies as a regulator.

- Companies are an important source of taxation income for the government, both from tax on corporate profits but also from tax on employment income and sales taxes.

- Companies are also employers, and one of the economic aims of government might be to achieve full employment.

- Some companies are major suppliers to the government.

❑ **Customers** - Customers have an interest in the actions of companies whose goods or services they buy, and might be able to influence what companies do.

❑ **Suppliers -** Similarly major suppliers to a company might have some influence over its actions.

❑ **Society as a whole** - A company might need to consider the concerns of society as a whole, about issues such as business ethics, human rights, the protection of the environment, the preservation of natural resources and avoiding pollution. Companies might need to consider how to protect their 'reputation' in the mind of the public, since a poor reputation might lead to public pressure for new legislation, or a loss in consumer (customer) support for the company's products or services.

Companies might therefore state their objectives in terms of seeking to increase the wealth of their shareholders, but subject to a need to satisfy other stakeholders too - rewarding employees well and being a good employer, acting ethically in business, and showing due concern for social and environmental issues.

The ability of stakeholders to influence what a company does will depend to a large extent on:

❑ the extent to which their interests can be accommodated and do not conflict with each other

❑ the power of each group of stakeholders to determine or influence the company's objectives and strategies.

4.2 Conflicts between different stakeholder objectives

Different stakeholders have differing interests in a company, and these might be incompatible and in conflict with each other. When stakeholders have conflicting interests:

❑ either a compromise will be found so that the interests of each stakeholder group are satisfied partially but not in full

❑ or the company will act in the interests of the most powerful stakeholder group, so that the interests of the other stakeholder groups are ignored.

In practice there might be a combination of these two possible outcomes. A company might make small concessions to some stakeholder groups but act mainly in the interests of its most powerful stakeholder group (or groups).

Some examples of conflicting interests of stakeholder groups are as follows:

❑ If a company needs to raise more long-term finance, its directors and shareholders might wish to do so by raising more debt capital, because debt capital is usually cheaper than equity finance. (The reason why this is so will be explained in a later chapter.) However, existing lenders might believe that the company should not borrow any more without first

increasing its equity capital – by issuing more shares or retaining more profits. The terms of loan agreements (the lending 'covenants') might therefore include a specification that the company must not allow its debt level (gearing level) to exceed a specified maximum amount.

❑ The government might want to receive tax on a company's profits, whereas the company will want to minimise its tax liabilities, through 'efficient' tax avoidance schemes.

❑ A company cannot maximise returns to its shareholders if it also seeks to maintain a contented work force, possibly by paying them high wages and salaries.

❑ A company cannot maximise short-term profits if it spends money on environmental protection measures and safe waste disposal measures.

However the most significant conflict of interest between stakeholders in a large company, especially a public company whose shares are traded on a stock market, is generally considered to be the conflict of interests between:

❑ the shareholders and

❑ the board of directors, especially the executive directors, and the other senior executive managers.

This perceived conflict of interests is fundamental to agency theory and the concepts of good corporate governance that have developed from agency theory.

4.3 Agency theory

Agency theory was developed by Jensen and Meckling (1976) who defined the agency relationship as a form of contract between a company's owners and its managers, where the owners appoint an agent (the managers) to manage the company on their behalf. As a part of this arrangement, the owners must delegate decision-making authority to the management.

The owners expect the agents to act in the best interests of the owners. Ideally, the 'contract' between the owners and the managers should ensure that the managers always act in the best interests of the shareholders. However, it is impossible to arrange the 'perfect contract', because decisions by the managers (agents) affect their own personal interests as well as the interests of the owners. Managers will give priority to their personal interests over those of the shareholders.

When this happens, there is a weakness or failing on the governance of the company.

Agency conflicts

Agency conflicts are differences in the interests of a company's owners and managers. They arise in several ways.

❑ **Moral hazard** - A manager has an interest in receiving benefits from his or her position as a manager. These include all the benefits that come from status, such as a company car, use of a company airplane, lunches, attendance at sponsored sporting events, and so on. Jensen and Meckling suggested that a manger's incentive to obtain these benefits is higher when he has no shares, or only a few shares, in the company. The biggest problem is in large companies.

❑ **Effort level** - Managers may work less hard than they would if they were the owners of the company. The effect of this 'lack of effort' could be lower profits and a lower share price. The problem will exist in a large company at middle levels of management as well as at senior management level. The interests of middle managers and the interests of senior managers might well be different, especially if senior management are given pay incentives to achieve higher profits, but the middle managers are not.

❑ **Earnings retention** - The remuneration of directors and senior managers is often related to the size of the company, rather than its profits. This gives managers an incentive to grow the company, and increase its sales turnover and assets, rather than to increase the returns to the company's shareholders. Management are more likely to want to re-invest profits in order to make the company bigger, rather than payout the profits as dividends.

❑ **Risk aversion** - Executive directors and senior managers usually earn most of their income from the company they work for. They are therefore interested in the stability of the company, because this will protect their job and their future income. This means that management might be risk- averse, and reluctant to invest in higher-risk projects. In contrast, shareholders might want a company to take bigger risks, if the expected returns are sufficiently high.

❑ **Time horizon** - Shareholders are concerned about the long-term financial prospects of their company, because the value of their shares depends on expectations for the long-term future. In contrast, managers might only be interested in the short-term. This is partly because they might receive annual bonuses based on short-term performance, and partly because they might not expect to be with the company for more than a few years. Managers might therefore have an incentive to increase accounting return on capital employed (or return on investment), whereas shareholders have a greater interest in long-term share value.

Agency costs

Agency costs are the costs that the shareholders incur when professional managers to run their company.

❑ Agency costs do not exist when the owners and the managers are exactly the same individuals.

❑ Agency costs start to arise as soon as some of the shareholders are not also directors of the company.

❑ Agency costs are potentially very high in large companies, where there are many different shareholders and a large professional management.

There are three aspects to agency costs:

❑ They include the **costs of monitoring** - A company establishes systems for monitoring the actions and performance of management, to try to ensure that management are acting in their best interests. An important example of monitoring is the requirement for the directors to present an annual report and audited accounts to the shareholders, setting out the financial performance and financial position of the company. Preparing accounts and having them audited has a cost.

❑ Agency costs also include the costs to the shareholder that arise when the managers take decisions that are not in the best interests of the

shareholders (but are in the interests of the managers themselves). For example, agency costs arise when a company's directors decide to acquire a new subsidiary, and pay more for the acquisition than it is worth. The managers would gain personally from the enhanced status of managing a larger group of companies. The cost to the shareholders comes from the fall in share price that would result from paying too much for the acquisition.

❑ The third aspect of agency costs is costs that might be incurred to provide incentives to managers to act in the best interests of the shareholders. These are sometimes called **bonding costs**. The main example of bonding costs are the costs of remuneration packages for senior executives. These costs are intended to reduce the size of the agency problem. Directors and other senior managers might be given incentives in the form of free shares in the company, or share options. In addition, directors and senior managers might be paid cash bonuses if the company achieves certain specified financial targets.

Reducing the agency problem

Jensen and Meckling argued that in order to reduce the agency problem, incentives should be provided to management to increase their willingness to take 'value-maximising decisions' – in other words, to take decisions that benefit the shareholders by maximising the value of their shares.

Several methods of reducing the agency problem have been suggested. These include:

❑ Devising a remuneration package for executive directors and senior managers that gives them an incentive to act in the best interests of the shareholders.

❑ Fama and Jensen (1983) argued that an effective board must consist largely of **independent non-executive directors**. Independent non- executive directors have no executive role in the company and are not full- time employees. They are able to act in the best interests of the shareholders.

❑ Independent non-executive directors should also take the decisions where there is (or could be) a conflict of interest between executive directors and the best interests of the company. For example, non-executive directors should be responsible for the remuneration packages for executive directors and other senior managers.

These ideas for reducing the agency problem are contained in codes of corporate governance.

4.4 Incentive schemes (management reward schemes)

This chapter has so far made the point that the main objective of a company should be a financial objective, but there are different ways of stating this objective and in measuring the extent to which the objective has been achieved.

There are different stakeholder groups with an interest in a company, and these are likely to have conflicting interests. The main conflict of interests is the agency problem and the different interests of shareholders and senior executive managers and directors.

This raises the question: Can the agency problem be reduced and can managers be persuaded to focus on returns to shareholders as the main objective of the company? Managers may be encouraged to work in the best interests of the company if there are remuneration incentive schemes (reward schemes) linked to profits, earnings, share price or Total Shareholder Return.

Most, if not all, large stock market companies have remuneration schemes for their executive directors and other senior managers, and the purpose of such schemes is to make the personal interests of the directors and managers similar to those of the shareholders. By achieving a financial performance that is in the interests of the shareholders, directors and managers will also obtain personal benefits for themselves.

Structure of a remuneration package for senior executives

The structure of a remuneration package for executive directors or senior managers can vary, but it is usual for a remuneration package to have at least three elements.

❑ A **basic salary** (with pension entitlements) - Basic salaries need to be high enough to attract and retain individuals with the required skills and talent.

❑ Annual performance incentives, where the reward is based on achieving or exceeding specified annual performance targets. The performance target might be stated as profit or earnings growth, EPS growth, achieving a profit target or achieving a target for TSR. Some managers might also have a non-financial performance target. Some managers might have several annual performance targets, and there is a reward for achieving each separate target. **Annual rewards** are usually in the form of a **cash bonus**.

❑ **Long-term performance incentives**, which are linked in some way to share price growth or TSR over a longer period of time (in practice typically three years). Long-term incentives are usually provided in the form of **share awards** or **share options** in the company. The purpose of these awards is to give the manager a personal incentive in trying to increase the value of the company's shares. As a holder of shares or share options, the manager will benefit financially from a rising share price.

Share awards

With a share award scheme, the company purchases a quantity of its own shares and awards these to its executive directors and other senior managers on condition that certain 'long-term' financial targets are achieved, typically over a three-year period.

Share options

A company might award share options to its executives. A share option gives its holder the right to purchase new shares in the company on or after a specified

date in the future, typically from three years after the options have been awarded. The right to buy new shares in the company is at a fixed price (an 'exercise price') that is specified when the share options are awarded. Typically the exercise price is the market price of the shares at the time the options are awarded. The holder of a share option gains from any increase in the share price above the exercise price, and so has a direct personal interest in a rising share price.

For example, a company might award share options to its chief executive officer. If the market price of the shares at the date of the award is, say, ₦7.00, the CEO might be given 500,000 share options at ₦7 per share, exercisable from three years after the date of the option award. If the share price three years later is, say, ₦10, the CEO will be able to buy 500,000 new shares at ₦7 and sell them immediately at ₦10, to make a personal financial gain of ₦1,500,000.

5 CORPORATE SOCIAL RESPONSIBILITY

Section overview

- Definition of corporate social responsibility (CSR)
- Principles of CSR
- CSR and stakeholders in the company
- The effect of CSR on company strategy

5.1 Definition of corporate social responsibility (CSR)

Corporate social responsibility refers to the responsibilities that a company has towards society. CSR can be described decision-making by a business that is linked to ethical values and respect for individuals, society and the environment, as well as compliance with legal requirements.

CSR is based on the concept that a company is a citizen of the society in which it exists and operates.

- ❑ As a corporate citizen of society, it owes the same sort of responsibilities to society at large that other citizens should owe.

- ❑ There is a social contract between a company and the society in which it operates. As the owner or user of large amounts of property and other resources, companies as corporate citizens also owe a duty to society to use its property and resources in a responsible way. In return, society allows the company to operate and remain in existence.

Corporate Social Responsibility is related to the idea that as well as their responsibilities to shareholders, boards of companies are also responsible to the general public and other stakeholder groups.

There are two key areas of responsibility:

- ❑ General responsibilities that are a key part of the board's duties which need to be completed in order to succeed in their industry and/or are regulatory/legal requirements that are imposed on them; and

- ❑ Duties that are seen by some people feel go beyond these general responsibilities.

5.2 Principles of CSR

Corporate social responsibility has five main aspects. For any company, some of these aspects might be more significant than others.

- ❑ A company should operate in an ethical way, and with integrity. A company should have a recognised code of ethical behaviour and should expect everyone in the company to act in accordance with the ethical guidelines in that code.

- ❑ A company should treat its employees fairly and with respect. The fair treatment of employees can be assessed by the company's employment policies, such as providing good working conditions and providing education and training to employees.

- ❑ A company should demonstrate respect for basic human rights. For example, it should not tolerate child labour.

- ❑ A company should be a responsible citizen in its community. Responsibility to the community might be shown in the form of investing in local

communities, such as local schools or hospitals. This can be an important aspect of CSR for companies that operate in under-developed countries or regions of the world.

❑ A company should do what it can to sustain the environment for future generations. This could take the form of:

- reducing pollution of the air, land or rivers and seas

- developing a sustainable business, whereby all the resources used by the company are replaced

- cutting down the use of non-renewable (and polluting) energy resources such as oil and coal and increasing the use of renewable energy sources (water, wind)

- re-cycling of waste materials.

5.3 CSR and stakeholders in the company

The concept of corporate citizenship and corporate social responsibility is consistent with a stakeholder view of how a company should be governed. A company has responsibilities not only to its shareholders, but also to its employees, all its customers and suppliers, and to society as a whole.

In developing strategies for the future, a company should recognise these responsibilities. The objective of profit maximisation without regard for social and environmental responsibilities should not be acceptable.

Example: CSR

When a company promotes itself as a company with strong ethical views and a considered policy on CSR, it exposes itself to reputation risk. This is the risk that its reputation with the general public and customers will be damaged by an unexpected event or disclosure.

For example, an ethical company might find that one or more of its major suppliers, based in a foreign country, is using forced labour or child labour in the production of goods that the company buys.

5.4 The effect of CSR on company strategy

The awareness of CSR will vary between different countries. To remain successful in business, companies must respond to changes in the expectations of its customers. In many countries, there has been a significant increase in public awareness of environmental problems, such as global warming (pollution and energy consumption) and the potential for natural disasters that this creates. There is also concern about the irreplaceable loss of many natural resources and the failure to re-cycle many raw materials that could be used again in products or services.

If companies fail to respond to growing public concern about social and environmental issues, they will suffer a damage to their reputation and the possible loss (long term) of sales and profits. This is the problem for companies of **reputation risk**.

Unfortunately, although there is genuine concern by some companies for CSR issues, other companies express concerns about CSR issues in order to improve their public relations image with the public, and as a way of marketing their products.

6 ETHICAL ISSUES IN FINANCIAL MANAGEMENT

Section overview

- Business ethics
- Corporate codes of ethics
- Content of a corporate code of ethics

6.1 Business ethics

In pursuing profits and shareholder wealth maximisation, companies should act ethically, and in giving advice financial managers should be conscious of any ethical issues that might be involved in the matter. Business ethics covers aspects of business behaviour such as:

❑ Honesty and integrity in business dealings with others: honesty is more than just remaining within the law!

❑ Concern for other stakeholders, such as employees, suppliers and customers.

❑ Respect for human rights: this might involve avoiding business dealings with unethical suppliers or suppliers who use child labour or slave labour.

❑ Concern for the environment: the need to reduce or avoid pollution and the need to develop a sustainable business.

❑ Recognition by large companies of the social responsibilities to the communities in which they exist and operate.

Some companies have expressed their concern for ethical conduct in a formal corporate code of ethics.

6.2 Corporate codes of ethics

A corporate code of ethics is a code of ethical behaviour, issued by the board of directors of a company. The decisions and actions of all employees in the company must be guided by the code. The effectiveness of a code of ethics depends on the leadership of the company – its directors and senior managers. These individuals must be seen to comply with the ethical code or other employees will see no purpose in complying with the code themselves.

It has been suggested that there are three reasons why companies might develop a code of ethics. These reasons are progressive, which means that companies might begin by having a code of ethics for the first reason, but then progress to the second and third reasons as they gain experience with implementing the code and appreciating its potential benefits.

❑ **Reason 1: Managing for compliance** - The company wants to ensure that all its employees comply with relevant laws and regulations, and conduct themselves in a way that the public expects. For example, companies providing a service to the general public need to ensure that their employees are polite and well-behaved in their dealings with customers.

❑ **Reason 2: Managing stakeholder relations** - A code of ethics can help to improve and develop the relations between the company and its shareholders, by improving the trust that shareholders have in the company. The code might therefore include the ethical stance of the

company on disclosing information to shareholders and the investing public (openness and transparency) and on respecting the rights of shareholders.

❑ **Reason 3: Creating a value-based organisation** - A company might recognise the long-term benefits of creating an ethical culture, and encouraging employees to act and think in a way that is consistent with the values in its code of ethics. (It could be argued that an ethical company, like a well-governed company, is more likely to be successful in business in the long-term. However, there is no firm evidence to prove this point, and it is therefore a matter of opinion).

Note on global organisations.

Global companies might have difficulty in developing and implementing a code of ethics for the entire organisation world-wide, because of differences in ethical values in different cultures in different parts of the world. A criticism of codes of ethics of global companies is that they often focus on the company's relationships with stakeholders in their 'home country' and do not give enough thought to their operations in other countries.

6.3 Content of a corporate code of ethics

There is no standard format or content for a code of ethics, but a typical code contains:

❑ general statements about ethical conduct by employees; and

❑ specific reference to the company's dealings with each stakeholder group, such as employees, customers, shareholders and local communities.

A code of conduct should specify that **compliance with local laws** is essential. In addition, employees should **comply with the policies and procedures** of the company. There might be a statement that any employee who fails to comply with the company's code of conduct will face disciplinary action.

The code might also include an **overview of business conduct**, and the need to protect the company's reputation and 'good name'. It might also contain statements about the values of the company, such as:

❑ acting at all times with integrity;

❑ protecting the environment;

❑ the 'pursuit of excellence';

❑ respect for the individual.

A code of conduct might address its main concerns about its dealings with stakeholder groups and its ethical treatment of each group.

❑ **Employees** - A code of ethics might include statements about:

• human rights, including the right of all employees to join legally- authorised organisations such as a trade union or political party;

• equal opportunities for all employees, regardless of gender, race, ethnic origin, religion, age, disability or sexual orientation;

• refusal to tolerate harassment of employees by colleagues or managers;

• concern for the health and safety of employees;

- respect for the privacy of confidential information about each employee; and

- company policy on giving or receiving entertainment or bribes.

❑ **Customers** - A code of ethics might include statements about:

- fair dealing with customers;

- product safety and/or product quality;

- the truthfulness of advertisements; and

- respect for the privacy of confidential information about each customer.

❑ **Competitors** - A code of ethics might include statements about:

- fair dealing with competitors; and

- the use of techniques for obtaining information about competitors (industrial spying).

❑ **Shareholders** - A code of ethics might not include much about shareholders, because the relationship between a company and its shareholders might be contained in a code of corporate governance that the company follows. The key issue with shareholders is to maintain and develop trust and confidence, which might be achieved through disclosure of information (openness and transparency).

An exam question will focus more on a practical ethical situation or dilemma and ask you to comment on it rather than a theoretical discourse on ethics. Codes of ethics are not mentioned in the syllabus. However, establishing such a code could be a practical suggestion to deal with a problem in an exam scenario and the detail above provides a list of the kinds of situations that an exam question might raise.

7 CHAPTER REVIEW

Chapter review
Before moving on to the next chapter check that you now know how to: ■ Explain the meaning of financial strategy and strategic financial management. ■ Explain the formulation of corporate objectives and identify the primary corporate objective ■ Explain how other objectives (both financial and non-financial) link to the primary corporate objective ■ Explain the treasury function ■ Define and list stakeholders and identify their interest in an organisation ■ Define corporate social responsibility and explain how it links corporate objectives to stakeholder requirements

CHAPTER

2

Regulatory background

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

A	Financial environment and role of financial manager and money market institutions		
	1	Financial environment and role of financial manager	
		f	Report on the professional, regulatory and legal frameworks relevant to financial management including stock exchange requirements, anti-money laundering regulations and directors' responsibilities.

Exam context

This chapter explains certain aspects of the regulatory and legal framework relevant to financial management in Nigeria.

By the end of this chapter, you should be able to:

■　　Define money laundering

■　　Explain the main legal rules enacted in Nigeria to combat money laundering

■　　Explain directors' responsibilities under Nigerian law

■　　Explain in overview the regulatory role of the Securities Exchange Commission

■　　Explain in overview the role of Nigerian Stock Exchange

1 MONEY LAUNDERING

Section overview

- Introduction
- Financial Action Task Force against Money Laundering
- Nigeria
- Specific rules on cash transfers
- Specific rules with regard to financial institutions and designated non-financial institutions
- Rules specific to designated non- financial institutions
- Rules specific to financial institutions

1.1 Introduction

Money laundering is an international problem which is addressed on an international level by mutual co-operation between countries and international bodies.

Money laundering covers any activity by which the apparent source and ownership of money or property representing the proceeds of crime are changed, so that they appear to have been obtained legitimately.

The methods by which money may be laundered are varied and can range in sophistication from simple to complex.

Money laundering often occurs in three steps:

❑ Cash is introduced into the financial system by some means ("placement"); then

❑ Complex financial transactions camouflage the illegal source ("layering"); then

❑ Wealth appears to have been generated from legal sources ("integration").

Money laundering takes several different forms although most methods can be categorized into one of a few types including:

❑ Structuring (smurfing): A method of placement by which cash is deposited with banks in smaller amounts in order to avoid suspicion.

❑ Bulk cash smuggling to jurisdictions with greater bank secrecy or less rigorous money laundering enforcement.

❑ Cash-intensive businesses that simply deposit both legitimate and criminally derived cash as legitimate earnings.

❑ Real estate may be purchased with illegal proceeds, and then sold. The proceeds from the sale appear to outsiders to be legitimate income.

1.2 Financial Action Task Force against Money Laundering

Formed in 1989 by the G7 countries, the Financial Action Task Force on Money Laundering (FATF) is an inter-governmental body whose purpose is to develop and promote an international response to combat money laundering and combat the financing of terrorism.

FATF is a policy-making body, which brings together legal, financial and law enforcement experts to achieve national legislation and regulatory reforms.

FATF recommendations

Countries should criminalise money laundering on the basis of the United Nations Conventions.

Countries should ensure that financial institution secrecy laws do not inhibit implementation of the FATF Recommendations.

Financial institutions should not keep anonymous accounts or accounts in obviously fictitious names.

Financial institutions should undertake customer due diligence measures, including identifying and verifying the identity of their customers, when:

❑　　Establishing business relations;

❑　　Carrying out occasional transactions above the applicable designated threshold or that are wire transfers;

❑　　There is a suspicion of money laundering or terrorist financing; or

❑　　The financial institution has doubts about the veracity or adequacy of previously obtained customer identification data.

Financial institutions should pay special attention to all complex, unusual large transactions, and all unusual patterns of transactions, which have no apparent economic or visible lawful purpose.

If a financial institution suspects or has reasonable grounds to suspect that funds are the proceeds of a criminal activity, or are related to terrorist financing, it should be required, directly by law or regulation, to report promptly its suspicions to the financial intelligence unit.

Financial institutions should develop programmes against money laundering and terrorist financing. These programmes should include:

❑　　The development of internal policies, procedures and controls, including appropriate compliance management arrangements, and adequate screening procedures to ensure high standards when hiring employees.

❑　　An ongoing employee training programme.

❑　　An audit function to test the system.

FATF assesses each member country against these recommendations in published reports. Countries seen as not being sufficiently compliant with such recommendations are subjected to financial sanctions.

1.3 **Nigeria**

Nigeria has comprehensive anti-money laundering legislation.

The Money Laundering (Prohibition) Act 2011 (as amended in 2012) contains the primary Nigerian anti-money laundering legislation.

It requires businesses within the regulated sector (banking, investment, money transmission, certain professions, etc.) to report to the authorities suspicions of money laundering by customers or others.

Money laundering is widely defined in Nigeria to include any handling or involvement with the proceeds of any crime as well as activities which would fall within the traditional definition.

Money laundering is prohibited in Nigeria. It is an

offence to:

❑ conceal or disguise the origin of;

❑ convert or transfer;

❑ removes from the jurisdiction; or

❑ acquire, use, retain or take possession or control of, any fund or property, which is known or reasonably ought to have been known to be the proceeds of an unlawful act.

Unlawful acts are defined very widely and would include tax evasion and securities fraud.

1.4 **Specific rules on cashtransfers**

Cash payments exceeding ₦5,000,000.00 in the case of an individual, or ₦10,000,000.00 in the case of a body corporate are illegal unless made through a financial institution.

Any cash transfer to a foreign country exceeding $10,000 transfer mu s t b e reported to the Central Bank of Nigeria within 7 days from the date of the transaction.

Transportation of cash or negotiable instruments in excess of US$10,000 or its equivalent by individuals in or out of the country must be declared to the Nigerian Customs Service.

1.5 Specific rules with regard to financial institutions and designated non- financial institutions

There is a significant burden based on financial institutions and designated non- financial Institutions (referred to as regulated entities in the following description).

> **Definition: Designated non-financial institution**
> Designated non-financial institutions includes dealers in jewellery, cars and luxury goods, chartered accountants, audit firms, tax consultants, clearing and settlement companies, legal practitioners, hotels, casinos, supermarkets, or such other businesses as the Federal Ministry of Commerce or appropriate regulatory authorities may from time to time designate.

Identification of customers

Regulated entities must identify customers and verify their identity using reliable, independent source documents. In addition they must identify and verify the identity of any beneficial owner.

Regulated entities must undertake customer due diligence measures when:

❏ establishing business relationships;

❏ carrying out occasional transactions above the applicable designated threshold prescribed by relevant regulation;

❏ carrying out occasional transaction that are wire transfers;

❏ there is a suspicion of money laundering or terrorist financing, regardless of any exemptions or thresholds; or `

❏ the company has doubts about the veracity or adequacy of previously obtained customer identification data.

Due diligence

Regulated entities must also:

❏ conduct on-going due diligent on a business relationship;

❏ scrutinize transactions undertaken during the course of the relationship to ensure that the transactions are consistent with the institution's knowledge of their customer their business and risk profile and where necessary, the source of funds; and

❏ ensure that documents, data or information collected under the customer due diligence process is kept up-to-date and relevant by undertaking reviews of existing records, particularly for higher risk categories of customers or business relationships.

Internal procedures, policies and controls

Regulated entities must develop programmes to combat the laundering of the proceeds of a crime or other illegal act, and these must include-

❑ the designation of compliance officers at management level at its headquarters and at every branch and local office;

❑ regular training programmes for its employees;

❑ the centralization of the information collected; and

❑ the establishment of an internal audit unit to ensure compliance with and ensure the effectiveness of the measures taken to enforce the provision of this Act.

Sundry

Where such a regulated entity suspects or has reasonable grounds to suspect that the amount involved in a transaction is the proceeds of a crime or an illegal act it must require identification of the customer notwithstanding that the amount involved in the transaction is less than US$1,000 or its equivalent.

Where the customer is a politically exposed person (as defined), the company must put in place appropriate risk management systems and obtain senior management approval before establishing and during any business relationship with the politically exposed person.

Suspicious transactions reporting

A transaction may:

❑ Involves a frequency which is unjustifiable or unreasonable; or

❑ Be surrounded by conditions of unusual or unjustified complexity; or

❑ Appear to have no economic justification or lawful objective; or

❑ (in the opinion of the regulated entity) involve terrorist financing or be inconsistent with the known transaction pattern of the account or business relationship.

Such transactions are deemed to be suspicious. The regulated entity must seek information from the customer as to the origin and destination of the fund, the aim of the transaction and the identity of the beneficiary.

The regulated entity must immediately report any suspicious transaction to the Economic and Financial Crimes Commission´;

1.6 Rules specific to designated non- financial institutions

Such a regulated entity whose business involves the one of cash transaction must submit to the Ministry a declaration of its activities before commencement of the business.

It must also identify a customer by requiring him to fill a standard data form and present his international passport, driving license, national identity card or such other document bearing his photograph as may be prescribed by the Ministry prior to any transaction involving a sum exceeding US$1,000 or its equivalent.

Such a regulated entity must record all such transaction chronological order, indicating each customers surname, forenames and address in a register numbered and forwarded to the Ministry.

1.7 Rules specific to financial institutions

Companies must report to the EFCC in writing within 7 and 30 days respectively any single transaction in excess of

❑ ₦5,000,000 or its equivalent, in the case of an individual; or

❑ ₦10, 000,000 or its equivalent, in the case of a body corporate.

The opening or maintaining of numbered or anonymous accounts by any person, Financial Institution or corporate body is prohibited.

A person must not establish or operate a shell bank in Nigeria.

The Nigerian regulatory authorities can apply to the Federal High Court for permission:

❑ To place any bank account or any other account comparable to a bank account under surveillance; or

❑ To obtain access to any suspected computer system;

❑ To obtain communication of any authentic instrument or private contract, together with all bank, financial and commercial records, when the account, telephone line or computer system is used by any person suspected of taking part in a transaction involving the proceeds, of a financial or other crime.

Banking secrecy or preservation of customer confidentiality cannot be invoked as a ground for objecting to the measures set out.

2 DUTIES OF DIRECTORS

Section overview

- Duties of directors
- Conflicts of duties and interests
- Duty of care and skill

2.1 Duties of directors

A director of a company stands in a fiduciary relationship towards the company and must act in the utmost good faith towards the company in any transaction with it or on its behalf.

Definition

A fiduciary is an individual in whom another has placed the utmost trust and confidence to manage and protect property or money.

Fiduciary relationship is where one person has an obligation to act for another's benefit.

A director also owes a fiduciary relationship with the company in the following circumstances:

❑ Where a director is acting as agent of a particular shareholder;

❑ Where even though he is not an agent of any shareholder, such a shareholder or other person is dealing with the company's securities.

A director must act at all times in what he believes to be the best interests of the company as a whole so as to preserve its assets, further its business, and promote the purposes for which it was formed. He must act in such manner as a faithful, diligent, careful and ordinarily skilful director would act in the circumstances.

In the performance of his functions, a director must have regard to the interests of the company's employees in general, as well as the interests of its members.

A director must exercise his powers for the purpose for which he is specified and must not do so for a collateral purpose. The power, if exercised for the right purpose, does not constitute a breach of duty, if it, incidentally, affects a member adversely.

Where, under the provisions set out in CAMA, a director is allowed to delegate his powers this must not be done in such a way that it may amount to an abdication of duty.

Illustration: Delegation

Directors have the responsibility to produce financial statements.

This responsibility might be delegated to an accountant employed for that purpose.

However, it is still the directors' responsibility that the financial statements are properly prepared. They must employ a competent person to perform the delegated task.

A director's responsibilities under law cannot be relieved in any way by provisions contained in the articles or resolutions of a company, or in any contract.

Legal position of directors

A director is an agent of the company.

Directors are trustees of the company's assets and powers.

❑ They must account for all the moneys over which they exercise control and must refund any moneys improperly paid away.

❑ They must exercise their powers honestly in the interest of the company and all the shareholders (not in their own or sectional interests).

2.2 Conflicts of duties and interests

The personal interest of a director must not conflict with any of his duties as a director.

A director must not make any secret profit when performing his duties. If the director discloses his interest in a transaction before he may escape liability. In other words, the profits are not secret and he might be entitled to keep them.

A director is privy to confidential information about a company. This is known as inside information. Directors must not misuse such information. This applies to a person who once was a director but has now left the company. He is still accountable and could be restrained by an injunction from misusing the information received by virtue of his previous position.

2.3 Duty of care and skill

This applies to both executive and non-executive directors:

Every director of a company must exercise the powers and discharge the duties of his office honestly, in good faith and in the best interests of the company.

A director must exercise that degree of care, diligence and skill which a reasonably prudent director would exercise in comparable circumstances.

Failure to take reasonable care may be grounds for an action for negligence and breach of duty.

Each director is individually responsible for the actions of the board in which he participated. Being absent from the board's deliberations (unless justified) does not relieve a director of such responsibility.

3 NIGERIAN STOCK EXCHANGE

Section overview

- Introduction
- Methods of listing securities
- General requirements of the listing rules

3.1 Introduction

The Nigerian Stock Exchange is regulated by the Securities and Exchange Commission and subject to its regulations.

Securities and Exchange Commission (SEC)

The SEC has a number of roles including:

- ❑ Registers all securities to be offered for sale to, or for subscription by, the public;
- ❑ Approves timing of new issues;
- ❑ Maintains surveillance over dealings in securities;
- ❑ Registers all stock exchanges including their branches and capital market operators; and
- ❑ Protects the securities market against any manipulations including insider trading.

Companies wishing to be admitted to the official list of the Nigerian Stock Exchange must, in addition to complying with the exchange's listing rules, comply with the relevant provisions of the Companies And Allied Matters Act 1990 and the Investment and Securities Act, 2007 Rules and Regulations.

The Nigerian Stock Exchange (NSE)

The NSE has a number of roles including:

- ❑ Provides the platform for buying and selling of existing securities;
- ❑ Provides liquidity for investors;
- ❑ Regulates the activities of the stock brokers;
- ❑ Encourages transactions in the new issue market.; and
- ❑ Helps to spread promoters' risks.

The detailed listings requirements of The Nigerian Stock Exchange are set out in 10 Chapters in the Green Book.

3.2 Methods of listing securities

In broad outline, the methods for listing of securities on the NSE are as follows:

❑ **Offer for subscription:** An invitation by or on behalf of a company or other authority to the public, for subscription of securities at a fixed price;

❑ **Offer for sale:** An offer to the public by or on behalf of a shareholder, the proceeds which will go to the vendor(s);

❑ **Placing:** Sale by a broker to his clients, of securities, which have previously been purchased or subscribed for;

❑ **Rights offer/issue**: A privilege offer/issue to existing shareholders to acquire proportionately additional shares in the company usually at a special price;

❑ **Capitalisation issue:** A bonus/scrip issue to existing shareholders;

❑ **Tender:** An offer of specific quantity of shares and stock to the public by or on behalf of a company or other authority or a third party for bidding;

❑ **Introduction:** The listing of securities already widely held;

❑ **Conversion:** An exchange for or conversion of securities into other classes of securities;

❑ **Options:** An offer to buy or sell some shares at an agreed price and time;

3.3 General requirements of the listing rules

An application for listing will only be entertained if sponsored by a dealing member of the exchange.

The company must be a public company, which will issue or has issued an invitation to the public to subscribe for its shares or has satisfied council that the public is sufficiently interested in the company's shares to warrant listing.

All securities for which listing is sought must first be registered with the Securities and Exchange Commission.

All application and documents to be considered or approved by Council should always be submitted to the exchange at the earliest possible date.

The final prospectus for approval must be forwarded to the exchange at least seven working days before the date for the completion board meeting.

Before the grant of listing, all applicant companies must sign a general undertaking that they will provide promptly certain information about their operations and that they will follow certain administrative procedures.

Where it is desired to increase the authorized share capital, the directors must state, in the explanatory circular or other documents accompanying the notice of meeting, whether or not they presently have any intention of issuing all or any part thereof.

A company which applies for listing must comply with the minimum public float requirement, prescribed by the listing standard criteria chosen by the issuer.

Subscriptions list must remain open for a maximum period of 28 working days.

A maximum of 10% of an offering will be allowed to staff of a company (or its subsidiaries or associated companies) on special application forms. Such offerings may be placed in trust for the employees.

Where a proportion of the shares in a placement or public offer is reserved for employees, the company must provide the exchange along with the general undertaking a list of members of staff who have been allotted shares, the number of such shares, the capacity in which they work for the company and the number of years of service with the company.

All companies admitted to listing on the exchange must pay a listing fee as specified.

All clauses in the company's memorandum & articles of association that restrict the transfer of fully paid-up shares must be expunged.

All listed companies must advertise the notice of their annual general meetings in at least two widely read newspapers at least 21 days before the annual general meeting and such advertisement must be conspicuously placed to cover a reasonable portion of a page.

The subscription monies pending allotment and return of funds to subscribers must be deposited in a designated bank account appointed by the issuing house and the company.

All accrued interests in respect of cleared allotments must be paid to the company to offset part of the cost of the Issue.

Return monies arising from an unsuccessful application or abortion of an offer/issue attract interest at the rate determined by the commission.

4   CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

■   Define money laundering

■   Explain the main legal rules enacted in Nigeria to combat money laundering

■   Explain directors' responsibilities under Nigerian law

■   Explain in overview the regulatory role of the Securities Exchange Commission

■   Explain in overview the role of Nigerian Stock Exchange

CHAPTER

3

The financial management environment

Contents

1 The economic environment

2 International financial institutions

3 Other influences of government on business

4 The financial management framework

5 The financial markets

6 The money markets

7 Money market instruments

8 Chapter review

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

A	Financial environment and role of financial manager and money market institutions		
	1	**Financial environment and role of financial manager**	
		c	Evaluate the impact of macroeconomic environment and the role of international financial institutions in strategic financial management.
	2	**The nature and roles of financial markets and institutions**	
		a	Identify the nature and roles of money and capital markets, both nationally and internationally.
		b	Explain the roles of financial intermediaries.
		c	Explain the functions of stock market and corporate bond market.
	3	**The nature and roles of money markets**	
		a	Describe the roles of money markets in providing:
			i	short-term liquidity to private and public sectors, and
			ii	short-term trade finance.
		b	Explain the functions of banks and other financial institutions in the operations of money markets.
		c	Explain the characteristics and roles of the following principal money market instruments:
			i	interest-bearing instruments;
			ii	discount instruments; and
			iii	derivative products.
		d	Compare and contrast capital and money market operations.

Exam context

Companies operate within an economic and financial environment, and changes in the conditions within this environment can be important for financial management. This chapter provides a brief survey of factors that might need to be taken into consideration by companies, and that might affect the decisions that management take.

By the end of this chapter, you should be able to:

■ Explain how government has a profound influence on the economic environment through the exercise of fiscal and monetary policy

■ Explain further government influences

■ Explain the role of the capital markets

■ Describe the characteristics of government securities

■ List the participants in financial markets and comment on their roles (some of this was covered in chapter 2)

■ Explain the role of the money markets

■ Describe money market instruments

1 THE ECONOMIC ENVIRONMENT

Section overview

- Government economic policy and macroeconomic policy targets
- Economic growth and gross domestic product (GDP)
- Economic policy
- Fiscal policy and its effect on business
- Monetary policy and inflation
- Monetary policy and the exchange rate
- Monetary policy and business

1.1 Government economic policy and macroeconomic policy targets

Macroeconomics refers to economics at a national or international level, as distinct from microeconomics, which is the economics of individual firms and markets, and macroeconomic policy is formulated by the country's government. Macroeconomic policy, and changes in economic policy and economic conditions, can have important consequences for corporate objectives and management decisions.

In advanced economies, there are normally five main macroeconomic policy objectives:

- ❏ To achieve sustained real growth in the national economy
- ❏ To achieve 'full employment'
- ❏ Price level stability
- ❏ To achieve balance of payments equilibrium
- ❏ Income redistribution

Success in achieving and maintaining 'full' employment depends to a large extent on success in achieving sustained real economic growth.

1.2 Economic growth and gross domestic product (GDP)

Economic growth is measured by the rate of growth in economic activity each year within a country.

GDP can be measured in any of three ways:

- ❏ By the volume of output of goods and services, and other economic activity, each year: the output approach
- ❏ By the amount of income earned each year by individuals and organisations within the year (e.g. company profits and the wages and salaries of individuals): this is the income approach
- ❏ By the amount of spending in the economy each year: this is the expenditure approach

Total GDP should be the same in total using any of the three methods of measurement. However, the expenditure approach to measuring GDP is the most useful for the purpose of analysis. Using this approach the total value of

GDP within a given period, typically one year, can be expressed in the following formula:
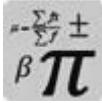
Formula: Gross domestic product (GDP)

$$GDP = C + G + I + (X - M)$$

Where:

C = Total annual consumption spending each year (by companies as well as individuals): this is spending on goods and services other than capital investment

G = Spending by the government (on consumption and investment by government)

I = Investment spending (other than investment spending by government)

X = The value of exports of goods and services M = The

value of imports of goods and services

(X – M) is the annual balance of trade for the country in international trade.

This formula shows that growth in GDP from one year to the next can be obtained through higher spending on consumption, higher government spending, more investment or an improvement in the balance of trade. However, growth is only achievable if an increase in C, G or I does not result in a matching fall in one of the other elements in the formula.

❑ For example the government might increase its annual spending by raising taxation. In raising taxation, it will reduce the spending power of individuals and companies, and as a consequence their might be a matching fall in consumption spending C or investment by companies I.

❑ Companies might want to increase investment spending, but to do so they will need to raise extra funds from somewhere. Funds for investment come from savings by individuals and organisations, and higher savings will result in less money for consumption.

GDP and inflation

The formula for GDP is a 'money' measurement that ignores inflation. There is a difference between:

❑ Growth in GDP in money terms and

❑ Growth in GDP in 'real' terms, which is growth after the effects of inflation have been removed.

For example, if GDP grows at an annual rate of 3% but the annual general rate of inflation is 2%, real growth in the economy is only 1%. If GDP grows at 3% but the rate of inflation is 5%, there will be 'negative growth' of about 2% in real terms (i.e. GDP will be about 2% less in real terms than in the previous year).

Government would be concerned about inflation for two reasons:

❑ It will want to achieve real growth in national income each year, not simply growth in 'money' terms.

❑　A high rate of inflation can have harmful effects on the economy and lead eventually to a fall in the rate of economic growth (and possibly economic recession).

There are several reasons why the government will try to prevent excessive inflation.

❑　Inflation results in a transfer of wealth within the economy in ways that might be considered unfair. Individuals on fixed incomes, such as many people with fixed pensions, will find that the real value of their income falls each year. Other members of society, such as owners of property, might benefit from rising asset prices.

❑　Inflation creates pressure for general cost increases. Employees will demand higher annual pay rises if the rate of inflation is rising. Higher employment costs might force employers to put up the prices of their goods and services, and at the same time avoid as many extra costs as possible – by making some workers redundant, perhaps, or by deferring investment spending.

❑　Experience has shown that a high rate of inflation, and high inflationary expectations, has the effect eventually of reducing real growth in the economy.

For the government, an economic policy objective to support the aims of growth in national income and full employment might therefore be to limit the rate of annual price inflation.

1.3　Economic policy

A government uses economic policy to try to influence economic conditions, with the objective of achieving sustained growth and full employment and restricting the rate of inflation. There are two main aspects of economic policy:

❑　Fiscal policy and

❑　Monetary policy.

1.4　Fiscal policy and its effect on business

Fiscal policy relates to government spending, taxation and borrowing.

The central government spends enormous amounts of money every year, and higher government spending increases GDP. However, government spending has to be financed, and the money is obtained from:

❑　taxation, and

❑　borrowing.

When the government plans an increase in its spending programme, it will probably seek to finance the higher spending, in full or in part, through higher taxation. Taxation is raised from a variety of sources, but the main sources of tax income are likely to be:

❑　The taxation of income of individuals

❑　The taxation of profits of companies

❑　Indirect taxation on expenditure, in the form of a sales tax or value added tax.

When the government spends more than it raises in taxes, it has to borrow the difference. In Nigeria, the main sources of borrowing for the government are:

❑ To obtain long-term finance, to issue government bonds through the Debt Management Office known as Sovereign bonds. This source accounts for the bulk of Nigeria's public debt.

❑ To obtain long-term finance, to borrow from multilateral sources (World Bank, African Development Bank etc.) and bilateral sources (China, etc.).

❑ To obtain short-term funding, to issue short-term financial instruments known as Treasury bills. (Treasury bills are a form of short term borrowing because the borrowed money is repaid when the bills are 'redeemed', usually after 91 days).

Fiscal policy and business

Fiscal policy affects business in a variety of ways.

❑ Companies might try to minimize their tax liabilities, possibly by transferring business operations to low-tax countries.

❑ The investment decisions by companies could be affected by tax. For example, the government might offer some tax relief for new investments, and companies will expect to receive tax allowances for capital investment.

❑ Spending decisions by customers could be affected by the rate of sales tax or value added tax. If the government increases the rate of value added tax, the volume of customer demand for the goods and services of companies will probably fall.

❑ Other tax changes can affect the rate of growth in the economy. For example, an increase in rates of income tax on individuals will reduce their spending ability.

If the government borrows by issuing bonds, investors will be attracted by the risk-free nature of investing in the bonds. (These bonds are regarded as risk-free because the government is most unlikely to default on its debts, especially when the debt is denominated in the national currency. If it needs to it can print more money to pay off its debts.)

Government borrowing might affect borrowing by companies. If companies also want to borrow by issuing bonds, they will need to offer a higher rate of interest to investors than the interest rate on government bonds, to persuade them to put their money in risky corporate bonds rather than risk-free government bonds.

1.5 Monetary policy and inflation

Monetary policy is policy relating to monetary issues in the economy, in particular:

❑ The rate of inflation

❑ Interest rates

❑ The exchange rate for the domestic currency against foreign currencies.

As explained earlier, there is a link between economic growth and the rate of inflation. Excessive inflation is associated with an 'over-heating' economy, leading to a slow-down in economic growth and possibly economic recession.

A major target of the government's monetary policy is likely to be control over inflation. This is currently the main objective of monetary policy, for example, in the US, the eurozone countries

and the UK. In these countries, interest rate policy is the main instrument of economic policy for controlling the rate of inflation. In Nigeria also, the Central Bank of Nigeria (CBN) uses the Monetary Policy Rate (the interest rate it charges when it lends to banks) as a major instrument of controlling inflation.

The link between interest rates and the rate of inflation can be summarised as follows.

In order to reduce the rate of inflation in the long term it is essential to reduce general expectations about what the future rate of inflation will be. Inflation will increase when inflationary expectations are high.

To reduce inflationary expectations, the authorities must be seen to take action to reduce inflationary pressures whenever these become evident. In the UK, USA and eurozone, the 'authorities' are the central bank.

The central bank can take action by raising the rate of interest at which it lends money to other banks. This rate of interest is sometimes called the 'central bank base rate'.

There is a 'transmission effect' in the economy, whereby the effect of the increase in the base rate works its way through to the rest of the economy. If banks have to pay more to borrow from the central bank, they will put up their interests rates to borrowers. In time higher costs of borrowing might reduce the demand by companies and individuals to borrow, and this in turn might reduce consumption spending.

❑ If spending in the economy is rising too quickly, and there is a risk of inflation, interest rates should therefore be raised. Higher interest rates will eventually discourage borrowing and the growth in credit, and so restrict the growth in spending

❑ If on the other hand the economy could grow more quickly without the threat of inflation, interest rates might be lowered, to stimulate spending and investment.

For companies, the implications of interest rate policy are perhaps fairly clear. If the central bank alters its rate of interest on lending to banks, this is likely to affect the rate at which companies can borrow from banks, and changes in the cost of borrowing might affect investment decisions.

1.6 Monetary policy and the exchange rate

Monetary policy can also affect the value of a country's currency. In general terms:

❑ Higher interest rates are likely to attract more investors into buying investments in the currency, and

❑ Lower interest is likely to persuade investors to sell their investments in the currency.

Changes in interest rates, by affecting supply and demand for the currency, can therefore alter its exchange rate value.

It would be possible for the government or central bank to make the exchange rate a key economic policy target, possibly with the aim of stabilising the value of the currency and encouraging international trade. However if the authorities use interest rates to manage the value of the country's currency in the foreign

exchange markets, interest rate policy cannot be used at the same time as a policy weapon for controlling inflation.

In the case of Nigeria, where a significant proportion of foreign exchange receipts come from oil, the exchange rate is largely a function of the price of oil in the international oil market. A rise in oil price and oil income leads to naira appreciation while a fall in oil receipts will bring about a depreciation of the naira in the long run (in the short run, to defend the value of the naira, the CBN usually intervenes using available foreign reserves).

1.7 Monetary policy and business

Businesses might be affected by the monetary policies of the government in a variety of ways.

❑ In the long term, businesses benefit from government control over the rate of inflation and restricted rises in prices, because real economic growth is likely to be greater.

❑ Changes in interest rates affect the cost of borrowing, and so profits. Higher interest rates on long-term finance might deter companies from making some new investments, which will result in a reduction in their capital spending.

❑ Changes in interest rates might affect spending by customers. For example, higher interest rates might reduce consumer spending, and so make it more difficult for companies to sell their goods and services.

❑ Changes in the exchange rate affect companies that sell goods to other countries or buy from suppliers in other countries.

- If there is a fall in the value of the currency, the products of exporting companies become cheaper to foreign buyers and export demand should increase. However, the cost of imported goods, priced in other currencies, will rise. This could lead to an inflationary spiral as higher costs lead to higher prices and higher wage demands.

- If there is an increase in the value of the currency, the products of exporting companies become more expensive to foreign buyers and export demand is likely to fall. The cost of imported goods, priced in other currencies, will fall. This will reduce the costs for companies of purchases from abroad, but could also increase the market competition from imported goods.

In your examination, you might be required to consider the implications for a company of a change in economic conditions, or a change in economic policy by the government, by considering how a company might be affected by the change and respond to it.

2 INTERNATIONAL FINANCIAL INSTITUTIONS

Section overview

- The World Bank
- The International Monetary Fund (IMF)
- Central banks
- Central Bank of Nigeria (CBN or "the Bank")
- The Federal Reserve (The Fed)
- European Central Bank

2.1 The World Bank

The international capital and money markets are accessible for governments of many countries and large companies. However, they are not accessible to governments and companies in many developing countries or to governments of under-developed countries.

However, unless under-developed countries and developing countries can improve their infrastructure of transport and communication systems and standards of education, foreign companies might be reluctant to invest in new capital projects. Before companies invest large amounts of capital, governments therefore need to invest heavily in their economic infrastructure.

The difficulties of developing countries in gaining access to capital have been recognised, and a role of the World Bank is to provide loan finance to countries in need of capital. In practice, this means lending to developing countries, subject to certain conditions (such as the requirement for the borrowing country to maintain strict discipline over its economic policies).

The objective of the World Bank is to promote long-term economic development and reduce poverty, by providing technical and financial support to help countries reform particular sectors of their economy and implement specific projects such as building schools, providing water and electricity and protecting the environment.

Financial support provided to countries by the World Bank is generally long-term, and the World Bank obtains funding to provide this financial assistance:

❑ from contributions by governments of wealthy countries; and

❑ by issuing bonds in the international bond markets.

Even so, the funds provided by the World Bank are insufficient to meet the total needs of developing and under-developed countries.

The World Bank consists mainly of two institutions:

❑ the International Bank for Reconstruction and Development (IBRD)

❑ the International Development Association (IDA).

International Bank for Reconstruction and Development (IBRD)

The IBRD provides financial assistance to 'middle income' countries and creditworthy poorer countries. This financial assistance is in the form of loans to pay for projects that:

❑ will reduce poverty and promote sustainable economic growth, and

❑ private sector companies will not finance.

The IBRD obtains most of the finance for its loans from money raised through issues of bonds by the World Bank. The loans are repayable.

International Development Association (IDA)

The IDA provides assistance to poorer countries in the form of interest-free loans and grants (known as 'credits'). Interest-free loans are repayable over a period of about 35 – 40 years, often with a grace period of ten years during which no repayments at all are made. Grants and loans are provided for projects relating to health, education, infrastructure development and similar purposes.

Some examples of IDA projects in recent years are as follows:

❑ In Nicaragua, finance was provided to restore a section of the Pan American Highway, and other roads, after severe devastation by Hurricane Mitch.

❑ In Bangladesh the IDA has provided finance for the building of a number of secondary schools for girls.

❑ In Vietnam, finance was provided to improve electricity supply.

2.2 The International Monetary Fund(IMF)

The International Monetary Fund (IMF) was established in 1944 as an international organisation with member countries.

Finance for the IMF comes from quota subscriptions by member countries, which are denominated in Special Drawing Rights or SDRs. The maximum amount of temporary financing that a company can obtain from the IMF is related to the size of its quota subscriptions.

The role of the IMF is to oversee the global financial systems, in particular:

❑ to improve international monetary co-operation;

❑ to promote exchange rate stability;

❑ to help countries to achieve balance of payments and facilitate in the country's development through influencing the economic policies of the country in question foster economic growth; and

❑ provide temporary financial assistance to countries with balance of payments difficulties.

Temporary loans and austerity

The IMF can grant temporary loans, from member states' deposits, to countries facing severe financial and economic difficulties. These temporary loans are often offered with different levels of conditions or austerity measures. The IMF believes that in order to regain control of the balance of payments, the country should take action to reduce the level of demand for goods and services.

To achieve this, the IMF often requires countries to adopt strict austerity measures such as reducing public spending and increased taxation, as conditions of the loan. It believes these conditions will help control the inflationary pressures on the economy, and reduce the demand for goods and services. As a result, this will help the country to move away from a position of a trade deficit and achieve control of its balance of payments.

However, these deflationary pressures may cause standards of living to fall and unemployment to rise. The IMF regards these as short-term hardships necessary to help countries sort out their balance of payment difficulties and international debt problems.

The IMF has faced a number of criticisms for the conditions it has imposed, including the accusation that its policies impact more negatively on people with lower or mid-range incomes, hinder long-term development and growth, and possibly result in a continuous downward spiral of economic activity.

2.3 Central banks

A central bank is an institution that manages a state's currency, money supply, and interest rates. They also usually oversee the state's commercial banking system.

Examples include:

❑ the Central Bank of Nigeria

❑ the Federal Reserve of the United States; and

❑ the European Central Bank (ECB).

2.4 Central Bank of Nigeria (CBN or "the Bank")

The CBN has overall control and administration of the monetary and financial sector policies of the Federal Government (The CBN Act of 2007 of the Federal Republic of Nigeria).

The objects of the CBN are as follows:

❑ ensure monetary and price stability;

❑ issue legal tender currency in Nigeria;

❑ maintain external reserves to safeguard the international value of the legal tender currency;

❑ promote a sound financial system in Nigeria; and

❑ act as Banker and provide economic and financial advice to the Federal Government.

The Bank is responsible for ensuring high standards of banking practice and financial stability through its surveillance activities of Nigerian banks and other financial institutions as well as the promotion of an efficient payment system.

In addition to its core functions, CBN has also performed major developmental functions, focussed on all the key sectors of the Nigerian economy (financial, agricultural and industrial sectors).

2.5 The Federal Reserve (TheFed)

The Federal Reserve (almost always referred to as "the Fed") is the central bank of the United States of America.

The Federal Reserve was founded by an act of congress in 1913. Its responsibilities have evolved since then to include the following:

❑ To serve as the central bank for the United States

❑ To maintain the stability of the financial system and contain systemic risk in financial markets

❑ To deal with crises in the banking system

❑ To supervise and regulate banking institutions

❑ To protect the credit rights of consumers

❑ To manage the nation's money supply through monetary policy.

❑ To act as a lender of last resort.

❑ To provide financial services to depository institutions, the U.S. government, and foreign official institutions, including playing a major role in operating the nation's payments system

❑ To strengthen U.S. standing in the world economy

Central bank

In its role as the central bank of the United States, the Fed serves provides banking services to US banks and other financial institutions and to the government.

As the government's bank, or fiscal agent, the Fed processes a variety of financial transactions involving trillions of dollars. The U.S. Treasury keeps an account with the Federal Reserve, into which are paid federal tax deposits. The account is used to make federal government payments.

The Federal Reserve is the lender of last resort in The USA. This means that it can provide credit to institutions unable to obtain credit elsewhere, the collapse of which might harm the US economy. Support is not automatic, for example in the 2008 banking crisis:

❑ the Fed authorised an $85 billion loan to prevent bankruptcy of international insurance giant American International Group (AIG); but

❑ it declined to support Lehman Brothers, a financial institution of long standing which was consequently forced to wind up.

Monetary policy

The term "monetary policy" refers to the actions undertaken by a central bank to influence the availability and cost of money and credit to help promote national economic goals. The Fed is able to influence the

The Fed is able to influence the federal funds rate. (This is the interbank lending rate – the rate that banks charge each other for loans). The following are the three main tools used to do this:

❑ Open market operations: purchase and sale of U.S. Treasury and federal agency securities;

  ❑ Discount rate: The interest rate charged to commercial banks and other financial institutions on loans from the Fed's regional lending facility (known as the discount window);

  ❑ Reserve requirements: The amount of funds that a bank must hold in reserve.

2.6 European Central Bank

The European Central Bank (ECB) is the central bank for the euro and administers monetary policy of the Eurozone. The Eurozone consists of 19 EU member states and is one of the largest currency areas in the world.

The primary objective of the ECB is to maintain price stability within the Eurozone. Its basic tasks are to define and implement the monetary policy for the Eurozone, to conduct foreign exchange operations, to take care of the foreign reserves of the European System of Central Banks and operation of the financial market infrastructure for settlement of securities in Europe.

The ECB has the exclusive right to authorise the issue of euro banknotes.

3   OTHER INFLUENCES OF GOVERNMENT ON BUSINESS

Section overview

- Introduction
- Competition policy
- Government assistance for business
- Green policies
- Corporate governance regulations

3.1   Introduction

Government can influence the activities and performance of businesses in other ways, in addition to the effects of fiscal policy and monetary policy. The following are specific areas where planning and decision-making by companies might be affected by government policy and regulation:

❑   competition policy;

❑   government assistance for business;

❑   green policies;

❑   corporate governance regulations.

3.2   Competition policy

The government might have laws or regulations for preventing anti-competitive actions by companies.

There might be rules preventing the creation of 'monopolies'. A monopoly is a company that is so large that it dominates the industry and market in which it operates.

There are some advantages for society in having monopolies, when a company needs to be very large in order to benefit fully from 'economies of scale' that reduce the costs of output products or services. Some of the benefits of lower costs for the producer might be passed on to customers in the form of lower prices. It has been argued that monopoly supply is necessary in utility industries, such as the provision of water, gas and electricity supplies.

Adverse consequences of monopoly

Monopolies are often considered 'undesirable' because they are often able to control prices and output of goods and services to a market. For example, a monopoly might be able to restrict the supply of goods or a service to a market and in doing so might be able to raise prices. This will boost the company's profits at the expense of its customers. In a more competitive market, supply is not restricted and prices are more competitive and 'fair'.

It is also possible that when a company holds a monopoly position in its market, it has no incentive to innovate and develop new products, because there is no competition creating pressures for product development. There is also no incentive to improve managerial and operational efficiency in a monopoly.

Government regulation of monopolies

A government might try to regulate and control monopolies and other anti- competitive behaviour by companies in several ways.

❑ One way of regulating monopolies is to establish a government body with the power to investigate and, if necessary, prevent proposed mergers or takeovers. Proposed mergers or takeovers that would create a monopoly might be prohibited, or allowed subject to certain conditions (such as a requirement that the merged company must sell off parts of its business to prevent the creation of a monopoly).

❑ In addition, if a company grows to such a large size that it might become a monopoly the government might order that the company should be broken up into several smaller companies.

The government might also prohibit anti-competitive practices by companies, and give a government body powers to investigate cases where anti-competitive practices are suspected. An example of such a practice is a **cartel arrangement** between companies, whereby all the companies in the cartel reach a secret agreement to:

❑ Restrict the supply of goods to the market, and 'divide' the market between themselves in agreed shares, and

❑ Control the prices charged to customers by charging the same price and avoiding price competition.

In the UK, the Competition Commission has powers to investigate proposed mergers and takeovers, existing monopolies and suspected cartel arrangements. In some cases, UK companies might be deterred from making a takeover bid for a rival company because of the expectation that the takeover will be investigated and then prohibited by the Competition Commission.

In Nigeria, the regulation of mergers and takeovers is the responsibility of the Securities and Exchange Commission.

3.3 Government assistance for business

The government might provide aid to companies in particular industries, or companies investing in particular parts of the country (such as development areas).

❑ Cash grants might persuade a company to invest in a country or region where they are available, rather than in other areas where they are not.

❑ In some cases, there might be competition between the development agencies in different countries to offer grants to foreign companies in order to persuade them to invest in their country.

3.4 Green policies

Companies might make profits because they do not have to take account of the full economic cost of their activities. The economic cost of business activity includes not only the direct costs of the business operations but also social costs. Social costs include the costs of damage to the environment and the costs of having to clean up waste and pollution created by business activities. These costs created by companies are sometimes referred to as '**externalities**'.

Many of these social costs are paid for by government, and so are paid by the taxpayer, but there is a growing recognition of these costs in some countries, where the government has developed 'green policies' aimed at either:

❑ reducing the amount of social costs or externalities, or

❑ making companies pay for the social costs they incur.

The government might therefore have a range of 'green' policies for the protection of the environment and promotion of 'sustainable business'. These include policies for:

❑ The prevention or reduction of pollution of the air, land or water (rivers and seas)

❑ Protection of natural resources such as deep sea fish stocks or hardwood timber forests

❑ The development of 'cleaner' and environmentally-friendly energy sources.

Many companies have been directly affected by 'green policy' legislation or regulations, and it seems inevitable that regulation will become more extensive and more restrictive over time, and that companies will react to the new regulations in the most appropriate way to protect their interests. Examples of ways in which companies might need to react include:

❑ Investing in technology that reduces pollution from factories and other manufacturing centres

❑ Developing products or packaging that are more 'environmentally friendly, such as robust biodegradable packaging materials

❑ Trading in 'carbon credits' in industries where these apply. Companies that create excessive levels of pollution might be able to avoid fines or penalties from the government by purchasing carbon credits in the market (a market that has been in existence for only a few years so far).

In addition if companies have to pay for the environmental costs they incur, these costs will be reflected in product prices charged by the companies. Product prices should therefore reflect more fairly their full economic cost.

3.5 Corporate governance regulations

Government might respond to serious financial mismanagement in companies with more regulation and restrictions on corporate activity.

Bad corporate governance might result in financial mismanagement which then might lead on to a corporate scandal and possibly the collapse of the company.

The initial demand for better corporate governance in the UK was prompted by financial scandals in several companies, including the Mirror Group Newspapers and Polly Peck International in the 1980s, which threatened to destroy investor confidence in the stock market.

Similarly the Sarbanes-Oxley Act was passed in the USA in 2002 as a result of several corporate scandals, including Enron and WorldCom, two of the largest corporations in the world at the time. The aim of the legislation was not only to prevent similar scandals in the future, but to restore confidence to the stock markets.

Also, the consolidation of the banking industry in Nigeria necessitated the issue of a code of corporate governance for banks post consolidation effective April 2006. In order to address weaknesses and improve the mechanisms for

enforcing its code of corporate governance issued in 2003, the SEC of Nigeria issued a revised code applicable to all public companies effective April 2011.

There are pressures for greater regulation of banks, particularly in the USA and Europe, following the 'sub-prime mortgage' lending scandal in 2007, as a result of which banks lost billions of dollars and some required financial support from the authorities or had to raise new equity finance to restore their capital. There is a view that stricter regulation is needed to restore confidence and liquidity in the lending markets.

4   THE FINANCIAL MANAGEMENT FRAMEWORK

Section overview

- Businesses and sources of finance
- Financial intermediaries
- The trade-off between risk and return

4.1   Businesses and sources offinance

Businesses raise new finance to invest. Long-term finance is needed to invest in long-term assets and working capital. Short-term finance might be needed to help with cash flow problems, and to ensure that the entity has enough funds to pay its suppliers and liabilities on time. Finance has a cost, because the providers of finance to a company expect a return on their investment.

Financial management involves deciding how to raise additional finance, and for how long, and ensuring that the providers of finance receive the returns to which they are either entitled (in the case of lenders) or which they expect (in the case of shareholders). Financial managers therefore need to have an understanding of the financial markets.

The main sources of new finance for companies include:

❑   Banks which might provide short-term lending facilities such as an overdraft or longer-term loan;

❑   The capital markets;

❑   The money markets.

4.2   Financial intermediaries

Borrowers of finance include companies, governments and individuals that need to raise money. Providers of finance are individuals, companies and other organisations with surplus funds to invest. Although it is possible for borrowers to obtain funding directly from an investor, it is usual for borrowers and investors/lenders to be brought together by financial intermediaries in the financial markets.

A financial intermediary is a person or organisation that operates between savers (investors) and borrowers. Their role is to re-direct the funds of savers and investors to the individuals and organisations that need to obtain finance.

Without financial intermediaries, it would be difficult for businesses to find individuals willing to provide all the money they need, for the length of time that they need it and at a cost they are willing to pay.

Banks as financial intermediaries

Banks are financial intermediaries. They take deposits from customers, and lend this money to other customers in the form of bank loans and bank overdrafts. If a company needs to borrow, it can go to a bank (the intermediary), instead of having to find an individual or an organisation with spare funds for lending.

Banks are important financial intermediaries because:

❑ They are a major source of debt finance for many companies and individuals

❑ They also create new credit.

The role of banks in credit creation is unique. Suppose that banks receive new customer deposits of ₦1 million. The banks can re-lend some of this money, but will hold some in the form of cash or near-cash investments, to cover the possibility that some of the deposits will be withdrawn. When banks lend money, this money becomes new customer bank deposits. In other words, by lending money, banks create more bank deposits, which can be lent. The new money that is lent becomes more new bank deposits, which can also be lent.

In performing an intermediary role, banks perform several functions.

❑ They are able to accept small deposits from customers and lend in much larger amounts to borrowers. Without banks, loans in large amounts would be difficult to obtain.

❑ Banks also to provide **maturity transformation**. Many bank deposits are short-term in nature and deposits can be withdrawn on demand or by giving only short notice. On the other hand, many borrowers want loans for several years – far longer than most customers are willing to keep deposits or savings accounts. Banks are able to accept short-term deposits and lend to borrowers over longer terms. In other words, short-term deposits are transformed by banks into longer-term loans.

❑ Banks also provide **risk transformation** for savers. If an individual lent money directly to a borrower, the individual would be faced with the risk of default by the borrower. However, if an individual deposits money with a bank and the bank re-lends the money to a borrower, the bank would be exposed to the credit risk from the borrower. The individual's credit risk would be limited to the risk of insolvency of the bank. Generally, this risk is much lower.

Banks are an important source of finance for all types of business and all sizes of business. In the case of small businesses, bank loans and overdrafts (and possibly lease finance) are the only readily-available source of borrowed capital.

Other financial intermediaries

The term 'financial intermediary' can be used to describe any person or organisation that brings together investors and individuals or organisations seeking to raise funds. In this sense, financial intermediaries include:

❑ Some investment banks and commercial banks, that deal in the capital markets with investors (buying and selling shares or bonds in the 'secondary' markets)

❑ Stock markets, which provide a market place for trading in shares.

Summary of major functions of financial intermediaries

The following functions are performed by financial intermediaries.

(a) **Go-between**

Firms with economically desirable projects might want funds to finance these projects, but might not know where to go to find willing lenders. Similarly, savers might have funds that they would be willing to invest for a suitable return, but might not know where to find firms which want to borrow and would offer such a return. Financial intermediaries are an obvious place to go to, when a saver has funds to save or lend, and a borrower wants to obtain more funds. They act in the role of go-between, and in doing so, save time, effort and transaction costs for savers and borrowers.

(b) **Maturity transformation**

Lenders tend to want to be able to realise their investment and get their money back at fairly short notice. Borrowers, on the other hand, tend to want loans for fixed terms with predictable repayment schedules. Financial intermediaries provide maturity transformation, because savers are able to lend their money with the option to withdraw at short notice, and yet borrowers are able to raise loans for fixed terms and with a predictable repayment schedule. Financial intermediaries such as banks and

building societies are able to do this because of the volume of business they carry out.

(c) **Risk transformation**

When a lender provides funds to a borrower, he must accept a risk that the borrower will be unable to repay. Financial intermediaries provide risk transformation. When a saver puts money into a financial intermediary, his savings are secure provided that the intermediary is financially sound. The financial intermediary is able to bear the risks of lending because of the wide portfolio of investments it should have.

(d) **Parcelling up**

Borrowers tend to want larger loans than individual savers can provide. For example, a firm might want to borrow ₦10,000, but the only savers it finds might be able to lend no more than ₦1,000 each so that the firm would have to find ten such savers to obtain the total loan that it wants. Financial intermediaries are able to 'parcel up' small savings into big loans, so that the discrepancy between small lenders and large borrowers is removed by the intermediary.

4.3 The trade-off between risk and return

When investors put money into financial investments, they expect to receive a return on their investment. In most cases, they also expect to accept some investment risk. Investment risk is the risk that returns will not be as high as expected.

For example:

❑ An investment might fall in value, as well as rise in value; for example, shares can go up or down in price;

❑ The investment will lose all its value, for example if a company goes into liquidation, there is a risk that shareholders will lose their entire investment;

❑ Borrowers will not repay what they owe in full or on time. For example, if a company goes into liquidation, its bondholders will not be repaid in full, although there might be some receipts from the sell-off of the collapsed company's assets.

❑ Investors in bonds rely on the creditworthiness of the bond issuer. Some bond issuers are more creditworthy than others, and so the investment is less risky.

In the case of equities, investors buy shares hoping for some dividends out of the profits each year, and for some increase over time in the share price. Equity returns are therefore a combination of dividends and capital gain. However, unprofitable companies might pay no dividends, and share prices might fall.
Equity investors can therefore face a substantial risk of negative returns.

As a general rule, investors will demand a higher return for putting their money into higher-risk investments. Each investor has his own preference for risk and returns, and will build an investment portfolio that appears to provide a suitable balance or 'trade-off' between risk and return.

The same principle applies to interest rates on bank loans. Banks will charge a higher rate of interest on loans where they consider the credit risk to be higher. Therefore:

❑ The interest rate on secured loans will be lower than the rate for unsecured loans to the same borrower

❑ The interest rate on a subordinated loan will be higher than the rate on a senior loan to the same borrower. (A subordinated loan ranks below a senior loan in the right to payment of interest, and the right to repayment out of selling the borrower's assets in the event of the borrower's default and liquidation).

Financial managers should be interested in risk and return in financial investments, and the risks and returns from the financial markets (for example, the equity markets) as a whole. However, financial managers do not concern themselves with the investment decisions of investors, and how individual investors make the trade-off between risk and return in their personal investment portfolio.

Separating the risk and return characteristics of market investments from the individual investment decisions of investors (and their individual preferences for risk and return) is known as the **Separation Theorem**.

A guide to the risk in capital instruments is as follows:

Risk level	Instrument	Comment
Highest risk	Equities	Risk of lower dividends and a falling share price.
		If the company goes into liquidation, equity shareholders are the last in line for payment from the sale of the company's assets.
		Shareholders are not entitled to any dividend unless there are distributed profits available after paying all interest obligations and any dividend payment obligations to preference shareholders.
High risk	Junk bonds	Bonds issued by companies that are considered a high credit risk. Junk bonds have a 'sub-investment grade' credit rating. A high interest yield is required to compensate investors for the high risk of default.
	Corporate bonds with an investment grade rating	Bonds issued by companies with a higher credit rating are 'investment grade rating'. Top-rated bonds are 'triple-A rated' (credit rating AAA).
		The better the credit rating, the lower the credit risk and the lower the yield paid to bondholders.
Low risk	Government bonds	Bonds issued by a government in their own currency, such as Nigerian Treasury Bills and Sovereign Bonds, gilts issued by the UK government or Treasuries issued by the US government, are considered risk-free. Investors consider the risk of default by the issuer to be zero.
		The interest yield on domestic government bonds of a government in a stable economy is therefore considered 'risk free'. In financial management, we refer to this interest yield as the 'risk-free rate of return'.

5 THE FINANCIAL MARKETS

Section overview

- Introduction
- Capital markets
- Characteristics of quoted government securities
- Participants in the capital markets

5.1 Introduction

The financial markets bring together organisations and individuals wishing to obtain finance and organisations and individuals wishing to invest.

In addition to the bank lending markets, the financial markets can be classified as capital markets or money markets.

The capital markets can be classified into:

❑ Equity markets; and

❑ Bond markets.

5.2 Capital markets

Capital markets are financial markets for primary issues and secondary market trading in long-term investments: equities and bonds. The capital markets are both national ('domestic') and international.

Many countries have at least one stock market. Although some bonds might be traded on stock markets, the main purpose of stock markets is to trade in shares of companies.

There is a **primary market** and a **secondary market** for shares.

❑ The primary market is used by companies to sell shares to investors for the first time, for example by issuing new shares to raise cash. The primary capital markets are therefore a source of new long-term capital for companies, governments and other organisations.

❑ The secondary market is used by investors to sell shares that they own, or to buy shares that are already in issue.

A successful primary market relies on a large and liquid secondary market, because when investors buy shares in the primary market, they want to know that they can sell their investment at any time at a fair market price.

Functions of a stock market

A stock market is a market place for buying and selling shares in companies that apply to have their shares traded on the exchange and whose application is accepted. It acts as both a primary market and a secondary market for shares.

In Nigeria, companies must obtain a listing for their shares and also apply to have their shares traded on the stock exchange. The major stock exchanges trade shares of domestic companies (companies registered in the same country) but also the shares of some international companies.

The **international stock markets** therefore consist mainly of national stock exchanges that also trade shares of some foreign companies. However the New York Stock Exchange owns Euronext which in turn owns the national stock exchanges of France, Belgium and the Netherlands.

The main functions of a stock exchange are to:

❑ Provide a system in which shares can be traded in a regulated manner.

❑ Enforce rules of business conduct on market participants, to ensure fair dealing.

❑ Ensure that there is an efficient system for providing new financial information about companies to investors in the market.

❑ Provide a system for recording information about the prices at which shares are bought and sold, and providing share price information to participants in the market.

The bond markets

There are also **domestic bond markets**. Bonds are debt instruments issued by governments, government agencies, international organisations and companies. Most bonds are issued for a fixed period of time (maturity) after which they are redeemed by the issuer, usually at their face value. During the time they are in issue, the issuer pays interest to the bondholders, usually once, twice or quarterly in each year at a fixed rate of interest.

Investors can trade the bonds in a secondary bond market, and so invest or disinvest at any time of their choosing.

In the US, the largest bond market is for US government bonds (Treasuries), but there is also a large and active market for corporate bonds, which are bonds issued by companies. In the UK, there is a large bond market for UK government bonds (gilts) but only a very small domestic market for corporate bonds.

As in the UK, the bond market in Nigeria is dominated by government bonds mainly federal government and some state bonds (Lagos, Edo, Delta, Imo, Rivers, Ogun have issued bonds at one time or the other). The size of corporate bonds is very small as only a few companies (mainly banks, Zenith, GTBank) have issued corporate bonds.

There are **international bond markets**. (At one time, these bond markets were called the 'eurobond markets'.) The international bond markets are used by large companies, governments and international organisations to issue bonds, usually in a major currency (US dollars or euros). The markets are organised by international investment banks. These banks advise issuers and organise the selling of the bonds to investors. Nigeria issued its first Eurobond in January 2011 ($500million) and another $1billion Eurobond in 2013.

International bonds are also traded in a secondary market, although much of the trading is arranged by telephone and e-mail. There is also an electronic trading platform for trading bonds electronically.

The bond markets are not accessible to small companies. The international bond markets are used by governments and very large companies to issue bonds denominated mainly in either US dollars or euros (although bonds in other currencies such a Japanese yen, Swiss francs or British pounds might occasionally be issued). Smaller non-US companies are able to borrow in the US corporate bond market, by issuing bonds denominated in dollars. However, foreign companies need to be fairly large and well-established to persuade US investors to buy their bonds.

5.3 Characteristics of quoted government securities

The characteristics of government securities quoted on the Nigerian Stock Exchange are discussed under the following headings:

Issuing prices

These are usually in units of ₦1,000 and at so much percent. The ₦1,000 represents the nominal or par value of the security.

Interest

Each government security usually has a rate of interest attached to it at the time of issuance. This is referred to as the nominal rate of interest (also called coupon rate).

This coupon rate may be fixed or variable. If it is fixed, it means the issuer guarantees a fixed amount of interest every year payable usually, twice a year.

If it is variable, it means the interest rate will be linked to movement in a particular market index such as the CBN monetary policy rate (MPR) but with a floor rate and a ceiling rate.

Example: Variable rate bond

A state revenue bond is issued at a coupon rate of 4½% above the MPR of 10% (with a maximum rate of 18%).

The floor rate will be 14½% and the ceiling rate will be 18%.

Investors in this bond are protected against interest rate risk although not against inflation risk if interest rates do not adjust fully for expected inflation

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Yield

This is the market rate of interest and the driving force for the market price (real value) of all quoted fixed - interest government securities.

The higher the yield or market interest rate the lower the value of a quoted fixed interest bond and vice versa.

For example, if investors feel that a fair rate of interest for investing now in long- term government securities is 20%, a previously issued State Revenue Bond with a fixed coupon of 10% and par value of ₦1000, will now be worth ₦500. Thus, a prospective investor in this particular bond will now pay ₦500 per unit.

Example:

Investors decide that a fair rate of interest for investing now in long- term government securities is 20%.

If a government issued a bond with a nominal value ₦1000 and a fixed coupon of 10% it would raise ₦500.

(The prospective investors would anticipate an interest stream of ₦100 per annum and set a price such that this interest stream would be 20% of that price.

Return

Return comprises both interest actually received during the period the security is held plus capital appreciation.

It is mathematically expressed as:
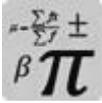
> **Formula: Annual return on a security**
>
> $$R = \frac{I + (P_1 - P_0)}{P_0} \times 100$$
>
> **Where:**
> I = interest receipts
> P_1 = value of bond at the end of the year P_0 =
> value of bond at the start of the year

Redemption

Repayment of the nominal amount borrowed by the government will be made at a specified future date (say 2020) or within a specified future period (2020-2025).

Where government bonds are undated, these bonds will probably never be repaid as the government has no obligation to repay by a specific date and repayment will depend on sharply falling interest rates when new issues could be made at a lower coupon on the same nominal value.

Repayment of a state bond is usually based on the issue of an Irrevocable Standing Payment Order (ISPO) which serves as a first charge upon (and is payable out of) the state's statutory allocation.

Advantages and disadvantages of investing in government bonds

Advantages

❑ Security of capital: Capital is usually secured as it is backed by the Federal or State government as the case may be. Also, as a bond approaches its repayment date, the market value will not fluctuate so much from its par value.

❑ Security of income: Income is also secured as default in paying interest is not expected from government

❑ Liquidity: Being a quoted security, there is a market where disposal can take place if there is need for cash

Disadvantages

❑ Risk: Being a quoted security, the bond has a price that could fluctuate.

❑ Inflation: Both income streams and capital values may be eroded by inflation.

5.4 Participants in the capital markets

The participants in the capital markets are those who are actively involved in the purchase and sale of stocks and shares and those institutions that are involved as regulatory authorities.

They include in the main:

❑   Individuals and companies;

❑   Banks and other financial institutions;

❑   Issuing houses;

❑   Stockbrokers;

❑   The Nigerian Stock Exchange (NSE) (covered in chapter 2);

❑   Securities and Exchange Commission (SEC) (covered in chapter 2); and

❑   Central Bank of Nigeria (CBN).

❑   Registrars

❑   Fund/Portfolio managers

❑   Receiving bankers

❑   Trustees

❑   Capital market consultants

❑   Central Securities Clearing System

Individuals, companies etc.

Individuals, companies, banks other financial institutions (insurance companies, unit trusts, finance houses) participate in the financial markets either as buyers or as sellers of securities.

Issuing houses

Issuing houses act as financial intermediaries in:

❑   The pricing of new issues (along with the issuing company);

❑   Underwriting of securities;

❑   Bringing new issues to the market;

❑   Determining the timing of new issues (subject to the approval of SEC).

❑   Performing specialist activities; and

❑   Providing financial advisory services.

Stockbrokers

Stockbrokers act as agents on behalf of buyers and sellers of securities on the stock market and collect commission called "brokerage". Investors can only buy or sell through stockbrokers who are licensed to represent them and trade on the Stock Exchanges.

Stockbrokers also provide professional advice on the selection and management of investments and assist project sponsors to raise money on the capital market.

Central Bank of Nigeria

The CBN operates mainly in the money markets and has a number of roles including:

❑ Managing the interest rate;

❑ Safeguarding the nation's economy against depreciation of the value of the naira; and

❑ Managing inflation.

❑ Responsible for financial system stability (money and capital market).

Registrars

Registrars:

❑ Keep the register of members of a company and effect appropriate changes in the register.

❑ Issue share certificates, effect payment of return/surplus monies (monies for rejected applications.

❑ Prepare and dispatch dividend and interest warrants, distribute Rights circulars, dispatch annual reports/accounts/notices of meetings.

❑ Verify certificates for purposes of sale and dispatch certificate to new investors.

Fund/Portfolio Managers

Fund/Portfolio managers perform advisory and investment services to their clients i.e. manage funds and portfolios on behalf of investors. In the process, they determine securities to transact in on behalf of their clients and also publish financial market periodicals to guide investors.

Receiving bankers

Receiving bankers receive and keep custody of proceeds of the public offers until disbursed to the Issuer by the Issuing house in accordance with the rules.

Trustees

Trustees:

❑ Monitor activities of fund managers on behalf of and in the interest of investors.

❑ Keep custody of assets (funds and documents) relating to Trusts for which they are appointed.

❑ Monitor the register of unit/note holders or contributors in a collective Investment scheme.

❑ Ascertain profitability of investments and the rationale behind investment decisions of Fund/investment managers as well as their compliance with relevant statutory provisions and Trust Deeds.

❑ Ensure that monthly and other mandatory periodic returns/reports are filed with SEC.

Capital Market Consultants

The *solicitor to the company* ensures that necessary resolutions are passed by the board of the Issuer; ensures that other necessary legal documents are prepared as appropriate and when needed.

The *solicitor to the offer* protects the interest of investors in any offer. He drafts relevant agreements e.g. trust deed, underwriting and vending agreements, etc. in consultation with the issuing house and other stakeholders. He verifies all legal documents supplied by other parties to an offer. He generally ensures that the offer fully complies with all regulatory requirements.

The *reporting accountant* reviews issuers audited accounts or statement of affairs and prepares reports addressed to the directors of company and for the attention of the issuing house(s). In that report, he is expected to express his professional opinion on the adequacy of the audited financial statements and the forecasts reviewed by him.

Central Securities Clearing System

Exchanges also act as the clearing house for each transaction, meaning that they collect and deliver the shares, and guarantee payment to the seller of a security. This eliminates the risk to an individual buyer or seller that the counterparty could default on the transaction.

In Nigeria, the *Central Securities Clearing System (CSCS)* is responsible for clearing and settlement of securities traded on the exchange. It also currently serves as a depository for dematerialized securities i.e. a reservoir of securities whose certificates have been verified and ready for transaction upon the mandate of the true owner.

6 THE MONEY MARKETS

Section overview

- Definition of the money markets
- Purpose of the money markets
- The inter-bank market
- The repo market
- Comparison of the repo market and inter-bank market

6.1 Definition of the money markets

The money markets are wholesale markets for dealing in short-term lending and borrowing and for trading short-dated financial instruments.

❑ 'Wholesale' markets are markets for large-value transactions.

❑ Short-dated financial instruments are financial instruments that have one year or less to maturity when they are issued. They include Treasury bills, bills of exchange, commercial paper and certificates of deposit (CDs). The repo market, which is one of the money markets, also deals in short-dated bonds (bonds with a short time remaining to maturity) as well as other money market securities.

The main money markets are:

❑ The inter-bank market; and

❑ The repo market.

There are international money markets for all the main currencies. For example, London is a major money market centre which operates large money markets in US dollars, euros, yen, Swiss francs and Canadian dollars as well as sterling.

Examples of instruments traded in the Nigerian money market include, treasury bills, Central Bank of Nigeria (CBN) certificates, commercial bank deposits, certificate of deposit (negotiable and non-negotiable), bankers' acceptances (BAs) and Commercial Papers (CPs).

6.2 Purpose of the money markets

The main purpose of the money markets is to provide:

❑ Short-term liquidity to entities needing money; and

❑ Short-term investment opportunities for entities with surplus liquidity.

Banks are the most active participants in the money markets, but some large companies also have direct access to the markets. Smaller companies and individuals might be offered an opportunity by their bank to borrow or lend at money market interest rates, and their access to the money markets is made through the bank. This means that companies are able to borrow or deposit money short-term in the money markets through their bank. When they participate through their bank, they can borrow or lend much smaller amounts of money than the normal size of money market transaction.

Money markets also provide ready access to short-term borrowing and lending opportunities in foreign currency. This is important for companies involved in

international trade that need short-term finance for transactions involving a foreign currency.

FMDQ OTC Securities Exchange

FMDQ OTC Securities Exchange (FMDQ) is an organisation with the strategic intent of bringing about revolutionary changes and fostering the development of the Nigerian financial markets.

Registered by the Securities and Exchange Commission (SEC), as an over-the- counter (OTC) market in 2012, and launched on in November 2013, FMDQ has dual responsibilities of a securities exchange and self-regulatory organisation (SRO) and brings together Nigeria's fixed income and currency operations under a single market governance structure.

6.3 The inter-bank market

The inter-bank market is a market for borrowing and lending large amounts of money for a short-term, often 'overnight' (for one day) but possibly up to one year. As the name of the market indicates, it is mainly a market for borrowing or lending between banks, but as explained earlier, companies are able to participate directly or through their bank. (When they participate through their bank, they can borrow or lend much smaller quantities of money.)

Interest rates in the inter-bank market vary according to:

❑ The duration of the loan; and

❑ The credit rating or credit status of the borrowing bank.

Banks with a very high credit rating are able to borrow at lower rates than banks with a lower credit rating.

The interest rates charged to top-quality banks are monitored.

❑ In Nigeria, a number of reference banks report their borrowing rates to the FMDQ OTC Securities Exchange each day, and these rates are used to determine the average borrowing rates for top-rated banks (NIBOR).

❑ Similarly, in London a number of banks report their borrowing rates to the British Bankers Association (BBA) each day, and the BBA uses these rates to determine the average borrowing rates for top-rated banks (LIBOR).

NIBOR (Nigerian Inter-Bank Offered Rate (NIBOR)

The Nigerian Inter-bank Offered Rate (NIBOR) represents the short-term lending rates of selected banks in the Nigerian inter-bank market, quoted as annualised rates.

NIBOR is a *polled rate,* constructed from quotes submitted from a group of 10 selected banks known as *Reference Banks*.

NIBOR is a *trimmed arithmetic mean* of some of the quotes submitted. The highest and lowest quotes (top 25% and the bottom 25%) are removed and the rest are averaged to four decimal places and published as NIBOR.

FMDQ OTC publishes NIBOR for four lending/borrowing terms (tenors) being, overnight (O/N), 1 month, 3 months and 6 months.

NIBOR is used as a benchmark floating rate index for financial contracts (e.g. money market instruments, retail loans, mortgages, bonds and interest rate derivatives) for which rates are quoted as NIBOR + a spread.

As an aside, note that FMDQ OTC also fixes two other benchmarks for use in the financial markets:

❏   NITTY – Nigerian Inter-bank Treasury Bills' True Yields; and

❏   NIFEX – Nigerian Inter-bank Foreign Exchange Fixings.

LIBOR

The BBA publishes these rates as the BBA London Inter-Bank Offered Rate or LIBOR. LIBOR (also written as Libor) is an important rate in the London markets, because it provides a guideline on interest rates to banks and it is also used as a benchmark interest rate in some derivatives markets. (Derivatives are explained later.)

The financial press publishes LIBOR rates, which might be presented as follows:

Illustration: Publication of LIBOR rates					
18th July	**Overnight**	**Month**	**Three months**	**Six months**	**One year**
US$ Libor	5.30375	5.32000	5.36000	5.40906	5.50594
Euro Libor	4.09063	4.11463	4.14250	4.28488	4.52538
£ Libor	5.60625	5.67125	5.84875	6.00250	6.26000
Swiss Fr Libor	2.39000	2.42000	2.48833	2.65083	2.91250
Yen Libor	0.61250	0.64250	0.74563	0.84938	0.99750
Canada Libor	4.34833	4.32167	4.46000	4.64000	4.89833

LIBOR can be regarded as a risk-free money market rate. The money market yield curve is normally upward-sloping, but this is not always the case, and a yield curve may be downward sloping along all or a part of its length.

Only a few LIBOR rates are published in the financial press, and it is possible to borrow or lend for any money market period.

Money market rates are shown as annual rates of interest. The actual amount of interest payable on a money market loan, or receivable on a money market deposit, depends on the term of the loan or deposit as well as the interest rate.

There are specific rules for the calculation of money market interest, but for the purpose of your examination, you can assume that the interest payable or receivable is the annual interest rate multiplied by the number of months of the loan or deposit and divided by 12. Here are some examples.

❏   For a three-month loan of $1,000,000 when three-month LIBOR is 5.36%, the interest rate is (5.36% × 3/12) 1.34% and the interest payable is $13,400.

❏   For a six-month deposit of €1,000,000 when six month LIBOR is 4.28488%, the interest rate is 2.14244% and interest receivable will be €21,424.40.

Only top-rated banks are able to borrow at LIBOR. Other banks and companies borrow at a 'spread' above LIBOR or earn interest on deposits at a rate below:

LIBOR. For example a company might be able to borrow at LIBOR plus 0.5% (plus 50 basis points), and if one-month LIBOR is 6.125%, it is able to borrow for one month at 6.625%.

Note on base rates

Not all companies borrow from their bank at a rate of interest based on LIBOR. Many companies, especially smaller companies, might pay a rate of interest on an overdraft or variable rate loan at an interest rate linked to the bank's base rate. For example a company might borrow at base rate plus 2%. A base rate is an 'administered rate' which means that it is set by the lending bank and is not directly related to market rates of interest.

Changes in money market interest rates

Money market interest rates can change rapidly, in response to market conditions and prospects for the economy. However, in the United States, the European Union and the UK, the biggest influence on LIBOR rates is the central bank. The central bank is able to raise or lower the money market interest rate for its dealings with commercial banks, and it uses interest rates to try to influence the state of the economy (and in particular the rate of inflation). If the central bank in the UK raises its interest rate by 0.25% for example, banks will immediately increase their LIBOR rates by the same amount.

6.4 The repo market

A *repo* is a sale and repurchase transaction where one party sells a quantity of short-dated bonds or money market securities to the other party and at the same time undertakes to buy them back at a specified future date at a higher price.

For example Bank A might arrange a repo transaction with Bank B, in which Bank A sells a quantity of short-dated government bonds and money market instruments to Bank B for $20 million and agrees to buy them back after 14 days for $20.046 million.

In effect a repo transaction is a short-term secured loan. In this example, Bank B is effectively lending $20 million to Bank A for 14 days and takes government bonds and money market instruments as security for the loan. When the repurchase takes place after 14 days, Bank B receives $46,000 more than it lent, which is the interest on the loan.

Importance of the repo market

The repo market is important in the USA, European Union and UK for two reasons.

❑ The central bank uses the repo market to provide liquidity to commercial banks, and sets the interest rate (repo rate) for these transactions. The 14- day 'gilt repo' rate is in effect the marginal cost of borrowing for banks that cannot obtain liquidity anywhere else. This rate is used by the central bank to influence other money market interest rates, as explained above.

❑ Commercial banks use the repo market for secured borrowing and lending between themselves. It is an alternative to the inter-bank market, where borrowing and lending is unsecured.

6.5 Comparison of the repo market and inter-bank market

Interest rates in the inter-bank market are slightly higher than interest rates in the repo market. This is because repo transactions are a form of secured lending whereas inter-bank loans are unsecured.

A bank with a large quantity of short-dated government bonds or money market securities will therefore prefer to borrow in the repo market than in the inter-bank market, because borrowing costs are less. However, banks might not hold large quantities of short-dated government bonds or money market securities. If these banks need to borrow, they will use the inter-bank market.

For the purpose of your examination, the inter-bank market and inter-bank market interest rate (LIBOR) are more significant than the repo rate, because the inter-bank rate is more relevant for obtaining short-term liquidity and for hedging both interest rate risk and foreign exchange risk. (Hedging risks is described later.)

7 MONEY MARKET INSTRUMENTS

Section overview

- Coupon-bearing and discount instruments
- Treasury bills
- Bills of exchange
- Certificates of deposit (CDs)
- Commercial paper (CP)
- Derivatives

The largest money market is the inter-bank market for loans and deposits. There are also markets for dealing in other money market 'instruments' or securities. These include:

❑ Treasury bills

❑ Bills of exchange (including bankers' acceptances or BAs)

❑ Certificates of deposit (CDs)

❑ Commercial paper (CP).

7.1 Coupon-bearing and discount instruments

There are two broad categories of money market instrument, coupon-bearing and discount instruments.

❑ Coupon-bearing instruments are instruments or securities on which interest is payable at a stated interest rate (or 'coupon') on a fixed amount of principal. When the instrument or security reaches its maturity date, its holder receives the initial principal plus interest in settlement. Examples of coupon-bearing instruments are certificates of deposit.

❑ Discount instruments are instruments or securities where the borrower undertakes to pay a fixed amount of principal at maturity, and the instrument is issued at a discount to its 'face value'. The difference between the discounted issue price and the eventual redemption price (face value) represents interest on the borrowing. Examples of discount instruments are Treasury bills, bills of exchange and commercial paper.

7.2 Treasury bills

Treasury bills are short-dated securities issued by a government, when money is needed to meet a short-term financing requirement. Treasury bills are normally issued for 91 days (three months).

They are discount instruments. The government might issue 91-day Treasury bills with a face value of ₦100 million at a price of, say, 98.75. It would raise
₦98.75 million from the issue and at the end of the 91 days it would pay ₦100 million to the holders of the bills. Interest for the three-month period would be
₦1.25 million on the ₦98.75 million raised, which is an interest rate of about 5% (annual).

There is an active market in Treasury bills. Buyers of Treasury bills can re-sell them before they mature to other investors or banks. Treasury bills should be risk-free, because they are

promises to pay by the government. A company with a short-term cash surplus might therefore decide to invest in Treasury bills, which can be re-sold at any time or held until the bills eventually mature.

7.3   Bills of exchange

A bill of exchange is a form of promise to pay a stated amount of money at a date in the future (usually in several months' time). A bill has a drawer and a drawee.

❑   The bill is issued by the borrower, and is 'drawn on' the drawee. When the bill is drawn, it is a form of 'You Owe Me'. With the bill the drawer is stating that the drawee owes a specified amount of money.

❑   The bill is then 'accepted' by the drawee, who signs the bill to indicate acceptance. An accepted bill becomes an undertaking by the drawee to pay the specified amount of money at the specified date.

A bill of exchange that is drawn on and accepted by a bank is called a bank bill.

There is an active market in bank bills, especially bills that have been accepted by banks with high credit ratings. This means that the drawer of a bill is able to obtain short-term finance by selling the accepted bill in the money markets.

Bank bills might be used as a source of short-term finance by companies in two ways.

❑   As a method of financing foreign trade transactions. Trade finance is described in a later section.

❑   As a method of raising short-term finance by means of bankers' acceptances (BAs), as an alternative to bank borrowing or issuing commercial paper.

Bankers' acceptances (BAs)

A company that intends to borrow amounts of money for a short-term over a period of time in the future might arrange a BA programme with a bank. Under the terms of the agreement, the bank undertakes to accept bills of exchange that are drawn on it by the company, up to a maximum amount. When the company needs short-term funding, it draws a bill on the bank. The bank accepts it and then sells it in the money market on behalf of the company at a discount.

The company therefore receives the money 'now'. The company must also pay the bank the face value of the bill when it reaches maturity, to enable the bank to settle the bill. The bill is therefore a form of short-term finance, and the interest cost is the difference between the discounted value of the bill when it is sold and the face value of the bill that must be paid in settlement

An advantage of BAs for a company is that if the programme is arranged with a top-quality bank, the discount rate (interest rate) on the accepted bills might be fairly low – lower than on other forms of money market borrowing.

> **Example: Bankers' acceptances**
>
> A company has arranged a bankers' acceptances programme with its bank. Under the terms of the arrangement, which lasts for one year, the company is able to draw bills on the bank up to a total value in issue at any time of ₦25 million.
>
> The company might draw a bill on the bank for ₦1,000,000 with a settlement date in three months' time. The bank accepts the bill and sells it for the company in the bills market. The company might receive, say, ₦985,222, so that the discount on the bill is ₦14,778.
>
> The discount means that the rate of interest for the three months is about:
>
> $$(₦14,778/₦985,222) \times 12/3 = 6.0\%$$
>
> After three months when the bill reaches maturity, the bank pays the bill and the company pays ₦1,000,000 to the bank.

7.4 Certificates of deposit (CDs)

A certificate of deposit is a certificate issued by a bank stating that the bank is holding a specified quantity of money as a term deposit, on which interest is being earned at a specified rate. The deposit cannot be removed from the bank until the end of the stated term, but it can be sold in a money market for CDs.

For example, an investor might place a deposit of ₦20 million with a bank for a fixed term of six months, and receive interest at 5.5% on the deposit. It might be agreed that the bank should issue a certificate of deposit that the depositor holds. However, if the depositor needs access to money before the end of the six months, it can sell the CD on to another investor or a bank and receive immediate cash.

7.5 Commercial paper (CP)

Large creditworthy companies have several ways of raising short-term finance, and might select the least-cost financing method. This might be borrowing at money market rates from a bank, arranging a BA programme or issuing commercial paper. The cheapest rate of financing might vary according to conditions in each of the money markets.

Commercial paper (CP) is an unsecured promissory note. A promissory note is a promise by the issuer of the note to pay a specific amount of money on a specified date. When a company issues CP it promises to pay the face value of the paper at a specified date in the future.

Non-financial companies issue CP through a bank, as part of a commercial paper programme. The bank issues the CP on behalf of the company and sells it to investors. All CP is negotiable, which means that it can be sold in the money market. In practice, however, investors buying CP normally hold it to maturity when they are paid the face value of the paper they have bought.

The company issuing the CP therefore receives immediate cash (at a discount to the face value of the paper) and makes a payment when the paper reaches maturity.

Only companies with a good credit rating are able to issue CP, and commercial paper is normally given a credit rating by one or more of the major credit rating agencies (Moody's, Standard & Poor's and Fitch). The interest rate payable on CP varies with the term to maturity

of the paper when it is issued, the credit rating for the paper and conditions in the market at the time of the issue.

Example: Commercial paper

A large company has arranged a commercial paper programme with a bank. The programme will last for two years. During that time the company may issue CP up to a total value of ₦300 million in issue at any time.

Initially, the company might issue ₦50 million of CP with a maturity date in three months' time. The bank sells the paper to a number of investors, who buy the paper at a discount and will receive payment of the full face value after three months.

Investors buying the CP are able to re-sell it if they wish to do so at any time before maturity, through a bank that deals in the CP market.

The company can issue more CP at any time, up to the specified limit.

Example: Commercial paper

A company has arranged a commercial paper programme with a bank. It issued ₦40 million worth of commercial paper with maturity of three months. The interest rate is 6.2%.

Required

Calculate the amount of money the company will receive from the CP issue.

Answer

The annual interest rate is 6.2%, so for three months the interest rate is approximately 6.2% × 3/12 = 1.55%.

Amount received from the issue × 1.0155 = ₦40 million.

Amount received from the issue = ₦40 million/1.0155 = ₦39,389,463. Interest

payable will be ₦40 million - ₦39,389,463 = ₦610,537.

7.6 Derivatives

The following useful definition of a derivative is found in IFRS (IAS 32: Financial Instruments: Presentation).

A derivative is a financial instrument with all three of the following characteristics:

- ❑ Its value changes in response to a specified underlying (interest rate, commodity price, exchange rate etc.);
- ❑ It requires no or little initial investment; and
- ❑ It is settled at a future date.

Categories of derivatives

Some derivatives are bespoke contracts stuck between two parties. These are described as over-the-counter (OTC) and are not traded. Examples of such derivatives include forward contracts and SWAPs (though there is trading in SWAPs as well).

Other derivatives are standardised with respect to amounts, settlement dates and other features. This allows these to be traded. Examples of traded derivatives include futures and options (though there OTC options are also very important).

Use of derivatives

The small initial outlay that is a characteristic of derivatives provides a party to a derivative contact with exposure to price change on large volumes of currency or commodity. For example, a dealer could enter into a crude oil derivative that might allow the dealer access to price movement on 1,000 barrels for far less outlay than actually buying the same 1,000 barrels outright.

Many derivatives are traded on exchanges, and so are easily available for buying and selling. Entities can buy or sell derivatives in order to set up speculative positions, so that a profit will be made from dealing in the derivatives provided that the market price of the 'underlying item' moves favourably.

Speculating in derivatives may expose entities to huge risks, if expectations do not come true and the price of the underlying item moves the 'wrong way'.
Occasionally, losses on derivatives positions can result in financial collapse of the company.

Derivatives can be used to obtain protection against exposure to the risk of an unfavourable movement in the market price of an item, such as the price of a commodity, an interest rate or a foreign exchange rate. This is covered in detail in later chapters of this text.

8   CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

■   Explain how government has a profound influence on the economic environment through the exercise of fiscal and monetary policy

■   Explain further government influences

■   Explain the role of the capital markets

■   Describe the characteristics of government securities

■   List the participants in financial markets and comment on their roles (some of this was covered in chapter 2)

■   Explain the role of the money markets

■   Describe money market instruments

Professional level
Strategic financial management

4

Discounted cash flow

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B				Business analysis
	5			Investment appraisal
		a		Discounted cash flow techniques
			i	Evaluate potential value added to an organisation arising from a specified capital investment project using the net present value (NPV)
			iii	Assess the relative merits of NPV and IRR.

Exam context

This chapter explains discounted cash flow and its use in appraising capital investments. Much of the content of this chapter will be familiar to you from an earlier paper.

By the end of this chapter, you should be able to:

- Explain discounting

- Explain NPV and apply the technique in project appraisal

- Explain IRR and apply the technique in project appraisal

- Discuss the relative merits of NPV and IRR

- Explain MIRR and apply the technique in project appraisal

- Identify relevant cash flows as inputs to DCF techniques

1 CAPITAL EXPENDITURE, INVESTMENT APPRAISAL AND CAPITAL BUDGETING

Section overview

- ■ Capital expenditure
- ■ Investment appraisal
- ■ Capital budgeting
- ■ Features of investment projects
- ■ Methods of investment appraisal

1.1 Capital expenditure

Capital expenditure is spending on non-current assets, such as buildings and equipment, or investing in a new business. As a result of capital expenditure, a new non-current asset appears on the statement of financial position (balance sheet), possibly as an 'investment in subsidiary'.

In contrast **revenue expenditure** refers to expenditure that does not create long- term assets, but is either written off as an expense in the income statement in the period that it is incurred, or that creates a short-term asset (such as the purchase of inventory).

Capital expenditure initiatives are often referred to as investment projects, or 'capital projects'. They can involve just a small amount of spending, but in many cases large amounts of expenditure are involved.

A distinction might possibly be made between:

❑ Essential capital spending to replace worn-out assets and maintain operational capability

❑ Discretionary capital expenditure on new business initiatives that are intended to develop the business make a suitable financial return on the investment.

Examination questions usually focus on discretionary capital expenditure.

1.2 Investment appraisal

Before capital expenditure projects are undertaken, they should be assessed and evaluated. As a general rule, projects should not be undertaken unless:

❑ They are expected to provide a suitable financial return, and

❑ The investment risk is acceptable.

Investment appraisal is the evaluation of proposed investment projects involving capital expenditure. The purpose of investment appraisal is to make a decision about whether the capital expenditure is worthwhile and whether the investment project should be undertaken.

1.3 Capital budgeting

Capital expenditure by a company should provide a long-term financial return, and spending should therefore be consistent with the company's long-term corporate and financial objectives. Capital expenditure should therefore be made with the intention of implementing chosen business strategies that have been agreed by the board of directors.

Many companies have a capital budget, and capital expenditure is undertaken within the agreed budget framework and capital spending limits. For example, a company might have a five-year capital budget, setting out in broad terms its intended capital expenditure for the next five years. This budget should be reviewed and updated regularly, typically each year.

Within the long-term capital budget, there should be more detailed spending plans for the next year or two.

❑   Individual capital projects that are formally approved should be included within the capital budget.

❑   New ideas for capital projects, if they satisfy the investment appraisal criteria and are expected to provide a suitable financial return, might be approved provided that they are consistent with the capital budget and overall spending limits.

Investment appraisal and capital budgets

Investment appraisal therefore takes place within the framework of a capital budget and strategic planning. It involves

❑   Generating capital investment proposals in line with the company's strategic objectives.

❑   Forecasting relevant cash flows relating to the project

❑   Evaluating the projects

❑   Implementing projects which satisfy the company's criteria for deciding whether the project will earn a satisfactory return on investment

❑   Monitoring the performance of investment projects to ensure that they perform in line with expectations.

1.4 Features of investment projects

Many investment projects have the following characteristics:

❑   The project involves the purchase of an asset with an expected life of several years, and involves the payment of a large sum of money at the beginning of the project. Returns on the investment consist largely of net income from additional profits over the course of the project's life.

❑   The asset might also have a disposal value (residual value) at the end of its useful life.

❑   A capital project might also need an investment in working capital. Working capital also involves an investment of cash.

Alternatively a capital investment project might involve the purchase of another business, or setting up a new business venture. These projects involve an initial capital outlay, and possibly some working capital investment. Financial returns from the investment might be expected over a long period of time, perhaps indefinitely.

1.5   Methods of investment appraisal

There are different financial reasons that might be used to make a capital investment decision. Management could consider the expected investment returns from the project. If so, they should use **discounted cash flow (DCF)** as a basis for their decision. DCF considers both the size of expected future returns and the length of time before they are earned.

There are two different ways of using DCF as a basis for making an investment decision:

❑ **Net present value (NPV) approach**. With this approach, a present value is given to the expected costs of the project and the expected benefits. The value of the project is measured as the net present value (the present value of income or benefits minus the present value of costs). The project should be undertaken if it adds value. It adds value if the net present value is positive (greater than 0).

❑ **Internal rate of return (IRR) approach**. With this approach, the expected return on investment over the life of the project is calculated, and compared with the minimum required investment return. The project should be undertaken if its expected return (as an average percentage annual amount) exceeds the required return.

2 DISCOUNTING

Section overview

- The time value of money
- Discounting
- Discount tables

2.1 The time value of money

One of the basic principles of finance is that a sum of money today is worth more than the same sum in the future. If offered a choice between receiving ₦10,000 today or in 1 year's time a person would choose today.

A sum today can be invested to earn a return. This alone makes it worth more than the same sum in the future. This is referred to as the time value of money.

The impact of time value can be estimated using one of two methods:

❑ Compounding which estimates future cash flows that will arise as a result of investing an amount today at a given rate of interest for a given period.

- An amount invested today is multiplied by a compound factor to give the amount of cash expected at a specified time in the future assuming a given interest rate.

❑ Discounting which estimates the present day equivalent (present value which is usually abbreviated to *PV*) of a future cash flow at a specified time in the future at a given rate of interest

- An amount expected at a specified time in the future is multiplied by a discount factor to give the present value of that amount at a given rate of interest.

- The discount factor is the inverse of a compound factor for the same period and interest rate. Therefore, multiplying by a discount factor is the same as dividing by a compounding factor.

- Discounting is the reverse of compounding.

2.2 Discounting

Formula: Discount factor

$$\text{Discount factor} = \frac{1}{(1 + r)^n}$$

Where:

r = the period interest rate (cost of capital) n = number of periods

Example: Discounting

A person expects to receive ₦13,310 in 3 years.

If the person faces an interest rate of 10% what is the present value of this amount?

$$\text{Present value} = \text{Future cash flow} \times \frac{1}{(1+r)^n}$$

$$\text{Present value} = 13,310 \times \frac{1}{(1.1)^3}$$

$$\text{Present value} = 10,000$$

Emphasis

Illustration: Discounting is the reverse of compounding

Compounding	$\text{Future value} = \text{Amount today} \times (1+r)^n$
Rearranging (and renaming the "amount today" as present value)	$\text{Present value} = \text{Future value} \times \dfrac{1}{(1+r)^n}$

Interpreting present values

The present value of a future cash flow is the amount that an investor would need to invest today to receive that amount in the future. This is simply another way of saying that discounting is the reverse of compounding.

It is important to realise that the present value of a cash flow is the equivalent of its future value. Using the above example to illustrate this, ₦10,000 today is exactly the same as ₦13,310 in 3 years at an interest rate of 10%. The person in the example would be indifferent between the two amounts. He would look on them as being identical.

Also the present value of a future cash flow is a present day cash equivalent. The person in the example would be indifferent between an offer of ₦10,000 cash today and ₦13,310 in 3 years.

Using present values

Discounting cash flows to their present value is a very important technique. It can be used to compare future cash flows expected at different points in time by discounting them back to their present values.

Example: Comparing cash flows.

A borrower is due to repay a loan of ₦120,000 in 3 years.

He has offered to pay an extra ₦20,000 as long as he can repay after 5 years. The lender

faces interest rates of 7%. Is the offer acceptable?

Existing contract $$PV = 120,000 \times \frac{1}{(1.07)^3} = ₦97,955$$

Client's offer $$Present\,value = 140,000 \times \frac{1}{(1.07)^5} = ₦99,818$$

The client's offer is acceptable as the present value of the new amount is greater than the present value of the receipt under the existing contract.

Example: Comparing cash flows

An investor wants to make a return on his investments of at least 7% per year.

He has been offered the chance to invest in a bond that will cost ₦200,000 and will pay ₦270,000 at the end of four years.

In order to earn ₦270,000 after four years at an interest rate of 7% the amount of his investment now would need to be:

$$PV = 270,000 \times \frac{1}{(1.07)^4} = ₦206,010$$

The investor would be willing to invest ₦206,010 to earn ₦270,000 after 4 years.

However, he only needs to invest ₦200,000.

This indicates that the bond provides a return in excess of 7% per year.

Example: Comparing cash flows

How much would an investor need to invest now in order to have ₦100,000 after 12 months, if the compound interest on the investment is 0.5% each month?

The investment 'now' must be the present value of ₦100,000 in 12 months, discounted at 0.5% per month.

$$PV = 100,000 \times \frac{1}{(1.005)^{12}} = ₦94,190$$

Present values can be used to appraise large projects with multiple cash flows. This is covered in the section 2 of this chapter.

2.3 Discount tables

Discount factors can be calculated as shown earlier but can also be obtained from discount tables. These are tables of discount rates which list discount factors by interest rates and duration.

Illustration: Discount tables (extract)

(Full tables are given as an appendix to this text).

Discount rates (r)

(n)	5%	6%	7%	8%	9%	10%
1	0.952	0.943	0.935	0.926	0.917	0.909
2	0.907	0.890	0.873	0.857	0.842	0.826
3	0.864	0.840	0.816	0.794	0.772	0.751
4	0.823	0.792	**0.763**	0.735	0.708	0.683

Where:

n = number of periods

Example: Discount factors from formula or tables

Calculate the present value of ₦60,000 received in 4 years assuming a cost of capital of 7%.

From formula

$$PV = 60,000 \times \frac{1}{(1.07)^4} = 45,773$$

From table (above)

$$PV = 60,000 \times 0.763 = 45,780$$

The difference is due to rounding. The discount factor in the above table has been rounded to 3 decimal places whereas the discount factor from the formula has not been rounded.

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3 NET PRESENT VALUE (NPV) METHOD OF INVESTMENT APPRAISAL

Section overview

- Introduction to discounted cash flow (DCF) analysis
- Calculating the NPV of an investment project
- Two methods of presentation

3.1 Introduction to discounted cash flow (DCF) analysis

Discounted cash flow is a technique for evaluating proposed investments, to decide whether they are financially worthwhile.

There are two methods of DCF:

- **Net present value (NPV) method**: the cost of capital r is the return required by the investor or company
- **Internal rate of return (IRR) method**: the cost of capital r is the actual return expected from the investment.

All cash flows are assumed to arise at a distinct point in time (usually the end of a year). For example, sales of ₦20m in year four are discounted as if they arose as a single amount at the end of year 4.

3.2 Calculating the NPV of an investment project

Approach

Step 1: List all cash flows expected to arise from the project. This will include the initial investment, future cash inflows and future cash outflows.

Step 2: Discount these cash flows to their present values using the cost that the company has to pay for its capital (cost of capital) as a discount rate. All cash flows are now expressed in terms of 'today's value'.

Step 3: The net present value (NPV) of a project is difference between the present value of all the costs incurred and the present value of all the cash flow benefits (savings or revenues).

- The project is acceptable if the NPV is positive.
- The project should be rejected if the NPV is negative.

Example: NPV appraisal

A company with a cost of capital of 10% is considering investing in a project with the following cash flows.

Year	₦(m)
0	(10,000)
1	6,000
2	8,000

Should the project be undertaken?

NPV calculation:

Year	Cash flow ₦(m)	Discount factor (10%)	Present value ₦(m)
0	(10,000)	1	(10,000)
1	6,000	$\dfrac{1}{(1.1)}$	5,456
2	8,000	$\dfrac{1}{(1.1)^2}$	6,612
NPV			2,068

The NPV is positive so the project should be accepted

Note that the above example refers to year 0, year 1 etc. This actually refers to points in time. "Year 0" is now. "Year 1" is at the end of the first year and so on.

Sometimes they are referred to as t0 (now) , t1 (end of first year), t2 (end of second year) etc.

It is less confusing to think of the project starting at *time 0* rather than describing it as *Year 0* (as there is no year 0).

> **Practice questions** **1**
>
> **1** A company is considering whether to invest in a new item of equipment costing ₦53,000 to make a new product.
> The product would have a four-year life, and the estimated cash profits over
>
> | Year | ₦ |
> |------|-------|
> | 1 | 17,000 |
> | 2 | 25,000 |
> | 3 | 16,000 |
> | 4 | 12,000 |
>
> Calculate the NPV of the project using a discount rate of 11%
>
> **2** A company is considering whether to invest in a new item of equipment costing ₦65,000 to make a new product.
> The product would have a three-year life, and the estimated cash profits over this period are as follows.
>
> | Year | ₦ |
> |------|-------|
> | 1 | 27,000 |
> | 2 | 31,000 |
> | 3 | 15,000 |
>
> Calculate the NPV of the project using a discount rate of 8%

3.3 Two methods of presentation

There are two methods of presenting DCF calculations. Both are shown below, with illustrative figures.

Format 1

Illustration: NPV layout

Year	Description	Cash flow (₦)	Discount factor at 10%	Present value (₦)
0	Machine	(40,000)	1.000	(40,000)
0	Working capital	(5,000)	1.000	(5,000)
1-3	Cash profits	20,000	2.487	49,740
3	Sale of machine	6,000	0.751	4,506
3	Recovery of working capital	5,000	0.751	3,755
	NPV			13,001

Format 2

Illustration: NPV layout

Year	0	1	2	3
	₦	₦	₦	₦
Machine/sale of machine	(40,000)			6,000
Working capital	(5,000)			5,000
Cash receipts		50,000	50,000	50,000
Cash expenditures		(30,000)	(30,000)	(30,000)
Net cash flow	(45,000)	20,000	20,000	31,000
Discount factor at 10%	1.000	0.909	0.826	0.751
Present value	(45,000)	18,180	16,520	23,281
NPV				12,981

For computations with a large number of cash flow items, the second format is probably easier. This is because the discounting for each year will only need to be done once.

Note that **changes in working capital** are included as cash flows. An increase in working capital, usually at the beginning of the project in Year 0, is a cash outflow and a reduction in working capital is a cash inflow. Any working capital investment becomes ₦0 at the end of the project.

4 DISCOUNTING ANNUITIES AND PERPETUITIES

Section overview

- Annuities
- Perpetuities
- Application of annuity arithmetic
- Annuities and perpetuities with growth

4.1 Annuities

An annuity is a constant cash flow for a given number of time periods. A capital project might include estimated annual cash flows that are an annuity.

Examples of annuities are:

❑ ₦30,000 each year for years 1 – 5

❑ ₦20,000 each year for years 3 – 10

❑ ₦500 each month for months 1 – 24.

The present value of an annuity can be computed by multiplying each individual amount by the individual discount factor and then adding each product. This is fine for annuities of just a few periods but would be too time consuming for long periods. An alternative approach is to use the annuity factor.

An annuity factor for a number of periods is the sum of the individual discount factors for those periods.

Example:

Calculate the present value of ₦50,000 per year for years 1 – 3 at a discount rate of 9%.

Year	Cash flow	Discount factor at 9%		Present value
1	50,000	$\dfrac{1}{(1.09)}$	= 0.917	45,850
2	50,000	$\dfrac{1}{(1.09)^2}$	= 0 842	42,100
3	50,000	$\dfrac{1}{(1.09)^3}$	= 0.772	38,600
NPV				126,550
or:				
1 to 3	50,000		2.531	126,550

An annuity factor can be constructed by calculating the individual period factors and adding them up but this would not save any time. In practice a formula or annuity factor tables are used.

Formula: Annuity factor (discount factor of an annuity)

There are two version of the annuity factor formula:

	Method 1	Method 2
Annuity factor	$= \dfrac{1}{r}\left(1 - \dfrac{1}{(1+r)^n}\right)$	$= \left(\dfrac{1 - (1+r)^{-n}}{r}\right)$

Where:

r = discount rate, as a proportion

n = number of time periods

Example: Present value of an annuity factor

Year	Cash flow	Discount factor	Present value
1 to 3	50,000	2.531 **(W)**	126,550

Working: Calculation of annuity factor

Method 1:

$$= \frac{1}{r}\left(1 - \frac{1}{(1+r)^n}\right)$$

$$= \frac{1}{0.09}\left(1 - \frac{1}{(1.09)^3}\right)$$

$$= \frac{1}{0.09}\left(1 - \frac{1}{1.295}\right)$$

$$= \frac{1}{0.09}(1 - 0.7722)$$

$$= \frac{1}{0.09}(0.2278) = 2.531$$

Method 2:

$$= \left(\frac{1 - (1+r)^{-n}}{r}\right)$$

$$= \left(\frac{1 - (1.09)^{-3}}{0.09}\right)$$

$$= \left(\frac{1 - 0.7722}{0.09}\right)$$

$$= \frac{0.2278}{0.09}$$

$$= 2.531$$

Illustration: Annuity factor table (extract)

(Full tables are given as an appendix to this text).

Discount rates (r)

(n)	5%	6%	7%	8%	9%	10%
1	0.952	0.943	0.935	0.926	0.917	0.909
2	1.859	1.833	1.808	1.783	1.759	1.736
3	2.723	2.673	2.624	2.577	**2.531**	2.487
4	3.546	3.465	3.387	3.312	3.240	3.170
5	4.329	4.212	4.100	3.993	3.890	3.791

Where:

n = number of periods

Practice questions

2

1 A company is considering whether to invest in a project which would involve the purchase of machinery with a life of five years

The machine would cost ₦556,000 and would have a net disposal value of ₦56,000 at the end of Year 5.

The project would earn annual cash flows (receipts minus payments) of ₦200,000.

Calculate the NPV of the project using a discount rate of 15%

2 A company is considering whether to invest in a project which would involve the purchase of machinery with a life of four years

The machine would cost ₦1,616,000 and would have a net disposal value of ₦301,000 at the end of Year 4.

The project would earn annual cash flows (receipts minus payments) of ₦500,000.

Calculate the NPV of the project using a discount rate of 10%

4.2 Perpetuities

A perpetuity is a constant annual cash flow 'forever', or into the long-term future.

In investment appraisal, an annuity might be assumed when a constant annual cash flow is expected for a long time into the future.
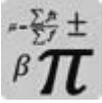
Formula: Perpetuity factor

$$\text{Perpetuity factor} = \frac{1}{r}$$

Where:

r = the cost of capital

Examples: Present value of perpetuities

Cash flow	Present value
2,000 in perpetuity, starting in Year 1	$= \frac{1}{r} \times \text{Annual cash flow}$
Cost of capital = 8%	$= \frac{1}{0.08} \times 2,000 = 25,000$

4.3 Application of annuity arithmetic

Equivalent annual costs

An annuity is multiplied by an annuity factor to give the present value of the annuity.

This can work in reverse. If the present value is known it can be divided by the annuity factor to give the annual cash flow for a given period that would give rise to it.

Illustration: Equivalent annual costs

What is the present value of 10,000 per annum from t1 to t5 at 10%?

Time	Cash flow	Discount factor	Present value
1 to 5	10,000	3.791	37,910

What annual cash flow from t1 to t5 at 10% would give a present value of 37,910?

	37,910
Divide by the 5 year, 10% annuity factor	3.791
	10,000

This can be used to address the following problems.

Example:

A company is considering an investment of ₦70,000 in a project. The project life would be five years.

What must be the minimum annual cash returns from the project to earn a return of at least 9% per annum?

Investment = ₦70,000

Annuity factor at 9%, years 1 – 5 = 3.890

Minimum annuity required = ₦17,995 (= ₦70,000/3.890)

Loan repayments

Example: Loan repayments

A company borrows ₦10,000,000.

This is to be repaid by 5 equal annual payments at an interest rate of 8%. Calculate the payments.

The approach is to simply divide the amount borrowed by the annuity factor that relates to the payment term and interest rate

	₦
Amount borrowed	10,000,000
Divide by the 5 year, 8% annuity factor	3.993
Annual repayment	2,504,383

Sinking funds

A person may save a constant annual amount to produce a required amount at a specific point in time in the future. This is known as a sinking fund.

Example: Sinking fund

A man wishes to invest equal annual amounts so that he accumulates ₦5,000,000 by the end of 10 years.

The annual interest rate available for investment is 6%. What equal

annual amounts should he set aside?

Step 1: Calculate the present value of the amount required in 10 years.

$$PV = 5,000,000 \times \frac{1}{(1.06)^{10}} = 2,791,974$$

Step 2: Calculate the equivalent annual cash flows that result in this present value

	₦
Present value	2,791,974
Divide by the 10 year, 6% annuity factor	7.36
Annual amount to set aside	379,344

If the man invests ₦379,344 for 10 years at 6% it will accumulate to ₦5,000,000.

An alternative to the above approach is to use a sinking fund factor.

Formula: Sinking fund factor

There are two version of the annuity factor formula:

Sinking fund factor $= \left(\dfrac{(1+r)^n - 1}{r} \right)$

Where:

r = interest rate, as a proportion
n = number of time periods

Example: Sinking fund (using sinking fund factor)

A man wishes to invest equal annual amounts so that he accumulates ₦5,000,000 by the end of 10 years.

The annual interest rate available for investment is 6%. What equal

annual amounts should he set aside?

Step 1: Estimate the sinking fund factor

$$= (\frac{(1+0.06)^{10} - 1}{0.06}) = 13.181$$

Step 2: Calculate the annual amount to be set aside by dividing the target amount by the sinking fund factor.

	₦
Present value	5,000,000
Divide by the 10 year, 6% sinking fund factor	13.181
Annual amount to set aside	379,344

Slight difference is due to rounding

4.4 Annuities and perpetuities with growth

Annuities and constant periodic growth.

An annuity that is expected to grow each year by a constant proportion is known as a "growing annuity" or an "increasing annuity".

Example: Growing annuity

A company expects to receive a sum every year for 5 years growing at 10% per annum.

The amount in today's value is ₦50,000. The cost

of capital is 15%.

The present value of the receipt is as follows:

Year	Cash flow	Discount factor at 15%	Present value
1	$50,000 \times (1.1) = 55,000$	0.870	47826
2	$50,000 \times (1.1)^2 = 60,500$	0.756	45747
3	$50,000 \times (1.1)^3 = 66,550$	0.658	43758
4	$50,000 \times (1.1)^4 = 73,205$	0.572	41855
5	$50,000 \times (1.1)^5 = 80,525$	0.497	40035
NPV			219,221

The expression for an annuity factor can be altered to include the expectation of constant periodic growth in the annuity.
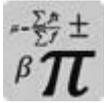
Formula: Annuity factor for growing annuity (discount factor of an annuity with constant annual growth)

$$PV = \frac{CF_1}{r-g}\left[1-\left(\frac{1+g}{1+r}\right)^n\right]$$

Where:

CF_1 = the first cash flow

r = discount rate, as a proportion

g = growth rate, as a proportion

n = number of time periods

Example: Growing annuity

A company expects to receive a sum every year for 5 years growing at 10% per annum.

The amount in today's value is ₦50,000. The cost of capital is 15%.

The present value of the receipt is as follows:.

$$PV = \frac{CF_1}{r-g}\left[1-\left(\frac{1+g}{1+r}\right)^n\right]$$

$$PV = \frac{55,000}{0.15-0.1}\left[1-\left(\frac{1.1}{1.15}\right)^5\right]$$

$$PV = 1,100,000[1-0.8007]$$

$$PV = 219,221$$

Perpetuities and constant periodic growth

The perpetuity factor can be altered to include the expectation of a constant periodic growth rate.

Formula: Perpetuity factor for growing perpetuity (discount factor of a perpetuity with constant annual growth)

$$PV = \frac{CF_1}{r-g}$$

5 INTERNAL RATE OF RETURN (IRR)

Section overview

- Internal rate of return (IRR)
- Estimating the IRR of an investment project
- IRR as an estimate

5.1 Internal rate of return (IRR)

The internal rate of return method (IRR method) is another method of investment appraisal using DCF.

The internal rate of return of a project is the discounted rate of return on the investment.

❑ It is the average annual investment return from the project

❑ Discounted at the IRR, the NPV of the project cash flows must come to zero.

❑ The internal rate of return is therefore the discount rate that will give a net present value of zero.

The investment decision rule with IRR

A company might establish the minimum rate of return that it wants to earn on an investment. If other factors such as non-financial considerations and risk and uncertainty are ignored:

❑ If a project IRR is equal to or higher than the minimum acceptable rate of return, it should be undertaken

❑ If the IRR is lower than the minimum required return, it should be rejected.

Since NPV and IRR are both methods of DCF analysis, the same investment decision should normally be reached using either method.

The internal rate of return is illustrated in the diagram below:

Illustration: IRR
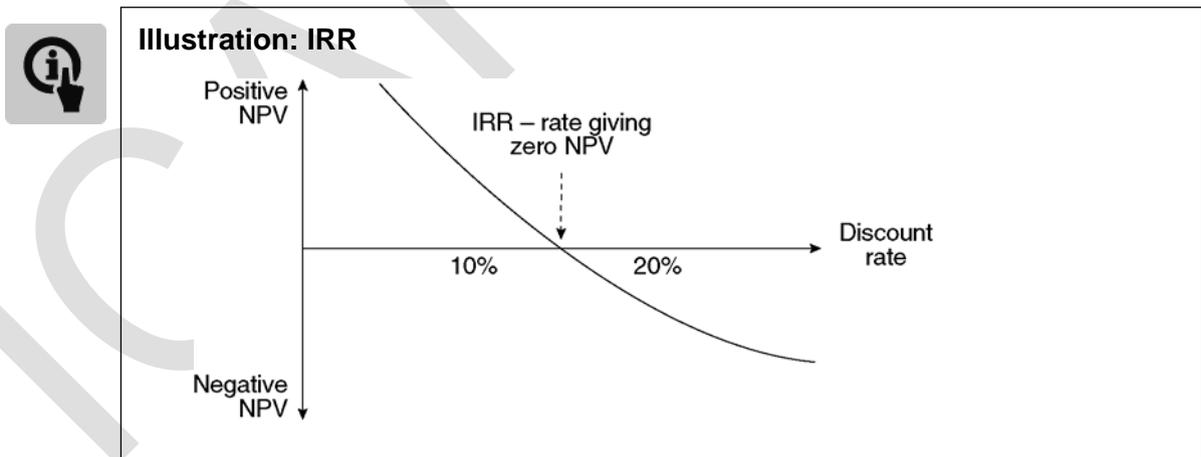
It is more correct to say that IRR is estimated rather than calculated. This is explained in more detail in the following sections.

5.2 Estimating the IRR of an investment project

To estimate the IRR, you should begin by calculating the NPV of the project at two different discount rates.

❑ One of the NPVs should be positive, and the other NPV should be negative. (This is not essential. Both NPVs might be positive or both might be negative, but the estimate of the IRR will then be less reliable.)

❑ Ideally, the NPVs should both be close to zero, for better accuracy in the estimate of the IRR.

When the NPV for one discount rate is positive NPV and the NPV for another discount rate is negative, the IRR must be somewhere between these two discount rates.

Although in reality the graph of NPVs at various discount rates is a curved line, as shown in the diagram above, using the interpolation method we assume that the graph is a straight line between the two NPVs that we have calculated. We can then use linear interpolation to estimate the IRR, to a reasonable level of accuracy.

The interpolation formula

Formula: IRR interpolation formula

$$IRR = A\% + \left(\frac{NPV_A}{NPV_A - NPV_B} \right) \times (B - A)\%$$

Ideally, the NPV at A% should be positive and the NPV at B% should be negative.

Where:

$NPV_A = NPV$ at A%

$NPV_B = NPV$ at B%

Example: IRR

A business requires a minimum expected rate of return of 12% on its investments. A proposed capital investment has the following expected cash flows.

Year	Cash flow	Discount factor at 10%	Present value at 10%	Discount factor at 15%	Present value at 15%
0	(80,000)	1.000	(80,000)	1,000	(80,000)
1	20,000	0.909	18,180	0.870	17,400
2	36,000	0.826	29,736	0.756	27,216
3	30,000	0.751	22,530	0.658	19,740
4	17,000	0.683	11,611	0.572	9,724
NPV			+ 2,057		(5,920)

Using

$$IRR = A\% + \left(\frac{NPV_A}{NPV_A - NPV_B} \right) \times (B - A)\%$$

$$IRR = 10\% + \left(\frac{2,057}{2,057 - -5,920} \right) \times (15 - 10)\%$$

$$IRR = 10\% + \left(\frac{2,057}{2,057 + 5,920} \right) \times 5\%$$

$$IRR = 10\% + \left(\frac{2,057}{7,977} \right) \times 5\%$$

$$IRR = 10\% + 0.258 \times 5\% = 10\% + 1.3\%$$

$$IRR = 11.3$$

Conclusion

The IRR of the project (11.3%) is less than the target return (12%).

The project should be rejected.

	Practice questions	**3**

1 The following information is about a project.

Year	₦
0	(53,000)
1	17,000
2	25,000
3	16,000
4	12,000

This project has an NPV of ₦2,210 at a discount rate of 11%

Estimate the IRR of the project.

2 The following information is about a project.

Year	₦
0	(65,000)
1	27,000
2	31,000
3	15,000

This project has an NPV of ₦(1,515) at a discount rate of 8%

Estimate the IRR of the project.

5.3 IRR as an estimate

The interpolation method is only approximate and is not exact. This is because it assumes that the IRR decreases at a constant rate between the two NPVs.

Illustration: IRR by interpolation
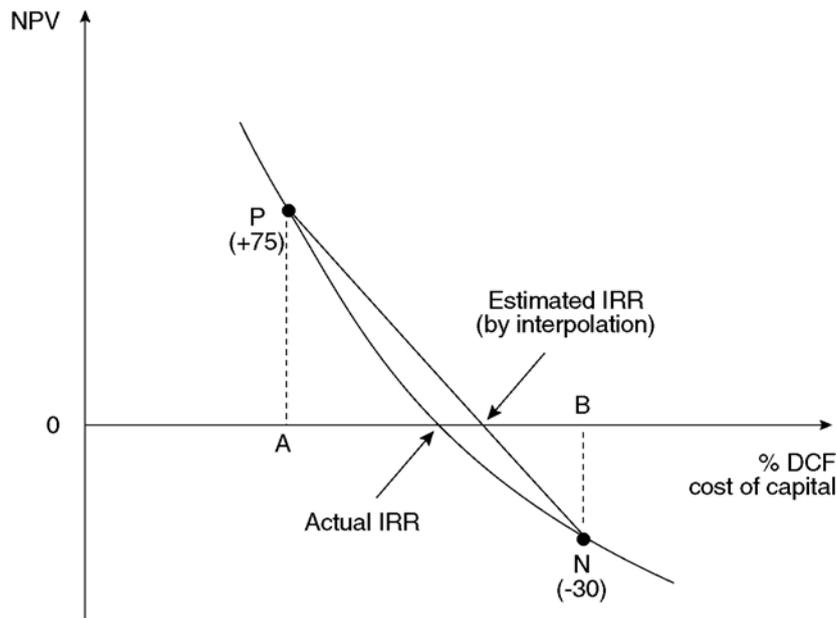
For a 'typical' project, the IRR estimated by the interpolation method is slightly higher than the actual IRR. The interpolation method gives a more accurate estimate of the IRR when:

❑ both NPVs in the calculation are close to 0; and

❑ the NPV at A% is positive and the NPV at B% is negative.

(Note that the IRR function in excel estimates IRR in a similar way. However, excel uses the initial IRR to recalculate the NPV and inputs this into a new calculation of IRR, and so on, until it reaches a point where both NPVs are very close to zero. This means that for all practical purposes, excel calculates the IRR rather than estimates it).

6 RELATIVE MERITS OF NPV AND IRR

Section overview

- Advantages of DCF techniques
- Advantages and disadvantages of the NPV method
- Advantages and disadvantages of the IRR method

6.1 Advantages of DCF techniques

NPV and IRR have several advantages in common.

☐ Both techniques are based on cash flows rather than accounting profits which are easier to manipulate and more difficult to interpret.

☐ Both techniques take account of time value. This is a very important variable that is not considered by less sophisticated techniques like return on capital employed.

☐ Both techniques take account of all cash flows modelled and not just those in a payback period.

6.2 Advantages and disadvantages of the NPV method

Advantages of the NPV method (compared to the IRR method)

NPV provides a single absolute value which indicates the amount by which the project should add to the value of the company.

The NPV decision rule is consistent with the objective of maximisation of shareholders' wealth.

Disadvantages of the NPV method (compared to the IRR method)

The following are often stated as the main **disadvantages** of the NPV method (compared to the IRR method).

Disadvantage	Commentary
The time value of money and present value are concepts that are not easily understood by those without a financial education.	This might be true but decision makers tend to be intelligent and educated people. If they do not understand something, they can have it explained to them).
There might be some uncertainty about what the appropriate cost of capital or discount rate should be for applying to any project. The approach would give a perfect answer in a perfect world but companies do not operate with perfect information so this undermines the usefulness of NPV.	Capital markets may not be perfect but they are often efficient. Companies should be able to arrive at a cost of capital that can be used. Also, the inability to measure a cost of capital could be considered a weakness of the IRR because the IRR has to be measured against a benchmark and the best of these would be the cost of capital.

6.3 Advantages and disadvantages of the IRR method

Advantages of the IRR method (compared to the NPV method)

Advantage	Commentary
The main advantage of the IRR method of investment appraisal (compared to the NPV method) is often given as it is easier to understand an investment return as a percentage return on investment than as a money value NPV.	People are used to receiving information based on percentages and so would be more comfortable with the notion of IRR but this does not mean that they would understand it.
	The supposed simplicity of IRR is an illusion. The percentage return is an average which takes account of time value. Without a certain level of financial education it is difficult to fully appreciate what the percentage answer actually means.
	Also remember that the decision makers are not the average man on the street. They are clever, educated people so would understand NPV or be in a position to do so.
	It is true that it is not necessary to know the cost of capital to calculate the IRR.
Another advantage of the IRR method is that it does not require an estimate of the cost of capital.	However, once calculated it must be compared to something and this is usually the cost of capital.
	Therefore, the cost of capital may not be necessary in the calculation of the IRR but is important in its use.

Disadvantages of the IRR method (compared to the NPV method)

Disadvantage	Commentary
One disadvantage of the IRR method compared to NPV is that it is a relative measure, not an absolute measure. The technique cannot choose between a 10% IRR based on an initial investment of ₦10,000 or a 10% IRR based on an initial investment of ₦10,000,000 or would choose a project with an IRR of 11% on an initial investment of ₦10,000 instead of a 10% IRR based on an initial investment of ₦10,000,000.	This is a weakness of the technique but techniques do not make decisions – people do.
	A decision maker should be able to understand the difference between these projects even if the technique does not provide that information.

The following disadvantages of IRR compared to NPV are more fundamental.

Mutually exclusive projects

For accept/reject decisions on individual projects, the IRR method will give the same decision as the NPV method. However, in making a choice between two mutually exclusive projects IRR might give a decision that is in conflict with NPV.

Consider the following graphs which illustrate NPV profiles at different costs of capital for two projects.

Illustration: Conflict of NPV and IRR for mutually exclusive projects
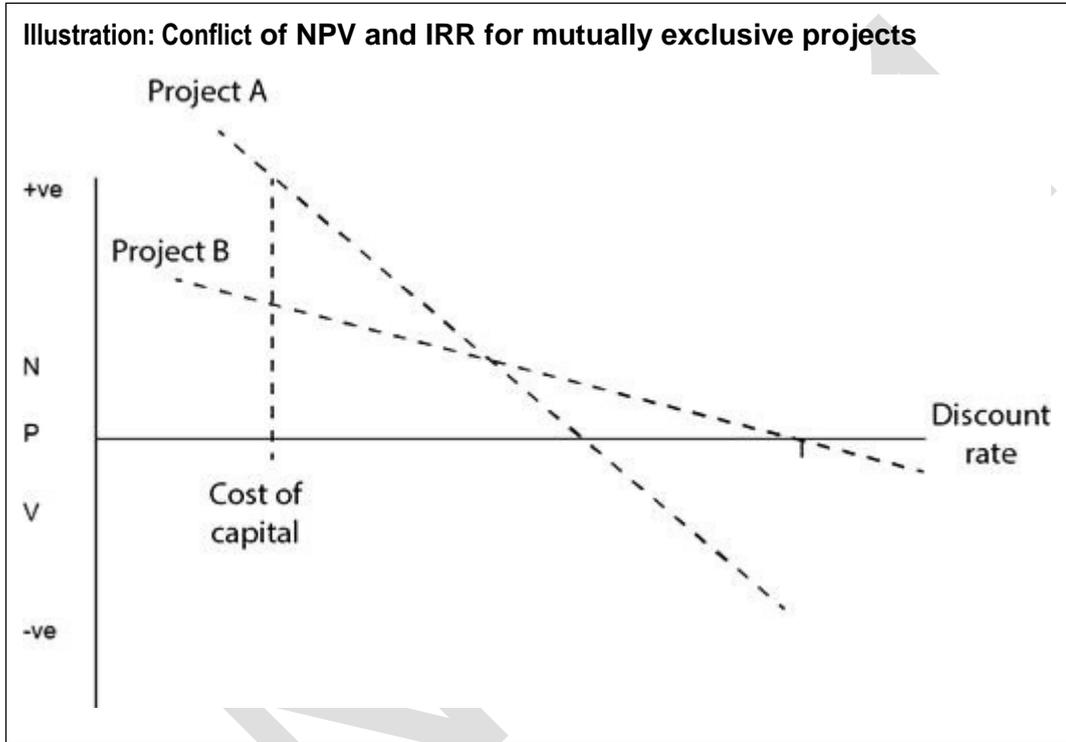
Project A has the higher NPV at the company's cost of capital but project B has the higher IRR.

Resolving the conflict is easy – use NPV! This can be justified on the basis that NPV has a more realistic reinvestment assumption than IRR. The concept of the reinvestment assumption refers to the discount rate used to re-express cash flows in different time terms. The NPV approach "time shifts" values using the cost of capital, whereas the IRR method "time shifts" values using the IRR. It is argued that using the cost of capital is more realistic as this is the cost faced by the company at the date of the appraisal.

Multiple IRRs

Another disadvantage of the IRR method is that a project might have two or more different IRRs, when some annual cash flows during the life of the project are negative. How should the different IRRs be interpreted?

Illustration: Multiple IRRs

Illustration: Multiple IRRs
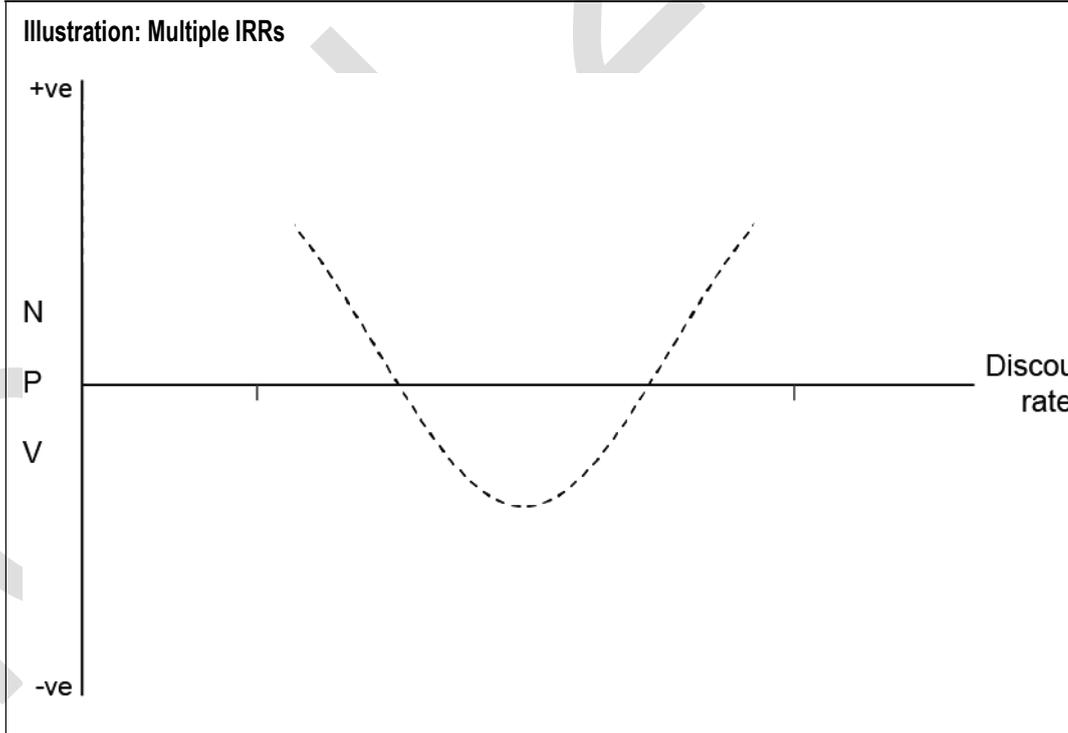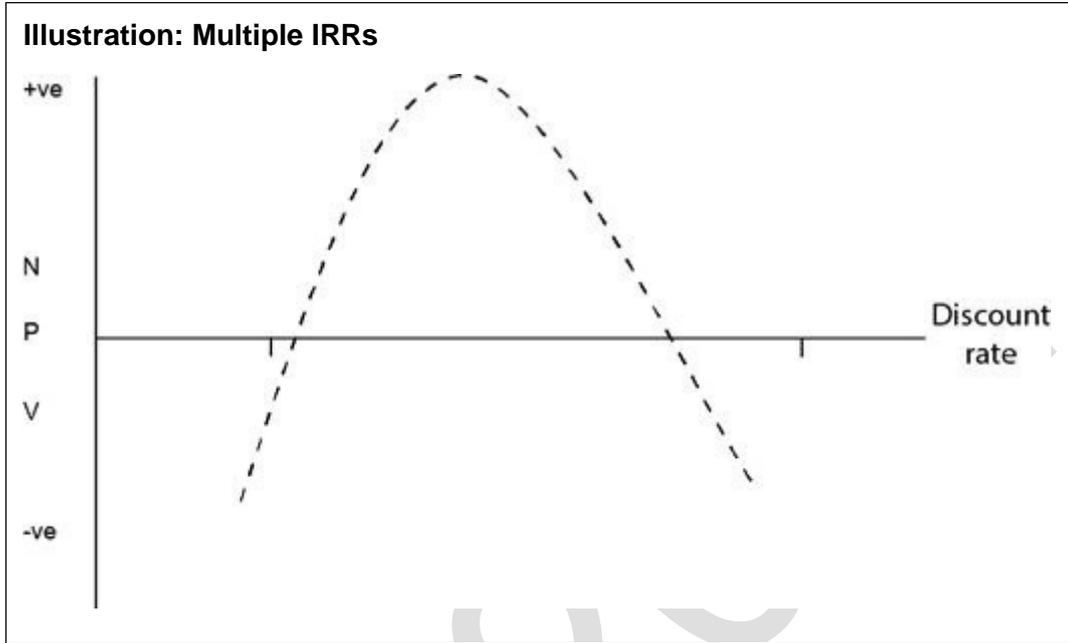
No IRRs

Some projects might not have an IRR at all. This problem is easily solved by appraising the project using NPVs.

Illustration: No IRRs
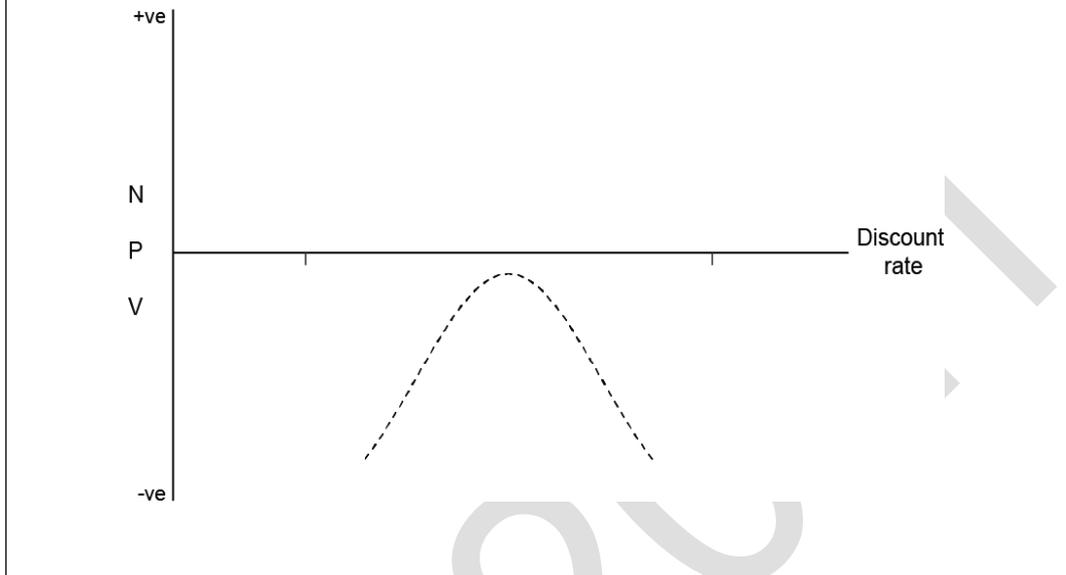
Illustration: No IRRs
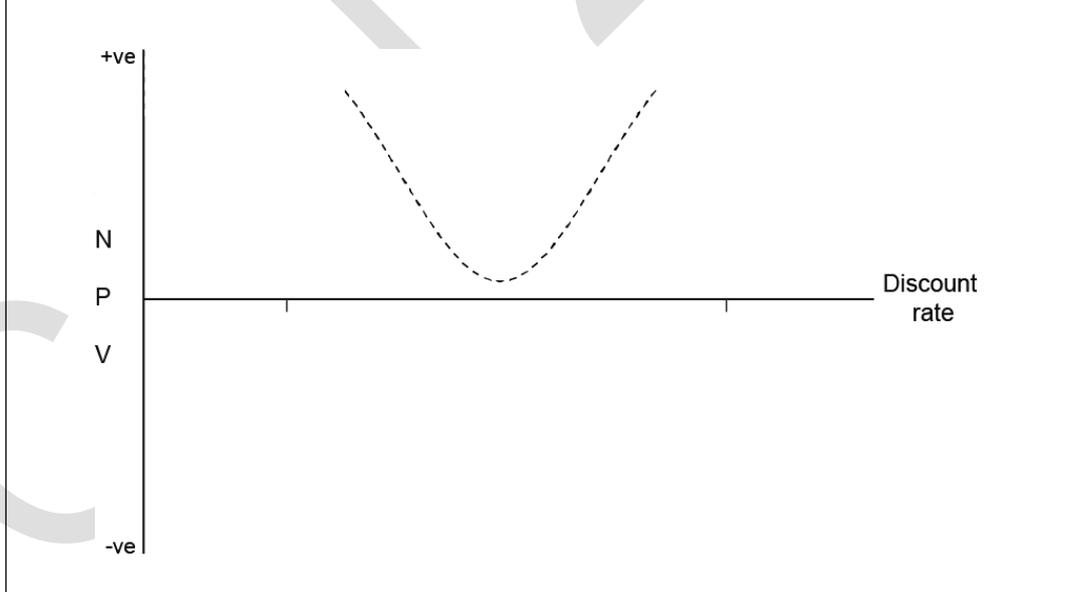
7 MODIFIED INTERNAL RATE OF RETURN (MIRR)

Section overview

■ Modified internal rate of return (MIRR)

■ Calculating MIRR

7.1 Modified internal rate of return (MIRR)

A criticism of the IRR method is that in calculating the IRR, an assumption is that all cash flows earned by the project can be reinvested to earn a return equal to the IRR.

For example, suppose that a project has an NPV of + ₦300,000 when discounted at the cost of capital of 8%, and the IRR of the project is 14%. In calculating the IRR, an assumption would be that all cash flows from the project will be reinvested as soon as they are received to earn a return of 14% - even though the company's cost of capital is only 8%.

Modified internal rate of return is a calculation of the return from a project, as a percentage yield, where it is assumed that cash flows earned from a project will be reinvested to earn a return equal to the company's cost of capital. So in the previous example of the project with an NPV of ₦300,000 at a cost of capital of 8%, MIRR would be calculated using the assumption that project cash flows are reinvested when they are received to earn a return of 8% per year.

Using MIRR for project appraisal

It might be argued that if a company wishes to use the discounted return on investment as a method of capital investment appraisal, it should use MIRR rather than IRR, because MIRR is more realistic because it is based on the cost of capital as the reinvestment rate.

7.2 Calculating MIRR

Approach

The MIRR of a project is calculated as follows:

Step 1: Calculate the total PV of the cash flows involved in the investment phase of the project. Do this by taking the negative net cash flows in the early years of the project, and discount these to a present value.

If the only negative cash flow is at time 0, the PV of the investment phase is this cash flow. However, if there are negative cash flows in Year 1, or Year 1 and 2, discount these to a present value and add them to the Year 0 cash outflow.

Step 2: Take the cash flows from the year that the project cash flows start to turn positive and compound these to an end-of-project terminal value, assuming that cash flows are reinvested at the cost of capital.

For example, if cash flows are positive from Year 1 of a five-year project:

❑ Compound the cash flow in Year 1 to end-of-year 5 value using the cost of capital as the compound rate

❑ Compound the cash flow in Year 2 to end-of-year 5 value using the cost of capital as the compound rate

❑   Compound the cash flow in Year 3 to end-of-year 5 value using the cost of capital as the compound rate

❑   Compound the cash flow in Year 4 to end-of-year 5 value using the cost of capital as the compound rate

❑   Add the compounded values for each year to the cash flow at the end of Year 5.

The total of the compounded values is the total value of returns during the 'recovery' phase of the project, expressed as an end-of-project value.

Step 3: The MIRR is then calculated as follows:

Formula: Modified internal rate of return (MIRR)

$$\text{MIRR} = \sqrt[n]{\frac{A}{B}} - 1$$

Where:

n = the project life in years

A = the end-of-year investment returns during the recovery phase of the project (as calculated in Step 2)

B = the present value of the capital investment in the investment phase (as calculated in Phase 1)

Example: Modified internal rate of return

A business requires a minimum expected rate of return of 8% on its investments. A proposed capital investment has the following expected cash flows and NPV.

Year	Cash flow	Discount factor at 8%	Present value
	₦		₦
0	(60,000)	1.000	(60,000)
1	(20,000)	0.926	(18,520)
2	30,000	0.857	25,710
3	50,000	0.794	39,700
4	40,000	0.735	29,400
5	(10,000)	0.681	(6,810)
NPV			9,480

The IRR of the project is about 11.5% (workings not shown).

Example (continued): Modified internal rate of return

The modified internal rate of return (MIRR) is calculated as follows: **Step 1. The**

PV of investment in the investment phase

Year	Cash flow	Discount factor at 8%	Present value
	₦		₦
0	(60,000)	1.000	(60,000)
1	(20,000)	0.926	(18,520)
			(78,520)

Step 2. Reinvest cash flows in the recovery phase at the cost of capital, 8%

Year	Cash flow	Compound at 8% to end of Year 5	Present value
	₦		₦
2	30,000	$\times (1.08)^3$	37,791
3	50,000	$\times (1.08)^2$	58,320
4	40,000	$\times (1.08)^1$	43,200
5	(10,000)		(10,000)
Total			129,311

Step 3. Calculate MIRR using the formula

$$\text{MIRR} = \sqrt[5]{\frac{129,311}{78,520}} - 1$$

MIRR = 0.1049 or 10.49%, say 10.5%.

The IRR is 11.5%, but the MIRR is lower because it assumes a lower reinvestment rate of cash inflows.

8 RELEVANT COSTS IN INVESTMENT DECISIONS

Section overview

- Relevant costs and decision-making
- Relevant cost of materials
- Relevant cost of existing equipment
- Relevant cost of investment in working capital
- Relevant cost of labour
- Opportunity costs

8.1 Relevant costs and decision-making

You should already be familiar with the concept that when any decision is evaluated in accounting, relevant costs should be used for the evaluation.

Definition of relevant costs and benefits

Relevant costs and benefits are future cash flows arising as a direct consequence of the decision under consideration.

❑ Relevant costs are **cash flows**. Any items of cost that are not cash flows must be ignored for the purpose of decision. For example, depreciation expenses are not cash flows and must always be ignored.

❑ Relevant costs are **future** cash flows. Costs that have already been incurred are not relevant to a decision that is being made now. The cost has already been incurred, whatever decision is made, and it should therefore not influence the decision. For example, a company might incur initial investigation costs of ₦20,000 when looking into the possibility of making a capital investment. When deciding later whether to undertake the project, the investigation costs are irrelevant, because they have already been spent.

❑ Relevant costs are also **costs that will arise as a direct consequence of the decision**, even if they are future cash flows. If the costs will be incurred whatever decision is taken, they are not relevant to the decision.

Some examples of relevant costs are given below, but you should already be familiar with the concept of relevant costs from your previous studies.

8.2 Relevant costs of materials

When materials will have to be purchased for a project, because there are no existing inventories of the materials, their relevant cost is their future purchase cost.

However if the materials required for a project are already held in inventory, their relevant cost depends on circumstances.

❑ If the materials are in regular use, and quantities consumed for the investment project would be replaced in the normal course of trading operations, the relevant cost of the materials is their current replacement cost.

❑ If the materials will not be replaced if they are used for the investment project, their relevant cost is the higher of:

- their net disposal value and

- the net contribution that could be earned using the materials for another available use.

Example: Relevant cost of materials

A company is considering a project with a 4 year life.

The project will require 5,000 kgs of material X per annum.

The company has 4,000 kgs of material X in inventory which cost ₦400 per kilogram.

The price for material X has since risen to ₦420 per kilogram. Material X

is used regularly by the company.

The relevant annual cash flows in respect of material X are as follows:

	t1 ₦ 000	t2 ₦ 000	t3 ₦ 000	t4 ₦ 000
In inventory (4,000 kgs × ₦420)	1,680			
Purchased (1,000 × ₦420)	420			
Purchased (5,000 × ₦420)		2,100	2,100	2,100
	2,100	2,100	2,100	2,100

Material X is in regular use.

Any units of the material that are held in inventory will have to be replaced. The relevant cost is their replacement cost.

= 5,000 kilograms × ₦420 = ₦2,100,000.

Example: Relevant cost of materials

A company is considering a project with a 4 year life.

The project will require 2,000 kgs of material Y per annum.

The company has 1,500 kgs of material Y in inventory which cost ₦144,000. The price for material Y has since risen to ₦100 per kilogram.

Material Y is no longer used by the company and will be sold for ₦36,000 if not used on the project.

The relevant annual cash flows in respect of material Y are as follows:

	t1 ₦ 000	t2 ₦ 000	t3 ₦ 000	t4 ₦ 000
Inventory (1,500 kgs @ scrap value)	36			
Purchased (500 × ₦100)	50			
Purchased (2,000 × ₦100)		200	200	200
	86	200	200	200

This is not in regular use. There are 1,500 kilograms in inventory, and an additional 500 kilograms would have to be purchased in year 1.

1,500 kgs per annum would need to be purchased in years 2 to 4.

8.3 Relevant cost of existingequipment

When new capital equipment will have to be purchased for a project, the purchase cost of the equipment will be a part of the initial capital expenditure, and so a relevant cost.

However, if an investment project will also make use of equipment that the business already owns, the relevant cost of the equipment will be the higher of:

❑ The current disposal value of the equipment, and

❑ The present value of the cash flows that could be earned by having an alternative use for the equipment.

Example: Relevant cost of existing equipment

A company is considering a project with a 4 year life.

The company owns plant which could be used on the project. The plant

has a disposal value of ₦100,000.

If not used on the project the plant could be used on a project which would generate future cash flows with a present value of ₦80,000.

The relevant cash flow at time 0 is as follows:

	₦
Disposal proceeds forgone	100,000

If not used on this project the plant could be sold for ₦100,000 or held to generate future cash flows of ₦80,000. Therefore, it would be sold.

Example: Relevant cost of existing equipment

A company is considering a project with a 4 year life.

The company owns plant which could be used on the project. The plant

has a disposal value of ₦100,000.

If not used on the project the plant could be used on a project which would generate future cash flows with a present value of ₦120,000.

The relevant cash flow at time 0 is as follows:

	₦
Disposal proceeds forgone	100,000
NPV of alternative project	20,000
	120,000
Alternatively	
PV of future cash flows from alternative use	120,000

> ### Example: Relevant cost of existing equipment
>
> A company owns a delivery truck. The truck is no longer used for regular work, and could be sold now for ₦800,000.
>
> There is an opportunity to use the truck on a special contract that would last for 2 years. At the end of that time the truck would be disposed of. Its sale value would by then be ₦600,000 after spending an extra ₦15,000 on repairs to get it into condition for sale.
>
> The relevant cash flows to be included in the NPV calculation are as follows:
>
> | | t0 ₦ 000 | t1 ₦ 000 | t2 ₦ 000 |
> |---|---|---|---|
> | Delivery truck (disposal proceeds fore gone | (800) | | |
> | Sales proceeds | | | 600 |
> | Repairs | | | (15) |

8.4 Using Deprival Value

When an asset which is currently owned by a business is required for another specific contract/project, the existing activity is to be deprived of that asset. The loss to the business from the existing activity being deprived of use of the asset is the deprival value. The value to be used in the investment appraisal is the asset's deprival value. The process of determining the deprival value of an asset can be summarised in the following diagram:
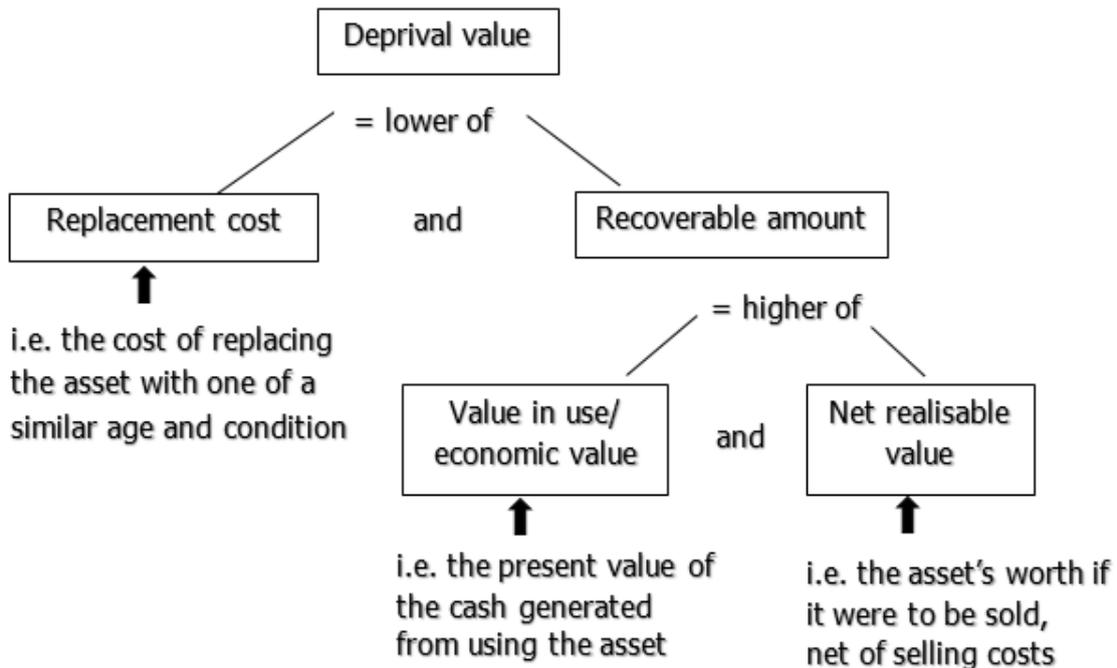
If the asset has a net realisable value in excess of its economic value, it should be sold, that is, it is better to sell it than keep on using it. If the economic value is higher than the net realisable value, it is worth keeping and using. At this point, therefore, were the firm to be deprived of the asset, the best alternative foregone is the higher of the net realisable value or economic value (the recoverable amount).

However, if the recoverable amount is less than the replacement cost, then the recoverable amount is the deprival value, that is, the asset would not be replaced were the firm to be deprived of its use. If the recoverable amount exceeds the replacement cost, the asset should be replaced as the latter represents its deprival value.

Example

A company has an existing machine which needs to be used on a new contract. The machine could be sold now for ₦4,000,000 or made use of to service the needs of existing customers for business which has a value (in present value terms) of ₦6,000,000.

Required

What is the opportunity cost of using the machine on a new contract:

a)   Assuming that it could not be replaced?

b)   If the machine could be replaced at a cost of either

       i)   ₦3,200,000

       ii)   ₦7,200,000

The opportunity cost can be computed as follows:

a)   The existing customers create more value than selling the machine, so the machine would not be sold. Hence the opportunity cost is the value in use of ₦6 million. This is the higher of its net realisable value (₦4 million) and its value in an alternative use (₦6 million).

       Note: If the value in use ever dropped below the net realisable value (NRV), then the asset would not be worth keeping.

b) i)   If the new contract will make use of a currently owned machine then in principle, the cost of using it will be replacement cost. If the value in use is ₦6 million, and the replacement cost is ₦3.20 million, then the machine will be replaced. The equipment cost of the new contract would therefore be ₦3.20 million.

    ii)   If however, the replacement cost is ₦7.20million then it is not worth replacing. Thus, the relevant cost of equipment for the new contract will be the opportunity cost or benefit foregone i.e. the ₦6million.

       In each case, therefore, the relevant cost is the cash flow effect of the decision to use the existing resource – either the replacement cost or the benefit in the next best case, that is, the deprival value.

8.5 Relevant cost of investment in working capital

It is important that you should understand the relevance of investment in working capital for cash flows.

Strictly speaking, an investment in working capital is not a cash flow. However, it should be treated as a cash flow, because:

❑   When capital investment projects are evaluated, it is usual to estimate the cash profits for each year of the project..

❑   However, actual cash flows will differ from cash profits by the amount of the increase or decrease in working capital.

You should be familiar with this concept from cash flow statements.

❑   If there is an increase in working capital, cash flows from operations will be lower than the amount of cash profits. The increase in working capital can therefore be treated as a cash outflow, to adjust the cash profits to the expected cash flow for the year.

❑   If there is a reduction in working capital, cash flows from operations will be higher than the amount of cash profits. The reduction in working capital can therefore be treated as a cash inflow, to adjust the cash profits to the expected cash flow for the year.

Example: Relevant cost of working capital

A company is considering whether to invest in the production of a new product. The project would have a six-year life. Investment in working capital would be ₦30,000 at the beginning of Year 1 and a further ₦20,000 at the beginning of Year 2.

It is usually assumed that a cash flow, early during a year, should be treated as a cash flow as at the end of the previous year.

The relevant cash flows for the working capital investment would therefore be as follows:

Year	₦
0 (cash outflow)	(30,000)
1 (cash outflow)	(20,000)
6 (cash inflow)	50,000

Example: Relevant cost of working capital

A company is considering a project with a 3 year life.

The project will require generate operating cash inflows over the life of the project as follows.

	t1 ₦ 000	t2 ₦ 000	t3 ₦ 000
Operating cash inflows	100	150	80

Working capital at the start of each year is expected to be 10% of the operating cash flows for that year.

The relevant cash flows for the working capital investment would therefore be as follows:

	t0 ₦ 000	t1 ₦ 000	t2 ₦ 000	t3 ₦ 000
Invested (outflow)				
10% of year 1 inflows	(10)			
10% of year 2 inflows (₦15,000) less amount already invested		(5)		
Released (inflow)				
10% of year 3 inflows (₦8,000) but ₦15,000 already invested so ₦7,000 released			7	
Release of remaining ₦8,000 at end of the project				8

8.6 Relevant cost of labour

The relevant costs of a decision to do some work or make a product will usually include costs of labour.

The relevant cost of labour for any decision is the additional cash expenditure (or saving) that will arise as a direct consequence of the decision.

❑ **If the cost of labour is a variable cost** and labour is not in restricted supply, the relevant cost of the labour is its variable cost.

❑ **If labour is a fixed cost and there is spare labour time available**, the relevant cost of using labour is zero.

❑ **If labour is in limited supply**, the relevant cost of labour should include the opportunity cost of using the labour time for the purpose under consideration instead of using it in its next-most profitable way. The cost of an hour of labour would be the pay per hour plus the lost contribution

8.7 Opportunity costs

Opportunity costs are the benefits forgone by using assets or resources for one purpose, instead of using them in the most profitable alternative way. Opportunity costs are commonly measured as contribution forgone, but might also be measured as a present value (in DCF analysis).

When resources have more than one alternative use, and are in limited supply, their opportunity cost is the contribution forgone by using them for one purpose and so being unable to use them for another purpose.

Example: Opportunity costs

A company is considering an investment in a major new information system. The investment will require the use of six of the company's IT specialists for the first one year of the project.

These IT specialists are each paid ₦100,000 each per year.

IT specialists are difficult to recruit. If the six specialists are not used on this project, they will be employed on other projects that would earn a total contribution of ₦500,000.

The relevant cost of the IT specialist in Year 1 of the project would be:

	₦
Basic salaries	600,000
Contribution forgone	500,000
Total relevant cost	1,100,000

Example: Relevant cost of labour (including opportunity costs)

A company is considering whether to invest in a new project which would run for 3 years.

The project requires labour as follows:

Department 1. This department has spare capacity. The contract requires 10 men from this department. The men each earn ₦2,000,000 per annum.

The company plan to make 15 men redundant in a year's time at a cost of ₦200,000 per person. If the project proceeds only 5 men will be made redundant.

Department 2. The contract would require 15 workers out of the 30 who work in department 2. The total annual labour cost of the department is ₦70,000,000. Department 2 labour is in short supply. The department produces services that earn a contribution of ₦30,000,000 perannum.

New workers would be recruited who would be capable of doing department 2 work but only in year 2 of the project.

Department 3. This department employs 100 workers each earning ₦2,500,000 per annum.

The department is operating at full capacity earning a contribution of ₦150 million.

The company could either divert 20 workers to the new project or could offer to pay an overtime premium of 50% to the workforce to encourage them to work extra hours.

Required:

What is the relevant cost for the contract of labour in the three departments?

Example (continued): Relevant cost of labour The

relevant cash flows for labour are as follows:

	t1 ₦m	t2 ₦m	t3 ₦m
Department 1 (note 1)			
Redundancy payment saved (10 ₦200,000)	2		
Salaries	nil	(20)	(20)
Department 2 (note 2)			
Labour cost	(35)	(35)	(35)
Lost contribution	(15)		
Department 3 (note 3)			
Labour cost	75	75	75

Note 1:

The 10 men engaged on the project would have been paid in the first year whether the project proceeds or not. Therefore, the incremental cost is nil.

The 10 workers engaged on the project will not be made redundant at t1 thus saving the redundancy payment.

Note 2:

Relevant cost in year 1 is the salaries of the 15 workers (50% of the workforce) plus the lost contribution:

(50% ₦70,000,000) + (50% ₦30,000,000)

= ₦35,000,000) + ₦15,000,000= ₦50,000,000

In years 2-4 the relevant cost is the amount paid for the workers who are recruited to replace those diverted to the project.

Note 3:

The company have a choice between diverting 20 workers (20% of the workforce) from existing work or of paying an overtime premium to obtain the effort of 20 workers. Costs of each course of action would be as follows:

Diverting 20 workers: (20 ₦2,500,000) + (20% ₦150,000,000) = ₦80,000,000.

Paying overtime premium: (20 ₦2,500,000) 150% = ₦75,000,000. The company would choose the lower cost therefore, the relevant cost is ₦75,000,000.

8 CHAPTER REVIEW

Chapter review
Before moving on to the next chapter check that you now know how to: ■ Explain discounting ■ Explain NPV and apply the technique in project appraisal ■ Explain IRR and apply the technique in project appraisal ■ Discuss the relative merits of NPV and IRR ■ Explain MIRR and apply the technique in project appraisal ■ Identify relevant cash flows as inputs to DCF techniques

SOLUTIONS TO PRACTICE QUESTIONS

Solutions   **1**

1 NPV calculation:

Year	Cash flow	Discount factor (11%)	Present value
0	(53,000)	1	(53,000)
1	17,000	$\dfrac{1}{(1.11)}$	15,315
2	25,000	$\dfrac{1}{(1.11)^2}$	20,291
3	16,000	$\dfrac{1}{(1.11)^3}$	11,699
4	12,000	$\dfrac{1}{(1.11)^4}$	7,905
NPV			2,210

The NPV is positive so the project should be accepted.

2 NPV calculation:

Year	Cash flow	Discount factor (8%)	Present value
0	(65,000)	1	(65,000)
1	27,000	$\dfrac{1}{(1.08)}$	25,000
2	31,000	$\dfrac{1}{(1.08)^2}$	26,578
3	15,000	$\dfrac{1}{(1.08)^3}$	11,907
NPV			(1,515)

The NPV is negative so the project should be rejected.

Solutions **2**

1   NPV calculation:

Year	Cash flow	Discount factor (15%)	Present value
0	(556,000)	1	(556,000)
5	56,000	$\dfrac{1}{(1.15)^5}$	27,842
1 → 5	200,000	$=\dfrac{1}{0.15}\left(1-\dfrac{1}{1.15^5}\right)$	670,431
NPV			142,273

The NPV is positive so the project should be accepted.

2   NPV calculation:

Year	Cash flow	Discount factor (10%)	Present value
0	(1,616,000)	1	(1,616,000)
4	301,000	$\dfrac{1}{(1.1)^4}$	205,587
1 → 4	500,000	$=\dfrac{1}{0.1}\left(1-\dfrac{1}{1.1^4}\right)$	1,584,932
NPV			174,519

The NPV is positive so the project should be accepted.

Solutions **3**

1 NPV at 11% is ₦2,210. A higher rate is needed to produce a negative NPV. (Say 15%)

Year	Cash flow	Discount factor at 15%	Present value at 15%
0	(53,000)	1,000	(53,000)
1	17,000	0.870	14,790
2	25,000	0.756	18,900
3	16,000	0.658	10,528
4	12,000	0.572	6,864
NPV			(1,918)

Using

$$IRR = A\% + \left(\frac{NPV_A}{NPV_A - NPV_B} \right) \times (B-A)\%$$

$$IRR = 10\% + \left(\frac{2,210}{2,210 - -1,918} \right) \times (15-10)\%$$

$$IRR = 10\% + \left(\frac{2,210}{2,210 + 1,918} \right) \times 5\%$$

$$IRR = 10\% + \left(\frac{2,210}{4,128} \right) \times 5\%$$

$$IRR = 10\% + 0.535 \times 5\% = 10\% + 2.7\%$$

$$IRR = 12.7\%$$

Solutions **3**

2 NPV at 8% is ₦(1,515). A lower rate is needed to produce a positive NPV. (say 5%)

Year	Cash flow	Discount factor at 5%	Present value at 5%
0	(65,000)	1,000	(65,000)
1	27,000	0.952	25,704
2	31,000	0.907	28,117
3	15,000	0.864	12,960
NPV			1,781

Using

$$IRR = A\% + \left(\frac{NPV_A}{NPV_A - NPV_B} \right) \times (B - A)\%$$

$$IRR = 5\% + \left(\frac{1,781}{1,781 - -1,515} \right) \times (8 - 5)\%$$

$$IRR = 5\% + \left(\frac{1,781}{1,781 + 1,515} \right) \times 3\%$$

$$IRR = 5\% + \left(\frac{1,781}{3,296} \right) \times 3\%$$

$$IRR = 5\% + 0.540 \times 3\% = 5\% + 1.6\%$$

$$IRR = 6.6\%$$

Professional level
Strategic financial management

DCF: taxation and inflation

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B	Business analysis				
	5	Investment appraisal			
		a	Discounted cash flow techniques		
			i	Evaluate potential value added to an organisation arising from a specified capital investment project using the net present value (NPV) model covering:	
					Inflation and specific price variation;
					Taxation;

Exam context

This chapter explains how to incorporate taxation and inflation into discounted cash flow models.

By the end of this chapter, you should be able to:

■ Identify taxation cash flows

■ Distinguish the money cost of capital and the real cost of capital

■ Apply the Fisher equation to evaluate an unknown variable

■ Explain the link between money cash flows and real cash flows

■ Identify money cash flows by taking inflation into account

■ Perform discounted cash flow analysis taking both taxation and inflation into account

1 DCF AND TAXATION

Section overview

- Taxation cash flows in investment appraisal
- Interest costs and taxation
- Timing of cash flows for taxation

1.1 Taxation cash flows in investment appraisal

In project appraisal, cash flows arise due to the effects of taxation. When an investment results in higher profits, there will be higher taxation. Tax cash flows should be included in DCF analysis. In DCF analysis it is normally assumed that tax is payable on the amount of cash profits in any year.

For example, if taxation on profits is 30% and a company earns ₦10,000 cash profit each year from an investment, the pre-tax cash inflow is ₦10,000, but there is a tax payment of ₦3,000.

Similarly, if an investment results in lower profits, tax is reduced. For example, if an investment causes higher spending of ₦5,000 each year and the tax on profits is 30%, there will be a cash outflow of ₦5,000 but a cash benefit from a reduction in tax payments of ₦1,500.

1.2 Interest costs and taxation

Interest cash flows are not included in DCF analysis. This is because the interest cost is in the cost of capital (discount rate).

Interest costs are also allowable expenses for tax purposes, therefore, present values are estimated using the post-tax cost of capital. The post-tax cost of capital is a discount rate that allows for the tax relief on interest payments. This means that because interest costs are allowable for tax purposes, the cost of capital is adjusted to allow for this and is reduced accordingly.

The cost of capital is explained in more detail in a later chapter. Briefly however, the following formula holds in cases where debt is irredeemable.

Formula: Post-tax interest cost

Post tax-cost of debt = Pre-tax interest cost (1 – tax rate)

Example: Post-tax interest cost

Interest on debt capital is 10% and the rate of tax on company profits is 30%.

Post tax-cost of debt	= Pre-tax interest cost (1 – tax rate)
	= 10% (1 − 0.3) = 7%

1.3 Timing of cash flows for taxation

When cash flows for taxation are included in investment appraisal, an assumption must be made about when the tax payments are made. The actual timing of tax payments depends on the tax rules that apply in the relevant jurisdiction. Usually, one or other of the following assumptions is used.

❑ tax is payable in the same year as the profits to which the tax relates; or

❑ tax is payable one year later ('one year in arrears'). (For example, tax on the cash profits in Year 1 is payable in Year 2).

Either of these two assumptions could be correct. An examination question should specify which assumption you should use.

Example: Timing of cash flows for taxation

A project costing ₦60,000 is expected to result in net cash inflows of ₦40,000 in year 1 and ₦50,000 in year 2.

Taxation at 30% occurs one year in arrears of the profits or losses to which they relate.

The post-tax cost of capital is 8%.

Assume that the cost of the project is not an allowable cost for tax purposes (i.e. capital allowances should be ignored).

Required

Calculate the NPV of the project.

Answer

	0	1	2	3
Initial outlay	(60,000)			
Cash inflows		40,000	50,000	
Tax on inflows			(12,000)	(15,000)
Annual cash flows	(60,000)	40,000	38,000	(15,000)
Discount factors	1	0.926	0.857	0.794
Present values	(60,000)	37,040	32,566	(11,910)
NPV				(2,304)

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2 TAX-ALLOWABLE DEPRECIATION (CAPITAL ALLOWANCES)

> **Section overview**
>
> - The nature of capital allowances
> - Straight-line method
> - Reducing balance method
> - Balancing charge or balancing allowance on disposal

2.1 The nature of capital allowances

When a business buys a non-current asset, depreciation is charged in the financial accounts. However, depreciation in the financial accounts is not an allowable expense for tax purposes.

Instead, the tax rules provide for 'tax-allowable depreciation' or capital allowances, according to rules determined by the government.

Tax-allowable depreciation affects the cash flows from an investment, and the tax effects must be included in the project cash flows.

There are two ways of allowing depreciation for tax purposes:

❑ The straight-line method; and

❑ The reducing balance method.

2.2 Straight-line method

Example: Calculation of tax effect of capital allowances – straight line method

An asset costs ₦80,000 and has an expected economic life of four years with no residual value.

If depreciation is allowed for tax purposes over four years using the straight-line method, the allowable depreciation would be ₦20,000 each year.

If the rate of tax on profits is 30%, the annual reduction in tax from the capital allowance is ₦20,000 × 30% = ₦6,000 for four years.

		Tax written down value (TWDV) ₦	Tax allowable depreciation ₦	Tax saving at 30% ₦
Time 0	Cost	80,000		
Year 1	Allowance claimed	(20,000)	20,000	6,000
		60,000		
Year 2	Allowance claimed	(20,000)	20,000	6,000
		40,000		
Year 3	Allowance claimed	(20,000)	20,000	6,000
		20,000		
Year 4	Allowance claimed	(20,000)	20,000	6,000
		0		

The tax cash flows (tax savings) should be treated as cash inflows in the appropriate year in the DCF analysis. In the above example:

❑ If tax cash flows occur in the same year as that the allowance is claimed, the cash inflows of ₦6,000 will occur in each of the years 1 – 4.

❑ If tax cash flows occur in the year following the claim for the allowance, the cash inflows of ₦6,000 will occur in each of the years 2 – 5.

2.3 Reducing balance method

With the reducing balance method, the tax-allowable depreciation expense in each year is a constant percentage each year of the tax written down value (TWDV) of the asset as at the beginning of the year. The TWDV of the asset is its cost minus all accumulated capital allowances to date.

Example: Calculation of tax effect of capital allowances – reducing balance method

An asset costs ₦80,000. Tax-allowable depreciation is 25% on a reducing balance basis.

Tax on profits is payable at the rate of 30%. The cash flow benefits from the tax depreciation are calculated as follows:

			Tax allowable	
Year		TWDV	depreciation (25%)	Tax saved (30%)
		₦	₦	₦
0	Cost	80,000		
1	Allowance claimed	(20,000)	20,000	6,000
		60,000		
2	Allowance claimed	(15,000)	15,000	4,500
		45,000		
3	Allowance claimed	(11,250)	11,250	3,375
		33,750		
4	Allowance claimed	(8,438)	8,438	2,531
		25,312		
5	Allowance claimed	(6,328)	6,328	1,898
	TWDV, end of Year 5	18,984		

The tax cash flows (tax savings) should be treated as cash inflows in the appropriate year in the DCF analysis (either in the same year that the allowance is claimed or one year in arrears, depending on the assumption used about the timing of tax payments).

Note that the relevant cash flow to be included in DCF analyses are the tax effects of the capital allowances not the capital allowances themselves.

Timing of the tax effect of capital allowances

The tax cash flows (tax savings) should be treated as cash inflows in the appropriate year in the DCF analysis (either in the same year that the allowance is claimed or one year in arrears, depending on the assumption used about the timing of tax payments).

There are a number of different assumptions that might be made about the timing of the tax effect of capital allowances. The two main assumptions are as follows:

❏　　Assumption 1: The capital allowance is claimed at the end of the year in which an asset is purchased and this results in a cash benefit at the date of the claim.

❏　　Assumption 2: The capital allowance is claimed at the end of the year in which an asset is purchased. The tax liability resulting from this computation is paid one year later.

Illustration: Timing of the tax effect of capital allowance

	Assumption 1	Assumption 2
Date of purchase	01/01/20X1 = time 0	01/01/20X1 = time 0
First claim for capital allowances in tax computation	31/12/20X1 = time 1	31/12/20X1 = time 1
Tax paid/received	31/12/20X1 = time 1	31/12/20X2 = time 2

In the above example, a company in the second tax situation would have to wait for two years before the tax benefit of the purchase of the capital asset. It would be easy for the company to reduce this wait by buying the asset one day earlier.

Illustration: Timing of the tax effect of capital allowances

	Assumption 1	Assumption 2
Date of purchase	01/01/20X1 = time 0	31/12/20X0 = time 0
First claim for capital allowances in tax computation	31/12/20X1 = time 1	31/12/20X0 = time 0
Tax paid/received	31/12/20X1 = time 1	31/12/20X1 = time 1

A company would usually want to receive tax benefit as soon as possible. In practice, a financial manager would time the purchase of an asset with the rules of the jurisdiction in mind. This means that the usual assumption is that the first tax benefit from purchasing a capital asset is one year after the date of purchase.

2.4 Balancing charge or balancing allowance on disposal

When an asset reaches the end of its useful life, it will be scrapped or disposed of. An asset might also be disposed of before the end of its useful life. On disposal, there might be a balancing charge or a balancing allowance. This is the difference between:

❑ The written-down value of the asset for tax purposes (TWDV); and

❑ Its disposal value (if any).

The effect of a balancing allowance or balancing charge is to ensure that over the life of the asset the total amount of capital allowances claimed is equal to the cost of the asset less its residual value.

Balancing allowance:

This occurs when the written-down value of the asset for tax purposes is higher than its disposal value.

The balancing allowance is an additional claim against taxable profits.

Balancing charge

This occurs when the written-down value of the asset for tax purposes is lower than the disposal value.

The balancing charge is a taxable amount, and will result in an increase in tax payments.

Impact on DCF analysis

The cash saving or cash payment is included in the cash flows for DCF analysis, either in the year of disposal of the asset or in the following year, depending on the assumption used about the timing of tax payments.

Note: An annual capital allowance is not claimed in the year of disposal of an asset. Instead, there is simply a balancing allowance (or a balancing charge).

Example: Impact on DCF analysis

A company is considering an investment in a non-current asset costing ₦80,000. The project would generate the following cash inflows:

Year	₦
1	50,000
2	40,000
3	20,000
4	10,000

Capital allowances are claimed at 25%, by the reducing balance method and the first tax benefit will occur one year after the date of acquisition (i.e.at t1).

It is expected to have a scrap value of ₦20,000 at the end of year 4. The post-tax

cost of capital is 9%.

Tax on profits is 30% and paid one year in arrears. **Required**

Calculate the NPV of the project.

Answer

	0	1	2	3	4	5
	₦000	₦000	₦000	₦000	₦000	₦000
Capital flows	(80.0)				20.0	
Tax saving on capital allowances (W)		6.0	4.5	3.4	2.5	1.6
Cash inflows		50.0	40.0	20.0	10.0	
Tax on cash inflows			(15.0)	(12.0)	(6.0)	(3.0)
Net cash flows	(80.0)	56.0	29.5	11.4	26.5	(1.4)
Discount factor	1.000	0.917	0.842	0.772	0.708	0.650
Present values	(80.0)	51.4	24.8	8.8	18.8	(0.91)
NPV						22.8

Working

Year		TWDV ₦	Tax allowable depreciation (25%) ₦	Tax saved (30%) ₦
0	Cost	80,000		
	Allowance claimed (t0)	(20,000)	20,000	6,000 (t1)
		60,000		
	Allowance claimed (t1)	(15,000)	15,000	4,500 (t2)
		45,000		
	Allowance claimed (t2)	(11,250)	11,250	3,375 (t3)
		33,750		
	Allowance claimed (t3)	(8,438)	8,438	2,531 (t4)
		25,312		
	Cash proceeds (t4)	(20,000)		
	Balancing charge (t4)	5,312	5,312	1,594 (t5)

The impact of the balancing allowance (charge) is that the amount claimed in allowances is always equal to the cost of the asset less its disposal proceeds.

This means that the amount of tax saved is always the tax rate applied to this difference. Therefore, in the above example:

❑ Total tax allowable depreciation = 80,000 – 20,000 = 60,000 (20,000 + 15,000 + 11,250 + 8,438 + 5,312).

❑ Total tax saved = 30% ☐ 60,000 = 18,000 (6,000 + 4,500 + 3,375 + 2,531 + 1,594).

Example: Impact on DCF analysis

A company is considering an investment in a non-current asset costing ₦80,000. The project would generate the following cash inflows:

Year	₦
1	50,000
2	40,000
3	20,000
4	10,000

Capital allowances are claimed at 25%, by the reducing balance method and the first tax benefit will occur one year after the date of acquisition (i.e.at t1).

It is expected to have a scrap value of ₦20,000 at the end of year 4. The post-tax

cost of capital is 9%.

Tax on profits is 30% and paid one year in arrears. **Required**

Calculate the NPV of the project.

Answer

	0	1	2	3	4	5
	₦000	₦000	₦000	₦000	₦000	₦000
Capital flows	(80.0)				20.0	
Tax saving on capital allowances (W)			6.0	4.5	3.4	4.1
Cash inflows		50.0	40.0	20.0	10.0	
Tax on cash inflows			(15.0)	(12.0)	(6.0)	(3.0)
Net cash flows	(80.0)	50.0	31.0	12.5	27.4	1.1
Discount factor	1.000	0.917	0.842	0.772	0.708	0.650
Present values	(80.0)	45.9	26.1	9.7	19.4	0.7
NPV						21.8

Answer (continued)

Working

Tax allowable

Year		TWDV	Depreciation (25%)	Tax saved (30%)
		₦	₦	₦
0	Cost	80,000		
	Allowance claimed (t1)	(20,000)	20,000	6,000 (t2)
		60,000		
	Allowance claimed (t2)	(15,000)	15,000	4,500 (t3)
		45,000		
	Allowance claimed (t3)	(11,250)	11,250	3,375 (t4)
		33,750		
	Cash proceeds (t4)	(20,000)		
	Balancing charge (t4)	13,750	13,750	4,125 (t5)

Proof:

❑ Total tax allowable depreciation = 80,000 – 20,000 = 60,000 (20,000 + 15,000 + 11,250 + 13,750).

❑ Total tax saved = 30% ⮾ 60,000 = 18,000 (6,000 + 4,500 + 3,375 + 4,125).

Practice question   **1**

A company is considering whether to invest in a new item of equipment. The equipment would cost ₦120,000 and have a useful life of four years, after which it would be disposed of for ₦45,000.

The equipment will reduce running costs by ₦50,000 each year (before taxation). Taxation is at the rate of 30%. The equipment would attract tax-allowable depreciation of 25% each year, by the reducing balance method.

Taxation cash flows occur one year in arrears of the cost or benefit to which they relate.

The cost of capital is 11% (after tax).

Required

Calculate the NPV of the project and recommend whether the investment in the project is worthwhile.(Assumethat the firstbenefit from the capitalallowancesis received at t1).

3 DCF AND INFLATION

Section overview

- Inflation and long-term projects
- Discounting money cash flows at the money cost of capital
- Discounting real cash flows at the real cost of capital
- General and specific inflation

3.1 Inflation and long-term projects

When a company makes a long-term investment, there will be costs and benefits for a number of years. In all probability, the future cash flows will be affected by inflation in sales prices and inflation in costs. DCF analysis should take inflation into account.

There are two ways of incorporating inflation into DCF analysis. A company should either:

❑ Discount the money cash flows at the money cost of capital; or

❑ Discount the real terms cash flows at the real cost of capital.

Discounting real cash flows using a real cost of capital will give the same NPV as discounting money cash flows using the money cost of capital, where the same rate of inflation applies to all items of cash flow.

Money/real cash flows

Real terms cash flows are what an item would cost or be sold for in current prices (i.e. before considering inflation).

Money cash flows refer to the amount that is actually received or paid at different points in time in the future (i.e. taking inflation into account. The money cash flows are estimated by initially pricing cash flows at current prices and then inflating them by the expected inflation rates.

Example: Money/real cash flows

A component costs ₦1,000 at today's prices

Inflation for the next two years is expected to be 4% per year

The component will cost ₦1,082 (₦1,000 ⬚ 1.04 ⬚ 1.04) in 2 years

₦1,000 is the cost of the component in real terms (real terms cash flow)

₦1,082 is the cost of the component in money terms (money cash flow)

Money/real cost of capital

Cost of capital is explained in detail in later chapters but briefly it is the rate of return required by the investors for investing in a project of a given risk. The models covered later estimate the money cost of capital.

Real cost of capital is the return that investors would require without inflation.

Money cost of capital is the return that investors would require with inflation. It follows that the money cost is higher than the real cost in times of inflation.
Investors want a return to compensate them for the risk in the project and an extra return to compensate them for the value of money falling.

A real rate of return can be calculated using the relationship

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Formula: Link between money cost, real cost and inflation (Fisher equation)

$$1 + m = (1 + r)(1+i)$$

Where:

m = money cost of capital r =

real cost of capital

I = inflation rate

Example: Money cost of capital to real cost of capital

If a company has a cost of capital of 12% and inflation is 5% Therefore:

$$(1 + m) = (1 + r) \times (1 + i)$$
$$(1 + 0.12) = (1 + r) \times (1 + 0.05) \ (1 + r)$$
$$= 1.12/1.05$$
$$r = 1.12/1.05 - 1 = 0.0667 \text{ or } 6.67\%$$

Information availability

In practice companies would have access to current prices and the money cost of capital. In order to perform DCF one or other of these must be changed.

Either the money cost of capital is restated to the real cost and this is used to discount the cash flows expressed in current terms, or the cash flows expressed in current prices are inflated and these are discounted at the money cost.

The second of these approaches is the most commonly used and should be adopted by you unless a question tells you otherwise.

3.2 Discounting money cash flows at the money cost of capital

The cost of capital used in DCF analysis is normally a **'money' cost of capital**. This is a cost of capital calculated from current market returns and yields.

When estimates are made for inflation in future cash flows, the rules are as follows:

❑ Estimate all cash flows at their inflated amount. Since cash flows are assumed to occur at the year-end, they should be increased by the rate of inflation for the full year.

❑ To estimate a future cash flow at its inflated amount, you can apply the formula:

Cash flow in year n at inflated amount = [Cash flow at current price level] $\times (1 + i)^n$ (where i is the annual rate of inflation).

❑ Discount the inflated cash flows at the money cost of capital, to obtain present values for cash flows in each year of the project and the NPV for the project.

Example: Discounting money cash flows at the money cost of capital

A company is considering an investment in an item of equipment costing ₦150,000. The equipment would be used to make a product. The selling price of the product at today's prices would be ₦10 per unit, and the variable cost per unit (all cash costs) would be ₦6.

The project would have a four-year life, and sales are expected to be:

Year	Units of sale
1	20,000
2	40,000
3	60,000
4	20,000

At today's prices, it is expected that the equipment will be sold at the end of Year 4 for ₦10,000. There will be additional fixed cash overheads of ₦50,000 each year as a result of the project, at today's price levels.

The company expects prices and costs to increase due to inflation at the following annual rates:

Item	Annual inflation rate
Sales	5%
Variable costs	8%
Fixed costs	8%
Equipment disposal value	6%

The company's money cost of capital is 12%. Ignore taxation. **Required**

Calculate the NPV of the project.

All the cash flows must be re-stated at their inflated amounts. An assumption needs to be made about what the cash flows will be in Year 1. Are 'today's' price levels the price levels to use in Year 1, or should the cash flows in Year 1 be increased to allow for inflation?

An examination question might tell you which assumption to use. If it does not, state your assumption in the answer. The usual assumption is that information is given in current prices so that Year 1 cash flows (which the model assumes to occur at the end of Year 1) must be inflated. This assumption is used to answer this question.

Answer

Item	Time 0	Year 1	Year 2	Year 3	Year 4
	₦	₦	₦	₦	₦
Initial outlay	(150,000)				
Disposal (₦10k × $(1.06)^4$)					12,625
Revenue					
At today's prices		200,000	400,000	600,000	200,000
Inflation factor		× 1.05	× 1.05²	× 1.05³	× 1.05⁴
Money cash flows		210,000	441,000	694,575	243,101
Costs					
Variable (current prices)		120,000	240,000	360,000	120,000
Fixed (current prices)		50,000	50,000	50,000	50,000
Total (current prices)		170,000	290,000	410,000	170,000
Inflation factor		× 1.08	× 1.08²	× 1.08³	× 1.08⁴
Money cash flows		183,600	338,256	516,482	231,283
Net cash flow	(150,000)	26,400	102,744	178,093	24,443
Discount factors (at 12%)	1.000	0.893	0.797	0.712	0.636
	(150,000)	23,575	81,886	126,802	15,546
NPV					97,809

Practice question **2**

A company is considering whether or not to invest in a five-year project. The investment will involve buying an item of machinery for ₦200,000.

At today's prices, the annual operating cash flows would be:

Year	Revenues	Running costs
	₦	₦
1	200,000	100,000
2	200,000	100,000
3	250,000	125,000
4	150,000	75,000
5	100,000	50,000

Revenues are expected to go up by 7% each year due to inflation, and costs are expected to go up by 12% per year due to inflation.

The machinery is expected to have a re-sale value at the end of year 5 of ₦20,000 at today's prices, but this amount is expected to rise by 5% each year due to inflation.

The cost of capital is 16%.

Required

Calculate the NPV of the investment project.

3.3 Discounting real cash flows at the real cost of capital

The cost of capital given for use in DCF analysis is normally a 'money' rate of return (also known as a **nominal rate of return**). The money rate of return should be used to discount money cash flows which have been adjusted to take into account inflation increases.

An alternative approach to DCF analysis is to discount real cash flows using a real cost of capital. Real cash flows are shown at today's prices.

Example: Both methods

A company is considering an investment in an item of equipment costing ₦150,000. Contribution per unit is expected to be ₦4 and sales are expected to be:

Year	Units
1	20,000
2	40,000
3	60,000
4	20,000

Fixed costs are expected to be ₦50,000 at today's price levels and the equipment can be disposed of in year 4 for ₦10,000 at today's price levels. The inflation rate is expected to be 6% and the money cost of capital is 15%.

Required

Calculate the NPV of the project:

(a)   using money cash flows and the money cost of capital

(b)   using the real value of cash flows and the real cost of capital

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Answer

(a) Using money cash flows and a money discount rate

Item	Time 0	Year 1	Year 2	Year 3	Year 4
	₦	₦	₦	₦	₦
Initial outlay	(150,000)				
Contribution		80,000	160,000	240,000	80,000
Fixed costs		(50,000)	(50,000)	(50,000)	(50,000)
Disposal proceeds					10,000
Net cash flow (at today's prices)	(150,000)	30,000	110,000	190,000	40,000
Adjust for inflation		$\times 1.06$	$\times 1.06^2$	$\times 1.06^3$	$\times 1.06^4$
Money cash flows	(150,000)	31,800	123,596	226,293	50,499
Discount at 15%	1.000	0.870	0.756	0.658	0.572
Present value	(150,000)	27,666	93,439	148,901	28,885
NPV					148,891

(b) Using real cash flows and a real discount rate

The real discount rate $= (1.15/1.06) - 1 = 0.085 = 8.5\%$

Item	Time 0	Year 1	Year 2	Year 3	Year 4
	₦	₦	₦	₦	₦
Initial outlay	(150,000)				
Contribution		80,000	160,000	240,000	80,000
Fixed costs		(50,000)	(50,000)	(50,000)	(50,000)
Disposal proceeds					10,000
Net cash flow (at today's prices)	(150,000)	30,000	110,000	190,000	40,000
Discount at 8.5%		$1/1.085$	$1/1.085^2$	$1/1.085^3$	$1/1.085^4$
Present value	(150,000)	27,650	93,440	148,753	28,863
					148,706

Both approaches give the same solution, with a small difference due to rounding errors.

3.4 General and specific inflation

Governments publish a rate (or rates) of inflation. The rate of inflation published by government is the average rate calculated on a "basket of goods" which the government believes to best reflect the spending patterns in the economy or in a part of the economy.

For example, the government might calculate an average rate based on what citizens buy on a day to day basis. This average rate might include different types of foodstuff, fuel, rent etc.

On the other hand the government might calculate an average rate based on what companies might buy (or what companies in a given sector might buy).

The point is that there is no single rate of inflation that should be used in investment appraisal.

A scenario might give a single, general rate of inflation or a series of rates that are specific to different types of cash flow.

Specific rates of inflation

In this case, money cash flows should be estimated and discounted at the money cost of capital as covered in section 3.2 above.

Example: Specific rates of inflation

A company is appraising a project which is expected to generate sales of ₦150,000 per annum and costs ₦100,000 per annum.

These prices are expressed in current terms and revenue is expected to inflate at 5% per annum and the costs at 6%.

The money cost of capital of the company is 10%.

The present value of these cash flows can be estimated by discounting the money cash flows at the money cost of capital as follows:

Item	Year 1	Year 2	Year 3	Year 4
	₦000	₦000	₦000	₦000
Revenue (₦150,000 inflating at 5% per annum)	157.5	165.38	173.64	182.33
Costs (₦100,000 inflating at 6% per annum)	(106.0)	(112.36)	(119.10)	(126.25)
Net cash inflow	51.50	53.02	54.54	56.08
Discount factor (10%)	0.909	0.826	0.751	0.683
Present values	46.82	43.81	40.98	38.30
NPV				169.91

General rate of inflation

In this case, either approach could be used. A company might either estimate money cash flows and discount them at the money cost of capital (as covered in section 3.2 above) or discount real cash flows at the real cost (as covered in section 3.3 above).

When using the first of these approaches (i.e. money cash flows at money cost) it would only be necessary to inflate the net total cash inflows or outflows for each period, as shown in the example in section 3.3.

Example: General rate of inflation

A company is appraising a project which is expected to generate sales of ₦150,000 per annum and costs ₦100,000 per annum.

These prices are expressed in current terms and the company wants to adjust these prices by the general rate of inflation when appraising the investment. The general rate of inflation is 5%.

The money cost of capital of the company is 10%.

The present value of these cash flows can be estimated as follows:

Discounting the money cashflows at the money cost of capital

Item	Year 1	Year 2	Year 3	Year 4
	₦000	₦000	₦000	₦000
Net cash inflow (₦150,000 − ₦100,000) inflating at 5% per annum	52.50	55.13	57.88	60.78
Discount factor (10%)	0.909	0.826	0.751	0.683
Present values	47.73	45.56	43.49	41.51
NPV				178.28

Discounting the real cash flows at the real cost of capital

The real cost of capital = (1.1/1.05) – 1 = 0.047619 or 4.7619%.

Item	Year 1	Year 2	Year 3	Year 4
	₦000	₦000	₦000	₦000
Net cash inflow (₦150,000 − ₦100,000) inflating at 5% per annum	50.00	50.00	50.00	50.00
Discount factor (4.7619%)	0.955	0.911	0.870	0.830
Present values	47.73	45.56	43.49	41.51
NPV				178.28

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4   CHAPTER REVIEW

Chapter review
Before moving on to the next chapter check that you now know how to: ■   Identify taxation cash flows ■   Distinguish the money cost of capital and the real cost of capital ■   Apply the Fisher equation to evaluate an unknown variable ■   Explain the link between money cash flows and real cash flows ■   Identify money cash flows by taking inflation into account ■   Perform discounted cash flow analysis taking both taxation and inflation into account

SOLUTIONS TO PRACTICE QUESTIONS

Solution 1

Year	0	1	2	3	4	5
	₦	₦	₦	₦	₦	₦
Capital equipment	(120,000)				45,000	
Savings before tax		50,000	50,000	50,000	50,000	
Tax on savings (30%)			(15,000)	(15,000)	(15,000)	(15,000)
Cash effect of allowances		9,000	6,750	5,063	3,797	(2,109)
Net cashflow	(120,000)	59,000	41,750	40,063	83,797	(17,109)
DCF factor at 11%	1.000	0.901	0.812	0.731	0.659	0.593
PV of cash flow	(120,000)	53,159	33,901	29,286	55,222	(10,146)
NPV					41,422	

The NPV is positive. This indicates that the project should be undertaken.

Working: Tax allowances on the investment

		Tax WDV	Tax saving (30% of allowance)	Timing
		₦	₦	
Time 0	Cost	120,000		
	Allowance claimed	(30,000)	9,000	1
		90,000		
Year 1	Allowance claimed	(22,500)	6,750	2
		67,500		
Year 2	Allowance claimed	(16,875)	5,063	3
		50,625		
Year 3	Allowance claimed	(12,656)	3,797	4
		37,969		
Year 4	Disposal	(45,000)		
	Balancing charge	(7,031)	(2,109)	5

Solution						**2**
	0	1	2	3	4	5
	₦	₦	₦	₦	₦	₦
Initial outlay	(200,000)					
Disposal (₦20k × $(1.05)^5$)						25,526
Revenue						
At today's prices		200,000	200,000	250,000	150,000	100,000
Inflation factor		$\times 1.07$	$\times 1.07^2$	$\times 1.07^3$	$\times 1.07^4$	$\times 1.07^5$
Money cash flows		214,000	228,980	306,261	196,619	140,255
Costs						
At today's prices		100,000	100,000	125,000	75,000	50,000
Inflation factor		$\times 1.12$	$\times 1.12^2$	$\times 1.12^3$	$\times 1.12^4$	$\times 1.12^5$
Money cash flows		112,000	125,440	175,616	118,014	88,117
Net cash flow		102,000	103,540	130,645	78,605	77,664
Discount factors (at 16%)	1.000	0.862	0.743	0.641	0.552	0.476
	(200,000)	87,924	76,930	83,743	43,390	36,968
NPV						128,955

Professional level
Strategic financial management

DCF: risk and uncertainty

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B	Business analysis			
	5	Investment appraisal		
		a	Discounted cash flow techniques	
			i	Evaluate potential value added to an organisation arising from a specified capital investment project using the net present value (NPV) model covering:
				Probability and sensitivity analyses;;
				Decision tree, simulation, certainty equivalent;
				Value of perfect and imperfect information;
				Project duration as a measure of risk; and
				Risk adjusted discount rates.

Exam context

This chapter explains how to adjust for (or otherwise take into account) risk and uncertainty in investment appraisal.

By the end of this chapter, you should be able to:

■   Perform sensitivity analysis and comment on its results

■   Use expected values as a means taking account of risk and uncertainty

■   Construct decision trees and use them to solve problems

■   Estimate the value of perfect information and imperfect information

■   Explain how risk adjusted discount rates might be used to adjust for project risk

■   Explain simulation

1 RISK AND UNCERTAINTY IN CAPITAL INVESTMENT APPRAISAL

Section overview

- The problem of risk and uncertainty
- Methods of assessing risk and uncertainty

1.1 The problem of risk and uncertainty

Investment projects are long-term projects, often with a time scale of many years. When the cash flows for an investment project are estimated, the estimates might be incorrect. Estimates of cash flows might be wrong for two main reasons:

❑ Risk in the investment, and

❑ Uncertainty about the future.

Risk

Risk exists when the actual outcome from a project could be any of several different possibilities, and it is not possible in advance to predict which of the possible outcomes will actually occur.

The simplest example of risk is rolling a dice. When a dice is rolled, the result will be 1, 2, 3, 4, 5 or 6. These six possible outcomes are known in advance, but it is not possible in advance to know which of these possibilities will be the actual outcome. With risk assessment, it is often possible to estimate the probabilities of different outcomes. For example, we can predict that the result of rolling a dice will be 1, 2, 3, 4, 5 or 6, each with a probability of 1/6.

Risk can often be measured and evaluated mathematically, using probability estimates for each possible future outcome.

Uncertainty

Uncertainty exists when there is insufficient information to be sure about what will happen, or what the probability of different possible outcomes might be. For example, a business might predict that sales in three years' time will be ₦500,000, but this might be largely guesswork, and based on best-available assumptions about sales demand and sales prices.

Uncertainty occurs due to a lack of sufficient information about what is likely to happen.

It is possible to assess the uncertainty in a project, but with less mathematical precision than for the assessment of risk.

Management should try to evaluate the risk and uncertainty, and take it into account, when making their investment decisions. In other words, investment decisions should consider the risk and uncertainty in investment projects, as well as the expected returns and NPV.

1.2 Methods of assessing risk and uncertainty

There are several methods of analysing and assessing risk and uncertainty. In particular:

❑ Sensitivity analysis can be used to assess a project when there is uncertainty about future cash flows;

❑ Probability analysis can be used to assess projects in which there is risk. Other methods

of risk and uncertainty analysis include:

❑ Risk modelling and simulation;

❑ Risk-adjusted discount rates; and

❑ Using discounted payback as one of the criteria for investing in capital projects.

2   SENSITIVITY ANALYSIS

Section overview
■ Introduction
■ Basic Principle
■ Example
■ Strengths and weaknesses of sensitivity analysis

2.1   Sensitivity analysis

Introduction

Investment involves expenditure now in return for a stream of future returns. The investment could be in the form of physical assets (capital budgeting or working capital management) or securities. As in most decision-making situations data is based on forecasts which are subject to varying degrees of uncertainty. The task in investment appraisal involves deciding whether the uncertain cost of the investment is outweighed by its uncertain benefits.

Basic principle

Sensitivity analysis in investment appraisal is a technique for assessing the sensitivity of a project's return or NPV to a variation in each of the items of cost or benefit in the project. The technique is to take the estimate for each uncertain factor one by one, and calculate the change necessary for the NPV to fall to zero, i.e. this is essentially breakeven analysis in NPV terms.

If sensitivity analysis is to be carried out, it is often useful to calculate net present values for each factor or cash flow item in such a way that PVs are found of individual elements of costs and revenues over the life of the project.

Example

Kola Ltd is considering a project with a life of 4 years. Details of the project include the following.

Outlay (new machine)	₦2,750
Annual sales (units)	10,000
Unit selling price	₦500
Unit variable cost	₦300
Annual cash fixed cost	₦600,000
Project specific cost of capital	9%

Required:

a)   Compute the NPV of the project
b)   Measure the sensitivity of the NPV to the various input factors.

Solution

a)   **Calculation of NPV   (₦'000)**

Year	Items	CF	Discount factor at 9%	PV
1 – 4	Sales	5,000	3.239	16,195
1 – 4	Variable costs	(3,000)	3.239	(9,717)
1 – 4	Contribution	2,000	3.239	6,478
1 – 4	Fixed cost	(600)	3.239	(1,943)
				4,535
Cost of machine				(3,750)
NPV				785

---

b) i) **Cost of machine**

$$\text{Sensitivity} = \frac{785}{3,750} \times 100 = 20.9\%$$

This means that the cost of the machine can rise by maximum of 20.9% if negative NPV is to be avoided.

ii) **Product selling price**

$$\text{Sensitivity} = \frac{\text{NPV}}{\text{PV of sales}} \times 100 = \frac{₦785}{₦16,195} \times 100 = 4.8\%$$

This means that if the project is to remain viable, the unit selling price of the product should not drop by more than 4.8%.

iii) **Sales volume (units)**

$$\text{Sensitivity} = \frac{\text{NPV}}{\text{PV of total variable costs}} \times 100 = \frac{₦785}{₦6,478} \times 100 = 12.1\%$$

This means that the project will remain viable (positive NPV) as long as the sales volume does not fall by more than 12.1%.

iv) **Unit variable cost (VC)**

$$\text{Sensitivity} = \frac{\text{NPV}}{\text{PV of total variable costs}} \times 100 = \frac{₦785}{₦9,717} \times 100 = 8.1\%$$

This means that the unit variable cost should not rise by more than 8.1% if negative NPV is to be avoided.

v) **Fixed cost (FC)**

$$\text{Sensitivity} = \frac{\text{NPV}}{\text{PV of total fixed costs}} \times 100 = \frac{₦785}{₦1,943} \times 100 = 40.4\%$$

This means that the maximum percentage increase in the annual fixed cost is 40.4%.

vi) **Cost of capital (COS)**

$$\text{Sensitivity} = \frac{\text{IRR} - \text{COS}}{\text{COS}} \times 100$$

Thus, the maximum cost of capital allowed is the IRR. The IRR is the break-even cost of capital (NPV = 0)

vii) **Life of the project**

To calculate the sensitivity of the project's life, we first need to compute its discounted payback period – as detailed below.

Year	NCF ₦'000	PVF at 9%	PV ₦'000	CUM. PV ₦'000
0	- 3,750	1	- 3,750	- 3,750
1	1,400*	0.917	1,284	-2,466
2	1,400	0.843	1,180	-1,286
3	1,400	0.772	1,080	- 206
4	1,400	0.708	991	785

$$\text{Discounted payback} = 3 + \frac{206}{991} = 3.21 \text{ Years}$$

This means that the project's life can be shortened to 3.21 years i.e. a maximum reduction of 19.75% ((3.21 – 4) / 4).

Strengths and weaknesses of sensitivity analysis

	Strengths
Sensitivity	Information will be presented to management in a form which facilitates subjective judgment to decide the likelihood of the various possible outcomes considered.
Critical issues	Identifies those areas which are critical to the success of the project; if the project is undertaken, those areas can be carefully monitored. • For example, if sales volume and/or price is identified as critical, further market research may help to improve confidence in the estimates. • If the cost of materials or bought-in components is critical, then fixed price contracts may be a possible way of limiting the cost and uncertainty. Alternatively, it may be possible to use futures and options to limit materials costs. • However, it should be noted that these attempts to reduce risk are not costless-market research costs money, option premiums must be paid, suppliers may demand up-front payments on fixed price contracts.
Simple	No complicated theory to understand; it is relatively straightforward
	Weaknesses
Independence	It assumes that changes to variables can be made independently, e.g. material prices will change independently of other variables, which is unlikely. If material prices were to rise, the firm would probably increase selling price at the same time and there may be little effect on NPV (depending on the effect of a price rise on sales demand).
Ignores probability	It only identifies how far a variable needs to change, it does not look at the probability of such a change.
No clear answer	It is not an optimising technique. It provides information on the basis of which decisions can be made. It does not point directly to a correct decision.

2 EXPECTED VALUE OF THE NPV: ASSESSMENT OF PROJECT RISK

Section overview

- Definition of expected value
- Calculating and using the EV of the NPV
- Advantages and disadvantages of using expected values

2.1 Definition of expected value

An expected value is a weighted average value, calculated using probability estimates of different possible outcomes. To calculate an expected value, the probability of each possible outcome is estimated, and the mean (average) outcome is calculated.

2.2 Calculating and using the EV of the NPV

Formula: Expected value

Expected value = Σpx

Where:

p = the probability of each outcome

x = the value of each outcome

When expected values are used to assess the risk in capital investment appraisal, x would be the NPV for each possible outcome, and the EV would be the expected value of the project net present value (the EV of the NPV).

The **basic decision rule** is that an investment project should be undertaken if the expected value of its NPV is positive.

However, a project with a positive EV of NPV might not be undertaken if the risk involved seems too great in relation to the amount of the return expected.

Example: Expected value of NPV

A company is considering an investment in a project.

The project is expected to run for five years and would cost ₦200,000.

The actual returns from the investment are subject to uncertainty, but the following estimates have been prepared for the different possible outcomes.

Probability	NPV (₦)
0.10	(8,000)
0.30	4,000
0.40	12,000
0.20	20,000

The EV of the NPV is calculated as follows:

Probability	NPV (₦)	EV (₦)
p	x	Px
	₦	₦
0.10	(8,000)	(800)
0.30	4,000	1,200
0.40	12,000	4,800
0.20	20,000	4,000
EVofNPV		9,200

The EV of the NPV is positive, +₦9,200. The decision should therefore be to undertake the investment, provided that the risk does not seem too great. In this example there is a 10% probability that the NPV will be negative, −₦8,000. Management might therefore consider whether the investment is worth undertaking, in view of this risk.

> **Practice question** **3**
>
> A company is considering an investment project which would involve an investment of ₦1,000,000.
>
> The expected returns will depend on economic conditions over the next four years. The following estimates have been prepared.
>
> The cost of capital is 10%.
>
> | Year | Strong economy ₦ | Weak economy ₦ |
> |------|------------------|----------------|
> | 0 | (1,000,000) | (1,000,000) |
> | 1 | 400,000 | 100,000 |
> | 2 | 600,000 | 300,000 |
> | 3 | 400,000 | 200,000 |
> | 4 | 300,000 | 50,000 |
> | | | |
> | Probability | 0.75 | 0.25 |
>
> **Required**
>
> Calculate the EV of the NPV of the project, and recommend whether the project should or should not be undertaken.

2.3 Advantages and disadvantages of using expected values

The **advantages** of using expected values of the NPV are as follows:

It is a weighted average measure of all the possible outcomes. It is therefore, arguably, a more appropriate measure of return than the most likely or most probable EV of NPV.

It provides a single figure, not a range of different figures, for making an investment decision.

The **disadvantages** of using expected values of the NPV are as follows:

The estimates of probabilities might be subjective, and based on judgement and guesswork.

The EV of the NPV is not a value for any of the actual possible outcomes. In other words, the EV itself will not happen. It is simply an average representing a number of different possible outcomes.

An EV is much more reliable for estimating the average outcome from events that will happen repeatedly, many times over. A weighted average is not nearly as suitable for estimating the expected outcome for a once-only capital expenditure project.

Most important of all, an EV does not provide any analysis of the project risk. When capital investment projects are evaluated, and a decision is made whether or not to undertake the investment, there should be a thorough analysis of the risk as well as the expected returns.

3 DECISION TREES

Section overview

- Decision trees
- Value of perfect information
- Value of imperfect information

3.1 Decision trees

Sometimes a decision might need to be taken in two or more stages, with the second-stage decision depending on what is the outcome from the first-stage decision.

A decision tree can be drawn to provide a methodical approach to calculating the expected value. A decision tree is built to show all possible outcomes and associated probabilities. A decision tree is drawn from its "root" up to its "branches" and then, once drawn, analysed from its "branches" back to its "root".

There are two different types of branching point in the tree:

Decision points – as the name suggests this is a point where a decision is made

Outcome points – an expected value is calculated here.

The following symbols are used for decision points and outcome points:

Illustration: Symbols
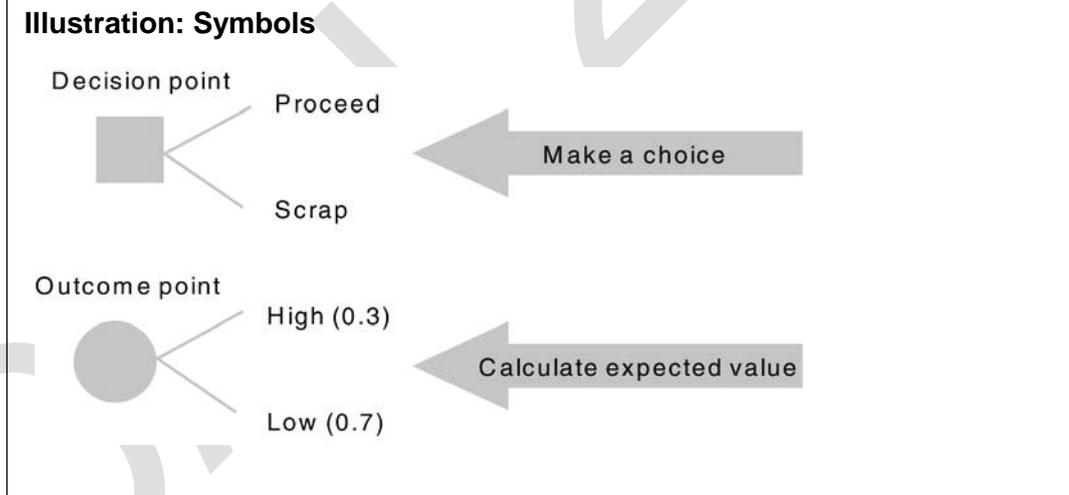
Example: Expected value

A company is considering whether to invest in a new project costing ₦12,000, which has an 80% chance of being successfully developed.

If it is developed successfully, the future cash flows from the project will depend on whether

the economic conditions are good or poor.

The present value of the future cash flows expected depend on the economic conditions which are forecast as follows:

Economic conditions	Present value of future cash flows	Probability
Good	50,000	0.6
Poor	(20,000)	0.4

Should the company undertake the project? Step 1:

Build the tree (in this direction)

Start with the decision that is being made:
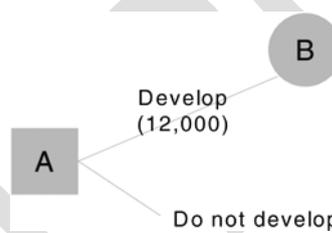
Then at point B draw the possibilities of the success or failure of the project together with the associated probabilities.
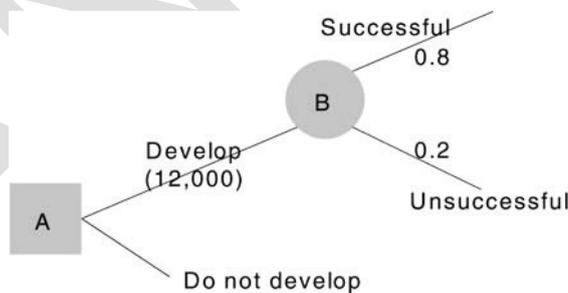
Then draw the possibilities of the different economic prospects together with the associated probabilities:
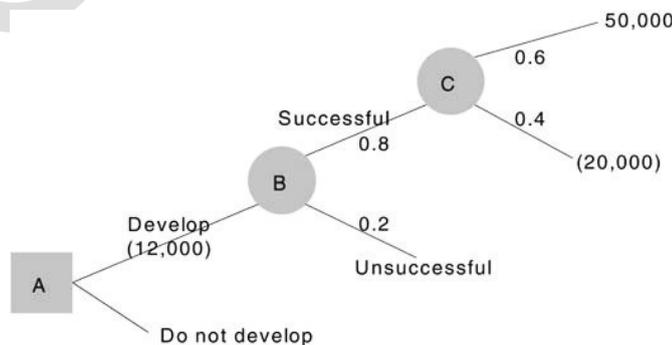
Example: Expected value (continued)

Step 2: Analyse the tree (in this direction⬆)

Expected present value at point C:
= (0.6 ×50,000) + (0.4 ×(20,000)) = 22,000

Expected present value at point B (EPVB)
= (0.8 × EVC) + (0.2 × zero)
= (0.8 × 22,000) + (0.2 × zero) = 17,600

Decision at point A (ENPVA)

Proceed at a cost of 12,000 to earn cash flows with a present value of 17,600 giving a net present value of 5,600 or do not proceed for zero

The decision is to invest for an ENPV of 5,600.

Example: Expected Value

Kenny Ltd is considering an investment in a new project with an initial expenditure of ₦60 million, payable now. The net cash inflows in the following three years will dependent upon the success of the initial advertising, the cost of which is included in the initial expenditure. If it is successful, net annual cash inflows will be ₦15m and if unsuccessful they will be ₦10m. There is a 70% chance of success. If the advertising is unsuccessful then the project will be terminated in year 3 and the assets sold for ₦40m; if it is successful then there is a 60% chance of receiving net annual cash inflows of ₦14m, and a 40% chance of receiving ₦11.5 in the following 5 years. In both cases the residual value of the assets will be ₦4m. The relevant discount rate is 14%.

Calculate the possible net present values which could result from the investment, given the above information and find the expected net present value. What is the standard deviation of the project?

Solution

The information given is best represented in a probability tree
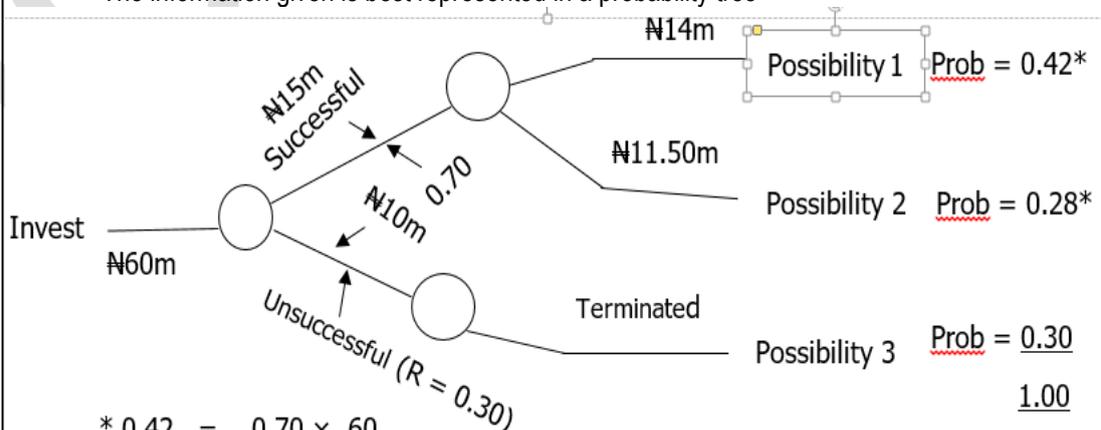
$$* 0.42 = 0.70 \times .60$$
$$* 0.28 = 0.70 \times .40$$

Calculation of Possible NPVs

Possibility 1

Yr	CF ₦m	DCF at 14%	PV ₦m
0	(60)	1	(60)
1 – 3	15	2.32	34.80
4 – 8	14	2.32	32.48
8	4	0.35	1.40
	NPV		8.68

Possibility 2

Yr	CF ₦m	DCF at 14%	PV ₦m
0	(60)	1	(60)
1 – 3	15	2.32	34.80
4 – 8	11.50	2.32	26.68
8	4	0.35	1.40
	NPV		2.88

Possibility 3

Yr	CF ₦m	DCF at 14%	PV ₦m
0	(60)	1	(60)
1 – 3	10	2.32	23.20
3	40	0.67	26.80
	NPV		(10.00)

Calculation of ENPV and Standard Deviation

Possibility	NPV (X)	Prob (P)	Exp. value (PX)	Variance $P(X - \bar{X})^2$
1	8.68	.42	3.65	21.89
2	2.88	.28	0.81	0.56
3	(10.00)	.30	(3.00)	39.40
ENPV = $\bar{X}$ =			1.46	61.85

$$\text{Std Deviation} = \sqrt{61.85} = ₦7.86m$$

3.2 Value of perfect information

Sometimes a question might go on to ask how much a company would be willing to pay to be absolutely certain of an outcome. In other words what is the value of perfect information?

The answer to this question can be simply expressed as:

Illustration: Value of perfect information	
	₦
Expected value without perfect information	X
Expected value with perfect information	X
Value of perfect information	X

Example: Value of perfect information

An organisation has offered to provide a perfect forecast of whether the future economic conditions will be good or bad.

What is the maximum amount that the company would pay for this forecast?

At point C – If the company knew that future economic conditions were good it would proceed but if it knew they were poor it would not proceed (thus avoiding the negative present value of ₦20,000).

The chance of the forecast being good is 60%. Therefore: Expected
  present value at point C (EPVC)
    = (0.6 ×50,000) = 30,000

  Expected present value at point B (EPVB)
    = (0.8 × EPVC) + (0.2 × zero) = (0.8 × 30,000) + (0.2 × zero) = 24,000

Decision at point A (ENPVA)

Proceed at a cost of ₦12,000 to earn cash flows with an expected present value of ₦24,000 (giving an expected net present value of ₦12,000.

The value of the perfect information is then calculated as follows:

	₦
Expected net present value with perfect information	12,000
Expected net present value without perfect information	5,600
Value of perfect information	6,400

3.3 Value of imperfect information

It might be possible to reduce uncertainty but not to remove it entirely. An expert might be able to make a forecast about the future but that expert might be wrong.

The approach to valuing imperfect information same as before but the calculations can be quite tricky.

Illustration: Value of imperfect information

	₦
Expected value without imperfect information Expected	X
value with imperfect information	X
Value of imperfect information	X

Example: Value of imperfect information

An organisation has offered to provide a perfect forecast of whether the future economic conditions will be good or bad.

The organisation normally achieves 85% accuracy (in other words they are wrong 15% of the time). This means that when the say the economy will be strong it may well be bad and vice versa. (Assume that the company will not proceed if a poor economy is forecast).

It is necessary to build a table of possible outcomes before solving the question.

	Economic conditions are good (60)	Economic conditions are poor (404)	
Expert forecasts the economy will be good	0.85 × 0.6 = 0.51	0.15 × 0.4 = 0.06	0.57
Expert forecasts the economy will be good	0.15 × 0.6 = 0.09	0.85 × 0.4 = 0.34	0.43
	0.6	0.4	1

Therefore there is a 57% (0.57) chance that the expert will forecast that the economy will be good.

When the expert says the economy is good he is correct 0.51 out of 0.57 times = 89.5% (0.895 times = 0.51/0.57) within that forecast. Therefore, he will be incorrect 10.5% (0,105 times) within that forecast.

The calculation of the value of imperfect information is as follows:

	₦
Expected present value at point C (EPVC)	
0.895 × 50,000	44,750
0.105 × (20,000)	(2,100)
	42,650
Probability of good verdict	0.57
	24,311
Probability of successful development	0.8
Expected present value at point B	19,448
	(12,000)
Expected net present value at point A	7,448

The value of the imperfect information is then calculated as follows:

	₦
Expected net present value with imperfect information	7,448
Expected net present value with imperfect information	5,600
Value of imperfect information	1,848

4 RISK ADJUSTED DISCOUNT RATES

Section overview

- Introduction
- Certainty equivalents
- Risk adjusted discount rates

4.1 Introduction

The calculation of NPV involves modelling the project cash flows and then discounting them. It is possible to take account of the riskiness of the project cash flows in this process. Two approaches are possible;

4.1.1 Cash flows can be restated to the risk free equivalent (certainty equivalents) and discounted at the risk free cost of capital; or

4.1.2 The cash flows as modelled can be discounted at the risk adjusted discount rate.

4.2 Certainty equivalents

A certainty equivalent is the risk free equivalent of a risky cash flow. This is difficult to understand at first and is best illustrated by way of example.

Example: Certainty equivalents

Suppose Mr A was offered a chance to win ₦1,000,000 on the flip of a coin. Under the offer Mr A would receive ₦1,000,000 if the coin landed on heads but zero if it landed on tails.

Mr A owns an asset (being the opportunity to win ₦1,000,000) and this asset has an expected value of ₦500,000. However, Mr A is not being offered any course of action that would result in this amount as he would either receive ₦1,000,000 or nothing.

Now suppose that Mr B offered to buy the asset off him for ₦100. It is likely that Mr A would reject this as a certain amount of ₦100 is not much compensation for a 50% chance of receiving a million.

However, if Mr B kept increasing the offer there would be a point where Mr A would be indifferent between the certainty of the sum offered and a 50% chance of receiving a million. That point is the certainty equivalent.

For example suppose that Mr B's increased his offer by increments until Mr A accepted an offer of ₦310,000 for his right.

The ₦310,000 is the certainty equivalent of the risky asset.

Certainty equivalents can be used in discounted cash flow calculations. Each cash flow is multiplied by a certainty equivalent factor to give a certainty equivalent figure. These figures are then discounted at the risk free rate.

Example: Certainty equivalents

A company is considering a project with the following cash flows:

Year	Net cash flow
	₦
0	(55,000)
1	15,000
2	35,000
3	30,000
4	20,000

The company has obtained the following certainty equivalent factors:

Year	Certainty equivalent factor
0	1.00
1	0.94
2	0.87
3	0.79
4	0.70

The company's cost of capital is 12% and the risk free rate is 8%.

The certainty equivalent present value is calculated as follows:

Item	Time 0	Year 1	Year 2	Year 3	Year 4
	₦	₦	₦	₦	₦
Cash flows	(55,000)	15,000	35,000	30,000	20,000
Certainty equivalent factors	1	0.94	0.87	0.79	0.70
Certainty equivalents	(55,000)	14,100	30,450	23,700	14,000
Discount factors (at 8%)	1.000	0.926	0.857	0.794	0.735
	(55,000)	13,057	26,096	18,818	10,290
NPV					13,260

4.3 Risk adjusted discount rates

The discount rate should always reflect the risk of the underlying cash flows being discounted. (This is the case under the certainty equivalent approach where the risk free equivalent cash flows are discounted at the risk free rate).

The weighted average discount rate (WACC) of a company is the rate of return required by its owners to compensate them for tying up their capital in that company. The owners decide on the level of return they require for investing in a company by comparing the risk of the company to the risk of alternative investment opportunities. Therefore, in a very real sense, the WACC of a company reflects the risk of that company's assets and returns. The WACC of capital of a company reflects the risk of that company.

It is only appropriate for a company to use its WACC as a discount rate if the risk of the project is the same as the overall risk of the company. If this is not the case an alternative rate should be used to reflect the risk of the project.

Discount rates are increased to reflect future cash inflows of higher risk. The use of a higher discount rate results in a lower NPV. This is as would be expected.

Suppose a business expected two receipts of ₦10,000 in one year's time but one of these was more risky than the other. In that case the riskier asset would be worth less. A higher discount rate would achieve this.

The calculation of WACC is explained in a later chapter.

Source of risk adjusted discount rates

In practice the treasury department of a multinational might provide a list of rates to be used to appraise projects of different types. For example they might specify 10% for asset replacement decisions but 12% for expansion decisions which by their nature are more risky. Such rates should be derived from a capital asset pricing model (CAPM) based approach but this is not always the case.

The CAPM will be explained in a later chapter. It is a technique which provides the required rate of return for an appropriate level of risk (measured as ꞵ) by adding a risk premium to the risk free rate.

Risk adjusted discount rates for negative cash flows

Discount rates are **increased** to reflect future cash **inflows** of higher risk. The use of a higher discount rate results in a lower positive NPV for a higher risk cash inflow.

Discount rates are **decreased** to reflect future cash **outflows** of higher risk. The use of a lower discount rate results in a higher negative NPV for a higher risk cash outflow. This is as would be expected.

Suppose a business faced two payments of ₦10,000 in one year's time but one of these was more risky than the other. In that case the riskier liability would be more expensive. A third party would demand a greater sum to take the risky liability than it would to take the less risky. A lower discount rate would achieve this.

5 OTHER METHODS OF RISK AND UNCERTAINTY ANALYSIS

Section overview

- Risk modelling: simulation modelling

5.1 Risk modelling: simulation modelling

The risk in an investment can be assessed by constructing a 'model' for the investment, and then considering possible variations in the possible outcomes.

For capital investment appraisal, a risk model might be constructed using a spreadsheet.

Having constructed the model, the risk in the investment can be assessed by testing different scenarios, such as delays in achieving the benefits from an investment, and combinations of variations in costs and benefits.

Simulation modelling

A complex risk model can be used to assess the range of possible outcomes from the investment, and to construct a probability distribution of possible outcomes, for statistical analysis. One such type of risk model is a Monte Carlo simulation model.

A Monte Carlo simulation is one that employs a random device for identifying what happens at a different point in a simulation.

A simulation model contains a large number of inter-related variables (for example sales volumes of each product, sales prices of each product, availability of constraining resources, resources per unit of product, costs of materials and labour, and so on).

For each variable, there are estimated probabilities of different possible values. These probabilities are used to assign a range of random numbers to each variable. (The random number allocation should reflect the probability distribution).

Example: Simulation

A company wishes to use simulation to provide forecasts of possible profit levels under different circumstances.

The company identifies four variables (sales volume, sales price, variable cost per unit and fixed costs) and believes that the value of each of these variables is independent of the other three variables. (Note that this would be very unlikely for sales volume and sales price).

The company has identified the possible values for each variable with their associated probability, and assigned a range of random numbers to these values as follows:

Sales volume				Variable cost per unit		
Units	Probability	Random number range	₦		Probability	Random number range
10,000	20%	01 – 20	2		10%	01 – 10
20,000	50%	21 – 70	3		30%	11 – 40
30,000	30%	71 – 00	4		40%	41 – 80
			5		20%	81 – 00

Sales price per unit			Fixed costs		
₦14	15%	01 – 15	₦200,000	85%	01 – 85
₦15	40%	16 – 55	₦220,000	10%	86 – 95
₦16	35%	56 – 90	₦240,000	5%	96 – 00
₦17	10%	91 – 00			

The model is then used to calculate the value of the outcome or result, for a given set of values for each variable.

This simple model can be used to calculate the expected profit, given a combination of sales volume, sales price, variable cost and fixed costs.

The values for each variable are determined by generating random numbers for each variable.

For example: If random numbers 14856327 are generated these become 14, 85, 63, 27 and are assigned as follows:

	Units	Probability	Random number range	Random number
Sales volume	10,000	20%	00 – 19	14
Sales price	₦16	35%	55 – 89	85
Variable cost per unit	4	40%	40 – 79	63
Fixed cost	₦200,000	85%	00 – 84	27

With a complex model, a large number of different variables could be given various possible values, with associated probabilities and random number allocations.

The model is then used to produce a large number of possible outcomes and NPVs for the project. For each possible outcome, random values are given to each of the uncertain variables by generating random numbers and deciding the value in accordance with the random number generated.

If the model produces hundreds, possibly thousands, of different possible NPVs, each calculated using different values for the variables according to the random numbers generated, the different outcomes can be analysed into a probability distribution with a mean and a standard deviation.

In many cases, the probability distribution will show the characteristics of a normal statistical distribution.

Where a normal distribution is produced, the mean and standard deviation can be used to analyse the possible outcomes from the project in some detail. For example, the probability of a negative NPV can be calculated, or the minimum expected NPV at the 95% or the 99% confidence level.

Advantages of simulation

5.1.1 The model can include all the possible values for each variable and their associated probabilities

5.1.2 Simulation can be very useful for the analysis of large and complex investment projects.

Disadvantages of simulation

5.1.3 Constructing a reliable simulation model can be complex, time-consuming and expensive. The benefits might not be worth the time and cost.

5.1.4 The probability estimates for each of the variables may be highly subjective and unreliable. This will affect the reliability of the risk assessment and probability distribution derived from the model.

6 CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Perform sensitivity analysis and comment on its results

- Use expected values as a means taking account of risk and uncertainty

- Construct decision trees and use them to solve problems

- Estimate the value of perfect information and imperfect information

- Explain how risk adjusted discount rates might be used to adjust for project risk

- Explain simulation

SOLUTIONS TO PRACTICE QUESTIONS

Solution 1

Item	Time 0	Year 1	Year 2	Year 3	Year 4
	₦	₦	₦	₦	₦
Initial outlay	(55,000)				
Income		50,000	80,000	100,000	40,000
Running costs (105%)		(36,750)	(57,750)	(73,500)	(31,500)
Net cash flow	(55,000)	13,250	22,250	26,500	8,500
Discount factors (at 10%)	1.000	0.909	0.826	0.751	0.683
	(55,000)	12,044	18,379	19,902	5,806
NPV					1,130

This analysis shows that the NPV would fall from 8,645 to 1,130 if running costs were 5% more than expected.

Solution 2

Part a: Equipment cost

Step 1: Calculate the present value of the equipment cost. This is given as 55,000.

Step 2: Compare the NPV of the project to this number to estimate the percentage change that would reduce the NPV to zero (at which point the decision would change).

The project would cease to have a positive NPV if the equipment cost was above the forecast by more than (8,645/55,000) = 0.157 or 15.7%

Part b: Running costs

Step 1: Calculate the present value of the running costs

Item	Year 1	Year 2	Year 3	Year 4
	₦	₦	₦	₦
Running costs	35,000	55,000	70,000	30,000
Discount factors (at 10%)	0.909	0.826	0.751	0.683
	31,815	55,430	52,570	20,490
PV of running costs				150,305

Step 2: Compare the NPV of the project to this number to estimate the percentage change that would reduce the NPV to zero (at which point the decision would change).

The project would cease to have a positive NPV if running costs are above the estimate by more than (8,645/150,305) = 0.058 or 5.8%.

		Strong economy (p = 0.75)		Weak economy (p = 0.25)	
Solution					**3**
Year		Cash flow	PV	Cash flow	PV
		₦	₦	₦	₦
0	1.000	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)
1	0.909	400,000	363,600	100,000	90,900
2	0.826	600,000	495,600	300,000	247,800
3	0.751	400,000	300,400	200,000	150,200
4	0.683	300,000	204,900	50,000	34,150
NPV			364,500		(476,950)

Expected value of the NPV

$= (0.75 × ₦364,500) + (0.25 × ₦(476,950)) = + ₦154,138.$

Using the EV of NPV as the basis for making the investment decision, the project should be undertaken. However, there is a 25% risk that the NPV will be negative.

CHAPTER

7

DCF: Specific applications

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B				Business analysis
	5			Investment appraisal
		b		Specific investment decisions
			i	Evaluate leasing and borrowing to buy.
			ii	Evaluate asset replacement decisions using equivalent annual cost and equivalent annual benefits.

Exam context

This chapter explains how to make lease or buy and asset replacement decisions.

By the end of this chapter, you should be able to:

■ Make lease or buy decisions

■ Identify the optimum replacement cycle of an asset that is needed on a continual basis

1 THE LEASE VERSUS BUY DECISION

Section overview

- The nature of the lease versus buy decision
- The acquisition decision
- The financing decision
- Example

1.1 The nature of the lease versus buy decision

A company might be faced with a decision about whether or not to acquire a new non-current asset, and if the asset is acquired, whether the acquisition should be financed with a bank loan or by means of a lease arrangement. This is usually referred to as a 'lease versus buy' decision.

The decision should be considered in two separate stages.

- ❑ The **acquisition decision** (or investment decision). The first step is to decide whether or not the asset should be acquired. This decision is based on the assumption that the asset will be purchased.

- ❑ The **financing decision**. The second stage is to make a financing decision. If the decision is to acquire the asset, this stage of the decision is to select the preferred method of financing the acquisition. In other words, whether to buy the asset for cash (financed by a bank loan) or whether to lease it.

Types of lease

IAS 17 described two types of lease (with each type being accounted for in a different way):

- ❑ finance leases; and
- ❑ operating leases.

The definitions of each type are repeated here for convenience.

A lease is classified as a finance lease if it transfers substantially all the risks and rewards incidental to ownership. A lease is classified as an operating lease if it does not transfer substantially all the risks and rewards incidental to ownership.

Whether a lease is a finance lease or an operating lease depends on the substance of the transaction rather than the form of the contract.

The legal form of a finance lease is that the lessor is the legal owner of the leased asset.

The economic substance of a finance lease is that the lessee has all the benefits and costs associated with ownership of the asset. The finance lessee is in the same position as it would have been if it had borrowed money to buy the asset itself. That is why such leases are called finance leases; they provide finance for the use of an asset.

Key features of a lease that would indicate that it was a finance lease would be:

❑ The lessee has the option, at a future date, to purchase the asset from the lessor, and the agreed purchase price is substantially lower than the expected fair value of the asset at the date the option to buy can be exercised.

❑ The term of the lease is for a major part of the expected economic life of the asset;

❑ At the inception of the lease, the present value of all the future lease payments amounts to substantially all of the fair value of the leased asset, or more;

❑ The leased asset is of such a specialised nature that it can only be used by the lessee (without the need for a major modification);

IFRS 16

IAS 17 has been superseded by IFRS 16. Under the new rules in IFRS 16 lessees must capitalise all leases in their financial statements. The distinction between operating and finance leases no longer applies for a lessee.

However, the distinction between operating and finance leases continues to apply from the lessor's view as do the finance lease indicators given above.

This all might sound to be irrelevant for this paper but lease or buy decisions are based on relevant cash flows. Taxation is a relevant cash flow and the tax legislation continues to make reference to operating and finance leases in the rules on tax deductibility. So in this respect the distinction is still important for lessees because it affects the deductibility of their lease payments.

1.2 The acquisition decision

The acquisition decision should be reached using the normal NPV method of investment appraisal.

The cash flows include:

❑ The purchase cost of the asset (usually as time 0 cash outflow).

❑ The expected benefits and costs from the project, such as extra cash revenues and cash expenses each year, and working capital requirements.

❑ The residual value at the end of the asset's life as a cash flow of the project in the final year.

❑ The tax cash flows which consist of the tax effect on tax of higher or lower annual cash profits, and also the effect on cash flows of tax-allowable depreciation (capital allowances).

The cost of capital should be the company's normal (after-tax) cost of capital.

1.3 The financing decision

If the decision in stage 1 is that the asset should be acquired, the next stage – the financing decision – is to decide on the best method of financing for the asset.

The financing decision is only necessary once the investment decision has been made and that decision is to proceed with the project. This means that the NPV of the project must be positive after taking into account the cash cost of the

asset. The finance decision then looks for a cheaper alternative to financing the use of the asset.

The preferred financing method is the one with the lower (or lowest) PV of cost.

Relevant cash flows

The asset will be acquired, no matter what financing method is chosen. This means that all the cash flows that will occur regardless of the financing method can be ignored because they are not relevant to the financing decision.

The only relevant cash flows are the cash flows which will change as a result of the financing method.

The relevant cash flows can be summarised as follows:

Purchase price of the asset (the amount borrowed)

If the purchase of the asset is financed with a bank loan, the cash flows for the bank loan should be discounted to a PV at the after-tax cost of borrowing.

However, the PV of the cash flows associated with a loan (interest payments and the tax relief on interest payments) discounted at the after-tax cost of capital is equal to the amount of the loan. (This is explained in a later chapter where cost of capital is covered). This means that the amount borrowed can be used instead of discounting future interest and tax relief on that interest.

The PV of the option to purchase the asset with a loan is reduced by the reduction in tax payments that will occur by claiming capital allowances on the asset. The net PV of cost is therefore the amount of the loan minus the PV of the tax benefits from capital allowances.

Tax savings on capital allowances

Nigerian rules in regard to capital allowances are as follows:

❑ A company that buys an asset to use in its business can claim capital allowances.

❑ A company that leases an asset under a finance lease can also claim capital allowances.

❑ A company leasing an asset under an operating lease cannot claim capital allowances. These are claimed by the lessor.

Therefore, the tax effect of the capital allowances is incremental to the financing decision between borrowing and buying an asset and leasing the asset under an operating lease.

The tax effect of capital allowances is not incremental to the financing decision between borrowing and buying an asset and leasing the asset under a finance lease.

Rentals

Rental payments by the lessee are incremental to borrowing and buying the asset for both finance leases and operating leases.

Tax relief on the rentals

Operating lease rental payments are deductible in full. Therefore, the tax relief on the rentals is incremental to the financing decision between borrowing and buying an asset and leasing the asset under an operating lease.

Only the interest element of a finance lease rental is tax deductible. Therefore, only the tax relief on the rentals is incremental to the financing decision between borrowing and buying an asset and leasing the asset under a finance lease.

Disposal proceeds

A lessee does not own the asset. Therefore, a lessee cannot benefit from the sale of an asset at the end of its useful life. This is incremental to the financing decision.

The relevant cash flows can be summarised as follows:

Cash flow	Borrow and buy the asset	Finance lease	Operating lease
Purchase price of the asset (the amount borrowed)	Yes		
Disposal proceeds from selling the asset	Yes		
Tax savings on capital allowances	Yes	Yes	
Lease rentals		Yes	Yes
Tax relief on full lease rentals			Yes
Tax relief on interest element of the lease rental		Yes	

Discount rate

The financing cash flows of the alternative financing method should be discounted at the post-tax cost of the borrowing.

1.4 Example

Example: Lease or buy decision

Crimson is considering a project requiring a new machine. The machine costs ₦3 million and it would have a useful life of three years and no residual value at the end of that time.

The machine will produce cash operating surpluses of ₦1.6 million each year. Tax allowable depreciation is 15% on a straight-line basis.

Tax is 30% on operating cash flows and is payable one year in arrears. Crimson has

an after-tax cost of capital of 20%.

It is considering either borrowing from the bank at the pre-tax interest rate of 14% and buying the asset outright, or leasing it at a cost of ₦1.3 million each year for three years, with the lease payments payable in arrears at the end of each year. (The lease is a finance lease).

Required

Evaluate the project. Should the asset be acquired, and if so which financing method should be used?

Investment decision

Answer

Stage 1: The acquisition decision (investment decision)

Year	0	1	2	3	4
	₦000	₦000	₦000	₦000	₦000
Machine cost	(3,000)				
Tax relief on machine		135	135	135	495
Operating cash flows		1,600	1,600	1,600	
Tax on operating cash flows			(480)	(480)	(480)
Net cash flows	(3,000)	1,735	1,255	1,255	15
Discount factor at 20%	1.000	0.833	0.694	0.579	0.482
PV at 20%	(3,000)	1,445	871	727	7
NPV (in ₦000)					50

Acquisition decision

The NPV is positive; therefore the machine should be acquired. **Workings:**

Tax-allowable depreciation = 15% × ₦3,000,000 = ₦450,000 per annum in years 1 – 3.

Therefore, total tax allowable depreciation = 3 × ₦450,000 = ₦1,350,000. Therefore, balancing allowance at end of Year 3 = ₦1,650,000 (₦3,000,000 – ₦1,350,000).

It is assumed that the first tax allowance for depreciation would be claimed early in Year 1, i.e. in Year 0, resulting in a tax saving (one year later) at the end of Year
1. The savings in tax payments will therefore be (one year in arrears): For Years 1 –

3: ₦450,000 × 30% = ₦135,000.

For Year 4: ₦1,650,000 × 30% = ₦495,000.

Finance decision: borrow and buy or finance lease

Answer: Stage 2: The finance decision (finance lease)

There are two financing options: to buy the asset with a bank loan or to obtain the asset under a finance lease arrangement.

The present value of the cash flows associated with the two financing options should be compared.

Tax impact of the capital allowances can be ignored as they would be claimed however the asset is financed

The PV is calculated using the post-tax cost of borrowing which is:

$$14\% \times (1 - 30\%) = 9.8\%.$$

PV of cost of purchasing				(3,000,000)
PV of leasing cost				
Year	**1**	**2**	**3**	
	₦000	₦000	₦000	₦000
Lease payments	(1,300)	(1,300)	(1,300)	
Tax relief on payments (W)		130	92	49
Net cash flows	(1,300)	(910)	(910)	390
Discount factor at 9.8%	0.911	0.829	0.755	0.688
PV at 9.8%	(1,184)	(970)	(913)	34
PV of leasing cost				(3,033)

Financing decision

Leasing is more expensive than borrowing the cash to buy the asset. Crimson should borrow money at 14% and buy the asset.

Workings (to find the tax relief on the rentals) Step 1:

Calculate the IRR of the rentals

Year	Cash flow	Discount Factor at 10%	Present value at 10%	Discount factor at 15%	Present value at 15%
	₦000		₦'000		₦'000
0	(3,000)	1.000	(3,000)	1,000	(3,000)
1 to 3	1,300	2.487	3,233	1.283	2,968
NPV			233		(32)

Using

$$IRR = A\% + \left(\frac{NPV_A}{NPV_B - NPV_A} \right) \times (B - A)\%$$

$$IRR = 10\% + \left(\frac{233}{265} \right) \times (15 - 10)\%$$

$$IRR = 14.36$$

The cost of the lease is 14.4%

Answer: Stage 2: The finance decision (finance lease)

Workings continued

Step 2: Construct an amortisation table

Year	Opening liability	Interest at 14.36%	Rental payment	Closing liability
1	3,000	431	(1,300)	2,131
2	2,131	306	(1,300)	1.137
3	1.137	163	(1,300)	0

Step 3: Tax relief on interest element of the rentals

Year	Interest	Tax on interest (30%)
1	431	130
2	306	92
3	163	49

Finance decision: borrow and buy or operating lease

> **Example: Lease or buy decision**
>
> Crimson is considering a project requiring a new machine. The machine costs ₦3million and it would have a useful life of three years and no residual value at the end of that time.
>
> Tax allowable depreciation is 15% on a straight-line basis.
>
> Tax is 30% on operating cash flows and is payable one year in arrears. Crimson has
>
> an after-tax cost of capital of 20%.
>
> It is considering either borrowing from the bank at the pre-tax interest rate of 14% and buying the asset outright, or leasing an equivalent facility at a cost of ₦1.3 million each year for three years, with the lease payments payable in advance at the beginning of each year. (Assume that this lease is an operating lease).
>
> **Required**
>
> Which financing method should be used?

Answer

PV of cost of purchasing

Year	0	1	2	3	4
	₦000	₦000	₦000	₦000	₦000
Machine cost	(3,000)				
Tax relief on machine		135	135	135	495
Net cash flows	(3,000)	135	135	135	495
Discount factor at 9.8%	1.000	0.911	0.829	0.755	0.688
PV at 9.8%	(3,000)	123	112	102	341
PV of cost of purchasing					(2,322)

PV of leasing cost

Year	1	2	3	4
	₦000	₦000	₦000	₦000
Lease payments	(1,300)	(1,300)	(1,300)	
Tax relief on payments (30%)		390	390	390
Net cash flows	(1,300)	(910)	(910)	390
Discount factor at 9.8%	0.911	0.829	0.755	0.688
PV at 9.8%	(1,184)	(754)	(687)	268
PV of leasing cost				(2,357)

Financing decision

An operating lease is more expensive than borrowing the cash to buy the asset. Crimson should

borrow money at 14% and buy the asset.

2 ASSET REPLACEMENT DECISIONS

Section overview

■ The nature of asset replacement decisions
■ Relevant cash flows
■ Equivalent annual cost method

2.1 The nature of asset replacement decisions

An asset replacement decision involves deciding how frequently a non-current asset should be replaced, when it is in regular use, so that when the asset reaches the end of its useful life, it will be replaced by an identical asset.

In other words, this type of decision is about identifying the most appropriate useful economic life of a non-current asset, and how frequently it should be replaced.

Here we are not dealing with a one-off decision about whether or not to acquire an asset. Instead we are deciding when to replace an asset we are currently using with another new asset; and then when the new asset has been used up, replacing it again with an identical asset; and so on in perpetuity. We are evaluating the cycle of replacing the machine – considering the various options for how long we should keep it before replacing it.

The **decision rule** is that the preferred replacement cycle for an asset should be the least-cost replacement cycle. This is the frequency of replacement that minimises the PV of cost.

2.2 Relevant cash flows

The cash flows that must be considered when making the asset replacement decision are:

❑ The capital cost (purchase cost) of the asset.

❑ The maintenance and operating costs of the asset: these will usually increase each year as the asset gets older.

❑ Tax relief on the running costs (which are allowable expenses for tax purposes).

❑ Tax relief on the asset (tax-allowable depreciation).

❑ The scrap value or resale value of the asset at the end of its life.

The main problem with evaluating an asset replacement decision is comparing these costs over a similar time frame. For example, how can we compare the PV of costs for asset replacement cycles of one, two, three, four and five years?

For example, you cannot simply compare the PV of cost over a two-year replacement cycle with the PV of cost over a three-year replacement cycle, because you would be comparing costs over two years with costs over three years, which is not a fair comparison.

2.3 The equivalent annual cost method

The equivalent annual cost method of calculating the most cost-effective replacement cycle for assets is as follows:

❑ For each choice of replacement cycle, the PV of cost is calculated over one full replacement cycle, with the asset purchased in year 0 and disposed of at the end of the life cycle.

❑ This PV of cost is then converted into an equivalent annual cost or annuity. The equivalent annual cost is calculated by dividing the PV of cost of the life cycle by the annuity factor for the cost of capital, for the number of years in the life cycle.

Formula: Equivalent annual cost

$$\text{Equivalent annual cost for replacement every } n \text{ years} = \frac{\text{PV of costs over one replacement cycle of length } n}{\text{Annuity factor (1 to } n\text{)}}$$

❑ The replacement cycle with the lowest equivalent annual cost is selected as the least-cost replacement cycle.

Example: Equivalent annual cost

NTN is considering its replacement policy for a particular machine, which it intends to replace every year, every two years or every three years.

The machine has purchase cost of ₦17,000 and a maximum useful life of three years.

The following information is also relevant:

Year	Maintenance/running costs of machine	Scrap value if sold at end of year
	₦	₦
1	1,900	8,000
2	2,400	5,500
3	3,750	4,000

The cost of capital for NTN is 10%.

What is the optimum replacement cycle? Ignore taxation. Use the equivalent annual cost method.

Answer

Replace every year

Year		Cash flow	Discount factor at 10%	PV
		₦		₦
0	Purchase	(17,000)	1.000	(17,000)
1	Maintenance costs	(1,900)	0.909	(1,727)
1	Resale value	8,000	0.909	7,272
	PV of cost			(11,455)

Equivalent annual cost = PV of cost/Annuity factor at 10% for 1 year

= ₦11,455/0.909 = ₦12,602.

Replace every two years

Year		Cash flow	Discount factor at 10%	PV
		₦		₦
0	Purchase	(17,000)	1.000	(17,000)
1	Maintenance costs	(1,900)	0.909	(1,727)
2	Maintenance costs	(2,400)	0.826	(1,982)
2	Resale value	5,500	0.826	4,543
	PV of cost			(16,166)

Equivalent annual cost = PV of cost/Annuity factor at 10% for 2 years

= ₦16,166/1.736 = ₦9,312.

Replace every three years

Year		Cash flow	Discount factor at 10%	PV
		₦		₦
0	Purchase	(17,000)	1.000	(17,000)
1	Maintenance costs	(1,900)	0.909	(1,727)
2	Maintenance costs	(2,400)	0.826	(1,982)
3	Maintenance costs	(3,750)	0.751	(2,816)
1	Resale value	4,000	0.751	3,004
	PV of cost			(20,521)

Equivalent annual cost = PV of cost/Annuity factor at 10% for 3 years

= ₦20,521/2.487 = ₦8,251.

Summary

Replace	Equivalent annual cost
	₦
Every year	12,602
Every two years	9,312
Every three years	8,251

Conclusion

The least-cost decision is to replace the asset every three years, because a three-year replacement cycle has the lowest equivalent annual cost.

Practice questions 1

LONG is considering its replacement policy for an item of equipment which has a maximum useful life of four years. The machine has purchase cost of ₦30,000. The

Year	Maintenance/running costs of machine	Scrap value if sold at end of year
	₦	₦
1	4,000	15,000
2	5,000	10,000
3	6,500	6,000
4	8,000	1,000

The cost of capital for LONG is 12%.

What is the optimum replacement cycle? Ignore taxation.

3 CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Make lease or buy decisions

- Identify the optimum replacement cycle of an asset that is needed on a continual basis

SOLUTIONS TO PRACTICE QUESTIONS

Solution				1

Replace every one year

Year		Cash flow	Discount factor (12%)	PV
		₦		₦
0	Purchase cost	(30,000)	1.000	(30,000)
1	Running costs	4,000		
1	Disposal value	15,000		
1	Net cash flow, Year 1	11,000	0.893	9,823
				(20,177)
	1 year, 12% annuity factor			0.893
	Equivalent annual cost			₦(22,595)

Replace every two years

Year		Cash flow	Discount factor (12%)	PV
		₦		₦
0	Purchase cost	(30,000)	1.000	(30,000)
1	Running costs	(4,000)	0.893	(3,572)
2	Running costs	(5,000)		
2	Disposal value	10,000		
2	Net cash flow, Year 2	5,000	0.797	3,985
				(29,587)
	2 year, 12% annuity factor			1.690
	Equivalent annual cost			₦(17,507)

Replace every three years

Year		Cash flow	Discount factor (12%)	PV
		₦		₦
0	Purchase cost	(30,000)	1.000	(30,000)
1	Running costs	(4,000)	0.893	(3,572)
2	Running costs	(5,000)	0.797	(3,985)
3	Running costs	(6,500)		
3	Disposal value	6,000		
3	Net cash flow, Year 3	(500)	0.712	(356)
				(37,913)
	3 year, 12% annuity factor			2.402
	Equivalent annual cost			₦(15,784)

Solution   **1**

Replace every four years

Year	Cash flow		Discount factor (12%)	PV
		₦		₦
0	Purchase cost	(30,000)	1.000	(30,000)
1	Running costs	(4,000)	0.893	(3,572)
2	Running costs	(5,000)	0.797	(3,985)
3	Running costs	(6,500)	0.712	(4,628)
4	Running costs	(8,000)		
4	Disposal value	1,000		
4	Net cash flow, Year 4	(7,000)	0.636	(4,452)
				(46,637)
	4 year, 12% annuity factor			3.037
	Equivalent annual cost			₦(15,356)

Recommendation

The machine should be replaced every four years, because this replacement policy gives the lowest equivalent annual cost.

Professional level
Strategic financialmanagement

Capital rationing

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B	Business analysis				
	5	Investment appraisal			
		a	Discounted cash flow techniques		
			i	Evaluate potential value added to an organisation arising from a specified capital investment project using the net present value (NPV) model covering:	
					Single period and multi-period capital rationing including linear programming formulation and interpretation of final tableau;

Exam context

This chapter explains single period and multi-period capital rationing.

The approach to identifying the optimum investment plan when capital is rationed in a single period is similar to that used in key factor analysis, a technique covered in an earlier paper. Whereas key factor analysis ranks products by identifying contribution per unit of scarce resource, the approach here is to rank projects by identifying the NPV per unit of capital investment (profitability index).

Multi-period capital rationing requires a linear programming approach. Note that the syllabus requires you to be able to formulate (but not solve) the programme.

By the end of this chapter, you should be able to:

■ Identify the optimum investment plan when capital is rationed in a single period and project and when the projects are divisible

■ Identify the optimum investment plan when capital is rationed in a single period and project and when the projects are not divisible

■ Formulate a linear programme that if solved would identify the optimum investment plan when capital is rationed in a more than one period and when the projects are divisible

1 CAPITAL RATIONING DECISIONS

Section overview

- The nature of capital rationing
- Single period capital rationing: divisible projects
- Single period capital rationing: non-divisible projects

1.1 The nature of capital rationing

Capital rationing occurs where there are insufficient funds available to invest in all projects that have a positive NPV.

As capital is in short supply, a decision has to be made about which projects to invest in with the capital that is available.

A distinction is sometimes made between 'hard' and 'soft' capital rationing.

- ❑ Hard capital rationing occurs when there is a real shortage of capital for investment. For example, a company might be unable to raise new capital in the capital markets or borrow large amounts from a bank. Its capital for investment might therefore be limited to the amount of capital it adds to the business each year as cash flows from retained profits.

- ❑ Soft capital rationing occurs when there is sufficient capital to invest in every project, but management has taken a policy decision that spending on capital investment should be limited to a budgeted maximum amount. The policy decision therefore sets a limit on the amount of capital available.

Several methods have been devised for indicating which projects should be selected for investment when there is capital rationing. These methods are based on the following assumptions:

- ❑ The choice of projects or investments should have the objective of maximising total NPV.

- ❑ The projects that are available for investment are comparable in terms of risk.

The method used to identify which projects to select depends on how many years of capital rationing there will be. Capital rationing might be for one year only (single period capital rationing) or might be for several years, and the investment projects will require some additional investment in each of the years when there will be capital rationing (multi-period capital rationing).

Types of problem

There are three types of problem to solve:

- ❑ Single period capital rationing where the projects are freely divisible;

- ❑ Single period capital rationing where the projects are indivisible; and

- ❑ Multi-period capital rationing where the projects are freely divisible

1.2 Single period capital rationing: divisible projects

Single period capital rationing describes a situation where the capital available for investment is in limited supply, but for one time period only (one year only). The limitation in supply is usually at time 0 (now) with capital freely available in other periods.

A decision needs to be made about which projects to invest in. Projects will not be undertaken unless they have a positive NPV, but when there is capital rationing a choice must be made between alternative projects that all have a positive NPV.

The method of reaching the decision about which projects to select for investment depends on whether the investments are fully divisible or indivisible.

Assumption

Projects are fully divisible. This means that a part of a project can be undertaken leading to a partial return (proportional to the amount invested).

For example suppose that an investment costing ₦100,000 is fully divisible and has an expected NPV of + ₦20,000. If capital is in short supply, the assumption is that it would be possible to invest a proportion of the ₦100,000, to obtain the same proportion of the NPV of + ₦20,000.

For example, it would be possible to invest only ₦50,000 in the project and the expected NPV would then be + ₦10,000.

This assumption looks very unrealistic at first sight but it often might occur in practice where companies construct joint ventures to exploit major opportunities.

Decision approach

Fully divisible projects are selected so as to maximise the NPV of the project mix.

The technique is to calculate NPV per ₦1 of capital invested (in the year of capital rationing) for each project, and to prioritise the projects for investment by ranking them in order of NPV per ₦1 invested.

The ratio of NPV to capital investment is called the **profitability index**.

The decision rule is therefore to invest in the projects with the highest profitability index, up to the limit of the investment capital available.

The approach is very similar to that used in key factor analysis which you covered in an earlier paper.

Example: Single period capital rationing: divisible projects

Capital for investment is limited at time 0 to ₦5,000,000.

There are four investment projects available with a positive NPV. All four projects are fully divisible.

The investment required for each project and the project NPVs are as follows:

Project	I	II	III	IV
	₦'000	₦'000	₦'000	₦'000
Investment at time 0	5,000	2,100	1,400	1,500
NPV	6,250	4,200	1,540	1,950

Which projects should be selected for investment, in order to maximise the total NPV?

Answer

Rank the projects in order of profitability index (NPV per ₦1 invested in the year of capital rationing).

Project	I	II	III	IV
	₦'000	₦'000	₦'000	₦'000
NPV	6,250	4,200	1,540	1,950
Investment at time 0	5,000	2,100	1,400	1,500
Profitability index	1.25	2.00	1.10	1.30
Ranking	3rd	1st	4th	2nd

The investment plan should be:

Project	Invest	NPV
	₦'000	₦'000
II	2,100	4,200
IV	1,500	1,950
	3,600	6,150
I (balance)*	1,400	1,750
Total	5,000	7,900

*The NPV earned is proportional to the investment = ₦1,400 × 1.25 = ₦1,750.

1.3 Single period capital rationing: non-divisible projects

When investment projects are non-divisible, the investment in a project can be either all or nothing. Part-investment is not possible.

The selection of investments should be those that offer the maximum NPV with the capital available. Finding the combination of projects that maximises NPV is a matter of trial-and-error, and testing all the possible combinations of investments that can be undertaken with the capital available.

Example: Single period capital rationing: non-divisible projects Capital for

investment is limited at time 0 to ₦5,000,000.

There are four investment projects available with a positive NPV. The

projects are indivisible.

The investment required for each project and the project NPVs are as follows:

Project	I	II	III	IV
	₦'000	₦'000	₦'000	₦'000
Investment at time 0	5,000	2,100	1,400	1,500
NPV	6,250	4,200	1,540	1,950

Which projects should be selected for investment, in order to maximise the total NPV?

Answer

The possibilities would be assessed as follows:

Possible combinations	Amount of investment	NPV
	₦'000	₦'000
I only	5,000	6,250
or		
II	2,100	4,200
III	1,400	1,540
IV	1,500	1,950
Total	5,000	7,690

No other combinations of investment are possible with the amount of capital available.

The decision that would maximise NPV is to invest in Projects II, III and IV.

All the cash was invested in the above example. Any cash that was not invested would be retained by the company (or perhaps not borrowed as it would not be used). The cash not invested would have a zero NPV.

Practice questions   **1**

A company has ₦20 million to invest at time 0.

There are four projects available for investment, all similar in terms of risk. The amount of investment required and the NPV of each project are as follows:

Project	Capital required at time 0 ₦m	Capital required at time 1 ₦m	NPV ₦m
A	8	0	+ 3.0
B	5	1	+ 2.0
C	6	0	+ 2.5
D	10	2	+ 4.2

Required:

(a)   Which projects should be selected if they are not divisible?

(b)   Which projects should be selected if they are divisible?

1.4   Possible complications

A scenario might contain further complications which must be taken into account when using the above methods

Mutually exclusive projects

It might be that projects are mutually exclusive. In other words, it is not possible to participate in both projects at the same time. For example, there may be two projects, each of which involves building a facility on the same piece of land.
Building one facility would exclude the possibility of building the other.

Example: Single period capital rationing with mutually exclusive projects: divisible projects

Capital for investment is limited at time 0 to ₦5,000,000.

There are four investment projects available with a positive NPV. All four projects are fully divisible.

Project II and project IV are mutually exclusive.

The investment required for each project and the project NPVs are as follows:

Project	I ₦'000	II ₦'000	III ₦'000	IV ₦'000
Investment at time 0	5,000	2,100	1,400	1,500
NPV	6,250	4,200	1,540	1,950

Which projects should be selected for investment, in order to maximise the total NPV?

Answer

Rank the projects in order of profitability index (NPV per ₦1 invested in the year of capital rationing).

Project	I	II	III	IV
	₦'000	₦'000	₦'000	₦'000
NPV	6,250	4,200	1,540	1,950
Investment at time 0	5,000	2,100	1,400	1,500
Profitability index	1.25	2.00	1.10	1.30
Ranking	3rd	1st	4th	2nd

The company can invest in either of two groups; I, II and III, or I, III and IV.

An optimum investment plan for each group should be calculated separately and the one with the highest NPV chosen.

Group 1: Projects I, II and III:

Project	Invest	NPV
	₦'000	₦'000
II	2,100	4,200
I (balance)	2,900	3,625
Total	5,000	7,825

Group 2: Projects I, III and IV:

Project	Invest	NPV
	₦'000	₦'000
IV	1,500	1,950
I (balance)	3,500	4,375
Total	5,000	6,325

Therefore, the company should invest in all of project II and 58% (2,900/5,000) of project I to earn an NPV of ₦7,825,000.

Example: Single period capital rationing with mutually exclusive projects: indivisible projects

Capital for investment is limited at time 0 to ₦5,000,000.

There are four investment projects available with a positive NPV. The projects are indivisible.

Project II and project IV are mutually exclusive.

The investment required for each project and the project NPVs are as follows:

Project	I	II	III	IV
	₦'000	₦'000	₦'000	₦'000
Investment at time 0	5,000	2,100	1,400	1,500
NPV	6,250	4,200	1,540	1,950

Which projects should be selected for investment, in order to maximise the total NPV?

Answer

The possibilities would be assessed as follows:

Possible combinations	Amount of investment	NPV
	₦'000	₦'000
I only	5,000	6,250
or		
II	2,100	4,200
III	1,400	1,540
Cash not invested	1,500	nil
	5,000	5,740
or		
III	1,400	1,540
IV	1,500	1,950
Cash not invested	2,100	nil
	5,000	3,490

No other combinations of investment are possible with the amount of capital available.

The decision that would maximise NPV is to invest in Project I only.

A project that must be undertaken regardless of profitability

A project might have to be accepted regardless of circumstance. In this case, capital is first allocated to that project. The balance of available capital is then allocated to the remaining projects using the approaches explained earlier.

Example: Single period capital rationing with a project which must be undertaken: divisible projects

Capital for investment is limited at time 0 to ₦5,000,000.

There are four investment projects available with a positive NPV. All four projects are fully divisible.

The investment required for each project and the project NPVs are as follows:

Project	I	II	III	IV
	₦'000	₦'000	₦'000	₦'000
Investment at time 0	5,000	2,100	1,400	1,500
NPV	6,250	4,200	1,540	1,950

Project III must be undertaken for strategic reasons.

Which projects should be selected for investment, in order to maximise the total NPV?

Answer

Rank the projects in order of profitability index (NPV per ₦1 invested in the year of capital rationing).

Project	I	II	III	IV
	₦'000	₦'000	₦'000	₦'000
NPV	6,250	4,200	1,540	1,950
Investment at time 0	5,000	2,100	1,400	1,500
Profitability index	1.25	2.00	1.10	1.30
Ranking	3rd	1st	4th	2nd

The investment plan should be:

Project	Invest	NPV
	₦'000	₦'000
III (must be undertaken)	1,400	1,540
II	2,100	4,200
	3,500	5,740
IV (balance)	1,500	1,950
Total	5,000	7,690

Example: Single period capital rationing with a project which must be undertaken: indivisible projects

Capital for investment is limited at time 0 to ₦5,000,000.

There are four investment projects available with a positive NPV. The projects are indivisible.

The investment required for each project and the project NPVs are as follows:

Project	I	II	III	IV
	₦'000	₦'000	₦'000	₦'000
Investment at time 0	5,000	2,100	1,400	1,500
NPV	6,250	4,200	1,540	1,950

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Answer

Rank the projects in order of profitability index (NPV per ₦1 invested in the year of capital rationing).

Project	I	II	III	IV
	₦'000	₦'000	₦'000	₦'000
NPV	6,250	4,200	1,540	1,950
Investment at time 0	5,000	2,100	1,400	1,500
Profitability index	1.25	2.00	1.10	1.30
Ranking	3rd	1st	4th	2nd

If project IV is undertaken there would be ₦3,600 left to invest in other projects. In that case project I could not be carried out as it requires an initial investment of ₦5,000. Therefore, the remaining amount would be invested in projects II and IV.

The investment plan should be:

Project	Invest	NPV
	₦'000	₦'000
III (must be undertaken)	1,400	1,540

2   Post – Completion Auditing

Post Audit: A post audit or a post-completion audit is a review of the cash inflows to and outflows from a project after it has reached the end of its life, or at least some years after it began. As far as possible, the actual cash flows should be measured and compared with the estimates contained in the original capital expenditure appraisal. The manager responsible for the project should be asked to explain any significant variances.

Post-audit checking cannot reverse the decision already made on the capital expenditure. However, it does have a certain control value – as detailed below:

- If a manager asks for and gets approval for a capital project, and knows that in due course, the project will be subject to a post audit, then the manager will be more likely to pay attention to the benefits and the costs than if no post audit were threatened;

- If the post audit takes place before the project life ends, and if it finds that the benefits have been less than expected because of management inefficiency, steps can be taken to improve efficiency and earn greater benefits over the remaining life of the project. Alternatively, the post audit may highlight those projects which should be discontinued;

- A post audit can help to identify managers who have been good performers and those who have been poor performers;

- A post audit might identify weaknesses in the forecasting and estimating techniques used to evaluate projects, and so should help to improve the quality of forecasting for future investments decisions;

- A post-audit might reveal areas where improvements can be made in method so as to achieve better results from capital investments in general; and

- The original estimates may be more realistic if managers are aware that they will be monitored, but post audits should not be unfairly critical.

Problems with post-audit

- **The disentanglement problem**: It may be difficult to separate out the relevant costs and benefits specific to a new project from other company activities, especially where facilities are shared and the new project requires an increase in shared overheads. Newly developed techniques of overhead cost allocation may prove helpful in this respect.

- **Projects may be unique**: If there is no prospect of repeating a project in the future, there may seem to be little point in post-auditing, since the lessons learned may not be applicable to any future activity. Nevertheless, useful insights into the capital budgeting system as a whole may still be obtained.

- **Prohibitive cost**: To introduce post-audits may involve interference with management information systems in order to generate flows of suitable data. Since post-auditing every project may be very resource-intensive, firms tend to be selective in their post-audits.

- **Biased selection**: By definition, only accepted projects can be post-audited, and among these it is often only underperforming ones that are singled out for detailed examination. Because of this biased selection mechanism, the forecasting and evaluation expertise of project analysts might be cast in an unduly bad light.

- **Lack of co-operation**: If the post-audit is conducted in too inquisitorial fashion, project sponsors are likely to offer grudging co-operation to the review team and be reluctant to accept and act upon their findings. The impartiality of the review team is paramount in this respect. For example, it would be inviting resentment to draw post-auditors from other parts of the company which may be competitors for scarce capital. Similarly, there are obvious dangers if reviews are undertaken solely by project sponsors. There is thus a need to assemble a balanced team of investigators.

- **Encourage risk-aversion**: If analysts' predictive and analytical abilities are to be thoroughly scrutinised, then they may be inclined to advance only 'safe' projects where little can go wrong and where there is less chance of being 'caught out' by events.

- **Environmental changes**: Some projects can be devastated by largely un-predictable swings in market conditions. This can make the post-audit a complex affair as the review team is obliged to adjust analysts' forecasts to allow for the 'moving of the goalposts'.

2 CHAPTER REVIEW

Chapter review

Before moving on to the next chapter, check that you now know how to:

- Identify the optimum investment plan when capital is rationed in a single period and project and when the projects are divisible

- Identify the optimum investment plan when capital is rationed in a single period and project and when the projects are not divisible

- Formulate a linear programme that if solved would identify the optimum investment plan when capital is rationed in a more than one period and when the projects are divisible X

SOLUTIONS TO PRACTICE QUESTIONS

Solutions   **1**

(a) Projects are not divisible

If the projects are not divisible, the first step is to identify the combinations of projects that may be selected with the capital available at time 0. The total NPV for each combination should be calculated and the combination with the highest total NPV should be selected.

Combination on of projects	Capital used at time 0	Total capital required at time 0	NPV generated	Total NPV
	₦m	₦m	₦m	₦m
A + B + C	8 + 5 + 6	19	3 + 2 + 2.5	7.5
A + D	8 + 10	18	3 + 4.2	7.2
B + D	5 + 10	15	2 + 4.2	6.2
C + D	6 + 10	16	2.5 + 4.2	6.7

Here, the combinations are easy to identify, and total NPV will be maximised by investing in projects A, B and C.

(b) Projects are divisible

If the projects are divisible and there is a maximum investment in each project, the aim should be to maximise the NPV per ₦1 invested at time 0 (the year of capital rationing: Year 1 is ignored because there is no capital rationing at time 1).

Project	NPV	Capital required at time 0	NPV per ₦1 invested at time 0	Priority for investment
	₦m	₦m	₦m	
A	3.0	8	0.375	4th
B	2.0	5	0.400	3rd
C	2.5	6	0.417	2nd
D	4.2	10	0.420	1st

The choice of investments should be as follows:

Project	Priority	Capital required at time 0	NPV per ₦1 invested at time 0	Total NPV
		₦m	₦m	₦m
D	1st	10	0.420	4.2
C	2nd	6	0.417	2.5
		16		
B (balance)	3rd	4	0.400	1.6
		20		8.3

Total NPV is maximised by spending the ₦20 million at time 0 by investing in 100% of Projects D and C, and investing the remaining ₦4 million in 80% of Project B. The total NPV will be (in ₦ million) 4.2 + 2.5 + (80% × 2) = ₦8.3 million.

The total NPV should always be higher when projects are divisible than when they are not divisible.

Professional level
Strategic financial management

CHAPTER

9

Cost of capital

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

C			Financing decisions
	2		**Estimating cost of capital**
			Evaluate and apply:
		a	Cost of equity using dividend growth model and capital asset pricing model (CAPM);
		b	Cost of fixed interest capital;
		c	Weighted average cost of capital (WACC);

Exam context

This chapter explains how to measure the cost of capital. This is a very important chapter as it explains the basis of calculating discount rates.

By the end of this chapter, you should be able to:

■ Use the dividend valuation model to measure the value of equity

■ Measure the cost of equity using the dividend valuation model with and without growth

■ Measure the pre-tax and post-tax cost of both irredeemable and redeemable debt

■ Measure the cost of convertible bonds

■ Calculate the weighted average cost of capital

1 RELATIVE COSTS OF EQUITY AND DEBT

Section overview

- Cost of equity, cost of debt and the weighted average cost of capital (WACC)
- Average and marginal cost of capital
- Comparing the cost of equity and the cost of debt

1.1 Cost of equity, cost of debt and the weighted average cost of capital (WACC)

The **cost of capital for investors** is the return that investors require from their investment. Companies must be able to make a sufficient return from their own capital investments to pay the returns required by their shareholders and holders of debt capital. The cost of capital for investors therefore establishes a cost of capital for companies.

- ❏ For each company there is a cost of equity. This is the return required by its shareholders, in the form of dividends or share price growth

- ❏ There is a cost for each item of debt finance. This is the yield required by the lender or bond investor

- ❏ When there are preference shares, there is also a cost of preference share capital.

The **cost of capital for a company** is the return that it must make on its investments so that it can afford to pay its investors the returns that they require.

The cost of capital for investors and the cost of capital for companies should theoretically be the same. However, they are different because of the differing tax positions of investors and companies.

- ❏ The cost of capital for investors is measured as a pre-tax cost of capital

- ❏ The cost of capital for companies recognises that interest costs are an allowable expense for tax purposes, and the cost of debt capital to a company should allow for the tax relief that companies receive on interest payments, reducing their tax payments. The cost of debt capital for companies is measured as an after-tax cost.

The **weighted average cost of capital** (WACC) is the average cost of all the sources of capital that a company uses. This average is weighted, to allow for the relative proportions of the different types of capital in the company's capital structure.

1.2 Average and marginal cost of capital

One approach to the evaluation of capital investments by companies is that all of their investment projects should be expected to provide a return equal to or in excess of the WACC. If all their investment projects earn a return in excess of the WACC, the company will earn sufficient returns overall to meet the cost of its capital and provide its investors with the returns they require. An alternative is to use the marginal cost of capital when evaluating investment projects.

The marginal cost of capital is the cost of the next increment of capital raised by the company.

1.3 Comparing the cost of equity and the cost of debt

The cost of equity is always higher than the cost of debt capital. This is because equity investment in a company is always more risky than investment in the debt capital of the same company.

❑ Interest on debt capital is often fixed: bondholders for example receive a fixed amount of annual interest on their bonds. In contrast, earnings per share are volatile and can go up or down depending on changes in the company's profitability.

❑ Providers of debt capital have a contractual right to receive interest and the repayment of the debt principal on schedule. If the company fails to make payments on schedule, the debt capital providers can take legal action to protect their legal or contractual rights. Shareholders do not have any rights to dividend payments.

❑ Providers of secured debt are able to enforce their security if the company defaults on its interest payments or capital repayments.

❑ In the event of insolvency of the company and liquidation of its assets, providers of debt capital are entitled to payment of what they are owed by the company before the shareholders can receive any payment themselves out of the liquidated assets.

Since equity has a higher investment risk for investors, the expected returns on equity are higher than the expected returns on debt capital.

In addition, from a company's perspective, the cost of debt is also reduced by the tax relief on interest payments. This makes debt finance even lower than the cost of equity.

The effect of more debt capital, and higher financial gearing, on the WACC is considered in more detail later.

2   COST OF EQUITY

Section overview
■ Methods of calculating the cost of equity
■ The dividend valuation model method of estimating the cost of equity
■ The dividend growth model method of estimating the cost of equity
■ Estimating growth
■ The CAPM method of estimating the cost of equity

2.1   Methods of calculating the cost of equity

The cost of equity is the annual return expected by ordinary shareholders, in the form of dividends and share price growth. However, share price growth is assumed to occur when shareholder expectations are raised about future dividends. If future dividends are expected to increase, the share price will also increase over time. At any time, the share price can be explained as a present value of all future dividend expectations.

Using this assumption we can therefore say that the current value of a share is the present value of future dividends in perpetuity, discounted at the cost of equity (i.e. the return required by the providers of equity capital).

There are two methods that you need to know for estimating what the share price in a company ought to be:

❏   The dividend valuation model; and

❏   The dividend growth model (Gordon growth model).

Each of these methods for obtaining a share price valuation uses a formula that includes the cost of equity capital.

The same models can therefore be used to estimate a cost of equity if the share price is known. In other words, the dividend valuation model and dividend growth model can be used either:

❏   To calculate an expected share price when the cost of equity is known; or

❏   To calculate the cost of equity when the share price is known.

Another method of estimating the cost of capital is the **capital asset pricing model (CAPM)**. This is an alternative to using a dividend valuation model method, and it produces a different estimate of the cost of equity.

2.2 The dividend valuation model method of estimating the cost of equity

If it is assumed that future annual dividends are expected to remain constant into the foreseeable future, the cost of equity can be calculated by re-arranging the dividend valuation model.

Formula: Dividend valuation model (without growth)
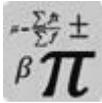
$$MV = \frac{d_1}{r_e}$$

This is the present value of a perpetuity

rearranging:

$$r_e = \frac{d_1}{MV}$$

This is an IRR of a perpetuity

Where:

r_E = the cost of equity

d = the expected future annual dividend (starting at time 1)

MV = the share price ex dividend

The formula assumes that dividends are paid annually and that the first dividend is received in one year's time. It is the present value of a constant perpetuity.

'Ex dividend' means that if the company will pay a dividend in the near future, the share price must be a price that excludes this dividend.

For example a company might declare on 1 March that it will pay a dividend of ₦0.60 per share to all holders of equity shares on 30 April, and the dividend will be paid on 31 May. Until 30 April the share price allows for the fact that a dividend of ₦0.60 will be paid in the near future and the shares are said to be traded 'cum dividend' or 'with dividend'.

After 30 April, if shares are sold they are traded without the entitlement to dividend, or 'ex dividend'. This is the share price to use in the cost of equity formula whenever a dividend is payable in the near future and shares are being traded cum dividend.

Example: DVM

A company's shares are currently valued at ₦8.20 and the company is expected to pay an annual dividend of ₦0.70 per share for the foreseeable future.

The cost of equity in the company can therefore be estimated as: (0.70/8.20) = 0.085 or 8.5%.

Practice question   **1**

A company's shares are currently valued at ₦8.20 and the company is expected to pay an annual dividend of ₦0.70 per share for the foreseeable future.

The next annual dividend is payable in the near future and the share price of ₦8.20 is a cum dividend price.

Estimate the cost of equity

2.3   The dividend growth model method of estimating the cost of equity

If it is assumed that the annual dividend will grow at a constant percentage rate into the foreseeable future, the cost of equity can be calculated by re-arranging the dividend growth model.

Formula: Dividend valuation model (with growth)

$$MV = \frac{d(1 + g)}{r_E - g}$$

> Note: this formula gives the present value of any cash flow which starts in one year's time and grows at a constant rate in perpetuity

rearranging:

$$r_E = \frac{d(1 + g)}{MV} + g$$

Where:

r_E = the cost of equity

d = the annual dividend for the year that has just ended

g = the expected annual growth rate expressed as a proportion (4% = 0.04, 2.5% = 0.025 etc.)

Therefore, d(1 + g) = expected annual dividend next year or d_1

MV = the share price ex dividend.

Example: DVM with growth

A company's share price is ₦8.20. The company has just paid an annual dividend of ₦0.70 per share, and the dividend is expected to grow by 3.5% into the for next annual dividend will be paid in one year's time.

The cost of equity in the company can be estimated as follows:

$$r_E = \frac{0.70\,(1.035)}{8.20} + 0.035$$

= 0.123 or 12.3%.

Practice question   2

A company's share price is ₦5.00. The next annual dividend will be paid in one year's time and dividends are expected to grow by 4% per year into the foreseeable future. The next annual dividend is expected to be ₦0.45 per share.

2.4 Estimating growth

The growth rate used in the expression is the growth rate that investors expect to occur in the future. This can be estimated in one of two ways:

❑ Extrapolation of historical growth; and

❑ Gordon's growth model.

Extrapolation of historical growth

This is based on the idea that the shareholders' expectations will be based on what has been experienced in the past.

An average rate of growth is estimated by taking the geometric mean of growth rates in recent years.
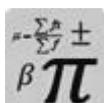
Formula: Geometric mean

$$\text{Geometric mean growth rate} = \sqrt[n]{\frac{\text{value at end of period of n years}}{\text{value at start}}} - 1$$

Where:

n = number of terms in the series (e.g. years of growth)

Example: Extrapolation of historical growth

A company has paid out the following dividends in recent years:

Year	Dividend
20X1	100
20X2	110
20X3	120
20X4	134
20X5	148

The average rate is calculated as follows:

$$g = \sqrt[4]{\frac{148}{100}} - 1 = 0.103 \text{ or } 10.3\%$$

Gordon growth model (or earnings retention model)

The Gordon growth model is similar to the dividend growth model, with the difference that the expected growth in annual dividends is calculated from the proportion of annual earnings that are retained and the rate of return on those retained profits.

The growth estimate is based on the idea that retained profits are the only source of funds. With no re-invested profits, the investment base of the company would not increase. Practically, this means no new funds invested in new products, new market, new factories, stores, and so on. Therefore, profit will not grow, and by implication, dividends (taking a long-term view) will not grow.

Growth therefore, comes about by retaining and reinvesting profits on which a return is earned. The relationship between these variables is shown by:

$$g = rb$$

Where: g = growth in future dividends

r = the current accounting rate of return

b = the proportion of profits (earnings) retained

If all measures are constant, then it may be shown that g, the rate of growth of dividends, is equal to the rate of growth of profits and is equal to the rate of growth in the share price. Given sufficient data, you may be required to estimate a growth rate based on the above model, as illustrated below.

Example

Consider the following summarised financial statements for XL Plc.

Statement of financial position as at 31 December, 2019

	₦m
Assets	400
Ordinary shares	200
Reserves	200
	400

Profit after tax (PAT) for the year ended 31 December, 2020	40
Dividends (a 40% payout)	16
Retained for the year	24

Statement of financial position as at 31 December, 2020

	₦m
Assets (400 + 24)	424
Ordinary shares	200
Reserves (200 + 24)	224
	424

If the company's accounting rate of return and earnings retention rate remain the same, what will be the growth in dividends in the next year?

Problems with the Gordon growth model/earnings retention model

The major problem with this model is:

- Its reliance on accounting profits;
- The assumption that r and b will be constant;
- Inflation can substantially distort the accounting rate of return if assets are valued on an historical costs basis; and
- The model also assumes all new finance comes from equity.

Shortcomings of the dividend valuation model (DVM)

Whilst the basic premise of the DVM is perhaps reasonable, being that a share is worth more if it is expected to pay out higher future dividends, there are a few problems with the underlying assumptions and with the data used.

- Underlying assumptions:
  - Shares have value because of the dividends. This is not **always** true – some companies have a deliberately low payout policy which can attract investors who prefer capital gains to an income stream. Some companies pay no dividends at all; for example, until some years ago Microsoft paid no dividends but Microsoft shares had a high value.

  - Dividends either do not grow, or grow at a constant rate – the former is unrealistic, the latter is true in the long term if one takes the view we are estimating a long-term average.
    Nevertheless, short-term variations in expected dividend growth would change the share price.

  - Estimates of future dividends based on historical data, such as historical growth rate and retention rates, implicitly assume dividend patterns will remain unchanged – it will be more useful to consider future market conditions, investor confidence, economic conditions, and so on when making the estimate of future dividends.

- Data used:
  - The share price is used in the DVM to help estimate the cost of equity to the company or the required rate of return to the investor.

    Share prices change on a daily basis, and not always in a perfectly efficient or rational manner.

  - The growth in future dividends.

    This is perhaps more likely to be linked to the growth in future earnings, than to past dividends. Earnings do not feature as such in the dividend valuation model. However, earnings should be an indicator of the company's long-term ability to pay dividends and therefore, in estimating the rate of growth of future dividends, the rate of growth of the underlying profits must also be considered. For example, if dividends

grow at 10% while earnings grow at 5%, before long the firm will run out of funds with which to pay dividends. Similarly, if dividends grow at 5% and profits at 10%, the firm will soon accumulate excess funds.

2.5 The CAPM method of estimating the cost of equity

Another approach to calculating the cost of equity in a company is to use the capital asset pricing model (CAPM). The CAPM is considered in more detail in the next chapter.

The formula for the model is as follows:
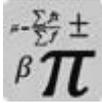
Formula: Capital asset pricing model (CAPM) $R_E = R_{RF} +$

$\beta (R_M - R_{RF})$

Where:

R_E = the cost of equity for a company's shares

R_{RF} = the risk-free rate of return: this is the return that investors receive on risk-free investments such as government bonds

R_M = the average return on market investments as a whole, excluding risk-free investments

β = the beta factor for the company's equity shares. The nature of the beta factor is explained in the next chapter.

Example: CAPM

The rate of return available for investors on government bonds is 4%. The average return on market investments is 7%. The company's equity beta is 0.92.

Using the CAPM, the company's cost of equity is therefore: 4% + 0.92

$(7 - 4)\% = 6.76\%$.

Practice questions   **3**

A company's shares have a current market value of ₦13.00. The most recent annual dividend has just been paid. This was ₦1.50 per share.

Required

Estimate the cost of equity in this company in each of the following circumstances:

a) Using the DVM and when the annual dividend is expected to remain ₦1.50 into the foreseeable future.

b) Using the DVM and when the annual dividend is expected to grow by 4% each year into the foreseeable future

c) The CAPM is used, the equity beta is 1.20, the risk-free cost of capital is 5% and the expected market return is 14%.

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3 COST OF DEBT CAPITAL

Section overview

- Introduction
- Cost of irredeemable fixed rate debt (perpetual bonds)
- Cost of redeemable fixed rate debt (redeemable fixed rate bonds)
- Cost of convertible debt
- Cost of preference shares

3.1 Introduction

Each item of debt finance for a company has a different cost. This is because different types of debt capital have differing risk, according to whether the debt is secured, whether it is senior or subordinated debt, and the amount of time remaining to maturity. (Note: Longer-dated debt normally has a higher cost than shorter-dated debt).

Calculation of the cost of debt uses the same sort of approach as that used to calculate the cost of equity using the dividend valuation model.

The market value of debt is the present value of all future cash flows in servicing the debt. A difference between debt and equity is that interest payments are tax deductible whereas dividend payments are not.

This means that debt might be valued from two different viewpoints:

❑ The lenders' viewpoint: discount the pre-tax cash flows (i.e. ignoring the tax relief on the interest) at the lenders' required rate of return (the pre-tax cost of debt.

❑ The company's viewpoint: discount the post-tax cash flows (i.e. including the tax relief on the interest) at the cost to the company (the post-tax cost of debt). This is the rate that is input into WACC calculations.

> **Example: Pre and post-tax cost of debt** A
>
> company takes out a bank loan.
>
> The bank charges interest at 10%.
>
> The company pays interest at 10% but obtains tax relief on this at 30%.
>
> The pre-tax cost of the debt is 10% and the post-tax cost is 10 (1 – 0.3) = 7%. This would be a component of the WACC calculation.

The required rate of return can be found by calculating the IRR of the cash flows associated with the debt using the market value as the amount of cash flow at time 0.

This is easily achieved if debt is irredeemable (i.e. it is never paid back so interest must be paid into infinity) by rearranging the expressions for cost of debt.

Calculating the cost of redeemable debt requires a full IRR calculation.

Nominal rate of interest

This is another rate that appears in cost of debt calculations. The nominal interest rate is used to identify the cash flow paid on a nominal amount of debt.

Example: Nominal interest rate

A company borrows ₦1,000,000 by issuing ₦1,000, 10% bonds.

This means that it has issued 1,000 bonds and each of these is for ₦1,000.

The company has to pay interest of 10% which totals to be ₦100,000 per annum (or ₦100 per annum for each individual bond).

Suppose the market value of the bonds changed to ₦2,000 (perhaps because the company's debt was looked on very favourably by the market).

This would have no effect on the nominal interest rate which is still 10% of the nominal value of the bonds.

However, the bondholders (the lenders) are now receiving ₦100,000 on an investment worth ₦2,000,000. This is a return of 5%. This is the pre=tax return and is also known as the yield on the bond.

3.2 Cost of irredeemable fixed rate debt (perpetual bonds)

The expressions for the market of irredeemable fixed rate bonds (perpetual bonds) and the rearrangement to provide an expression for the cost of debt are as follows:
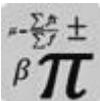
Formula: Cost of irredeemable fixed rate debt

Pre-tax cost of debt (the lender's required rate of return)

$$MV = \frac{i}{r_d}$$

rearranging:

$$r_d = \frac{i}{MV}$$

Post tax cost of debt

$$MV = \frac{i(1-t)}{\text{Post tax } r_d}$$

$$\text{Post tax } r_d = \frac{i(1-t)}{MV}$$

Where:

r_D = the cost of the debt capital

i = the annual interest payable

t = rate of tax on company profits.

MV = Ex interest market value of the debt

Note that calculations are usually performed on a nominal amount of 100 or 1,000.

Example: Cost of debt

The coupon rate of interest on a company's irredeemable bonds ('perpetual bonds') is 6% and the market value of the bonds is 103.60. The tax rate is 25%.

(a)   The pre-tax cost of the debt is 6/103.60 = 0.058 or 5.8%.

(b)   The after-tax cost of the bonds is 6 (1 – 0.25)/103.60 = 0.043 or 4.3%.

3.3   Cost of redeemable fixed rate debt (redeemable fixed rate bonds)

Value of redeemable debt

This is calculated as the present value of the future cash flows:

❑   To be received by the lender discounted at the pre-tax cost of debt (the lender's required rate of return); or

❑   To be paid by the company (net of tax relief on the interest flows) discounted at the post-tax cost of debt (the cost to the company).

Example: Market value of loan stock A

company has issued 7% loan stock.

Annual interest has just been paid. The bonds will be redeemed at par after four years.

The lenders' required rate of return is 8.14%.

Required

Calculate the market value of the loan stock.

Answer

Year	Cash flow			
Year		Cash flow	Discount factor (8.14%)	PV
1	Interest	7.00	0.925	6.48
2	Interest	7.00	0.855	5.99
3	Interest	7.00	0.791	5.55
4	Interest	7.00	0.731	5.13
4	Redemption	100.00	0.731	73.10
0	Market value			96.25

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Cost of redeemable debt

The cost of redeemable bonds is their redemption yield. This is the return, expressed as an average annual interest rate or yield, that investors in the bonds will receive between 'now' and the maturity and redemption of the bond, taking the current market value of the bonds as the investment. It is the investment yield at which the bonds are currently trading in the bond market.

This is calculated as the rate of return that equates the present value of the future cash flows payable on the bond (to maturity) with the current market value of the bond. In other words, it is the IRR of the cash flows on the bond to maturity, assuming that the current market price is a cash outflow.

The redemption of the principal at maturity is not an allowable expense for tax purposes. This means that post-tax cost of redeemable debt cannot be calculated by multiplying the pre-tax cost by (1 − t). A full IRR calculation must be carried out.

The approach is to calculate the post-tax cost of debt as the IRR of the future cash flows, allowing for tax relief on the interest payments and the absence of tax relief on the principal repayment using the market value as the cash flow at time 0.

The cash flows for calculating the cost of redeemable debt

The cash flows used to calculate an IRR (redemption yield) are:

❑ The current market value of the bond, excluding any interest payable in the near future (shown as a cash outflow).

❑ The annual interest payments on the bond (shown as a cash inflow).

❑ Tax relief on these annual interest payments : these are cash outflows (the opposite of the interest payments) and occur either in the same year as the interest payments or one year in arrears, depending on the assumption used about the timing of tax payments (shown as a cash outflow)

❑ The redemption value of the bonds, which is often par (shown as a cash inflow).

Tutorial comment

Note: You may find the direction of cash flows to be a little confusing here. For example, the interest payments are to be shown as an inflow!

You do not have to do this. What really matters is that the market value and tax benefits are shown as being in one direction and the interest and redemption in the other. You could show the former as inflows and the latter as outflows and it would give exactly the same answer.

However, we are used to calculating IRRs where there is an initial cash outflow so it is better to structure these calculations in this way as you have less chance of making an error in the interpolation.

Example: Post-tax cost of debt

The current market value of a company's 7% loan stock is 96.25.

Annual interest has just been paid. The bonds will be redeemed at par after four years.

The rate of taxation on company profits is 30%. **Required**

Calculate the after-tax cost of the bonds for the company.

Answer

It is assumed here that tax savings on interest payments occur in the same year as the interest payments.

Yr.	Cash flow		Try 6% Discount factor	PV	Try 5% Discount factor	PV
0	Market value	(96.25)	1.000	(96.25)	1.000	(96.25)
1	Interest less tax	4.90	0.943	4.62	0.952	4.66
2	Interest less tax	4.90	0.890	4.36	0.907	4.44
3	Interest less tax	4.90	0.840	4.12	0.864	4.23
4	Interest less tax	4.90	0.792	3.88	0.823	4.03
4	Redemption	100.00	0.792	79.20	0.823	82.30
	NPV			(0.07)		+ 3.41

Using interpolation, the after-tax cost of the debt is:

$$5\% + \frac{3.41}{(3.41 + 0.07)} \times (6 - 5)\% = 5.98\%, \text{ say } 6.0\%.$$

3.4 Cost of convertible debt

The cost of a convertible bond is the higher of:

❑ The cost of the bond as a straight bond that will be redeemed at maturity, and

❑ The IRR of the relevant cash flows assuming that the conversion of the bonds into equity will take place in the future.

The cost of capital of the bond as a straight bond is only the actual cost of the bond if the bonds are not converted into shares at the conversion date. The IRR of the relevant cash flows is the cost of the convertible bond assuming that conversion will take place.

The relevant cash flows for calculating this yield (IRR) are:

❑ The current market value of the bonds (Year 0 outflow);

❑ Annual interest on the bonds up to the time of conversion into equity (annual inflows);

❑ Tax relief on the interest (annual outflows);

❑ The expected market value of the shares, at conversion date, into which the bonds can be converted.

Example:

The current market value of a company's 7% convertible debenture is ₦108.70. Annual interest has just been paid.

The debenture will be convertible into equity shares in three years' time, at a rate of 40 shares per debenture.

The current ordinary share price is ₦3.20 and the rate of taxation on company profits is 30%.

The post-tax cost of the bonds are calculated as follows:

Yr.		Cash flow	Try 10% DCF factor	PV	Try 9% DCF factor	PV 0
	Market value	(108.7)	1.000	(108.7)	1.000	(108.7)
1- 3	Interest less tax	4.9	2.487	12.19	2.531	12.40
3	Value of shares on conversion (40 x ₦3.2)	128.0	0.751	96.13	0.772	98.82
	NPV			(0.38)		+ 2.52

Using interpolation, the after-tax cost of the debt is:

9% + [2.52/(2.52+ 0.38)] × (10 – 9)% = 9.9%.

The cost of the convertibles as a straight bond is obviously less than 9.9% (since the market value is above par and the coupon is only 7%). The market therefore expects the bonds to be converted into equity, and the after-tax cost is 9.9%.

Practice questions   **4**

A company has issued 4% convertible bonds that can be converted into shares in two years' time at the rate of 25 shares for every ₦100 of bonds (nominal value).

It is expected that the share price in two years' time will be ₦4.25.

If the bonds are not converted, they will be redeemed at par after four years. The yield

required by investors in these convertibles is 6%.

What is the value of the convertible bonds?

3.5   Cost of preference shares

For **irredeemable preference shares**, the cost of capital is calculated in the same way as the cost of equity assuming a constant annual dividend, and using the dividend valuation model.

Formula: Dividend valuation model (without growth)

$$MV = \frac{d}{r_p}$$

This is the present value of a perpetuity

rearranging:

$$r_p = \frac{d}{MV}$$

This is an IRR of a perpetuity

Where:

r_p = the cost of preference shares

d = the expected future annual dividend (starting at time 1)

MV = the share price ex dividend

For **redeemable preference shares**, the cost of the shares is calculated in the same way as the pre-tax cost of irredeemable debt. (Dividend payments are not subject to tax relief, therefore the cost of preference shares is calculated ignoring tax, just as the cost of equity ignores tax.)

4 CALCULATING THE WEIGHTED AVERAGE COST OF CAPITAL (WACC)

> **Section overview**
>
> - Method of calculating the weighted average cost of capital (WACC)
> - WACC and market values
> - Conditions under which WACC can be used

4.1 Method of calculating the weighted average cost of capital (WACC)

The weighted average cost of capital (WACC) is a weighted average of the (after- tax) cost of all the sources of capital for the company.

The different costs are weighted according to their market values. This can be done using a formula or a table.

Formula: WACC

$$WACC = r_E \frac{MV_E}{MV_{TOTAL}} + r_D \frac{MV_D}{MV_{TOTAL}} + r_P \frac{MV_P}{MV_{TOTAL}}$$

There would be a different term for each type of capital in the above formula.

Illustration: WACC

Source of finance	Market value	×	Cost (r)	Market value × cost
			r	rMV
Equity	MV_E	×	r_E	$r_E MV_E$
Preference shares	MV_P	×	r_P	$r_P MV_P$
Debt	MV_D	×	r_D	$r_D MV_D$
Total	$\sum MV$			$\sum rMV$

WACC = $\sum rMV / \sum MV$

Example: WACC

A company has 10 million shares each with a value of ₦4.20, whose cost is 7.5%.

It has ₦30 million of 5% bonds with a market value of 101.00 and an after-tax cost of 3.5%.

It has a bank loan of ₦5 million whose after-tax cost is 3.2%.

It also has 2 million 8% preference shares of ₦1 whose market price is ₦1.33 per share and whose cost is 6%.

Calculate the WACC.

Answer

Source of finance	Market value	Cost	Market value × cost
	₦ million	r	MV × r
Equity	42.00	0.075	3.150
Preference shares	2.66	0.060	0.160
Bonds	30.30	0.035	1.061
Bank loan	5.00	0.032	0.160
	79.96		4.531

$$WACC = \frac{4.531}{79.960} = 0.05667, \text{ say } 5.7\%.$$

Formula for WACC

WACC =

$(0.075 \times 42/79.96) + (0.06 \times 2.66/79.96) + (0.035 \times 30.3/79.96) (0.032 \times 5/79.96)$

= 0.05667 or 5.7%

Practice questions   **5**

A company has 20 million shares each with a value of ₦6.00, whose cost is 9%.

It has debt capital with a market value of ₦80 million and a before-tax cost of 6%.

The rate of taxation on profits is 30%.

Calculate the WACC.

4.2   WACC and market values

For a company with constant annual 'cash profits', there is an important connection between WACC and market value. (Note: 'Cash profits' are cash flows generated from operations, before deducting interest costs.)

If we assume that annual earnings are a constant amount in perpetuity, the total value of a company (equity plus debt capital) is calculated as follows:
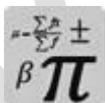
Formula: WACC and market value

$$\text{Total market value of a company} = \frac{\text{Earnings}\,(1-t)}{\text{WACC}}$$

From this formula, the following conclusions can be made:

❑   The lower the WACC, the higher the total value of the company will be (equity + debt capital), for any given amount of annual profits.

❑   Similarly, the higher the WACC, the lower the total value of the company.

For example, ignoring taxation, if annual cash profits are, say, ₦12 million, the total market value of the company would be:

❑   ₦100 million if the WACC is 12% (₦12 million/0.12)

❑   ₦120 million if the WACC is 10% (₦12 million/0.10)

❑   ₦200 million if the WACC is 6% (₦12 million/0.06).

The aim should therefore be to achieve a level of financial gearing that minimises the WACC, in order to maximise the value of the company.

Important questions in financial management are:

❑   For each company, is there an 'ideal' level of gearing that minimises the WACC?

❑   If there is, what is it?

These issues are addressed in a later chapter on gearing and capital structure.

4.3   Weighted average cost of capital (WACC) and capital asset pricing model   (CAPM)

The weighted average cost of capital (WACC) can be used as the discount rate in investment appraisal provided that some restrictive assumptions are met. These assumptions are:

- The investment project is small compared to the value of the investing organisation;
- The business activities of the investment project are similar to the business activities currently undertaken by the investing organisation;
- The financing mix used to undertake the investment project is similar to the current financing mix (or capital structure) of the investing company; and
- Existing finance providers of the investing company do not change their required rates of return as a result of the investment project being undertaken.

These assumptions are essentially saying that WACC can be used as the discount rate provided that the investment project does not change either the business risk or the financial risk of the investing organisation.

If the business risk of the investment project is different to that of the investing organisation, the CAPM can be used to calculate a project-specific discount rate. The procedure for this calculation is covered in chapter 16.

The benefit of using a CAPM-derived project-specific discount rate is illustrated in the figure below. Using the CAPM will lead to better investment decisions than using the WACC in the two shaded areas, which can be represented by projects A and B.

Project A would be rejected if WACC is used as the discount rate, because the internal rate of return (IRR) of the project is less than the WACC. This investment decision is incorrect, however, since project A would be accepted if a CAPM-derived project-specific discount rate is used because the project IRR lies above the security market line (SML). The project offers a return greater than that needed to compensate for its level of systematic risk, and accepting it will increase the wealth of shareholders.

Project B would be accepted if WACC was used as the discount rate because its IRR is greater than the WACC.

This investment decision is also incorrect, however, since project B would be rejected if using a CAPM-derived project-specific discount rate, because the project IRR offers insufficient compensation for its level of systematic risk.
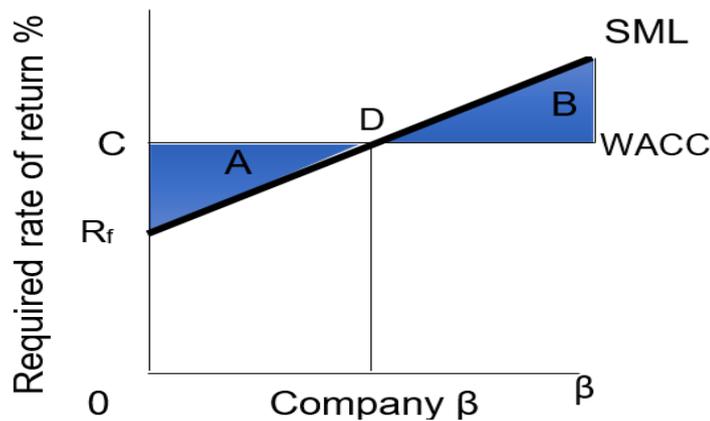
Advantages of the CAPM

The CAPM has several advantages over other methods of calculating required return, explaining why it has been popular for more than 40 years. These are:

- It considers only systematic risk, reflecting a reality in which most investors have diversified portfolios from which unsystematic risk has been essentially eliminated;

- It is a theoretically-derived relationship between required return and systematic risk which has been subject to frequent empirical research and testing;

- It is generally seen as much better method of calculating the cost of equity than the dividend growth model (DGM) in that it explicitly considers a company's level of systematic risk relative to the stock market as a whole; and

- It is clearly superior to the WACC in providing discount rates for use in investment appraisal.

Among the major difficulties inherent in the practical application of the CAPM are:

- **Determining the excess return R_m – R_f.**
  The term relates to the expected return of the market portfolio over the riskless asset. This is difficult to determine in practice.

- **Determining the risk-free rate -** Problems are found in identifying a riskless security. In view of the term structure of interest rates, the interest rate to be used is the yield on a security with the same approximate life as the project to be appraised.

- **Estimation of beta for the firm's equity and for the firm as a whole -** The coefficient for equity may be estimated by simple linear regression of security returns on market returns. To overcome possible sampling error, confidence limits on the beta estimate may be required. Unless the firm is all equity-financed, the equity beta must be converted into a firm beta in order to obtain an overall average required return.

- **Determining beta for individual projects –** Frequently, there is little objective evidence concerning a project's beta and so an estimate, necessarily subjective and open to argument, must be made.

- **The concentration only on systematic, rather than overall, risk -** A risky project which has a return uncorrelated with the market will be treated as financially equivalent to a risk-free project. Whilst this may be justified in the context of a well-diversified portfolio, they are unlikely to be considered equal by corporate management.

- **The CAPM is a single period return model -** Hence it should be used with caution in the analysis of any multi-period capital project.

5   CHAPTER REVIEW

> ### Chapter review
>
> Before moving on to the next chapter check that you now know how to:
> - Use the dividend valuation model to measure the value of equity
> - Measure the cost of equity using the dividend valuation model with and without growth
> - Measure the pre-tax and post-tax cost of both irredeemable and redeemable debt
> - Measure the cost of convertible bonds
> - Calculate the weighted average cost of capital

SOLUTIONS TO PRACTICE QUESTIONS

Solution 1

The cost of equity in the company can be estimated as:
0.70/(8.20 − 0.70) = 0.70/7.50 = 0.093 or 9.3%.

Solution 2

The cost of equity in the company can be estimated as follows:

$$r_E = \frac{0.45}{5.00} + 0.04 \textbf{ = 0.13 or 13\%.}$$

Solution 3

(a) Cost of equity = $\dfrac{1.50}{13.00}$ = 0.115 or 11.5%.

(b) Cost of equity = $\dfrac{1.50(1.04)}{13.00}$ + 0.04 = 0.16 or 16%.

(c) Cost of equity = 5% + 1.20 (14 − 5)% = 15.8%.

Solution 4

Value of the convertible bond if it is expected to convert the bonds into shares

Year		Amount	Discount factor at 6%	Present value
		₦		₦
1	Interest	4.00	0.943	3.77
2	Interest	4.00	0.890	3.56
2	Share value (25 × ₦4.25)	106.25	0.890	94.56
				101.89

Value of the convertible bond if not converted into shares

Year		Amount	Discount factor at 6%	Present value
		₦		₦
1	Interest	4	0.943	3.77
2	Interest	4	0.890	3.56
3	Interest	4	0.840	3.36
4	Interest and capital redemption	104	0.792	82.37
				93.06

The value of the convertible bond will be 101.78, in the expectation that the bonds will be converted into shares when the opportunity arises.

Solution 5

The after-tax cost of the debt capital is 6% (1 – 0.30) = 4.2%. **Using a table for calculations:**

Source of finance	Market value	Cost	Market value × Cost
	₦ million	r	MV ×r
Equity	120.00	0.090	10.80
Bonds	80.00	0.042	3.36
	200.00		14.16

WACC = 14.16/200 = 7.08%

Using the formula:

$$\text{WACC} = \left[\frac{120}{200} \right] 9\% + \left[\frac{80}{200} \right] 6\% (1 - 0.30)$$

= 5.4% + 1.68% = 7.08%

Both methods give the same WACC.

CHAPTER

10

Portfolio theory and the capital asset pricing model (CAPM)

Contents

1 Risk and investments

2 Portfolio theory

3 Capital market line

4 Capital asset pricing model (CAPM)

5 The cost of capital for capital investment appraisal

6 Chapter overview

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

C			Financing decisions		
	5		**Portfolio theory and asset pricing models**		
		a	Portfolio theory		
			Assess and apply:		
			i	Risk and return relationship in investments;	
			ii	Risk (standard deviation) of 2-asset-portfolio; and	
			iii	Risk reduction through diversification.	
		b	Capital asset pricing model (CAPM)		
			i	Discuss:	
				◻	Systematic and unsystematic risks;
				◻	Capital market line (CML) and the security market line (SML); and
				◻	Alpha value and its use.
			ii	Calculate Beta factor and explain its uses.	
		c	Evaluate return on assets using multi factor model (MFM).		

Exam context

This chapter explains two models which can be used to take account of the risk of investments. These are portfolio theory and the capital asset pricing model.

By the end of this chapter, you should be able to:

- Measure risk as a variance

- Explain portfolio theory

- Measure the risk return characteristics of a two asset portfolio

- Comment on the risk return characteristics of a two asset portfolio

- Explain the difference between systematic and unsystematic risk

- Explain how beta values are used as a measure of systematic risk

- Measure a required rate of return using the CAPM equation

- Explain how the CAPM can be used to identify discount rates for capital projects

1 RISK AND INVESTMENTS

Section overview

- Risk and return on investments
- What is investment risk?
- Measuring risk as a variance or standard deviation of expected returns
- Diversification to reduce risk
- Calculating covariance and correlation coefficient

1.1 Risk and return in investments

Investors invest in shares and bonds in the expectation of making a return. The return that they want from any investment could be described as:

❑ A return as reward for providing funds and keeping those funds invested, plus

❑ A return to compensate the investor for the risk.

As a basic rule, an investor will expect a higher return when the investment risk is higher.

1.2 What is investment risk?

Investors in bonds, investors in shares and companies all face investment risk. In the case of

bonds, the risks for the investor are as follows:

❑ The bond issuer may default, and fail to pay the interest on the bonds, or fail to repay the principal at maturity.

❑ There may be a change in market rates of interest, including interest yields on bonds. A change in yields will alter the market value of the bonds. If interest rates rise, the market value of bonds will fall, and the bond investor will suffer a loss in the value of his investment.

In the examination, you might be told to assume that debt capital is risk-free for the purpose of analysing the cost of equity. In practice however, only government debt denominated in the domestic currency of the government is risk-free.

In the case of **equity shares**, the risks for the investor are that:

❑ the company might go into liquidation; or

❑ much more significantly, the company's profits might fluctuate, and dividends might also rise or fall from one year to the next.

For investors in equities, the biggest investment risk comes from uncertainty and change from one year to the next in annual profits and dividends. Changes in expected profits and dividends will affect the value of the shares. Bigger risk is associated with greater variability in annual earnings and dividends.

When a company invests in a new project, there will be an investment risk. This is the risk that actual returns from the investment will not be the same as the expected returns but could be higher or lower. This investment risk for companies is similar to the investment risk facing equity investors.

Some types of investment are more risky than others because of the nature of the industry and markets. For example, investments by a supermarkets group in

building a new supermarket is likely to be less risky than investment by an IT company in a new type of software. This is because the IT business is inherently more risky than the supermarkets business. When business risk is higher, returns are less predictable or more volatile, and the **expected returns should be higher to compensate for the higher business risk**.

1.3 Measuring risk as a variance or standard deviation of expected returns

The risk of variations in annual profits and dividends can be measured. When annual returns can differ by a large amount from normal or expected (average) returns, and there are considerable differences in returns from one year to the next, returns are **volatile**.

High volatility in returns is associated with high investment risk.

Risk can be measured statistically, either from an analysis of historical returns achieved in the past, or from probability estimates of returns in the future. The measurement of risk is a measurement of the volatility of possible returns.

This volatility can be measured as either the variance or standard deviation of expected returns.

For an investment, we can measure both:

❑ an expected or average annual return; and

❑ a variance or standard deviation of the returns. (The standard deviation is the square root of the variance).
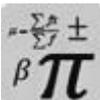
Formula: Variance

$$\sum p(r - \bar{r})^2$$

Where:

p = the probability of a given return on the investment

r = the amount of that return

$\bar{r}$ = the average expected return on the investment. This is the expected value (EV) of the return.

If you are not familiar with the calculation of a variance, study the following example carefully.

Example: Measuring risk as a variance or standard deviation of expected returns

Based on historical analysis, it has been established that the probable returns on equity investment A are:

		Expected value
Probability p	Return r	(EV) of return p $\Box$ r
	%	%
0.2	2	0.4
0.5	6	3.0
0.3	8	2.4
Mean (r bar)		5.8

The variance of the returns is calculated as follows:

Probability p	Return r	r – r	(r – r)²	p (r – r)²
	%	%		
0.2	2	- 3.8	14.44	2.888
0.5	6	+ 0.2	0.04	0.020
0.3	8	+ 2.2	4.84	1.452
Variance (σ^2)				4.36%
Standard deviation (σ)				2.09%

The expected return from the investment is therefore 5.8% with a standard deviation of 2.8%. The statistical significance of the standard deviation depends on whether the variability in possible returns has a recognisable statistical distribution, such as a standard normal distribution.

Concept of return

Investors hold securities (e.g. shares, bonds, etc.) because they hope for positive returns. Purchasers of ordinary shares, for examples are attracted by two components of return, first, the anticipated dividend(s) payable during the holding period, and second, the expected capital gain.

In general, for any holding period, the percentage return, R, from holding a stock is:

$$R = \frac{(EV - BV) + D}{BV} \times 100$$

Where:
EV = Value of the stock at the end of the holding period
BV = Value of the stock at the beginning of the holding period
D = Dividend received during the holding period

Example: Calculating return

You bought a stock for ₦150 and it is now worth ₦55. During the period, you received a dividend at ₦2. Calculate
i)   the total return
ii)   the capital gain yield
iii) the dividend yield

Solution

i)   Total return (TR)

$$= \frac{(55 - 50) \times 2}{50} \times 100$$

= 14%

ii) Capital gain yield (CGY) =

$$\frac{55 - 50}{50} \times 100 = 10\%$$

iii) Dividend Yield (DY) =

$$\frac{2}{50} \times 100 = 4\%$$

Notes
- Because the stock has not been sold, the capital gain is unrealised
- It is clear that: TR = CGY + DY
  Unless otherwise stated, reference to return should be interpreted as the total return

Expected return from a two – asset portfolio

The expected return of a portfolio consisting of assets A and B is the weighted average of the returns from the two assets.

Formula: Expected return from a two – asset portfolio

$$R_P = W_A R_A + W_B R_B$$

Where:

W_A = % of funds, or weight, committed to asset A

W_B = % of funds, or weight, committed to asset B

R_A = the expected return from asset A

R_B = the expected return from asset B

Notice that because all of the funds under consideration are committed to one asset or another to form the portfolio, we must have: $W_A + W_B = 1$

This implies that we can express one of the weights in terms of the other. Thus, in the above formula for portfolio we can write: $W_B = 1 - W_A$

Example: Expected return from a two-asset portfolio

You have ₦1,000,000 to invest in stock A and stock B. The following information is given for the two stocks.

Stock	Current Price	Expected price in one year	Expected dividend
A	₦40	₦48	₦0
B	₦50	₦63	₦2

a) You have decided to invest ₦750,000 on stock A and ₦250,000 on stock B. Calculate the expected return on your portfolio.

b) Now assume you desire an expected return of 28% on your portfolio, how would you invest your ₦1,000,000?

c) Alternatively, assume you desire a return of 36%, how much should you invest in each stock.

Solution

a) W_A = 750,0000/1,000,000 = 75%
    W_B = 250,000/1,000,000 = 25% =100% - 75%

$$R_A = \frac{(48 - 40) + 0}{40} \times 100 = 20\%$$

$$R_B = \frac{(63 - 50) + 2}{50} \times 100 = 30\%$$

R_P = (0.75 × 20) + (0.25 × 30) = 22.5%

b) We need to make use of the equation:
$$R_P = W_A R_A + W_B W_B$$
$$= W_A R_A + (1 - W_A) R_B$$

Substituting:

28 = W_A(20) + (1 - W_A)(30)

$28 = 20W_A + 30 - 30W_A - 2 = -10W_A$

W_A = 2/10 = 0.2

$W_B = 1 - W_A = 1 - 0.2 = 80\%$

This means that 20% of the total fund (i.e. ₦200,000) should be invested on stock A and the balance of 80% (i.e. ₦800,000) should be invested on stock B.

c) Using the same procedure as (b) above:

36 = W_A(20) + (1 - W_A) (30)

$36 = 20W_A + 30 - 30W_A$

6 = - 10W_A

W_A = - 0.6, i.e., - 60%

W_B = 1 - - 0.6 = 1.6 i.e. 160%

This means that the investor should **borrow** 60% of his total fund, at an interest rate of 12%, and invest the entire ₦1,600,000 on stock B.

Proof
$$R_P = (-0.6)(20) + (1.6)(30)$$
$$= -12\% + 48\% = 36\%$$

1.4 Diversification to reduce risk

To a certain extent, an investor can reduce the investment risk – in other words, reduce the volatility of expected returns – by diversifying his investments, and holding a portfolio of different investments.

Creating a portfolio of different investments can reduce the variation of returns from the total portfolio, because if some investments provide a lower-than- expected return, others will provide a higher-than-expected return. Extremely high or low returns from the overall portfolio are therefore less likely to occur.

Similarly, a company could reduce the investment risk in its business by diversifying, and building a portfolio of different investments. However, it can be argued that there is no reason for a company to diversify its investments, because an investor can achieve all the diversification he requires by selecting a diversified portfolio of equity investments.

An investment portfolio consisting of all stock market securities (excluding risk- free securities), weighted according to the total market value of each security, is called the **market portfolio**.

The degree of reduction in risk due to diversification depends on how the returns on the investments change together in response to changing economic conditions. For example, if the returns on one investment fall as the returns on another rise they could be combined to reduce volatility (risk).

There are two important statistical measures used to describe the association between two variables. They are:

❑ covariance; and

❑ correlation coefficient.

1.5 Calculating covariance and correlation coefficient

Introduction

You could be required to calculate variances, standard deviations, covariance and correlation coefficient in the exam.

The following example shows you how to do this. It may look complicated but in most cases it is a straightforward matter of setting up appropriate columns to provide the totals needed and then using these in the appropriate equations.

Example: Raw data

The following information relates to two securities (X and Y) and how they behave under different sets of economic conditions (described as states of the world).

State of the world	Probability (p)	Returns from share X (Rx)	Returns from share Y (Ry)
A	0.3	25%	28%
B	0.5	22%	18%
C	0.2	12%	15%

The above information will be used to illustrate the calculation of:

❑ variance of returns and hence the standard deviation of returns on two securities;

❑ the covariance of returns on those two securities;

❑ the correlation coefficient of the returns from the two securities by rearranging the expression for covariance; and

❑ the correlation coefficient of the returns from the two securities from the raw data.

Variance and standard deviation

> ### Example: Variance and standard deviation
>
> The variance (and hence the standard deviation) of the returns on each share is calculated as follows:
>
> Share X
>
> | p | Rx (%) | pRx | Rx − R̄x | (Rx − R̄x)² | p(Rx − R̄x)² |
> |-----|--------|-------|--------|-----------|------------|
> | 0.3 | 25 | 7.50 | 4.10 | 16.81 | 5.04 |
> | 0.5 | 22 | 11.00 | 1.10 | 1.21 | 0.61 |
> | 0.2 | 12 | 2.40 | (8.90) | 79.21 | 15.84 |
> | | | 20.90 | | | |
> | | | = R̄x | Variance | | 21.49% |
> | | | | Standard deviation (σX) | | 4.64% |
>
> Share Y
>
> | p | Ry (%) | pRy | Ry − R̄y | (Ry − R̄y)² | p(Ry − R̄y)² |
> |-----|--------|-------|--------|-----------|------------|
> | 0.3 | 28.00 | 8.40 | 7.60 | 57.76 | 17.33 |
> | 0.5 | 18.00 | 9.00 | (2.40) | 5.76 | 2.88 |
> | 0.2 | 15.00 | 3.00 | (5.40) | 29.16 | 5.83 |
> | | | 20.40 | | | |
> | | | = R̄y | Variance | | 26.04% |
> | | | | Standard deviation (Y) | | 5.10% |

The calculations above show that the returns of share X are less volatile than the returns on share Y. In other words, share X is less risky than share Y.

Covariance

The formulae for the calculation of covariance from raw data are as follows:
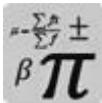
Formula: Covariance

The following formula can be used to calculate the covariance when data is presented as a series of pairs of values for x and y:

$$\text{Covariance}_{AB} = \frac{\Sigma(x - \bar{x})(y - \bar{y})}{n}$$

Where:

x, y = value of return on shares x and y respectively

$\bar{x}\bar{y}$ = mean values of returns on shares x and y respectively

The following formula can be used to calculate the covariance when data is presented as a probability distribution of pairs of values for x and y (as in our example):

$$\text{Covariance}_{AB} = \Sigma p(x - \bar{x})(y - \bar{y})$$

Example: Covariance

The covariance is calculated as follows (using data from some of the columns constructed for the variance calculations):

Covariance of returns of securities X and Y

p	$R_x - \bar{R}_x$	$R_y - \bar{R}_y$	$p(R_x - \bar{R}_x)(R_y - \bar{R}_y)$
0.3	4.10	7.60	9.348
0.5	1.10	(2.40)	(1.32)
0.2	(8.90)	(5.40)	9.612
		Covariance$_{XY}$	17.64

Correlation coefficient (from the covariance)

The covariance formula can be rearranged and expressed in terms of the correlation coefficient as follows:
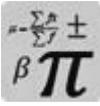
Formula: Correlation coefficient

$$\text{Covariance}_{XY} = \rho_{XY}\sigma_X\sigma_Y$$

Rearranging:

$$\rho_{XY} = \frac{\text{Covariance}_{XY}}{\sigma_X\sigma_Y}$$

Example: Correlation coefficient

Given the values calculated previously:

Covariance $_{XY}$	= 17.64
σ_X	= 4.64
σ_Y	= 5.10

The correlation coefficient can be found as follows:

$$\rho_{XY} = \frac{\text{Covariance}_{XY}}{\sigma_X\sigma_Y}$$

$$\rho_{XY} = \frac{17.64}{4.64 \times 5.10} = 0.746$$

Correlation coefficient (from the raw data)

Formula: Correlation coefficient (r)

The following formula can be used to calculate the correlation coefficient when data is presented as a series of pairs of values for x and y:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

Where:

x, y =   value of pairs of data.

n =   the number of pairs of values for x and y.

The following formula can be used to calculate the covariance when data is presented as a probability distribution of pairs of values for x and y:

$$r = \frac{(\sum exy) - \sum ex \sum ey}{\sqrt{(\sum ex^2 - (\sum ex)^2)(\sum ey^2 - (\sum ey)^2)}}$$

Where:

p =   the probability associated with a value of x and y

Example: Correlation coefficient

The raw data can be used to assemble the totals necessary to calculate the correlation coefficient as follows:

Share X

p	Rx (%)	pRx	Rx^2	pRx^2
0.3	25	7.50	625	187.5
0.5	22	11.00	484	242
0.2	12	2.40	144	28.8
	ΣpRx =	20.90	**ΣpRx^2 =**	458.3

Share Y

p	Ry (%)	pRy	Ry^2	pRy^2
0.3	28.00	8.40	784	235.2
0.5	18.00	9.00	324	162
0.2	15.00	3.00	225	45
	ΣpRy =	20.40	**ΣpRy^2 =**	442.2

Using information from above

p	Rx (%)	Ry (%)	pRxRy
0.3	25	28.00	210
0.5	22	18.00	198
0.2	12	15.00	36
		ΣpRxRy =	444

Formula: Correlation coefficient (r)

$$r = \frac{(\sum exy) - \sum ex \sum ey}{\int (\sum ex^2 - (\sum ex)^2)(\sum ey^2 - (\sum ey)^2)}$$

$$r = \frac{444 - (20.9 \times 20.4)}{\int (458.3 - 20.9^2)(442.2 - 20.4^2))}$$

$$r = \frac{444 - 426.36}{\int (458.3 - 436.81)(442.2 - 416.16)}$$

$$r = \frac{17.64}{\sqrt{21.49 \times 26.04}} = \frac{17.64}{\sqrt{559.6}} = \frac{17.64}{23.66}$$

$$r = 0.746 \, (\text{as before})$$

2 PORTFOLIO THEORY

Section overview

- Introduction to portfolio theory
- Diversification to reduce risk
- Two-asset portfolios
- Making investment decisions
- Systematic and unsystematic risks

2.1 Introduction to portfolio theory

Portfolio theory is concerned with how investors should build a portfolio of investments that gives them a suitable balance between return and investment risk. Portfolio theory provides a theoretical basis for the capital asset pricing model, which is an important model in financial management.

Risk averse investors will accept risk provided that they are compensated for it by an adequate return. However if they could reduce their risk without a reduction in return this would be even better.

This is possible by the process of diversification.

2.2 Diversification to reduce risk

An investor can reduce the investment risk (in other words, reduce the volatility of expected returns) by diversifying his investments, and holding a portfolio of different investments.

Creating a portfolio of different investments can reduce the variance and standard deviation of returns from the total portfolio, because if some investments provide a lower-than-expected return, others will provide a higher- than-expected return. Extremely high or low returns are therefore less likely to occur.

(Similarly, a company could reduce the investment risk in its business by diversifying, and building a portfolio of different investments. However, it can be argued that there is no reason for a company to diversify its investments, because an investor can achieve all the diversification he requires by selecting a diversified portfolio of equity investments.)

Diversification to reduce risk: the correlation of investment returns

The extent to which investment risk can be reduced by building a portfolio of different investments depends on the **correlation of the returns from the different investments in the portfolio**.

- When returns from different investments in a portfolio are **positively correlated,** this means that when the return from one of the investments is higher than expected, the returns from the other investments will also be higher than expected. Similarly, when returns from one investment are lower than expected, the returns from all the investments in the portfolio will be lower than expected.

❑ When returns from two different investments in a portfolio are **negatively correlated,** this means that when the return from one of the investments is higher than expected, the returns from the other investment will be lower than expected.

❑ When returns from two investments are neither positively nor negatively correlated, this means that when the returns from one investment are higher than expected, the returns from the other investment might be either higher or lower than expected.

Investment risk is reduced by building up a portfolio of investments whose returns are negatively correlated, or where correlation is low.

Correlation coefficient of investment returns

The correlation of the returns from different investments can be measured statistically by a **correlation coefficient**, from an analysis of historical data about returns (or from probability estimates of future returns).

A correlation coefficient can range in value from +1 (perfect positive correlation) to – 1 (perfect negative correlation).

A correlation coefficient close to zero indicates very little correlation between investment returns.

Investment risk is reduced most effectively by having investments in a portfolio whose returns are negatively correlated, or where there is not much correlation.

You might be required to calculate the correlation coefficient of the returns from two investments in a portfolio (a two-investment portfolio). You will not be required to make any calculations of correlation for a portfolio of more than two investments, but the same principles apply to larger portfolios.

Summary

When an investment(a) is added to an existing portfolio (b) the risk of the new portfolio formed will usually be less than a simple weighted average of the individual risks of a and b alone.

Some investments might do even more than this. Some investments can be added to an existing portfolio to give a new portfolio of lower risk than the existing portfolio. This is because of the way that the investments' returns interact with each other in different sets of economic conditions – "states of the world".
Whether such investments are acceptable will depend on the effect that they have on the return of the existing portfolio.

2.3 Two-asset portfolios

Portfolio theory works by looking at the impact that a new investment will have on an existing portfolio. The risk/return characteristics of the existing portfolio are compared to those of the portfolio if the new investment were included.

Expected return from a two-asset portfolio

The expected return from a two-asset portfolio is the weighted average of the returns from the two investments.

Formula: Expected return from a two-asset portfolio

$$R_P = R_A x + R_B(1 - x)$$

Where:

R_P = the expected return from the two-asset portfolio R_A = the expected return from investment A

R_B = the expected return from investment B

x = the proportion of investment A in the portfolio (for example, 40% = 0.40)

$(1 - x)$ = the proportion of investment B in the portfolio

The above equation shows that the expected return from a two asset portfolio is a simple weighted average of the returns of each asset in the portfolio.

Standard deviation of return for a two-asset portfolio

The overall standard deviation of the return from a two-asset portfolio can be calculated using the following formula, which is given to you in the formula sheet for the examination.
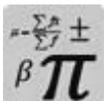
Formula: Standard deviation of return for a two-asset portfolio

$$\sigma_P = \sqrt{\sigma_A{}^2 x^2 + \sigma_B{}^2(1 - x)^2 + 2x(1 - x)\rho_{AB}\sigma_A\sigma_B}$$

Where:

σ_P = the standard deviation of returns of the portfolio

σ_A = the standard deviation of returns of investment A

σ_B = the standard deviation of returns of investment B

x = the proportion of the portfolio consisting of investment A

$(1 - x)$ = the proportion of the portfolio consisting of investment B

ρ_{AB} = the correlation coefficient of the returns of investment A and investment B

$\rho_{AB} \sigma_A \sigma_B$ = the covariance of the returns for investment A and investment B

Example: Standard deviation of return for a two-asset portfolio (with perfect positive correlation)

A portfolio consists of 70% of investment A and 30% of investment B.

The expected return on investment A is 7% and the expected return on investment B is 9%.

The standard deviation of returns of investment A is 2.19%. The

standard deviation of returns of investment B is 4.1%.

The correlation coefficient of the returns of investment A and investment B = +1

Expected return from the portfolio:

(7% × 70%) + (9% × 30%) = 7.6%.

Standard deviation (risk) of the returns from the portfolio:

$$\sigma_P = \sqrt{\sigma_A^2 x^2 + \sigma_B^2(1-x)^2 + 2x(1-x)\rho_{AB}\sigma_A\sigma_B}$$

$$\sigma_P = \sqrt{(2.19)^2(0.7)^2 + (4.1)^2(0.3)^2 + 2(0.7)(0.3)(1)(2.19)(4.1)} = \sqrt{7.634}$$

$$\sigma_P = \sqrt{7.634} = 2.763$$

The portfolio therefore has an expected return of 7.6% with a standard deviation of 2.763%.

If the correlation of returns of the two investments in a portfolio is +1 (perfect positive correlation) the standard deviation of the portfolio is the simple weighted average of the standard deviations of the returns of the individual investments.

Demonstration:

$$\sigma_P = (2.19 \times 0.7)^2 + (4.1 \times 0.3)^2 = 2.763 \text{ (as above)}$$

Further comment:

You can arrive at this conclusion as follows:

$$\sigma_P = \sqrt{(2.19)^2(0.7)^2 + (4.1)^2(0.3)^2 + 2(0.7)(0.3)(1)(2.19)(4.1)}$$

simplifies to:

$$\sigma_P = \sqrt{((2.19 \times 0.7) + (4.1 \times 0.3))^2}$$

Cancelling the square root and the squares give:

$$\sigma_P = (2.19 \times 0.7) + (4.1 \times 0.3) = 2.763$$

If the returns on the two investments are perfectly positively correlated the value of the correlation coefficient is +1. This is the highest value it can take.

❑ Therefore, any other value for the correlation coefficient would be less than this.

❑ Therefore any other value for the standard deviation of the returns of the portfolio must be less than a simple weighted average of the standard deviation of the returns of the individual investments.

It would be very unusual in practice to find two investments the returns of which show perfect positive correlation. This means that in practice two asset portfolios will almost always have a risk (because that is what we are talking about) which is less than a simple weighted average of the risks of the individual investments.

Let us return to the above example. Imagine an investor who held a portfolio which only included shares in A. His return would be 7% with a risk of 2.19%.

If he included an investment in B in his portfolio (in the given proportions):

❑   return would increase from 7% to 7.6%; but

❑   risk would increase from 2.19% to 2.763%.

If the investor was able to find shares offering a similar return to those of B but the returns of which showed a lower correlation of returns with the shares he already holds (A in this case) he might be able to achieve the increased return and **lower** his risk.

The following example illustrates this by showing what happens if there is a high degree of negative correlation.

Example: Standard deviation of return for a two-asset portfolio (with perfect negative correlation)

A portfolio consists of 70% of investment A and 30% of investment B.

The expected return on investment A is 7% and the expected return on investment B is 9%.

The standard deviation of returns of investment A is 2.19%. The

standard deviation of returns of investment B is 4.1%.

The correlation coefficient of the returns of investment A and investment B = −1

Expected return from the portfolio:

(7% × 70%) + (9% × 30%) = 7.6%.

Standard deviation (risk) of the returns from the portfolio:

$$\sigma_P = \int \sigma_A{}^2 x^2 + \sigma_B{}^2(1-x)^2 + 2x(1-x)\rho_{AB}\sigma_A\sigma_B$$

$$\sigma_P = \int (2.19)^2 0.7^2 + 4.1^2(0.3)^2 + 2(0.7)(0.3)(-1)(2.19)(4.1) = \sqrt{0.091809}$$

$$\sigma_P = \sqrt{0.091809} = 0.303$$

The portfolio therefore has an expected return of 7.6% with a standard deviation of 0.303%.

The risk in this portfolio is significantly less than the risk from the two individual investments (whose standard deviations are 2.19% and 4.10%).

This is due to the fact that the returns from the two investments have perfect negative correlation.

Just as it would be very unusual in practice to find two investments the returns of which show perfect positive correlation it would also be rare to find two investments the returns of which show perfect negative correlation. However, an investor does not need to find such an investment in order to reduce his risk. The following table shows the risk of the above portfolio assuming different values for the correlation coefficient.

Example: Standard deviation of return for a two-asset portfolio

A portfolio consists of 70% of investment A and 30% of investment B.

The expected return on investment A is 7% and the expected return on investment B is 9%.

The standard deviation of returns of investment A is 2.19%. The

standard deviation of returns of investment B is 4.1%.

The risk associated with the above portfolio given different degrees of correlation of the returns of A and those of B are as follows:

Correlation coefficent	Standard deviation of returns of the portfolio (risk)
1	2.763%
0	1.9654%
−0.3	1.6528%
−0.4	1.5344%
−0.5	1.4062%
−0.6	1.2650%
−0.7	1.1059%
−0.8	0.9198%
−0.9	0.6848%
−1	0.3030%

The above example shows that an investor, who held a portfolio which only included shares in A, could increase his return and decrease his risk if he could find shares with the risk return characteristics of shares in B as long as the returns on those shares showed zero correlation (or less) with the returns of A.

This applies to portfolios with many different investments, not just to two- investment portfolios. However, the equivalent expression, to find the risk of portfolios with more than two investments, quickly becomes much more complex.

2.4 Making investment decisions

If the risk return characteristics of a portfolio are compared to those of the portfolio with a new investment there are a series of possible outcomes. Not all of these would allow a decision to be made:

RETURN	RISK	CONCLUSION
Improved by new investment	Risk lowered by new investment	Accept the investment – it improves the risk return position
Improved by new investment	Stays the same	
Stays the same	Risk lowered by new investment	
Return reduced by new investment	Risk increased by new investment	Reject the investment – it will make the risk/return position less favourable
Stays the same	Risk increased by new investment	
Return reduced by new investment	Stays the same	
⬜	⬜	Unable to decide. It depends on whether the fall in return is compensated by the fall in risk
⬜	⬜	Unable to decide. It depends on whether the increase in return is thought to be adequate compensation for the increase in risk

---

Example:

Suppose that an investor has a choice of selecting any of the following portfolios:

Portfolio	Expected return	Risk (= σ)
	%	%
A	6.0	4.0
B	7.0	3.0
C	9.0	5.5
D	8.0	6.0

A normal (risk-averse) investor will not select Portfolio A, because Portfolio B offers a higher return than Portfolio A for less risk.

Similarly, a risk-averse investor will not select Portfolio D, because Portfolio C offers a higher return than Portfolio D for less risk.

It is not clear whether a risk-averse investor would select Portfolio B or Portfolio C, because Portfolio C offers a higher return for greater risk, and Portfolio B offers a lower return but less risk.

2.5 Systematic and unsystematic risk

Although investors can reduce their investment risk by diversifying, not all risk can be eliminated. There will always be some investment risk that cannot be eliminated by diversification.

❑ When the economy is weak and in recession, returns from the market portfolio as a whole are likely to fall. Diversification will not protect investors against falling returns from the market as a whole

❑ Similarly, when the economy is strong, returns from the market as a whole are likely to rise. Investors in all or most shares in the market will benefit from the general increase in returns.

Therefore there are two types of risk:

❑ **Unsystematic risk**, which is risk that is unique to individual investments or securities, that can be eliminated through diversification

❑ **Systematic risk or market risk**. This is risk that cannot be diversified away, because it is risk that affects the market as a whole, and all investments in the market in the same way.

Illustration: Systematic and unsystematic risk
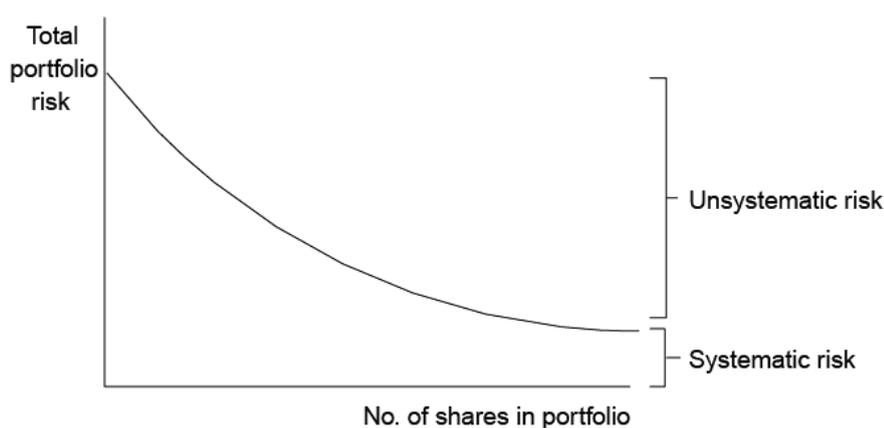
Implications of systematic and unsystematic risk for portfolio investment

The distinction between systematic risk and unsystematic risk has important implications for investment.

❑ Investors expect a return on their investment that is higher than the risk- free rate of return (unless they invest 100% in risk-free investments).

❑ The higher expected return is to compensate investors for the higher investment risk.

❑ By diversifying, and investing in a wide range of different securities, investors can eliminate unsystematic risk. This is because if some investments in the portfolio perform much worse than expected, others will perform much better. The good-performing and poor-performing investments 'cancel each other out'.

❑ In a well-diversified portfolio, the unsystematic risk is therefore zero. Investors should therefore not require any additional return to compensate them for unsystematic risk.

❑ The only risk for which investors should want a higher return is systematic risk. This is the risk that the market as a whole will perform worse or better than expected.

3   CAPITAL MARKET LINE

Section overview

- Portfolio theory revisited
- Multi-asset portfolios
- The market portfolio
- The capital market line

3.1   Portfolio theory revisited

In the previous section we calculated the risk and return of two asset portfolios when the returns of the assets showed perfect positive and perfect negative correlation. The risks and returns of possible portfolios constructed with different proportions of the two assets can be shown on a graph.

Perfect positive correlation

The graph of the possible portfolios constructed from two assets the returns of which show perfect positive correlation would be a straight line as follows:

Illustration: Risk and return of portfolios constructed from two assets with perfect positive correlation
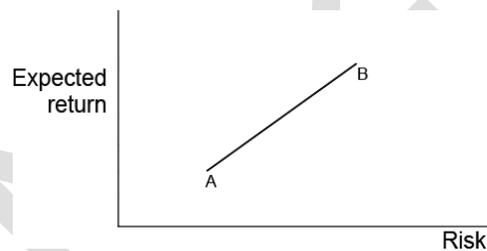
This is because both the risks and returns of each portfolio are a simple weighted average of the risks and returns of the individual assets that make up the portfolio.

Perfect negative correlation

The graph of the possible portfolios constructed from two assets the returns of which show perfect negative correlation would be a made up of two straight lines with a risk free portfolio as follows:

Illustration: Risk and return of portfolios constructed from two assets with perfect negative correlation
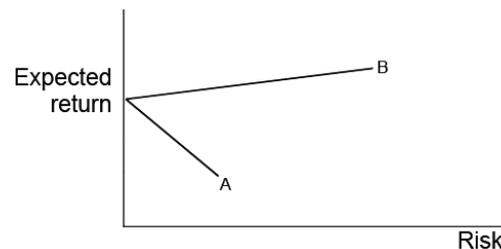
Note that a rational investor would choose only those portfolios that sit on the top line because they give the highest level of return for a given level of risk. The portfolios on the top line are said to be efficient.

Other correlation coefficients

All other correlation coefficients must take a value within the limits set by perfect positive correlation and perfect negative correlation.

The graph of the possible portfolios constructed from two assets the returns of which show anything but perfect positive correlation or perfect negative correlation would be a curve as follows:

Illustration: Risk and return of portfolios constructed from two assets neither perfect positive nor perfect negative correlation
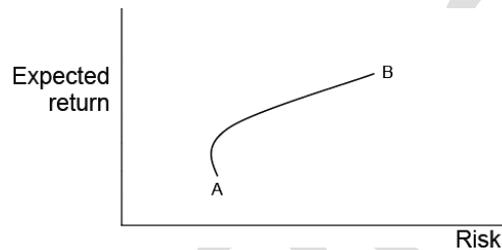
So far we have only considered two asset portfolios. The risks and returns of all possible portfolios made up of two assets are represented by a line (straight or a curve).

3.2 Multi-asset portfolios

When there are more than two assets, a plot of the risks and returns of all possible portfolios with different proportions of the assets are represented as an area.

Illustration: Risk and return of portfolios constructed from more than two assets

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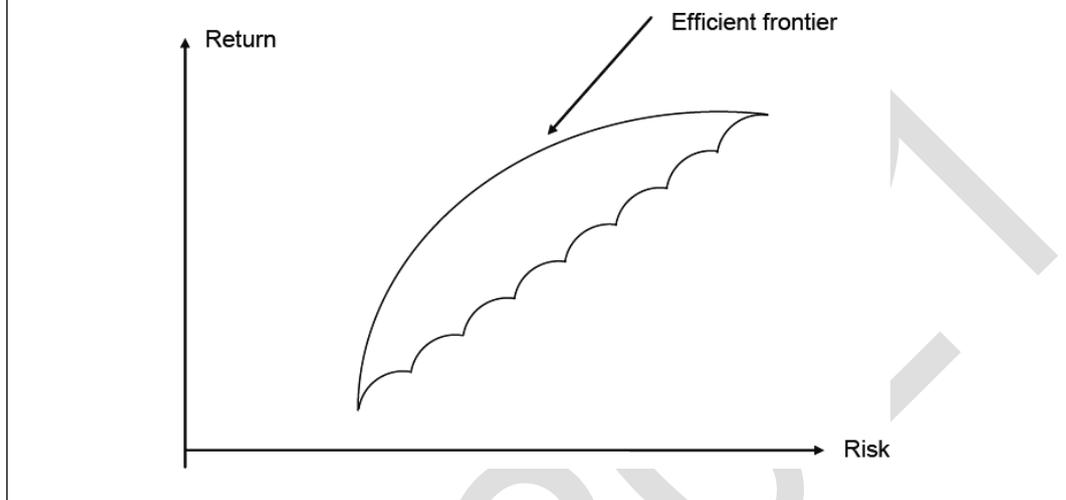
A rational investor would only be willing to hold portfolios that sit on the top curve of this area because these offer the best risk and return combinations.

The top boundary of the area is known as the efficient frontier. Portfolios on the boundary are described as being "mean-variance efficient". A portfolio is mean- variance efficient if it offers:

❏ maximum return for a given level of risk; or

❏ minimum risk for a given level of return.

Investors can assemble a wide variety of different portfolios, each consisting of different investments and in differing proportions. However, rational investors will always select a portfolio that offers a higher expected return or a lower risk than other portfolios that could be assembled.

An efficient portfolio is a portfolio that offers:

❏ a higher expected return than any other portfolio, for a given level of risk, or

❏ a lower amount of risk than any other portfolio, for a given size of expected return.

The efficient frontier of portfolios

In theory, it would be possible to prepare a graph showing every possible portfolio that investors might choose from the market as a whole, with the expected return from the portfolio plotted on the y axis and the risk of the portfolio, measured as the standard deviation of its expected returns, on the x axis.

The efficient portfolios all lie on the top edge. A line can be drawn through these efficient portfolios, to obtain the efficient frontier of investment portfolios. A risk- averse investor will always choose a portfolio on this efficient frontier.

Illustration: The efficient frontier of portfolios
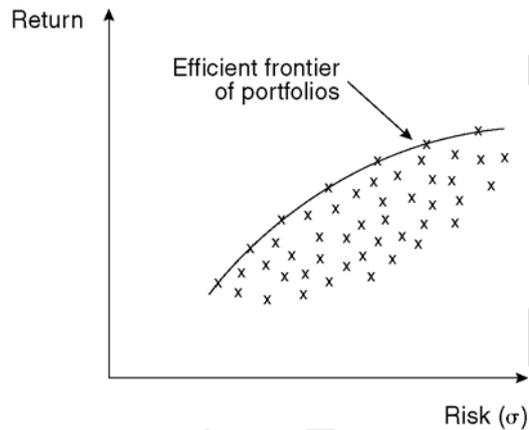
Investor preferences: indifference theory

The next question is whether investors might choose any investment portfolio on this efficient frontier, or whether there is any particular portfolio that will be preferred by all investors, above all the other portfolios.

This question is addressed using the concept of indifference curves and investor preferences.

Risk-averse investors are prepared to accept higher risk for a higher investment return, but may also choose a lower expected return for lower risk. An investor's preferences for higher returns or less risk can be illustrated in a graph of indifference curves.

Illustration: Indifference curves
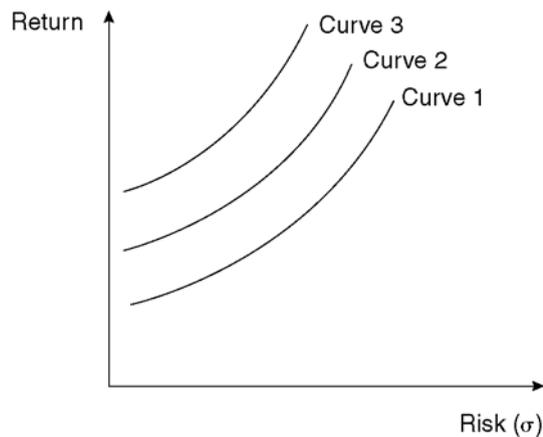
This graph shows three indifference curves:

❑　　Curve 1 shows the combinations of risk and return that are of equal merit or attractiveness to the investor. The investor will be indifferent about choosing any portfolio that lies on this curve.

❑　　Similarly, Curve 2 shows the combinations of risk and return that are of equal merit or attractiveness to the investor. The investor will be indifferent about choosing any portfolio that lies on this curve. However, the investor will prefer a portfolio on Curve 2 rather than a portfolio on Curve 1, because portfolios on Curve 2 will offer a higher return for less risk than portfolios on Curve 1 (or lower risk for the same return).

❑　　Curve 3 also shows the combinations of risk and return that are of equal merit or attractiveness to the investor and the investor will be indifferent about choosing any portfolio on this curve. However, the investor will prefer a portfolio on Curve 3 rather than a portfolio on Curve 2, because portfolios on Curve 3 will offer a higher return for less risk than portfolios on Curve 2 (or lower risk for the same return).

Rational investors will select a portfolio for investment that lies on an indifference curve as far to the left on the graph as possible.

3.3 The market portfolio

Theoretically, the efficient frontier of portfolios can be combined with investors' indifference curves on the same graph. If this were done the graph would show that there is only one portfolio on the efficient frontier that would maximise the satisfaction of investors. This is at point M on the graph below.

This is the point where an indifference curve as far to the left as possible touches the efficient frontier.

Portfolio M is called the market portfolio.

Illustration: Market portfolio
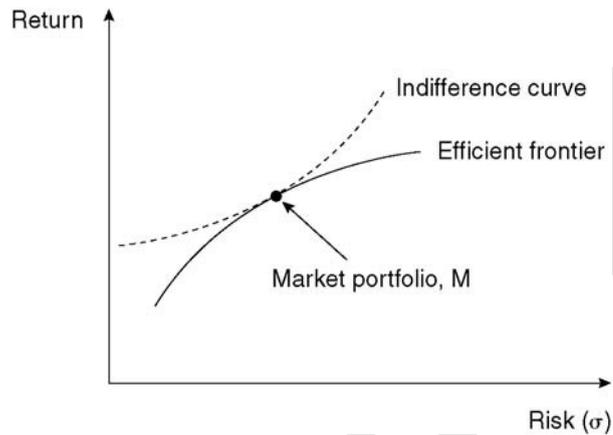
The market portfolio is a portfolio of all investments traded on the stock market, in quantities that reflect their relative overall market value, but excluding risk-free investments.

In practice, investors do not hold shares in every company on the stock market. However, the forces of supply and demand should ensure that all investments have risk/return characteristics that are equivalent to those in the market portfolio. Furthermore, major investors do hold a sufficiently large number of different investments so that their portfolio closely resembles the market portfolio.

The next step is to introduce the possibility of risk free investments.

3.4 The capital market line

The market portfolio does not include risk-free investments. However, risk free investments (or at least investments with very low risk) are available to investors. In practice, government bonds denominated in the domestic currency are classified as risk-free investments.

Investors can choose to invest in a portfolio consisting partly of the market portfolio and partly of risk-free investments. This returns us to the idea of a two asset portfolio. A graph showing the risk and returns of different proportions of investment in a risk free asset and an asset with risk (the market portfolio) would be a straight line. This is called the capital market line.

Illustration: Capital market line
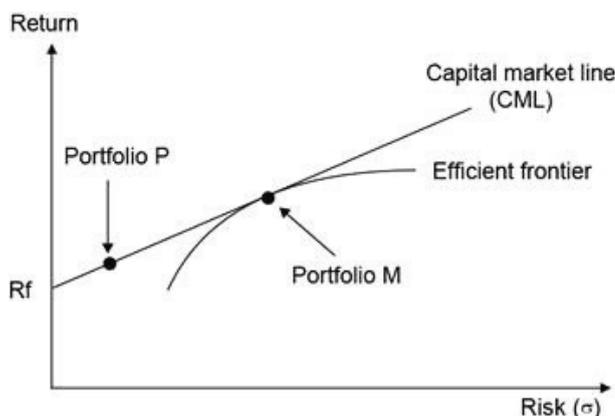
A straight line can be drawn from the portfolio that is 100% risk-free (where the line intersects the vertical axis) to touch the efficient frontier at a tangent. This will be at the market portfolio M. An investor can select any portfolio on this line, such as Portfolio P, to provide a mixture of risk-free investments and the market portfolio investments.

The line that joins the risk free asset and the market portfolio M is called the **capital market line**. The capital market line (CML) shows all combinations of risk-free investments and market portfolio investments that investors may select.

Example: Capital market line

A has a portfolio which lies on the capital market line. (A can lend and borrow at the risk-free rate)**.**

A has one third of her funds invested at the risk-free rate, which is 9%, and the remainder in a market portfolio of equities.

The market portfolio has an expected return of 15% and a standard deviation of 12%.

The risk and return of her portfolio can be calculated as follows:

Expected return from the portfolio: (9% × 1/3) + (15% × 2/3) = 13%. Risk of the portfolio: (zero × 1/3) + (12% × 2/3) = 8%.

The CML extends beyond Portfolio M. Portfolios on this part of the CML are created when an investor uses all of his own money and borrows additional funds (at the risk-free rate of interest) to invest in market portfolio investments.

Example: Capital market line

B has a portfolio which lies on the capital market line. (B can lend and borrow at the risk-free rate which is 9%).

The market portfolio has an expected return of 15% and a standard deviation of 12%.

B's expected return on his total portfolio is 18%.

The composition of B's portfolio can be calculated as follows:

B's expected return of 18% is 3% greater than the market return (15%). B must

therefore borrow to increase his expected return to 18%.

The difference between the market return (15%) and the risk free rate (9%) is 6%.

B needs 3% above the market return which is half of the difference between the market return and the risk free rate.

B must, therefore, have borrowed one half as much as his initial capital. The return from his portfolio is as follows:

(15% × 1.5) – (9% × 0.5) = 18%.

Risk of the portfolio: (12% × 1.5) = 18%.

---

4   CAPITAL ASSET PRICING MODEL (CAPM)

Section overview

- Systematic risk in securities
- The beta factor of a security
- Formula for the CAPM
- Security market line
- The beta factor of a small portfolio
- Alpha factor
- Does the CAPM have predictive power?
- Advantages and disadvantages of the CAPM
- Arbitrage pricing model

4.1   Systematic risk in securities

The capital asset pricing model (CAPM) establishes a relationship between investment risk and expected return from individual securities. It can also be used to establish a relationship between investment risk and the expected return from specific capital investment projects by companies.

The CAPM was explained in an earlier chapter as a model for estimating the cost of equity in a company, i.e. the returns that are required by equity investors. This section explains some of the assumptions and components of the CAPM.

As explained in the previous section, systematic risk is risk that cannot be eliminated by diversifying. Every individual security, with the exception of risk-free securities, has some systematic risk. This is the same systematic risk that applies to the market portfolio as a whole, but the amount of systematic risk for the shares in an individual company might be higher or lower than the systematic risk for the market portfolio as a whole.

Since investors can eliminate unsystematic risk through diversification and holding a portfolio of shares, their only concern should be with the systematic risk of the securities they hold in their portfolio. The return that they expect to receive should be based on their assessment of systematic risk, rather than total risk (systematic + unsystematic risk) in the security.

The CAPM assumes that investors hold diversified investment portfolios and are therefore concerned with systematic risk only and not unsystematic risk.

The systematic risk of a security can be compared with the systematic risk in the market portfolio as a whole.

❑   A security might have a higher systematic risk than the market portfolio. This means that when the average market return rises, due perhaps to growth in the economy, the return from the security should rise by an even larger amount. Similarly, if the average market return falls due to deterioration in business conditions, the return from the security will fall by an even larger amount.

❑   A security might have a lower systematic risk than the market portfolio, so that when the average market return rises, the return from the security will rise, but by a smaller amount. Similarly, when the average market return falls, the return from the security will also fall, but by a smaller amount.

A risk-free security has no systematic risk, because returns on these securities are unaffected by changes in market conditions. The shares of every individual company, however, have some systematic risk.

4.2 The beta factor of a security

The systematic risk for an individual security is measured as a beta factor. This is a measurement of the systematic risk of the security, in relation to the systematic risk of the market portfolio as a whole.

The **beta factor for the market portfolio itself = 1.0**.

Beta factor of risk-free securities

Risk-free investments provide a predictable and secure return. They have no systematic risk.

In the real world there are no risk-free investments, but short-term government debt issued in the domestic currency can normally be regarded as very safe investments. The current yield on short-term government debt is usually taken as a risk-free return. In the UK this is the current yield on UK government Treasury bills.

Since they have no systematic risk, the **beta factor for risk-free securities = 0.**

The risk-free rate of return varies between different countries, and can go up or down. The beta factor of a risk-free security, however, is 0 at all times.

Beta factor of company securities

The formula for calculating a security's beta factor is as follows:
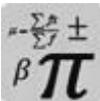
Formula: Beta value

$$\beta_S = \frac{\text{Covariance of the returns of the investment with the returns from the market}}{\text{Variance of the market}}$$

$$= \frac{\rho_{sm}\,\sigma_s\,\sigma_m}{\sigma_m \times \sigma_m}$$

$$= \frac{\rho_{sm}\,\sigma_s}{\sigma_m}$$

Where:

β_S = Beta factor of security S

ρ_{sm} = Correlation coefficient of returns form security S with the returns from the market

σ_S = Standard deviation of the returns of security S

σ_M = Standard deviation of the returns of the market

The 'market as a whole' is the market portfolio.

The beta factor for the shares of an individual company:

❑ Must always be higher than the risk-free beta factor (higher than 0)

❑ Will be less than 1.0 if its systematic risk is less than the systematic risk for the market portfolio as a whole

❑ Will be more than 1.0 if its systematic risk is greater than the systematic risk for the market portfolio as a whole.

When the beta factor for an individual security is greater than 1, the increase or fall in its expected return (ignoring unsystematic risk) will be greater than any given increase or decrease in the return on the market portfolio as a whole (= the 'market return').

When the beta factor for a security is less than 1, the security is relatively low- risk. The expected increase or decrease in its expected return (ignoring unsystematic risk) will be less than any given increase or decrease in the market return.

Beta factors for stock market companies (quoted companies) are measured statistically from historical stock market data (using regression analysis) and are available on the internet from sources such as DataStream and the London Business School Risk Management Service.

4.3 Formula for the CAPM

The formula for the capital asset pricing model is used to calculate the expected return from a security (ignoring unsystematic risk).
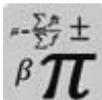
Formula: Capital asset pricing model (CAPM)

$$R_E = R_{RF} + \beta (R_M - R_{RF})$$

Where:

R_E = the cost of equity for a company's shares

R_{RF} = the risk-free rate of return: this is the return that investors receive on risk-free investments such as government bonds

R_M = the average return on market investments as a whole, excluding risk-free investments

β = the beta factor for the company's equity shares.

The expected return from an individual security will therefore vary up or down as the return on the market as a whole goes up or down. The size of the increase or fall in the expected return will depend on:

❑ The size of the change in the returns from the market as a whole, and

❑ The beta factor of the individual security.

> **Example: CAPM**
>
> The risk-free rate of return is 4% and the return on the market portfolio is 8.5%. What is the expected return from shares in companies X and Y if:
>
> a) the beta factor for company X shares is 1.25
>
> b) the beta factor for company Y shares is 0.90?

> **Answer**
>
> a) Company X: RS = 4% + 1.25 (8.5 – 4)% = 9.625%
>
> b) Company Y: RS = 4% + 0.90 (8.5 – 4)% = 8.05%.

The market premium

If an investor invests in a portfolio of risk-free assets, he will receive the risk-free rate of return, which is the interest yield on those risk-free assets.

To compensate an investor for investing in the market portfolio, the expected return must be higher than on risk-free investments. The **market premium** is the difference between the expected return on the market portfolio and a portfolio of risk-free investments.

> **Formula: Market premium**
>
> $$\text{Market premium} = R_M - R_{RF}$$
>
> **Where:**
>
> R_M is the market rate of return (the expected return on the market portfolio)
>
> R_{RF} is the risk-free rate of return

If you look again at the CAPM formula, you will see that the market premium is an element in the formula for the CAPM. The return required from shares in any company by an investor who holds a diversified portfolio should consist of:

❑ The return on risk-free securities

❑ Plus a premium for the systematic investment risk: this premium is the market premium multiplied by the beta factor for the particular security.

In the UK, the market premium historically has normally been within the range of about 3.5% to 5%.

The capital asset pricing model formula is the equation of the Security Market Line.

4.4 Security market line

The Security Market Line is derived from the capital market line. It is a graph that shows the required return from any investment given its beta factor. Actual returns from investments can be compared to the figure from the security market line to determine whether that investment is under or overvalued.

Illustration: Security market line
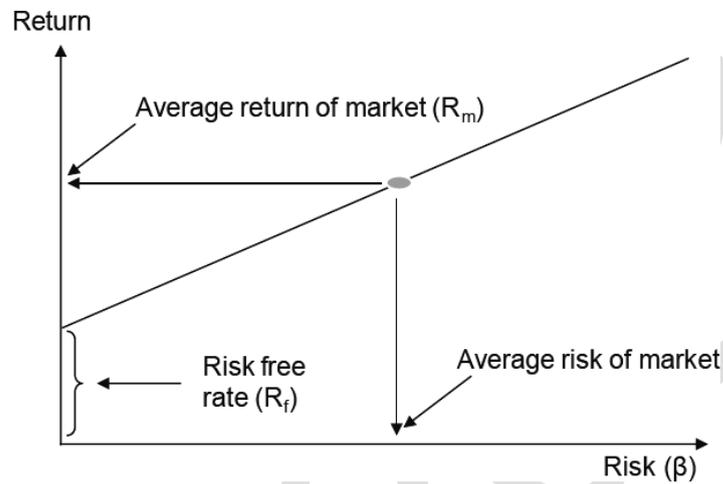
4.5 The beta factor of a small portfolio

A portfolio of investments containing just a few securities will not be fully representative of the market portfolio, and its systematic risk will therefore be different from the systematic risk for the market as a whole.

The relationship between the systematic risk of a small portfolio and the systematic risk of the market as a whole can be measured as a beta factor for the portfolio.

A beta factor for a portfolio is the weighted average value of the beta factors of all the individual securities in the portfolio. The weighting allows for the relative proportions of each security in the portfolio.

Example: Beta factor of a portfolio

A portfolio contains five securities. The proportions of each security in the portfolio and the beta factor of each security are as follows:

Security	Proportion of the portfolio	Beta factor of the security
1	10%	1.20
2	25%	0.90
3	15%	0.96
4	30%	1.15
5	20%	1.06

The beta factor for the portfolio is calculated as follows:

Security	Proportion of the portfolio	Beta factor of the security	
	p	β	pβ
1	10%	1.20	0.120
2	25%	0.90	0.225
3	15%	0.96	0.144
4	30%	1.15	0.345
5	20%	1.06	0.212
Beta factor for the portfolio			1.046

4.6 Alpha factor/value

The beta factor for shares is a measure of systematic risk and it ignores variations in the equity returns caused by unsystematic risk factors. When shares yield more or less than their expected return (based on the CAPM), the difference is an abnormal return. This abnormal return might be referred to as the alpha factor.

The **alpha value** can be seen as a measure of how wrong the CAPM is, it may be thought of as the difference between the expected return on a security or investment, given its systematic risk, and the actual return.
Alpha values:
a) Reflect only temporary, abnormal returns, if CAPM is a realistic model;
b) Can be positive or negative;
c) Over time, will tend towards zero for any individual share, and for a well-diversified portfolio taken as a whole will be zero; and
d) May exist due to the inaccuracies and limitations of the CAPM.

If the **alpha value** is **positive**, investors who do not hold shares will be tempted to buy them (to take advantage of the abnormal return), and investors who do hold shares will want to hold on to them, so share prices will rise. If the **alpha value** is **negative**, investors won't want to buy them, and current holders will want to sell them, so share prices will fall.

For example, ABC plc's shares have a beta value of 1.2 and an alpha value of +2%. The market return is 10% and the risk-free rate of return is 6%.

The required return is 6% + (10% - 6%) × 1.2 = 10.8%
The current return = expected return ± alpha value = 10.8% + 2% = 12.8%

The alpha factor for a security is simply the balancing figure in the following formula:
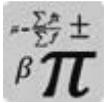
Formula: Capital asset pricing model (CAPM) with alpha value

$$R_S = R_{RF} + \beta_S (R_M - R_{RF}) + \alpha$$

Example: Abnormal return

The return on shares of company A is 11%, but its normal beta factor is 1.10. The risk-free rate of return is 5% and the market rate of return is 8%.

There is an abnormal return on the shares:

$$11\% = 5\% + 1.10 (8 - 5)\% + \alpha$$

$$\Rightarrow \alpha = 2.7\%.$$

Example: Abnormal return

An investor tries to buy shares or bonds for his portfolio that provide a positive abnormal return. He is considering two shares and two bonds for adding to his portfolio.

The required return on shares is measured by the Capital Asset Pricing Model (CAPM). The required return for bonds is measured using a model similar to the CAPM, except that the 'beta' for a bond is measured as the ratio of the duration of the bond in years to the duration of the bond market as a whole.

The following information is available:

Shares	Expected actual return (%)	Standard deviation of returns	Correlation coefficient of returns with the market
Equity market	11.0	12	1.00
Company X	9.5	14	0.92
Company Y	12.0	17	0.83

Bonds	Duration (years)	Coupon (%)	Redemption yield (%)
Bond market	6.0	-	6.2
Bond P	5.0	7	6.4
Bond Q	8.5	6	6.5

The risk-free rate of return is 5%.

Required:

Identify which of these investments currently offers a positive abnormal return.

Answer

The first step is to calculate beta factors for the shares and the similar factors for the bonds.

For shares, the beta factor is calculated as the correlation coefficient multiplied by the standard deviation of returns for the share, divided by the standard deviation of market returns.

Security		Beta factor
Share X	(0.92 × 14)/12	1.073
Share Y	(0.83 × 17)/12	1.176
Bond P	(5.0/6.0)	0.833
Bond Q	(8.5/6.0)	1.417

We can now calculate the required return for each security (using the CAPM) and compare it with the expected actual returns. The difference is the abnormal return. For bonds, the redemption yield should be used as the measure of return.

Actual

Security	Required return		expected return	Abnormal return
	%		%	%
Share X	5% + 1.073(11 − 5)%	11.44	9.50	− 1.94
Share Y	5% + 1.176(11 − 5)%	12.06	12.00	− 0.06
Bond P	5% + 0.833(6.2 − 5)%	6.00	6.40	+ 0.40
Bond Q	5% + 1.417(6.2 − 5)%	6.70	6.50	− 0.20

Only bond P offers a positive abnormal return. If the investor makes investment decisions on the basis of abnormal returns, he will invest in this bond and add it to his portfolio. (However, the abnormal return could be eliminated by a rise in the price of the bond.)

4.7 Does the CAPM have predictive power?

If CAPM says a 16.5% return should be expected from Company A shares is that found to be the case in practice?

CAPM is, generally, quite a good predictor of returns on shares. However there are anomalies including the following:

❑ Companies with beta values greater than 1 tend to give slightly lower returns that CAPM would suggest and shares with betas of less than 1 produce slightly higher returns than CAPM would lead us to expect.

❑ The CAPM is a particularly poor predictor of the return on shares in certain industries, for example oil and gas and mining companies.

The CAPM is not perfect, but it is probably the best model available.

4.8 Advantages and disadvantages of the CAPM

The CAPM is based on some simplifying assumptions. For example, the CAPM assumes:

❑ A perfect capital market, in which all investors have access to all available information about the financial markets

❑ Uniformity of investor expectations

❑ All forecasts (expectations) are made in the context of just one time period.

In spite of these simplifying assumptions, the CAPM appears to be reliable in practice. The advantages and disadvantages of the CAPM are summarised in the following table.

Advantages of CAPM	Weaknesses of CAPM
It provides a measurable relationship between risk and return.	It can be difficult to estimate statistically reliable values for the risk- free rate and market rate of return, and the beta factor for a security.
It can be used to estimate the cost of capital for securities, notably equity shares.	It focuses on systematic risk only and ignores unsystematic risk. Unsystematic risk is significant for an investor who does not have a well-diversified portfolio.
It can be adapted to establishing a required (risk-adjusted) DCF return on capital investments by a company.	It makes no distinction between the ways in which a security provides its return (for example dividends or share price increase).

4.9 Arbitrage pricing model

The CAPM is a "single factor" model. It calculates a return on an investment by relating the market risk premium to the systematic risk of the investment.

Researchers claim to have identified other factors that also affect return, including:

- ❑ company size;

- ❑ unexpected changes in interest rates;

- ❑ unexpected changes in industrial production levels; and

- ❑ unexpected inflation

Multi-factor models have been developed. The best known of these is the arbitrage pricing model. The model is similar to the CAPM in that it relates a risk premium to the underlying risk factor. However, whereas the CAPM says that there is only one such factor (systematic risk) the arbitrage pricing model says there are several. Therefore, according to this model, an investor requires a return to compensate for each of these separate risk factors.
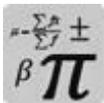
Formula: Arbitrage pricing model

$$R_E = R_{RF} + \beta_1 (R_1 - R_{RF}) + \beta_2 (R_2 - R_{RF}) + \beta_3 (R_3 - R_{RF}) \text{ (and so on)}$$

Where:

R_E = the cost of equity for a company's shares

$\beta_{1,2,3}$ = the beta factor for factor 1, 2, 3 (i.e. a measure of the risk associated with the factor)

$(R_{1,2,3} - R_{RF})$ = the risk-premium associated with factor 1, 2 or 3

Systematic risk is by far the most important determinant of return, but it probably is not the only one.

5 THE COST OF CAPITAL FOR CAPITAL INVESTMENT APPRAISAL

Section overview

- CAPM and the WACC
- Company value and cost of capital
- Average and marginal cost of capital
- Using the CAPM for capital investment appraisal

5.1 CAPM and the WACC

The capital asset pricing model can be used to calculate a cost of equity for any company. It can also be used to calculate a cost of capital for corporate debt, but this is less likely to feature in your examination. The cost of equity calculated using the CAPM can then be used in the calculation of the company's weighted average cost of capital.

The CAPM probably provides a more reliable estimate of the cost of equity than the dividend valuation model or the dividend growth model, because:

- ❑ The CAPM ignores volatility in returns caused by unsystematic risk factors, which should not affect the cost of equity for well-diversified investors

- ❑ The beta factor for each company is measured statistically from historical stock market data.

In your examination you might be required to calculate a cost of equity using the CAPM and then use your cost of equity to calculate a WACC.

5.2 Company value and cost of capital

The previous chapter explained how the cost of capital can be calculated from expected returns (dividends or interest) and the market value of securities. It is also possible, using the same mathematical method, to calculate what the market value of shares or bonds ought to be, given expectations of future returns (dividends and interest) and the cost of capital. One basic rule is that for a given size of expected future returns, the total value of a company is higher when the cost of capital is lower.

By making simplifying assumptions of constant annual operating profits, and paying out all earnings as dividends each year, we can state a formula linking the total value of a company to its WACC:

Formula: WACC and market value

$$\text{Total market value of a company} = \frac{\text{Earnings}\,(1 - t)}{\text{WACC}}$$

Where: t = the corporate tax rate

There is a direct relationship between expected future returns for investors, the cost of capital and the total market value of a company.

A similar concept is applied in investment appraisal and DCF analysis of capital projects. There is a relationship between:

(a)   the future cash flows that a capital investment project will be expected to provide;

(b)   the cost of capital; and

(c)   the value that the future cash flows will create.

With investment appraisal using DCF analysis, the expected future cash flows (cash profits) from a capital investment project are discounted at a cost of capital. The total value of the company should increase if the project has a positive NPV when the cash flows are discounted at the appropriate cost of capital. The expected increase in the value of the company should be the amount of the NPV.

The appropriate cost of capital for calculating the NPV should be a cost of capital that represents the investment risk of the project and the returns that the project must earn to meet the requirements of the providers of the capital.

5.3   Average and marginal cost of capital

The marginal cost of capital of a capital investment project is the additional minimum return that the project must provide to meet the requirements of the providers of the capital. The cost of the additional capital required for a new capital investment project can be defined as the **marginal cost of capital**. There will be an increase in the total value of the company from investing in a project only if its NPV is positive when its cash flows are discounted at the marginal cost of the capital.

The **average cost of capital** is the cost of capital of all existing capital, debt and equity. This is represented by the WACC.

Capital investments should be discounted at their marginal cost of capital, but are usually discounted at the company's WACC.

This is because it is generally assumed that the effect of an individual project on the company's marginal cost of capital is not significant; therefore all investment projects can be evaluated using DCF analysis and the WACC, on the assumption that the WACC will be unchanged by investing in the new project.

In some cases, however, this assumption is not valid. The marginal cost of capital is not the WACC in cases where:

❑   The capital structure will change because the project is a large project that will be financed mainly by either debt or equity capital and the change in capital structure will alter the WACC. If the WACC changes, the marginal cost of capital and the WACC will not be the same.

❑   A new capital project might have completely different business risk characteristics from the normal business operations of the company. If the business risk for a project is completely different, the required return from the project will also be different. In such cases, the CAPM might be used to establish a suitable marginal cost of capital for capital investment appraisal of the specific project.

5.4 Using the CAPM for capital investment appraisal

Some types of capital investment projects are more risky than others because the business risk is greater. For example, the systematic risk of investing in the manufacture of cars may be higher than the systematic risk of investing in a retailing business. Investing in the construction of residential houses might be less risky than investing in the construction of office blocks. Similarly, the risk of investing in one country may be higher than the risk of investing in another country, due to differences in the business environment or economic conditions.

Since different types of business operation have different business risk, the asset betas of each type of business operation are also different.

When there are significant differences in business risk between different capital investment projects, if follows that the required return from particular investments should be adjusted to allow for differences in systematic risk.

If a beta factor for a particular project can be established, a risk-adjusted cost of capital can be applied to the project. This risk-adjusted cost of capital should then be used to calculate the project NPV.

The calculation of a project-specific discount rate is explained in a later chapter.

6   CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Measure risk as a variance
- Explain portfolio theory
- Measure the risk return characteristics of a two asset portfolio
- Comment on the risk return characteristics of a two asset portfolio
- Explain the difference between systematic and unsystematic risk
- Explain how beta values are used as a measure of systematic risk
- Measure a required rate of return using the CAPM equation
- Explain how the CAPM can be used to identify discount rates for capital projects

Professional level
Strategic financial management

Sources of finance: equity

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

C	Financing decisions			
	1	Sources of finance		
		a	Assess the range of long-term sources of finance available to businesses, including equity, debt and venture capital.	
		b	Evaluate and discuss methods of raising equity finance, including:	
			i	Rights issue;
			ii	Placement;
			iii	Public offer;
			iv	Stock exchange listing; and
			v	Financial market dealers' quotations over the counter (FMDQOTC).

Exam context

This chapter explains different sources of short and long term funds. It continues to discuss different methods of raising equity.

By the end of this chapter, you should be able to:

- Explain how retained profits are a major source of funds
- List different types of short and long term funds
- Explain different means of raising funds through issuing equity
- Measure the value of a rights issue

1 SOURCES OF LONG-TERM AND SHORT-TERM FINANCE

Section overview

- Sources of finance and financial management
- Sources of short-term funds
- Sources of long-term funds
- Introduction to equity finance
- Internal sources of finance and dividend policy

1.1 Sources of finance and financial management

An important aspect of financial management is the choice of methods of financing for a company's assets. Companies use a variety of sources of finance and the aim should be to achieve an efficient capital structure that provides:

❑ A suitable balance between short-term and long-term funding

❑ Adequate working capital

❑ A suitable balance between equity and debt capital in the long-term capital structure.

1.2 Sources of short-term funds

Sources of short-term funding are used to finance some current assets. (In some cases, companies operate with current liabilities in excess of current assets, but this is unusual.)

Most of the usual sources of short-term finance have been described in an earlier chapter on working capital. Briefly, these are:

❑ Bank overdraft

❑ Short-term bank loans

❑ Suppliers (trade payables).

The main points to note about these sources of finance are as follows.

Bank overdraft

A company might arrange a bank overdraft to finance its need for cash to meet payment obligations. An overdraft facility is negotiated with a bank, which sets a limit to the amount of overdraft that is allowed. From the point of view of the bank, the company should be expected to use its overdraft facility as follows:

❑ The overdraft should be used to finance short-term cash deficits from operational activities. The company's bank balance ought to fluctuate regularly between deficit (overdraft) and surplus. There should not be a 'permanent' element to the overdraft, and an overdraft should not be seen as a long-term source of funding.

❑ An overdraft facility is for operational requirements and paying for running costs. An overdraft should not be used to finance the purchase of long-term (non-current) assets.

❑ The bank normally has the right to call in an overdraft at any time, and might do so if it believes the company is not managing its finances and cash flows well.

Short-term bank loans

Short-term bank loans might be arranged for a specific purpose, for example to finance the purchase of specific items. Unlike an overdraft facility, a bank loan is for a specific period of time, and there is a repayment schedule.

Trade payables

As explained in an earlier chapter, a company should try to negotiate favourable credit terms from its suppliers. Trade credit from suppliers has no cost, and is therefore an attractive method of short-term finance. However, a company should honour its credit arrangements and pay its suppliers on time at the end of the agreed credit period. It is inappropriate for a company to increase the amount of its trade payables by taking excess credit and making payments late.

Debt factoring

Companies that use debt factors to collect their trade receivables might obtain financing for most of their trade receivables from the factor. Factoring was explained in the earlier chapter on the management of trade receivables. One of the services offered by a factor is to provide finance for up to 70% or 80% of the value of outstanding trade receivables that the factor has undertaken to collect.

Operating leases

In some cases, operating leases might be an alternative to obtaining short-term finance. Operating leases are similar to rental agreements for the use of non- current assets, although they might have a longer term. (Rental agreements are usually very short term.).

Companies that obtain the use of non-current assets with operating lease agreements avoid the need to purchase the assets and to finance these purchases with capital.

Operating leases might be used extensively by small and medium-sized business enterprises which find it difficult to obtain finance to pay for non-current asset purchases.

1.3 Sources of long-term funds

Long-term funding is required for a company's long-term assets and also to finance working capital. The main sources of long-term capital are:

❑ Equity finance

❑ Debt finance

❑ Lease finance (finance leases).

Debt finance and lease finance are dealt with in the next chapter.

For some companies, long-term finance might be provided in the form of venture capital. **Venture capital** is described in the later chapter on sources of finance for small and medium-sized enterprises.

1.4 Introduction to equity finance

Equity finance is finance provided by the owners of a company – its ordinary shareholders, also called equity shareholders. (Some forms of irredeemable preference share might be regarded as equity finance, but in practice irredeemable preference shares are rare in public companies.)

New equity finance can be raised by issuing new shares for cash, or issuing new shares to acquire a subsidiary in a takeover. Methods of issuing new shares are described in the next section of this chapter.

For most companies, however, the main source of new equity finance is internal, from retained profits.

1.5 Internal sources of finance and dividend policy

When companies retain profits in the business, the increase in retained profits adds to equity reserves. The retained capital, in principle, is reinvested in the business and contributes towards further growth in profits.

Increasing long-term capital by retaining profits has several major benefits for companies.

❑ When new equity is raised by issuing shares, there are large expenses associated with the costs of the issue. When equity is increased through retained earnings, there are no issue costs because no new shares are issued.

❑ The finance is readily-available, without having to present a case to a bank or new shareholders. Shareholder approval is not required for the retention of earnings.

However there may be a limit to the amount of earnings available for retention. There are three main reasons for this.

❑ The company might not earn large profits. Earnings can only be retained if the company is profitable.

❑ Retained earnings must be used efficiently, to provide a suitable return on investment. Unless retained earnings contribute to future growth in earnings and dividends, shareholders will demand higher dividends and lower earnings retention.

❑ Earnings are either retained or paid out to shareholders as dividends. By retaining earnings, a company is therefore withholding dividends from its shareholders. A company might have a dividend policy, and its shareholders might have expectations about what future dividends ought to be. Earnings retention is therefore restricted by the constraints of dividend policy.

Long-term finance and working capital management

Improvements in working capital efficiency can also release cash. Efficient inventory management, collection of trade receivables and payment of trade payables can reduce the requirement for working capital. A reduction in working capital generates a one-off additional source of cash funding that can be used for investment.

2 RAISING NEW EQUITY EXTERNALLY

Section overview

- Private companies and public companies: issuing new shares
- Methods of issuing new shares for cash
- Public offer
- Placing
- Stock market introduction
- Rights issue
- Underwriting of new share issues
- Share repurchases

2.1 Private companies and public companies: issuing new shares

Companies can raise equity capital externally by issuing new shares for cash, but the opportunity to do so is much more restricted for private companies than for public companies.

Private companies and issuing shares for cash

Private companies cannot offer their shares for sale to the general investing public, and shares in private companies cannot be traded on a stock market. They can sell shares privately to investors but it is usually difficult to find investors who are willing to put cash into equity investments in private companies.

The existing owners of a company might not have enough personal capital to buy more shares in their company. Existing shareholders are therefore a limited source of new capital.

Other investors usually avoid investing in the equity of private companies because the shares are not traded on a stock exchange, and consequently they might be:

❑ Difficult to value;

❑ Difficult to sell when the shareholder wants to cash in the investment.

Small companies and most medium-sized companies are private companies, and most are unable to raise significant amounts of new equity capital by issuing shares. They rely on retained earnings for new equity capital, but given their small size, profits are relatively small and this restricts the amount of retained profits they can reinvest in the business.

Public companies and new share issues

Public companies may offer their shares to the general public. Many public companies arrange for their shares to be traded on a stock market. The stock market can be used both as a market for issuing new shares for cash, and also a secondary market where investors can buy or sell existing shares of the company. The existence of a secondary market and stock market trading in shares means that:

❑ The shares of a company have a recognisable value (their current stock market price) and

❏   Shareholders can sell their shareholdings in the market whenever they want to cash in their shareholding.

However, before their shares can be traded on a stock exchange, a public company must:

❏   Satisfy the regulatory authorities that the company and its shares comply with the appropriate regulatory requirements, and appropriate information about the company and its shares will be made available to investors, and

❏   Obtain acceptance by the appropriate stock exchange for trading in the shares.

In Nigeria, there is a main stock market operated by the Nigerian Stock Exchange, and a secondary market for shares in smaller companies, the Emerging market. (Companies wanting to have their shares accepted for trading on this must meet certain regulatory requirements, but these are not as onerous as the requirements for companies on the main market.)

Electronic trading platforms for secondary market trading in shares have been developed and are capturing a substantial proportion of the total volume of secondary market trading in shares of the major companies, especially in the USA and the European Community.

2.2   Methods of issuing new shares for cash

There are three main methods of issuing new shares for cash:

❏   Issuing new shares for purchase by the general investing public: this is called a **public offer**.

❏   Issuing new shares to a relatively small number of selected investors: this is called a **placing**

❏   Issuing new shares to existing shareholders in a **rights issue.**

2.3   Public offer

A public offer is an offer of new shares to the general investing public. Because of the high costs involved with a public issue, these are normally large share issues that raise a substantial amount of money from investors.

In many countries, including Nigeria, UK and USA, a company whose shares are already traded on the stock market cannot make a public offer of new shares without shareholder permission (which is unlikely to be obtained, because existing shareholders would suffer a dilution in their shareholding in the company and would own a smaller proportion of the company).

Instead, companies whose shares are already traded on the stock market will use a rights issue or a placing when it wishes to issue new shares for cash.

A public offer might be used to bring the shares of a company to the stock market for the first time. The term for this type of share issue is an *Initial Public Offering* or *IPO*. The company comes to the stock market for the first time in a 'stock market flotation'. In Nigeria and the UK, the terms 'prospectus issue' and 'offer for sale' are also used to describe a public offer. A distinction is often made between an Offer for subscription and an Offer for sale. Unlike in the case of the former, an offer for sale does not bring about an increase in the share capital of the company and the proceeds go to the vendor and not the company as it involves mere redistribution of shares from the current owner/vendor (who is selling) to the public

The shares that are offered to investors in an IPO might be a combination of:

❏ new shares (issued to raise cash for the company) and

❏ shares already in issue that the current owners are now selling.

Only the new shares issued by the company in the IPO will provide new equity capital for the company.

Example: IPO

Stabba is a company that is being converted from private to public company status and is planning a stock market flotation with a public offer of shares.

In the flotation, the company wants to raise ₦800 million in cash for investment in its businesses. Issue costs will be 5% of the total amount of capital raised.

The company's investment bank advisers have suggested that a share price of ₦800 to ₦900 per share should be sustainable after the flotation, and a suitable issue price per share would therefore be ₦800.

Required

How many new shares should be issued and sold in the public offer?

Answer

Cash required after issue costs (= 95% of cash raised): ₦800 million

Capital required before issue costs deducted: ₦800 million/0.95 = ₦842.1 million

Number of shares to issue to raise:

$$₦842.1 \text{ million} = ₦842.1m/₦800 = 1,052,625 \text{ shares.}$$

Offer for sale by tender

In a normal public offer, the issue price for the new shares is a fixed price and the new shares are offered at that price. With an offer for sale by tender, investors are invited to apply to purchase any amount of shares at a price of their own choosing. The actual issue price for the new shares is the minimum price tendered by investors that will be sufficient for all the shares in the issue to be sold. Offers for sale by tender are now very uncommon.

2.4 Placing

A placing involves the sale of a relatively small number of new shares, usually to selected investment institutions. A placing raises cash for the company when the company does not need a large amount of new capital. A placing might be made by companies whose shares are already traded on the stock exchange, but which now wishes to issue a fairly small amount of new shares.

The prior approval of existing shareholders for a placing should be obtained.

2.5 Stock exchange introduction

In a stock exchange introduction, a company brings its existing shares to the stock market for the first time, without issuing new shares and without raising any cash. The company simply obtains stock market status, so that its existing shares can be traded on the stock market.

The rules of the stock exchange might require that a minimum percentage of the shares of the company should be held by the general investing public. If so, a stock exchange introduction is only possible for a company that has already issued shares to the public, without trading them on the stock market.

A stock market introduction is rare, but might be used by a well-established company (formerly a private company) whose shares are now held by a wide number of individuals and institutions.

When a company makes a stock market introduction, it is able at some time in the future to issue new shares for cash, should it wish to do so, through a placing or a rights issue.

2.6 Rights issue

A rights issue is a large issue of new shares to raise cash, by a company whose shares are already traded on the stock market.

Company law about rights issues varies between countries. In Nigeria and the UK, any company (public or private) wishing to issue new shares to obtain cash must issue them in the form of a rights issue, unless the shareholders agree in advance to waive their 'rights'. Large new share issues by existing stock market companies will therefore always take the form of a rights issue.

A rights issue involves offering the new shares to existing shareholders in proportion to their existing shareholding. For example, if a company has 8 million shares in issue already, and now wants to issue 2 million new shares to raise cash, a rights issue would involve offering the existing shareholders one new share for every four shares that they currently hold (2 million: 8 million = a 1 for 4 rights issue).

Rights issues are described in more detail in the next section.

2.7 Underwriting of new share issues

Large new issues of shares for cash are usually underwritten. When an issue is underwritten, a group of investment institutions (the underwriters) agree to buy up to a maximum stated quantity of the new shares at the issue price, if the shares are not purchased by other investors in the share issue. Each underwriter agrees to buy up to a maximum quantity of the new shares, in return for an underwriting commission (an agreed percentage of the issue value of the shares they underwrite).

The advantage of underwriting is that it ensures that there will be no unsold shares in the issue, and the company can be certain of raising the expected amount of cash.

The main disadvantage of underwriting is the cost (the underwriting commission payable by the company to the underwriters).

If a company does not want to pay to underwrite a rights issue, it might offer the new shares at a very low price compared to the market price of the existing shares. The very low price should, in theory, attract investors and ensure a successful share issue. This type of low-priced share issue is called a **deep- discounted** issue.

Both public offers and rights issues are commonly underwritten. In Nigeria, every public offer must be 80% underwritten by the Issuing House(s). This ensures that the Issuer of securities receive proceeds of at least 80% of the total volume of

securities on offer notwithstanding the level of subscription of the offer by the public.

2.8 Share repurchases

Instead of increasing their equity capital by issuing new shares, a company might repurchase some of its equity shares and cancel them. The shares might be repurchased in the stock market, or bought back directly from some shareholders. The effect of repurchasing shares and cancelling them is to reduce the company's equity capital, with a corresponding fall in cash.

Example: Share repurchases

A company has 200 million shares of ₦100 each (par value) in issue and the shares have a market price of ₦300.

The company repurchases 50,000 shares at this market price and cancels them.

The cost of ₦15 million would result in a reduction in share capital and reserves of ₦15 million, and a reduction in cash of ₦15 million.

The company would be left with 199,950,000 shares in issue.

There are two main reasons why a company might repurchase and cancel shares.

❑ It has more cash than it needs and the surplus cash is earning a low return. There is no foreseeable requirement for the surplus cash. Buying back and cancelling some shares will therefore increase the earnings per share for the remaining shares, and so might result in a higher share price for the remaining shares. In this situation, the company is overcapitalised and share repurchases can bring its total capital down to a more suitable level.

❑ Debt capital is readily-available and is cheaper than equity. A company might therefore repurchase some of its shares and cancel them, and replace the cancelled equity with debt capital, by issuing new corporate bonds or by borrowing from a bank. The result will be a capital structure with higher financial gearing.

3 RIGHTS ISSUES

> ### Section overview
>
> - The issue price
> - The theoretical ex-rights price
> - The shareholders' choices
> - Advantages and disadvantages of rights issues

A rights issue is an issue for shares for cash, where the new shares are offered to existing shareholders in proportion to their current shareholding.

3.1 The issue price

The share price of the new shares in a rights issue should be lower than the current market price of the existing shares. Pricing the new shares in this way gives the shareholders an incentive to subscribe for them. There are no fixed rules about what the share price for a rights issue should be, but as a broad guideline the issue price for the rights issue might be about 10% - 15% below the market price of existing shares just before the rights issue.

> **Example:**
>
> A company planning a 1 for 3 rights issue when the market price of its shares is ₦600, might offer the new shares in the rights issue at a fixed price in the region of ₦510 to ₦540.

3.2 The theoretical ex-rights price

When a company announces a rights issue, the market price of the existing shares just before the new issue takes place is called the **'cum rights' price**. ('cum rights' means 'with the rights').

The theoretical ex-rights price is what the share price ought to be, in theory, after the rights issue has taken place.

- ❑ All the shares will have the same market price after the issue.

- ❑ In theory, since the new shares will be issued at a price below the cum rights price, the theoretical price after the issue will be lower than the cum rights price.

The **theoretical ex-rights price** is simply the weighted average price of the current shares 'cum rights' and the issue price for the new shares in the rights issue.

Example: Theoretical ex-rights price

A company announces a 2 for 5 rights issue at a price of ₦300 per share. The market price of the existing shares before the rights issue is ₦370.

The theoretical ex-rights price can be calculated as follows.

Market value of 5 existing shares	(5 × ₦370)	1,850
Issue price of 2 shares in the rights issue	(2 × ₦300)	600
Theoretical value of 7 shares		2,450
Theoretical ex-rights price	(= ₦2,450/7)	₦350

The value of rights

The holder of five shares in the company in the previous example could buy two new shares in the rights issue for ₦300 each, and these two shares will be expected to rise in value to ₦350, a gain of ₦50 for each new share or ₦100 in total for the five existing shares.

We can therefore say that the theoretical value of the rights is:

❑ ₦50 for each new share issued; or

❑ ₦20 (₦100/5 shares) for each current share held.

Shareholders are allowed to sell their rights to subscribe for the shares in the rights issue, and investors who buy the rights are entitled to subscribe for shares in the rights issue at the rights issue price. The most common way of stating the value of rights is the value of the rights for each existing share. In the example, the theoretical value of the shares would normally be stated as ₦20.

There is no real gain as the shareholder has paid cash to the company equal to the amount of the change in share price.

Yield – adjusted theoretical ex-right price (TERP)

Normally, we presume that when we do a rights issue, the money from it generates the same rate of return as existing funds.

But, if the new money raised is likely to earn a different return from the current return, the yield-adjusted theoretical ex-rights price should be calculated.

The yield-adjusted price demonstrates how the market will view the rights issue.

Example Yield – adjusted theoretical ex-right price (TERP)

A company with a current WACC of 10% is planning a 1 for 4 rights issue. The issue is to be made at a discount of 25% to the current share price of ₦2.50. The fund raised is to be used to finance a project that has a yield of 14%.

Required:

Calculate the yield adjusted theoretical ex-right price (TERP).

Solution

Yield adjusted TERP is applicable because the yield on the new project (14%) is not the same as the yield on existing projects (10%).

In computing the yield adjusted TERP, simply apply the following index to the issue price:

Y_{new}/Y_{old}, where:
Y_{new} = Yield on new project
Y_{old} = Yield on existing projects

Issue price = ₦2.50 × 0.75 = ₦1.875
Adjusted issue price = ₦1.875 × 0.14/0.10 = ₦2.625

The yield adjusted TERP can now be computed as follows:

		₦
4 existing shares@₦2.50	=	10.00
<u>1</u> new share@2.625*	=	<u>2.625</u>
<u>5</u>		<u>12.625</u>

Yield-adjusted TERP = ₦12.625/5 = ₦2.525

(*Note that this adjustment is only for the purpose of calculating TERP. It does not affect the total amount of fund raised).

3.3 The shareholders' choices

When a company announces a rights issue, the shareholders have the following choices:

❑ They can **take up their rights**, and buy the new shares that have been offered to them.

❑ They can **renounce their rights**, and sell the rights in the market. By selling rights, the shareholder is selling to another investor the right to subscribe for the new shares at the issue price.

❑ They can take up some rights and renounce the rest. This is a combination of the two options above.

❑ They can **do nothing**. If they do nothing, their existing shares will fall in value after the rights issue (perhaps from the cum rights price to the theoretical ex-rights price), and they will suffer a loss in the value of their investment. The company might try to sell the new shares to which the 'do- nothing' shareholders were entitled, and pay them any surplus receipts above the rights issue price. However, the 'do-nothing' shareholders are still likely to suffer a loss.

If a shareholder takes up his rights, in theory he will be no worse and no better off. Similarly, if a shareholder renounces his rights and sells them, he will be no better and no worse off.

Example: Shareholders' choices

A company announces a 1 for 4 rights issue. The issue price is ₦500 per share. The current market price per existing share is ₦625.

The theoretical ex-rights price can be calculated as follows:

Market value of 4 existing shares	(4 × ₦625)	2,500
Issue price of 1 share in the rights issue	(1 × ₦500)	500
Theoretical value of 5 shares		3,000
Theoretical ex-rights price	(₦3,000/5)	₦600

Rights taken up

If a shareholder takes up his rights, he will be required to subscribe ₦500 in cash to purchase each new share. In theory, the value of his shares will rise from ₦2,500 for every four shares he owns to ₦3,000 for every five shares that he owns, but he has paid an additional ₦500 to the company.

In theory, he will therefore be neither better off nor worse off. In practice, the gain or loss on his investment will depend on what the actual share price is after the rights issue (since the actual share price might be higher or lower than the theoretical ex-rights price).

Rights renounced and sold

If the shareholder renounces his rights and sells them, the theoretical value of his rights will be ₦25 (₦(600 – 500)/4 shares)) for each existing share. If he sells his rights at this price, he will earn ₦100 for every four shares that he owns.

After the rights issue, the value of his four shares will fall, in theory, from ₦625 to ₦600 each, or from ₦2500 to ₦2400 for every four shares. There will be a theoretical fall in his investment value by ₦100 for every four shares held, but this is offset by the sales value of the rights.

In theory, he will therefore be neither better off nor worse off.

	₦
Cum rights value of four shares (4 × ₦625)	2,500
Theoretical ex-rights value of four shares (4 × ₦600)	2,400
Expected fall in value of four shares	(100)
Sale value of rights (4 × ₦25)	100
Net gain/loss	zero

3.4 Advantages and disadvantages of rights issues

Rights issues give existing shareholders the right to buy the new shares in a share issue. If an issue did not have to be a rights issue, the company would be able to offer the shares to all investors.

Advantages

The advantages of a rights issue are as follows:

❑ A rights issue gives shareholders the right to retain the same percentage of the company's total share capital, and so avoid a 'dilution' in the proportion of the company that he owns.

❑ A rights issue prevents the company from selling new shares at below the current market price to other investors.

Disadvantages

The disadvantages of a rights issue are as follows:

❑ The company might want to raise a large amount of cash for new investment, but the existing shareholders might be unwilling or unable to invest in the new shares.

❑ Shareholders can retain the same proportion of shares in the company by subscribing for new shares in the issue. There is no reason to give them preferential treatment.

❑ If a new share issue is offered to all investors, the issue price might be at or near the current market price, instead of at a discount to the current 'cum rights' price.

4   CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Explain how retained profits are a major source of funds

- List different types of short and long term funds

- Explain different means of raising funds through issuing equity

- Measure the value of a rights issue

Professional level
Strategic financial management

Sources of finance: debt

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

C	Financing decisions		
	1	Sources of finance	
		a	Assess the range of long-term sources of finance available to businesses, including equity, debt and venture capital.

Exam context

This chapter explains debt as a source of finance.

By the end of this chapter, you should be able to:

- Explain and use the terminology of debt finance
- Describe the features of convertibles
- Describe the features of preference shares

1 USING DEBT CAPITAL

Section overview

- The nature of debt finance
- Long-term, medium-term and short-term debt finance
- Interest payments
- Tax relief on interest
- Straight debt
- Access to the bond markets for companies
- Debt finance and risk for the borrower
- Advantages and disadvantages of debt finance to the investor
- Finance leases

1.1 The nature of debt finance

The term 'debt finance' is used to describe finance where:

- ❑ The borrower receives capital, either for a specific period of time (redeemable debt) or possibly in perpetuity (irredeemable debt);

- ❑ The borrower acknowledges an obligation to pay interest on the debt for as long as the debt remains outstanding; and

- ❑ The borrower agrees to repay the amount borrowed when the debt matures (reaches the end of the borrowing period).

For companies, the most common forms of debt finance are:

- ❑ Borrowing from banks; and

- ❑ Issuing debt securities.

Debt finance might be **secured** against assets of the borrower. When a debt is secured, the lender has the right to seek repayment of the outstanding debt out of the secured asset or assets, in the event that the borrower fails to make payments of interest and repayments of capital on schedule. The secured assets provide a second source of repayment if the first source fails.

When a debt is **unsecured**, the lender does not have this second source of repayment in an event of default by the borrower.

For both secured and unsecured debt, the borrower is usually required to give certain undertakings or '**covenants**' to the lender, including an undertaking to make interest payments in full and on time. The borrower will be in default for any breach of covenant, and the lenders will then have the right to take legal action against the borrower to recover the debt.

FMDQ OTC Securities Exchange

FMDQ OTC Securities Exchange is Nigeria's foremost debt capital, foreign exchange and derivatives over-the-counter securities exchange. It has dual responsibilities as a securities exchange and a self-regulatory organisation.

With a primary focus on the OTC markets – fixed income (e.g. treasury bills and bonds), currency and derivatives, FMDQ brings together Nigeria's fixed income and currency operations under a single market governance structure.

1.2 Long-term, medium-term and short-term debt finance

Debt finance can be long-term, medium-term or short-term finance. For companies:

❑ Long-term finance is usually obtained by issuing bonds. Bonds might also be called loan stock or debentures.

❑ Medium-term debt finance (with a maturity of up to about five or seven years) is usually in the form of bank loans, but a company might also issue bonds with a maturity of just a few years. Medium-dated bonds are often called 'notes'.

❑ Short-term debt finance is usually in the form of a bank overdraft or similar bank facility. Large companies might be able to obtain short-term debt finance in other ways, such as:

  • by issuing short-term debt securities in the money markets as commercial paper, within a commercial paper programme

  • by arranging a 'bills acceptances' programme with a bank

Irredeemable debt

Debt capital might be irredeemable or 'permanent'. However, irredeemable debt is not common, and virtually all debt is redeemable (or possibly convertible, see below).

Committed and uncommitted funds

Most debt finance is committed, which means that the lender has undertaken to provide the finance until the agreed maturity of the debt. The borrower does not have the risk that the lender will demand immediate repayment of the debt, without notice before the agreed maturity date.

Some lending is uncommitted, which means that the lender is not obliged to lend the money, and having lent the money can demand immediate repayment at any time. A bank overdraft facility is normally uncommitted lending by the bank, and the bank has the right to demand immediate repayment at any time. A bank overdraft can therefore be a fairly risky type of borrowing for a company.

1.3 Interest payments

The frequency of interest payments varies according to the type of debt.

❑ For a bank loan or a bond, the interest payable is calculated on the full amount of the debt.

❑ For a bank overdraft (or a revolving credit with a bank), interest is charged only on the current overdraft balance.

For example, if a company has a loan of ₦100,000, it will pay interest on the full amount of the loan. However, if it has a bank overdraft facility of ₦100,000, it will pay interest only on the overdraft balance, typically with interest charged on a daily basis.

The interest rate on most medium-term bank loans is a **floating rate** or **variable rate**. This means that the rate of interest is adjusted for each successive payment period, according to any changes that have occurred in the interest rate since the beginning of the previous interest period. Lending to companies is at either a margin above the bank's base rate or a margin above another reference rate of interest, such as the London Inter-bank Offered Rate (LIBOR).

For example, the interest rate on a bank loan might be payable every six months at six-month LIBOR plus 1%. At the beginning of each six-monthly interest period, the interest for the period will be fixed at whatever the current six-month LIBOR rate happens to be, plus 1%.

The interest rate on most bonds and notes is at a **fixed coupon rate**. The interest payable in each interest period is a fixed amount, calculated as the fixed coupon percentage of the nominal value of the bonds. For example, if a company issues 6% bonds with interest payable every six months, the company will pay
₦30 for every ₦1,000 nominal value of bonds every six months.

1.4 Tax relief on interest

Interest costs are an allowable expense for tax purposes. This can make debt finance an attractive 'cheap' source of finance.

> **Example:**
>
> A company borrows ₦10 million at an interest cost of 5% per year. The rate of taxation is 30%.
>
> The company will pay ₦500,000 each year in interest.
>
> Its tax payments to the federal government will be reduced by ₦150,000 (30% × ₦500,000). The net cost of interest is therefore ₦350,000, and the after-tax cost of debt is 3.5% (₦350,000/₦10 million, or 5% × (100 – 30)).
>
> In comparison, dividends on shares are not an allowable cost for tax purposes. Dividends are paid out of after-tax profits.

1.5 Straight debt

The term 'straight debt' means a fixed amount of redeemable debt at a fixed rate of interest.

For example, a company might issue ₦200 million of 6% bonds, with a maturity of 15 years. The company will pay interest of ₦12 million each year on the bonds, for 15 years, and at the end of the 15 years, the company will redeem the bonds, usually at par value or face value, and so would return ₦200 million to the bondholders.

1.6 Access to the bond markets for companies

Many companies cannot borrow by issuing bonds in the bond markets. Private companies are prohibited by law from offering bonds to the general public; therefore if these companies want to borrow, they must seek a bank loan or find investors who are willing to invest in their bonds or loan notes.

Large public companies are able to raise capital by issuing bonds in the international bond markets, and they usually pay to have their bonds given a credit rating by one or more credit rating agencies such as Moody's and Standard & Poor's. Investment institutions are often prepared to invest in corporate bonds with a good credit rating (an 'investment grade' rating) if the return ('yield') is attractive. Bonds in the international markets are usually denominated in US dollars or euros, although there are some issues in other currencies such as yen, Swiss francs and British pounds.

Smaller public companies outside the US find it more difficult to issue bonds in the bond market, because the amount of debt they need to raise is often too small to interest major investors, and only major investors buy bonds.

There is a much larger market in the US for corporate bonds, denominated in US dollars. By offering a high fixed rate of interest, companies are often able to issue bonds even though they are not 'investment grade' (i.e. 'sub-investment grade bonds' or 'junk bonds').

The secondary market in bonds is operated by bond dealers in banks, and the liquidity of the secondary market is variable. Many investors in bonds hold them as long-term investments and do not acquire them for short-term reasons. Unlike equity share prices, bond prices are generally fairly stable and do not offer investors an opportunity for quick capital gains from buying and re-selling.

1.7 Debt finance and risk for the borrower

Although debt capital is cheap, particularly in view of the tax relief on interest payments, it can also be a risky form of finance for a company.

❑ Lenders have a prior right to payment, before the right of shareholders to a dividend. If a company has low profits before interest and a large amount of debt, the profits available for dividends could be very small.

❑ There is always a risk that the borrower will fail to meet interest payments or the repayment of debt principal on schedule. If a borrower is late with a payment, or misses a payment, there is a default on the loan. A default gives the lenders the right to take action against the borrower to recover the loan.

In comparison with providers of debt capital, equity shareholders do not have similar rights for non-payment of dividends.

Companies should therefore avoid excessive amounts of debt finance, because of the default risk. (However, there are differing views about how much debt finance is 'safe' and how high debt levels can rise before the capital structure of a company becomes too risky.)

1.8 Advantages and disadvantages of debt finance to the investor

The comments about debt finance have so far focused on the borrower. A financial manager also needs to be aware of the attractions and disadvantages of debt capital for the lender or investor.

Advantages

There are significant advantages for an investor to lend money (by purchasing bonds) rather than to invest in equity. Lending is considered safer than investing in equity:

❑ The loan is usually redeemable, so that the capital will be returned.

❑ The interest has to be paid by the company, irrespective of how well or badly it has performed.

❑ The debt might be legally secured on assets of the company – the debt holder can force the company to sell the assets on which the loan is secured if the company defaults. However, most bonds are unsecured.

❑ Debt ranks higher than equity in a winding up of a company and the liquidation of its assets. Lenders therefore have more chance of getting their investment returned, compared to the equity holders.

Main disadvantage

The main disadvantage of debt finance compared with equity finance for the investor is that:

❑ The returns from investing in debt bonds are fairly predictable. The interest rate is fixed. There might be some increase or decrease in the market value of bonds, if market yields on bonds change: however, the size of any such capital gain or loss is usually fairly small.

❑ In contrast, with equity investments, shareholders benefit when the company is successful. Dividends will probably rise in the company's annual profits growth, and there could also be substantial capital gains from increases in the share price.

1.9 Finance leases

Leases are a form of debt finance.

Companies can acquire assets with leasing finance instead of buying assets with equity or debt capital.

Following new rules introduced in IFRS 16, the lessor views leases as being of two types. Operating leases offer a lessee a means of acquiring assets for the fairly short term. Finance leases, in the other hand, offer the lessee a means of acquiring an asset for most, or all, of the asset's expected economic life.

From a financial reporting view the operating lease, finance lease distinction is no longer relevant for lessees as IFRS 16 requires the capitalisation of all leases.
However, the leasing industry will continue to offer both types. The main

features of a finance lease arrangement are as follows:

❑ A company acquires a new non-current asset, such as a machine, an item of equipment, a motor vehicle, or even an aeroplane or ship.

❑ The purchase cost of the leased asset is paid by a lease finance company.

❑ The lease finance company (the lessor) and the company (the lessee) enter into a lease agreement, which covers all or most of the economic life of the asset.

❑ Under the terms of the lease agreement, the lessee agrees to make a number of regular fixed payments to the lessor over the term of the lease.

❑ Each payment comprises a capital element and an interest element. The lessee can claim tax relief on the interest (not the full rental).

❑ The lessee is responsible for insurance and running and maintenance costs for the asset.

❑ The lessor is the legal owner of the asset in law but for practical purposes, the lessee treats the asset as if it is the owner.

❑ The lessee is entitled to claim the relevant capital allowances.

For financial reporting purposes, the principle of 'substance over form' applies. The leased asset (from all leases with limited exceptions) is reported in the statement of financial position (balance sheet) of the lessee as a non-current

asset (a right of use asset). This is matched (initially) by a long-term debt obligation to the lessor, which is gradually paid off over the term of the lease.

This means that for financial reporting purposes, lease finance is actually reported in the statement of financial position (balance sheet) as a debt obligation, and the regular lease payments are reported as a mixture of finance costs (interest) and repayment of the obligation to the lessor.

Example: Lease

A Limited acquires a machine under a finance lease arrangement. The purchase cost of the machine would be ₦100,000. However, the company arranges to make six annual lease payments of ₦19,000 over the term of the lease agreement.

The legal owner of the machine is the lessor.

A Limited (as lessee) will make the six annual lease payments and claim the tax relief.

In the financial accounts, A Limited will show the machine as a non-current asset at a cost of ₦100,000 and this will be depreciated over the term of the lease. Initially, there will also be a debt of ₦100,000 in the balance sheet, payable to the lessor. This will be repaid gradually over the term of the lease.

For the purpose of the income statement, the lease payments are treated partly as a repayment of the lease 'debt' and partly as an interest cost on this debt.

This paper does not require you to know the details of the financial reporting rules for lease finance. However, you need to be aware that lease finance is a source of 'debt finance' that is widely used by companies of all sizes.

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2 CONVERTIBLE BONDS AND BONDS WITH WARRANTS ATTACHED

Section overview

- Convertible bonds
- Bonds with warrants attached
- Comparison of convertibles and bonds with warrants

Sometimes, companies issue bonds with an equity element included or attached. These bonds are sometimes called 'hybrid debt' securities, because they combine debt and equity features. (For financial reporting purposes, companies are required to segregate the debt from the equity element in the statement of financial position (balance sheet)).

The two main types of hybrid debt instrument are:

❑ Convertible bonds, and

❑ Bonds with equity warrants attached.

2.1 Convertible bonds

Convertible bonds are bonds that give their holder the right, but not the obligation, at a specified future date to convert their bonds into a specific quantity of new equity shares.

❑ If the bondholders choose to exercise the right, they will become shareholders in the company, but will surrender their bonds.

❑ If the bondholders decide not to exercise their right to convert, the bonds will be redeemed at maturity.

Example: Convertible bonds

B Limited issues ₦100 million of 3% convertible bonds. The bonds are convertible into equity shares after five years, at the rate of 20 shares for each ₦1,000 of bonds. If the shares are not converted, the company will have the right to redeem them at par immediately. Alternatively, the bonds will be redeemed after ten years.

For the first five years, the company will pay interest on the convertible bonds. After five years, the bondholders must decide whether or not to convert the bonds into shares.

If the market value of 20 shares is higher than the market value of ₦1,000 of the convertibles, the bondholders will exercise their right and convert the bonds into shares. They will make an immediate capital gain on their investment. (For example, if the share price is ₦60, the bondholders will exchange ₦1,000 of bonds for 20 shares, and the value of their investment will rise to ₦1,200).

If the market value of 20 shares is lower than the market value of ₦1,000 of the convertibles, the bondholders will not exercise their right to convert, and will hold their bonds until they are redeemed by the company (which will be either immediately or at the end of the tenth year).

Conversion premium

When convertible bonds are first issued, the market value of the shares into which the bonds will be convertible is always less than the market value of the convertibles.

This is because convertibles are issued in the expectation that the share price will rise before the date for conversion. Investors will hope that the market value of the shares will rise by enough to make the market value of the shares into which the bonds will be convertible higher than the value of the convertible as a 'straight bond'.

The amount by which the market value of the convertible exceeds the market value of the shares into which the bonds will be convertible is called the **conversion premium**.

Example: Conversion premium

A company issues 4% convertibles bonds at a price of ₦1,015.

The bonds will be convertible after six years into equity shares at the rate of 30 shares for every ₦1,000 of bonds. The current market price of the company's shares is ₦25.

The market price of the bonds is ₦1,015 for every ₦1,000 face value of bonds. The conversion premium is therefore ₦1,015 – (30 × ₦25) = ₦265 for every ₦1,000 of convertibles.

Advantages of convertibles

The advantages of convertibles **for companies** are as follows:

❑ The company can issue bonds now, and receive tax relief on the interest charges, but hope to convert the debt capital into equity in the future.

❑ The interest rate on convertibles is lower than the interest rate on similar straight bonds. This is because investors in the convertibles are expected to accept a lower interest rate in return for the option to convert the bonds into equities in the future.

❑ Occasionally, there is strong demand from investors for convertibles, and companies can respond to investors' demand by issuing convertibles in order to raise new capital.

The advantages of convertibles **for investors** are as follows:

❑ Investors receive a minimum annual income up to the conversion date, in the form of fixed interest.

❑ In addition, investors in convertibles will be able to benefit from a rise in the company's share price, and hope to make an immediate capital gain on conversion.

❑ Convertibles therefore combine some fixed annual income and the opportunity to benefit from a rising share price.

The risk for investors in convertibles is that the share price will not rise sufficiently to make conversion worthwhile. When this happens, it would have been better to invest in straight bonds, which would have paid higher interest.

2.2 Bonds with warrants attached

A company might issue bonds with share warrants attached.

Share warrants are a form of option, giving the holder of a warrant in a company the right, but not the obligation, to subscribe for a specified quantity of new shares in the company at a future date, at a fixed purchase price.

Example: Bonds with warrants attached

A company might issue ten-year 4% bonds with warrants attached.

Each ₦1,000 of bonds might give the holder the right to subscribe for ten new shares in the company after four years, at a price of ₦55 per share.

If the share price is higher than ₦55 when the date for exercising the warrants arrives, the warrant holder will exercise his right to buy new shares at ₦55.

If the share price is less than ₦55 when the date for exercising the warrants arrives, the warrant holder will not exercise the warrants, and will let his rights lapse.

2.3 Comparison of convertibles and bonds with warrants

Bonds with warrants attached are similar to convertibles, and the advantages of issuing them are similar.

The main difference between bonds with warrants and convertibles is that:

❏ With convertibles, the right to subscribe for equity shares is included in the bond itself, and if the bonds are converted, the investor gives up the bonds in exchange for the equity shares.

❏ With bonds with warrants, the warrants are detachable from the bonds. The bonds are therefore redeemed at maturity, in the same way as straight bonds. The warrants are separated from the bonds, and the warrant holder either exercises the warrants to subscribe for new shares when the time to do so arrives, or lets the warrants lapse.

Since warrants are detachable from the bonds, they can be traded separately. The right to subscribe for new shares belongs to the owner of the warrants, not the bondholder. This means that an investor can buy bonds with warrants attached when the company issues them, sell the warrants in the stock market and retain the bonds.

3 PREFERENCE SHARES

Section overview

- ■ Near-debt
- ■ Basic features of preference shares
- ■ Types of preference shares
- ■ Advantages and disadvantages of preference shares

3.1 Near-debt

Near-debt is a term to describe finance that is neither debt nor equity, but is closer to debt in characteristics than equity.

Various types of preference shares might be described as near-debt. They are not debt finance, but neither are they equity. In financial reporting, preference shares are more likely to be shown in the statement of financial position (balance sheet) as long-term liabilities, rather than equity, although this depends on the characteristics of the shares.

3.2 Basic features of preferenceshares

The basic features of preference shares are as follows:

❑ Most preference shares are issued with a fixed rate of annual dividend. For example, a company might issue 7% preference shares of ₦1, with dividends of ₦0.035 per share payable every six months (dividends of
₦0.07 per ₦1 share every year). If the company's annual profits rise or fall, the preference dividend remains the same.

❑ Preference dividends are paid out of after-tax profits. Preference dividends, like equity dividends, do not attract tax relief. This usually means that preference shares are a more expensive form of capital for companies than debt finance.

❑ Preference shareholders will be entitled to receive dividends out of profits before any remaining profit can be distributed to equity shareholders as equity dividends.

❑ If the company goes into liquidation, preference shareholders rank ahead of equity shareholders, but after providers of debt finance, in the right to payment out of the proceeds from sale of the company's assets.

Preference shares do not have any significant advantages for investors or for companies above straight debt finance. They are fairly uncommon, except perhaps in companies financed largely by venture capital.

In financial reporting, preference shares might be shown in the statement of financial position (balance sheet) as debt finance rather than equity, and preference share dividends are reported as interest costs in the income statement if the preference shares are reported as debt. However, even if preference dividends are reported as interest costs, they do not attract tax relief.

3.3 Types of preference shares

A company might issue different classes of preference shares. Each class of preference shares might have different characteristics. For example, one class of shares might pay a dividend of 5% and another might pay a dividend of 6%. One class might be redeemable preference shares and another, irredeemable shares, and so on.

The different types of preference shares are summarised below.

❑ **Redeemable preference shares** are redeemable by the company, typically at their par value, at a specified date in the future. **Irredeemable preference shares** are perpetual shares and will not be redeemed.

❑ **Cumulative preference shares** are shares for which the dividend accumulates if the company fails to make a dividend payment on schedule. For example, if a company fails to make a dividend payment to its cumulative preference shareholders in one year, because it does not have enough cash for example, the unpaid dividend is added to the next year's dividend. The arrears of preference dividend must be paid before any dividend payments on equity shares can be resumed. With **non- cumulative preference shares**, unpaid dividends in any year do not accumulate, and will not be paid at a later date.

❑ **Participating preference shares**: These shares give their owners the right to participate, to a certain extent, in excess profits of the company when it has a good year. The dividend rate is therefore not necessarily fixed each year. For this reason, the coupon dividend rate tends to be lower than for other types of preference shares.

❑ **Convertible preference shares**: These are similar to convertible bonds. They give the shareholders the right to convert their shares at a future date into a fixed quantity of equity shares in the company.

3.4 Advantages and disadvantages of preference shares

The **advantages** of preference shares for **companies** are that:

❑ The annual dividend is fixed, and so predictable (with the possible exception of participating preference shares).

❑ Dividends do not have to be paid unless the company can afford to pay them, and failure to pay preference dividends, unlike failure to pay interest on time, is not an event of default.

The **disadvantages** of preference shares for **companies** are that:

❑ Dividends are not an allowable cost for tax purposes

❑ They are not particularly attractive to investors.

4 CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Explain and use the terminology of debt finance

- Describe the features of convertibles

- Describe the features of preference shares

CHAPTER

13

Finance for small and medium sized entities (SMEs)

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

The detailed syllabus includes the following:

C		Financing decisions
	1	**Sources of finance**
		a	Assess the range of long-term sources of finance available to businesses, including equity, debt and venture capital.
	4	**Finance for small and medium-sized entities (SMEs)**
		Discuss the various sources and problems of access to finance for SMEs including:
		a	Business angel;
		b	Government assistance;
		c	Supply chain financing; and
		d	Crowd funding.

Exam context

This chapter explains the sources of finance available to small and medium sized entities. It continues by providing a summary of the features of different sources of finance explained in this and earlier chapters.

By the end of this chapter, you should be able to:

■ Understand the importance of SMEs in the economy

■ Explain possible sources of finance to an SME

■ Explain venture capital

■ Explain supply chain capital and crowd funding

■ Explain different types of government assistance that might be available

■ List the features of different sources of finance

1 THE CHARACTERISTICS OF SMES

Section overview

- Definition
- Relative importance

1.1 Definition

While there is no universally-accepted definition of what constitutes a small or medium sized enterprise, they are

❑ Private companies;

❑ Owned by a few individuals, typically a family group.

The precise definition of what constitutes a SME may differ according to the industry in which the firm operates.

The Central Bank of Nigeria's communiqué No 69 of the monetary policy committee meeting of April 15, 2010 acknowledged the existence of several definitions of SMEs one of which states that an enterprise that has an asset base (excluding land) of between N5 million to N500million and labour force of between 11 and 300 belongs to the SME sub-sector.

1.2 Relative importance

The National Bureau of Statistics (NBS) put the total number of SMEs in Nigeria at over 17 million in 2014.

Of the total number of businesses in the EU, less than 0.5% is classified as large businesses. In the EU, small and medium enterprises account for almost 66% of employment and more than 54% of turnover. The majority of employment growth has come from small firms in the EU and the US.

This means that small and medium-sized enterprises make up a very large part of a national economy. For a company to grow its economy, it is therefore important that SMEs should be able to grow their businesses. To do this, they need long-term capital.

The problem of raising sufficient long-term capital to grow their business is much greater for SMEs than for larger companies.

2 THE FINANCING PROBLEM

Section overview
■ Equity finance and SMEs
■ Debt finance and SMEs
■ Leasing and SMEs

2.1 Equity finance and SMEs

SMEs are normally owned by a few individuals. These existing owners are often reluctant to issue new equity to new investors as this will dilute their control of the business. External investors might also be reluctant to buy shares in a SME, because of the high investment risk.

One possible source of new equity capital for a SME would be a new issue of shares to the existing owners, who would then put more of their personal wealth into their company. However the existing owners might not be willing to put more of their own money into their company. Even if they were willing to put more money into their company, they might not have enough personal wealth to meet the company's capital requirements.

If SMEs cannot raise extra equity capital by issuing new shares, retained earnings are their only source of new equity. Even in profitable small companies, it takes a long time to build up capital through retained earnings, and it might be too late to take advantage of the required investment opportunities. Opportunities for growing the business even faster might be lost.

Short-term sources of capital can be used to some extent to help a small company to grow its business, but SMEs cannot rely extensively on short-term finance. SMEs might even face difficulties in negotiating trade credit if they have not been in business long enough to build up a track record for creditworthiness. Banks are also reluctant to offer a large overdraft, unless the owner of a company is willing to provide a personal guarantee for the facility (perhaps in the form of a bank mortgage over the family home). Too much reliance on short-term finance also increases the risk of **overtrading**, which was explained in an earlier chapter.

Without additional external capital, many SMEs are unable to grow as quickly as their owners would wish. Many SMEs try to obtain finance in the form of medium- term or longer-term debt, or to acquire assets through leasing.

2.2 Debt finance and SMEs

The main source of external finance available to SMEs is bank finance. There are many problems for a SME in negotiating bank finance:

❑ SMEs are often limited companies or partnerships for which financial information does not have to be published to a wide audience. There may be only limited requirements for external audit, or no legal requirement for an annual audit. The SME will have to provide the bank with sufficient financial information and also convince the bank that it has a credible business plan that should ensure its ability to repay the money it borrows.

❑ The SME may lack experienced management and a bank may be unwilling to trust them with its money. For example a bank might suspect that the profit forecasts provided by the management of an SME might be far too optimistic and inaccurate.

❑ The SME might have few assets to offer the bank as security for a loan. It is often the case that long-term loans are easier to obtain as these can be secured with mortgages against property (land and buildings) owned by the SME. The main problem arises with short and medium-term loans, for which adequate security does not exist, and this is known as the 'maturity gap'.

❑ The high-risk nature of investment projects by SMEs might mean that even if a bank is willing to lend money, it will require a high risk premium to be incorporated into the interest rate.

2.3 Leasing and SMEs

SMEs make extensive use of leasing as a method of obtaining long-term assets. Both operating leases and finance leases might be used. A feature of a lease is that the leasing company remains the owner of the asset. In the event that a company cannot make the scheduled lease payment, the lessor is able to take back the asset. This provides some form of security. A lessor might therefore be more willing to agree a leasing deal with an SME than a bank is willing to make a loan or offer a large bank overdraft facility.

3   VENTURE CAPITAL

Section overview

- The nature of venture capital
- Business angel finance
- Obtaining venture capital

3.1   The nature of venture capital

SMEs will usually try to raise the finance they need from retained earnings and bank finance, and by leasing assets. Working capital requirements can be reduced by negotiating credit terms with suppliers, and possibly by factoring trade receivables and obtaining some factor finance.

For SMEs with an ambitious strategy for growth, these sources of finance are unlikely to be sufficient. In some cases it might be possible to raise new finance in the form of venture capital.

Venture capital is capital provided to a SME by one or more external investors, in the form of equity capital, preference shares or debt finance – perhaps a mixture of all three. Some investment institutions specialise in providing venture capital finance to private companies to support their growing businesses.

Venture capital investors require large returns on their investment, because of the high risks involved. They want the profits on their successful investments to cover the losses they inevitably suffer on business ventures that fail.

3.2   Business angel finance

Business angels are wealthy individuals who invest directly in small businesses, usually by purchasing new equity shares. The business angel does not get involved personally in the management of the company, but hopes to make a large return on his investment from dividends and eventually from the sale of the shares when the company has grown.

The main problems with business angel finance are as follows.

❑   There are not many business angels, and it is usually very difficult for a small company to identify an individual who might be willing to consider making an equity investment in the company.

❑   Since there are not many business angels, there is far too little business angel finance available to meet the potential demand for equity capital from small companies.

3.3   Obtaining venture capital

The term 'venture capital' is normally used to mean capital provided to a private company by specialist investment institutions, sometimes with support from banks.

Venture capitalists might be willing to provide finance to new businesses in return for an equity stake in the business. In addition to equity capital they might also agree to provide extra finance in the form of preference shares. With some venture capital arrangements, a bank might also be willing to provide loan capital as part of an overall financing package for the company.

The company will have to demonstrate to the venture capitalist organisation that it has a clear strategy and a convincing business plan. It must demonstrate that its management are experienced, have sufficient skills to make a success of the business and are committed to achieving success. Sometimes the venture capital organisation will require a representative to be on the board or will appoint an independent director.

Exit route for the venture capital investor

A venture capital organisation will not invest money in a company unless it is satisfied that there is a strategy for the company that will enable them to withdraw their investment at a profit, if the company is successful. This is known as an 'exit route' for their investment, and a venture capitalist might expect an exit route to be available after about five years or so from the time of making the investment in the company.

The exit route might be:

❑ A stock market listing, if the company grows quickly and is successful. When the company's shares are brought to the stock market, the venture capitalist can sell its shares.

❑ A 'trade sale' of the company to a larger company. A venture capitalist investor might insist that the company should be sold to a larger rival, so that they can take their profits and disinvest.

❑ Refinancing by another venture capital organisation. A venture capitalist might be able to transfer its investment in a company to another venture capitalist.

Problems with obtaining venture capital finance

The main problem with obtaining venture capital finance is finding a venture capital organisation that is prepared to look at the possibility of investing in the company.

The problem is particularly severe for companies that want to raise 'seed corn' finance to build up their business from a very small beginning. Venture capitalists are often reluctant to spend time and resources in looking at small ventures where the potential returns are likely to be small. They are much more likely to be interested in financing well-established medium-sized private companies, such as private companies that gain 'independence' in a management buyout. Medium- sized businesses often need new equity to enable them to build their business to a point where a stock market flotation is possible, and the risk of business failure is lower than with smaller 'start-up' ventures.

In the UK, for example, most of the larger venture capital organisations are not prepared to consider providing finance for start-up companies or newly- established small companies, and focus instead on more well-established companies such as management buyout companies.

On the other hand there are some very large financial institutions that provide venture capital to companies on a global scale, including the provision of capital to companies in China and India. For example in April 2008 US-based private equity group Warburg Pincus announced the creation of a $15 billion global fund for investing mainly in venture capital investments and 'growth capital' for private companies. The company announced at the time that it was looking at a five-year to seven-year time frame for its investments.

4 OTHER SOURCES OF CAPITAL

Section overview

- Supply chain financing
- Crowd funding
- Government assistance

4.1 Supply chain financing

The globalisation of businesses has led to worldwide supply chains with multinational buyers purchasing from a diverse group of suppliers in numerous countries.

Supply chain finance involves a supplier selling its invoices to a bank at a discount as soon as they are approved by the buyer. This means that the supplier receives their cash earlier than would have been the case had the supplier waited for the buyer to pay in the usual way.

The buyer makes payment to the party that has bought the invoice from the supplier. This party would usually be a bank. The buyers are usually large multinationals with good credit risk. The bank will pay an amount for the invoice based on the buyer's credit risk rather than the higher credit risk of the smaller supplier. Therefore, the supplier receives more cash than they would have through, say factoring arrangements.

Supply chain finance is often described as a win-win situation for the buyer and supplier. The buyer optimises working capital by delaying payment, and the supplier accelerates operating cash flow.

4.2 Crowdfunding

Crowdfunding (also known as peer to peer funding) involves raising money from a large number of people via the internet in order to fund a project.

A crowdfunded project typically involves three groups of participants:

❑ Project initiators: People (companies) who wish to raise cash to fund a project. Project initiators will produce a business plan in order to tempt others to invest in their project.

❑ Crowdfunding websites: Various organisations provide internet platforms which allow the project initiator to advertise the project in order to solicit contributions and allow investors to appraise the projects on offer.

❑ Investors

Crowdfunding can be used to raise money from investors who wish to support a project that interests them rather than making a financial return. For example, some musicians have raised cash to fund the production of an album. However, it is also available to fund commercial ambition and large amounts have been raised. For example, a project aimed at funding the development of a video game raised $75m against an initial target of $500,000.

4.3 Government assistance

The Central Bank of Nigeria development finance initiatives involve the formulation and implementation of various policies, to encourage and enable financial institutions to deliver services in an effective, efficient and sustainable manner. The initiatives are mainly targeted at agricultural sector, rural development and micro, small and medium enterprises.

Small and Medium Enterprises Equity Investment Scheme (SMEEIS)

The Scheme requires all banks in Nigeria to set aside 10% of their profit after tax for equity investment and promotion of small and medium enterprises.

Funding provided under the scheme is in the form of equity investment in eligible enterprises and/or cheap loans (at single digit interest rates) in order to reduce the burden of interest and other financial charges of normal bank lending. In addition, the banking industry provides financial, advisory, technical and managerial support.

The scheme applies to all business activities except for trading and financial services businesses.

Small and Medium Enterprises Credit Guarantee Scheme (SMECGS),

The Central Bank of Nigeria guarantees loans of up ₦100 million made by participating banks to businesses involved in manufacturing, agricultural value chain, education or any other activity that might be agreed from time to time.

Agric credit guarantee scheme

This scheme is to encourage banks to provide funding to farmers by providing guarantee cover to banks who give loans to the agricultural sector.

5 SUMMARY OF SOURCES AND COSTS OF FINANCE

Section overview

- Introduction
- Equity
- Debt
- Hybrids
- Leases
- Venture capital
- Business angels
- Private equity
- Asset securitisation and sale

5.1 Introduction

An important aspect of financial management is the choice of methods of financing for a company's assets. Companies use a variety of sources of finance and the aim should be to achieve an efficient capital structure that provides:

- A suitable balance between short-term and long-term funding
- Adequate working capital
- A suitable balance between equity and debt capital in the long-term capital structure.

Factors that must be considered include:

- Amount needed
- Cost
- Duration
- Flexibility
- Repayment
- Impact on financial statements

5.2 Equity

Features

Finance raised through sale of shares to existing or new investors (existing investors often have a right to invest first – pre-emption rights).

Providers of equity are the ultimate owner of the company. Issue costs

can be high.

Cost of equity is higher than other forms of finance.

New issues to new investors will dilute control of existing owners.

Equity can be used, when appropriate:

❑ to provide long term finance; and

❑ in preference to debt finance, if company is already highly geared.

Private companies may not be allowed to offer shares for sale to the public at large (e.g. in the UK).

5.3 Debt

Debt can be short or long term. Short

term includes:

❑ Bank overdrafts

❑ Bank loans

Bank overdrafts – Features

❑ Flexible with regard to amount and available immediately within pre-arranged limits.

❑ Interest and fees are tax deductible.

❑ Interest is only paid when the account is overdrawn.

❑ Penalties for breaching overdraft limits can be severe.

❑ Overdrafts are repayable on demand.

Overdraft, when appropriate can be:

❑ used to finance day to day operations; and

❑ an important component of working capital management policies.

Bank loans – Features

❑ Available for specified periods and must be repaid according to a pre agreed schedule. This means that the company knows when it needs to make cash payments.

❑ Interest and fees are tax deductible.

❑ Once the loan is taken interest is paid for the duration of the loan.

❑ A loan might be repayable, if loan covenants are breached, but failing that, the cash is available for the term of the loan.

❑ Can be taken out in a foreign currency as a hedge of a foreign investment.

❑ A company can offer security in order to secure a loan.

When appropriate:

❑ Short term loans are suitable for funding smaller investments; and

❑ Long term loans are suitable for funding major investments.

5.4 Hybrids

Features

❑ A hybrid is a financial instrument that combines features of equity and debt for example, convertible debt.

❑ Interest is paid at an agreed rate for a specified period. At the end of the period the holder can choose to be repaid in cash or to change the debt into equity shares. Whether or not conversion occurs depends on the share price at the conversion date.

❑ The issuing company will to raise cash in order to pay back the amount if conversion is not chosen.

❑ Lower interest rates than straightforward (vanilla) debt as the lender is, in effect, lending money and buying a call option on the company's shares.

❑ Interest and fees are tax deductible.

When appropriate:

❑ Can be used for long term investments.

❑ Useful if the share price is low at the time of issue thus making equity issue too dilutive.

5.5 Leases

Features

Two types:

❑ Operating leases – right-of-use assets; and

❑ Finance leases – on statement of financial position.

Legal ownership of the asset remains with the lessor.

Lessee has the right of use of the asset in return for a series of rental payments.

Tax deductibility of rental payments depends on the tax regime but typically they are tax deductible in one way or another.

All leases are capitalised and affect key ratios (ROCE, gearing)

When appropriate:

Operating leases

❑ For the acquisition of smaller assets but also for very expensive assets; and

❑ Common in the airline industry.

Finance leases – Can be used for very big assets (e.g. oil field servicing vessels).

5.6 Venture capital

Features

❑ The term 'venture capital' is normally used to mean capital provided to a private company by specialist investment institutions, sometimes with support from banks in the form of loans.

❑ The company must demonstrate to the venture capitalist organisation that it has a clear strategy and a convincing business plan.

❑ A venture capital organisation will only invest if there is a clear 'exit route' (e.g. a listing on an exchange).

❑ Investment is typically for 3-7 years.

When appropriate:

❑ Can be an important source of finance for management buy-outs;

❑ Can provide finance to take young private companies to the next level; and

❑ May provide cash for start-ups but this is less likely.

5.7 Business angels

Features

❑ Business angels are wealthy individuals who invest directly in small businesses, usually by purchasing new equity shares but do not get involved in the management of the company.

❑ Business angels are not that common.

❑ There is too little business angel finance available to meet the potential demand for equity capital from small companies.

When appropriate – it is a way for small companies to raise equity finance.

5.8 Private equity funds

Features

❑ Private equity is equity in operating companies that are not publicly traded on a stock exchange.

❑ Private equity as a source of finance includes venture capital and private equity funds.

❑ A private equity fund looks to take a reasonably large stake in mature businesses.

❑ In a typical leveraged buyout transaction, the private equity firm buys majority control of an existing or mature firm and tries to enhance value by eliminating inefficiencies or driving growth.

❑ Their view is to realise the investment possibly by breaking the business into smaller parts.

When appropriate:

❑ If used as a source of funding a private equity fund will take a large stake (30% is typical) and appoint directors.

❑ It is a method for a private company to raise equity finance where it is not allowed to do so from the market.

5.9 Asset securitisation and sale

Features

Securitisation is the process of conversion of existing assets or future cash flows into marketable securities.

Typically, the following occur simultaneously:

❑ Company A sets up Company B (described as a special purpose vehicle or SPV) and transfers an asset to it (or rights to future cash flows);

❑ Company B issues securities to investors for cash. These investors are then entitled to the benefits that will accrue from the asset; and

❑ The cash raised by Company B is then paid to Company A.

In substance this is like Company A raising cash and using the asset as security. Accounting rules might require Company A to consolidate Company B even though it might have no ownership interest in it.

Conversion of existing assets into marketable securities is known as asset- backed securitisation and the conversion of future cash flows into marketable securities is known as future-flows securitisation.

Used extensively in the financial services industry.

When appropriate:

❑ Allows the conversion of assets which are not marketable into marketable ones.

❑ Securitisation allows the company to borrow at rates that are commensurate with the rating of the asset. A company with a credit rating of BB might hold an asset rated at AA. If it securitises the asset it gains access to AA borrowing rates.

6 CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Understand the importance of SMEs in the economy

- Explain possible sources of finance to an SME

- Explain venture capital

- Explain supply chain capital and crowd funding

- Explain different types of government assistance that might be available

- List the features of different sources of finance

Islamic finance

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

C			Financing decisions		
		c	Methods of raising short and long term Islamic finance including major differences between Islamic finance and the other forms of business finance		
			i	Evaluate the concept of riba (interest) and how returns are made by Islamic financial securities.	
			ii	Evaluate Islamic financial instruments available to businesses including:	
					Murabaha (trade credit);
					Ijara (lease finance);
					Mudaraba (equity finance);
					Sukuk (debt finance); and
					Musharaka (venture capital).
					(Note: calculations are not required)

Exam context

This chapter explains the features of Islamic finance that distinguish it from traditional western forms of finance and then continues by explaining different types of Islamic financial product.

By the end of this chapter, you should be able to:

■ Explain how Islamic finance differs from traditional western forms of finance; and

■ Explain different types of Islamic financial product.

1 ISLAMIC FINANCE

Section overview

- ■ Introduction to Islamic finance
- ■ Specific guidance
- ■ Types of finance
- ■ Types of sukuk

1.1 Introduction to Islamic finance

Islamic finance rests on the application of Shariah. Sharia law is derived from the Quran (believed to be Allah's divine revelation to the prophet Muhammed) and the teachings of Muhammed.

Muslims believe that Sharia law shows the path to be followed as ordained by Allah. It covers all aspects of life and Muslims believe that following this path will lead to physical and spiritual wellbeing.

Sharia law sets out five categories of actions that guide a Muslim's actions: These are acts that are:

- ▪ Obligatory;
- ▪ Meritorious;
- ▪ Commendable;
- ▪ Reprehensible; and
- ▪ Forbidden.

The main principles of Islamic finance are that:

- ▪ Wealth must be generated from legitimate trade and asset-based investment (the use of money for the purposes of making money is expressly forbidden);
- ▪ Investment should have a social and an ethical benefit to wider society beyond pure return;
- ▪ Risk should be shared; and
- ▪ Harmful activities (*haram*) should be avoided.

The intention is to avoid injustice, asymmetric risk and moral hazard (where the party who causes a problem does not suffer its consequences) and unfair enrichment at the expense of another party.

It is estimated US $1.6 trillion of assets are managed according to these principles under the rules of Islamic finance.

1.2 Specific guidance

The following activities are prohibited:

❑ Charging and receiving interest (riba).

   ▪ This contradicts the principle that risk must be shared and is also contrary to the ideas of partnership and justice.

   ▪ Using money to make money is forbidden.

   ▪ Investment in companies that have too much borrowing is also

prohibited. What constitutes "too much borrowing" is a matter for

interpretation but is typically defined as debt totalling more than 33% of

the stock market value over the last 12 months.

❑ Investments in businesses involved in alcohol, gambling, or anything else that the Shariah considers unlawful or undesirable (haram).

❑ Investments in transactions that involve speculation or extreme risk. (This is seen as gambling).

❑ Entering into contracts where there is uncertainty about the subject matter and terms of contracts (This includes a prohibition on short selling, i.e. selling something not yet owned).

Permitted activities

Islamic banks are allowed to obtain their earnings through profit-sharing investments or fee-based returns. If a loan is given for business purposes the lender should take part in the risk. This usually involves the lender buying the asset and then allowing a customer to use the asset for a fee.

1.3 Types of finance

The following Islamic financial instruments provide Shariah-compliant finance. Often the cash flows from these techniques might be the same as they would have been under standard western practice. However, the key difference is that the rate of return is based on the asset transaction and not based on interest on money loaned.

❑ **Murabaha**

In traditional western finance a customer would borrow money from a bank in order to finance activity, say the purchase of an asset. However, under Sharia the bank cannot charge interest.

Murabaha is a form of trade credit for asset acquisition that avoids the payment of interest. The bank buys the asset and then sells it on to the customer on a deferred basis at a price that includes an agreed mark-up for profit. Payment can be made by instalments but the mark-up is fixed in advance and cannot be increased, even if there is a delay in payment.

❑ **Ijara**

A form of lease finance agreement where a bank buys an asset for a customer and then leases it to the customer over a specific period at an agreed rental which allows the bank to recover the capital cost of the asset and a profit margin.

❑ **Mudaraba**

The bank provides capital and the customer provides expertise to invest in a project. Profits generated are distributed according in a predetermined ratio but cannot be guaranteed. The bank does not participate in the management of the business. This is like the bank providing equity finance.

The project might make a loss. In this case, the bank loses out. The customer cannot be made to compensate the bank for this loss as that would be contrary to the mutual sharing of risk.

❑ **Musharaka**

This is a joint venture or investment partnership between two parties who both provide capital towards the financing of new or established projects. Both parties share the profits on a pre-agreed ratio, allowing managerial skills to be remunerated, with losses being shared on the basis of equity participation.

❑ **Sukuk**

This is debt finance but Islamic bonds cannot bear interest. Sukuk holders must have an ownership interest in the assets which are being financed. The sukuk holders' return for providing finance is a share of the income generated by the assets. Modern sukuk share many features with western securitisations.

There are many different types of sukuk including:

▪ Ijara sukuk (sukuk al-ijara);

▪ Mudaraba sukuk (sukuk al-mudaraba);

▪ Murabaha sukuk (sukuk al-murabaha); and

▪ Musharaka sukuk (sukuk al-musharaka).

1.4 Types of sukuk

Sukuk are shariah compliant "bonds". Typically sukuk are certificates that represent ownership of an asset or its usufruct. (usufruct refers to all of the benefits that the ownership of an asset would convey).

This section explains types of sukuk arrangements in more detail. There are different ways in which each type of sukuk might be structured. The detail of a structure might vary from those in the following explanations.

❑ **Sukuk al-ijarah**

This is a sale and leaseback transaction. Suppose

Business A wishes to raise finance.

A sponsor (say Business A's bank) would set up a special purpose vehicle (SPV) with the purpose of buying an asset off Business A (which would be later leased back to it) at a pre-agreed price.

The SPV would issue ownership certificates (sukuk) to investors for cash. The amount raised would be the amount needed to buy the asset off Business A.

```
        ┌──────────────────┐
        │   Sukuk holders  │
        └──────────────────┘
          │ ▲
    Cash  │ │  Certificates of
          ▼ │    ownership
        ┌──────────────────┐
        │       SPV        │
        └──────────────────┘
```
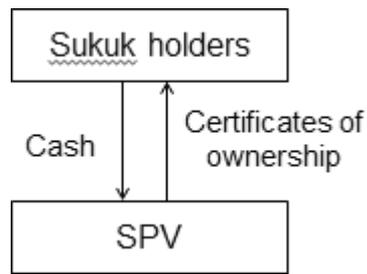
The SPV would buy the asset off Business A. The SPV would own the asset and in turn be owned by the sukuk holders.

```
        ┌──────────────────┐
        │       SPV        │
        └──────────────────┘
          │ ▲
    Cash  │ │  Ownership of
          ▼ │     asset
        ┌──────────────────┐
        │   Business A     │
        └──────────────────┘
```
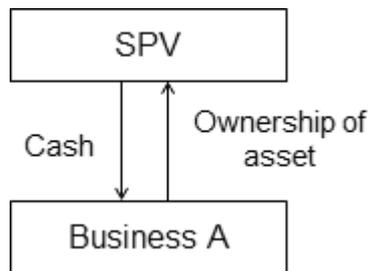
Business A would lease the asset back from the SPV for a series of pre-agreed rentals. The cash thus collected by the SPV would be paid as distributions to the sukuk holders.

```
        ┌──────────────────┐
        │   Sukuk holders  │
        └──────────────────┘
                  ▲
                  │  Distributions
        ┌──────────────────┐
        │       SPV        │
        └──────────────────┘
          │        ▲
  Lease of│        │  Rentals
   asset  ▼        │
        ┌──────────────────┐
        │   Business A     │
        └──────────────────┘
```
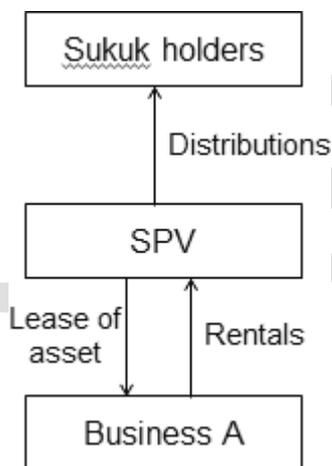
Note that Business A would be described as being the "obligator" in this transaction.

❑ **Mudaraba sukuk (sukuk al-mudaraba)**

Business B wishes to raise finance for a major, new, construction project. The approach is to set up an SPV which would own the project and engage Business B to run it.

A sponsor (say Business B's bank) would set up a special purpose vehicle (SPV) with the purpose of investing in the project.

The SPV would issue ownership certificates (sukuk) to investors for cash. The amount raised would be the amount needed to finance the project.

Business B is contracted to run the project and would be entitled to a fee/share of profit.

On completion of the project the SPV transfers ownership of the asset to the customer.

The fees received from the customer are used to pay Business B's fee and to provide distributions to the sukuk holders.

❑ **Murabaha sukuk (sukuk al-murabaha)**

Business C wishes to raise finance to buy a large amount of iron ore.

A sponsor (say Business C's bank) would set up a special purpose vehicle (SPV) with the purpose of buying the ore.

The SPV would issue ownership certificates (sukuk) to investors for cash. The amount raised would be the amount needed to buy the ore.

The SPV buys the ore.

The SPV then sells the ore to Business C at a profit. Business C pays for the ore according to a pre-agreed schedule of payments and these are passed on to the sukuk holders.

❑ **Musharaka sukuk (sukuk al-musharaka)**

Business D wishes to raise finance for a major, new, construction project. The approach is to set up an SPV which would enter into a joint venture with Business D. Business D would provide the expertise needed to run the project and the sukuk holders (through) the JV would provide the finance.

The sukuk holders participate in the management of the joint venture.

The profits and losses of the JV are shared between Business D and the sukuk holders.

The Sharia board

There is no ultimate authority for Sharia compliance.

Each Islamic bank's adherence to the principles of Sharia law is governed by its own Sharia board. This is a body within an Islamic financial institution that has the responsibility for ensuring that all products and services offered by that institution are compliant with the principles of Sharia law.

2 CHAPTER REVIEW

Chapter review
You should now know how to:

- Explain how Islamic finance differs from traditional western forms of finance
- Explain different types of Islamic financial product

CHAPTER

15

Dividend policy

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

C			Financing decisions
	1		**Sources of finance**
		d	Assess and advise on appropriate dividend policy.

Exam context

This chapter explains the theoretical and practical bases of dividend policy.

By the end of this chapter, you should be able to:

- Explain the different theories of dividend policy
- Explain different approaches to dividend policy
- Identify the practical influences on the payment of a dividend
- Suggest alternatives to the payment of a cash dividend

1 BACKGROUND TO DIVIDEND POLICY

Section overview

- Introduction
- Modigliani and Miller's dividend irrelevance theory
- Real world influences
- Traditional view of dividend policy
- Dividend relevance theories

1.1 Introduction

The relationship between the dividend decision and the financing decision

Total earnings are retained or paid out in dividends. Retained earnings are the surplus profits available to the company for investment after dividend has been paid. Dividends reduce equity capital.

When a company wants to raise more capital for investment, it could do so by paying no dividend at all and retaining 100% of earnings. The only external capital it then needs to raise is the amount by which its capital requirements exceed its earnings. In practice, however, not many companies would do this. Instead, they have a dividend policy that they make known to their shareholders and try to apply in practice (subject to profits being large enough). Even when they want to raise fresh capital, they will probably continue to pay dividends.

Dividend policy is the set of guidelines a company uses to decide how much of its earnings it will pay out to shareholders. This chapter discusses different approaches that companies might take in setting dividend policy.

Dividend policy and shareholder wealth

The objective of the management of a company is to maximise shareholder wealth. It follows that management need to understand the impact of dividend policy on shareholder wealth.

Ownership of shares in a company affects the wealth of the owners in part from the dividends paid out by the company and in part a capital gain arising from the growth in the value of the company's shares.

In other words, the return to shareholders is delivered in two parts:

- dividend paid; and
- capital gain/loss in the share price.

The dividend decision that a company makes is a decision as to how the return is delivered or how much of the annual earnings should be paid out as dividends and how much of the annual earnings should be retained and re-invested within the company, flowing through to shareholders in the form of a capital gain on the share price.

There are two theories on whether dividend policy affects the wealth of shareholders:

- Modigliani and Miller's dividend irrelevance theory; and
- the traditional view of dividend policy.

1.2 Modigliani and Miller's dividend irrelevance theory

Modigliani and Miller sought to explain the real world influences on dividend policy. Their objective was to build models that would aid financial managers in making decisions about dividends levels.

Their starting point was to construct a model based on simplifying assumptions to see what would be expected in this simple world. The assumptions include the following:

❑ Capital markets are perfect:

- All investors value securities in the same way

- There are no dealing costs

- Perfect information (all participants know and understand any new information the instant it comes into existence)

❑ No taxation (or, at least, there are no differences between the taxation on dividends and on capital gains).

Remember that they did not say the world was like this. The nature of mathematical modelling is such that the model is constructed to describe a simplified version of what is being studied. Predictions based on the model can then be compared with the real world in an attempt to understand the impact of real world influences. Often, people write that their model was incorrect or was open to criticism but the more accurate statement is that the model does not accurately describe the real world nor was it meant to.

What the model says

Dividend policy is irrelevant, and the level of dividends paid out by a company does not affect the wealth of shareholders. The total market value of a company will be the same regardless of whether the dividend pay-out ratio is 0%, 100% or any ratio in between.

MM argued that the value of a company's shares depends on the rate of return it can earn from its business. 'Earning power' matters, but dividends do not. They argued that if a company has opportunities for investing in capital projects with a positive NPV, they can either:

❑ use retained earnings to finance the investment; or

❑ pay out earnings and dividends and obtain the equity that it needs for capital investment from the stock market.

For example, if a company has earnings of ₦100 million and investment opportunities costing ₦100 million that have a positive NPV, it does not matter whether it pays no dividend and invests all its earnings on the capital projects, or whether it pays dividends of ₦100 million and raises new equity capital of ₦100 million for the capital project investments.

If the company pays out dividends and raises new equity capital, the existing shares will fall in value by the amount of the dividend payments. However this loss of value will be replaced by the new equity raised in the market, so the total value of the company's equity will be unaffected.

❑ Loss in value of existing shares = Amount of dividends paid

❑ Total value of equity before the dividend payment and equity issue = Total value of equity after the dividend payment and equity issue

Whenever shareholders want cash, it does not matter whether they obtain it in the form of dividends or by selling their shares in the market.

Clearly this does not describe what happens in reality as many companies pay dividends. This leads to the question of what is there in the real world which would cause the model to behave differently.

1.3 Real world influences

Transaction costs

The MM model assumes that there are no costs involved in selling shares, so that shareholders should be indifferent between getting cash in the form of dividends or getting it by selling some shares. In practice this is not the case. Investors who were holding shares for the income they generated would mind how their return was delivered if they had to incur transaction costs when realising their capital gains so as to turn them into income. Such investors would strongly prefer if the return was delivered in the form of dividends, rather than capital gains.

Taxation

The MM model assumes that there is no taxation (or at least, there is no difference between tax on dividends and tax on capital gains). This is often not the case in practice. If dividends were taxed and capital gains were tax free, shareholders would mind how their return was delivered - they would strongly prefer it to be delivered in the form of capital gains rather than dividends.

Imperfect information

The MM model assumes that shareholders possess perfect information about the returns that will be obtained by companies from their new capital investments.
Since future earnings can be predicted with confidence, MM argued that share prices would remain close to their real value. In practice, however, this is not the case. Shareholders cannot always assess the real value of their shares with confidence: this is one reason why many shareholders prefer high cash dividends instead of the prospect of bigger capital gains in the future.

Costs of raising capital

The MM model assumes that there are no costs involved in raising new equity capital, so that there is no cost difference between retaining earnings and raising new equity. This is not the case. Costs of raising new capital would be taken into account by companies when making decisions about pay-outs.

Shareholder preferences

Under the MM dividend irrelevance model all shareholders would behave in a rational way and given they have perfect information all would view the world in the same way. However, in practice, some shareholders prefer to receive dividends from their equity investments. Others are not concerned about dividends and would prefer the company to reinvest all its earnings in order to pursue growth strategies that will increase the market value of the shares. Many shareholders prefer a mixture of dividends and retaining some profits for share price growth. (For many years, for example, software giant Microsoft had a policy of retaining its earnings to invest in growth, with no dividend pay-outs and then announced the biggest dividend distribution and share buy-back in corporate history).

Shareholders will buy and hold shares of companies that pursue a dividend policy consistent with their preferences for dividends or share price growth, and companies might try to pursue a dividend policy consistent with the preferences of most of their shareholders

1.4 Traditional view of dividend policy

The traditional view of dividend policy is that dividend payments should be at a level that enables the company to maximise the value of its shares. Retaining earnings adds to earnings growth in the future, and earnings growth will enable the company to increase dividends in the future.

The optimal dividend policy is the dividends and retentions policy that maximises the share price using the dividend growth model to obtain a share price valuation.

Example: Traditional view of dividend policy

A company pays out 40% of its earnings in dividends and retains the remaining 60% of earnings which it can reinvest in the business to earn a return of 10% per year.

For every ₦100 of earnings in the current year, it will pay dividends of ₦40 and by reinvesting ₦60 it will add to future annual earnings by 6% (= 60% ⛌ 10%) each year.

Annual earnings next year will be ₦106.

This model is Gordon's growth model and was described in an earlier chapter.

The traditional view is that dividend policy does affect shareholders' wealth. The traditional view is not a theory as such. It describes what seems to be the case in practice but does not provide an explanation of different approaches to dividend policy decisions.

1.5 Dividend relevance theories

The MM assumptions do not hold in the real world. Dividend policy can influence the value of the firm due to real life imperfections.

There are several theories to explain how dividend policy is important in arriving at the market value of a company including:

❑   the clientele effect;

❑   bird-in-hand effect; and

❑   dividend signalling.

Clientele effect

This analysis argues that, in the real world, there are differential tax treatments of dividends and capital gains, and there are transaction costs on share dealings.

As a result, shareholders are concerned as to how their return is delivered to them by the company. Thus companies should follow a consistent dividend policy so as to ensure that they gather to them a clientele of shareholders who like that particular policy.

The idea is that the actual dividend policy that a company follows is unimportant but, having decided on a particular policy, they should then keep to it.

The bird-in-hand effect

This is named after the adage, "a bird in the hand is worth two in the bush).

Some investors may find capital gains more tax-efficient than dividends, and some investors will avoid transaction costs if their returns are delivered in the form of capital gains rather than dividends. However, despite all this, investors generally have a strong preference for dividends because a dividend is certain. Investors prefer a certain dividend now, to the promise of uncertain future dividends (arising out of retaining and re-investing earnings).

Dividend signalling and information asymmetry

The term "information asymmetry" refers to a situation where some stakeholders have access to more information about a company than others. In particular, the management have access to all information about the company but the shareholders have access only to publicly available information.

Signalling theory contends that management can use dividend payments to communicate information about the future prospects of the business to the owners.

Investors read "signals" into the company's dividend decision and that these signals say as much about the company's future financial performance as they say about its past financial performance.

A dividend which differs from shareholders expectations about dividends might send signals to the market and affect share price.

❑ A higher than expected dividend may signal that the board of directors are confident about the future and may lead to an increase in share price

❑ A lower than expected dividend may signal that the company is in financial difficulties and lead to a fall in share price.

These effects can be reduced by issuing explanations as to why the company has made the change.

A company might also use dividend policy to send signals to the stock market about its future prospects and intentions.

Research has indicated that dividends do actually reduce information asymmetry.

2 DIVIDEND POLICY

Section overview

- Approaches to dividend policy
- Constant pay-out ratio
- Residual theory of dividend policy
- Hybrid dividend policy
- Special dividend

2.1 Approaches to dividend policy

There are several approaches to dividend policy:

❑ constant pay-out ratio (stable dividend policy);

❑ residual dividend policy; and

❑ hybrid dividend policy.

2.2 Constant pay-out ratio

Dividends are set as a percentage of a company's annual earnings. As a company's earnings per share fluctuates up or down, so will the dividend. For most companies, the goal is to increase earnings each year, and as such the dividend should increase each year as well

In practice dividend policy might be stated in terms of an intention of the board of directors to increase annual dividends in line with growth in earnings per share.

When dividends increase by the same proportionate amount as the rise in EPS, it is said to maintain a constant 'pay-out ratio'.

Shareholders can monitor the future profit expectations of the company to predict the amount of dividends they are likely to receive in the future.

2.3 Residual theory of dividend policy

The residual theory of dividend policy is that the optimal amount of dividends should be decided as follows.

❑ If a company has capital investment opportunities that will have a positive NPV, it should invest in them because they will add to the value of the company and its shares.

❑ The capital to invest in these projects should be obtained internally (from earnings) if possible.

❑ The amount of dividends paid by a company should be the residual amount of earnings remaining after all these available capital projects have been funded by retained earnings.

❑ In this way, the company will maximise its total value and the market price of its shares.

A practical problem with residual theory is that annual dividends will fluctuate, depending on the availability of worthwhile capital projects. Shareholders will therefore be unable to predict what their dividends will be.

Many companies seek to maintain a set debt-to-equity level and this can lead them to adopt a residual dividend policy. This is because the need maintain the debt to equity ratio affects how much they will raise from debt and how much from equity.

Example: Residual dividend policy

A company generates ₦10,000,000 each year in earnings and wants to maintain a 50% debt-to-equity ratio.

The company needs ₦6,000,000 next year to invest in growth opportunities.

If the company wants to hold the 50% ratio, it would finance the projects with ₦4,000,000 in equity and ₦2,000,000 in debt.

The ₦4,000,000 in equity financing would leave ₦6,000,000 for dividend distribution.

2.4 Hybrid dividend policy

This (as the name suggests) sits somewhere between the residual and stable dividend policies.

Companies in cyclical industries tend to adopt the hybrid policy. Since business economics can fluctuate, they will pay a regular dividend that can be easily maintained, plus an extra dividend if business conditions are good.

2.5 Special dividend

A special dividend is a non-recurring distribution of company assets, usually in the form of cash, to shareholders.

A special dividend might be declared after exceptionally strong company earnings results as a way to distribute the profits directly to shareholders. For example, in 2004, Microsoft announced a $32 billion dividend to its shareholders because it had huge cash balances which were surplus to its investment needs.

Special dividends can also occur when a company wishes to make changes to its financial structure or spin off a subsidiary company to its shareholders.

3 PRACTICAL ISSUES

Section overview

- Practical influences on the dividend decision
- Alternatives to cash dividends
- Dates associated with dividend payments

3.1 Practical influences on the dividend decision

There are several practical limitations and influences on the amount of dividends paid by companies.

Investment opportunities

The amount of earnings a company wishes to retain might be affected by the number of suitable investment opportunities available to the company. If there are few investment projects available which can generate sufficient return then surplus cash should be returned to shareholders. Companies might payout as dividends any surplus cash for which they have no long-term need

Legal constraints

There might be legal restrictions on the maximum dividend payments. Companies can only pay dividends out of accumulated net realised profits. There may also be restrictions imposed by loan agreements to protect lenders.

Liquidity

Retained profit is not the same as retained cash. A company might be highly profitable but still have low levels of surplus cash. The dividends paid must not threaten a company's liquidity and dividends might be limited by the availability of cash.

Other factors which may affect the dividend policy of a firm include:

- dividend policies of similar firms;
- loan redemption obligations;
- taxation; and
- level of inflation.

3.2 Alternatives to cash dividends

There are alternatives to paying cash dividends.

Scrip dividends

A company that wants to retain cash for reinvestment but does not want to reduce its dividends might offer its shareholders a scrip dividend. A scrip dividend is a dividend paid in the form of new shares. Instead of receiving cash, the shareholder receives new shares.

The rules of the stock exchange might require that when a company wants to make a scrip dividend, it must offer a cash dividend alternative, so that shareholders can choose between new shares and cash.

In practice, scrip dividends have not proved popular and they are fairly uncommon.

Share repurchases

Share repurchases were mentioned earlier in chapter 17.

If a company has surplus cash and is over-capitalised, it might decide to repurchase some shares as an alternative to paying out the cash in the form of a higher dividend.

If a company chooses to pay a higher dividend, this might act as a signal to shareholders who then expect high dividends in future years too. If the cash is used for share repurchases instead of higher dividends, future dividend expectations will not be affected.

3.3 Dates associated with dividend payments

Dividend payments could be made once at the end of the financial year (final) or staggered in the course of the year in addition to the one made at the end of the year (interim and final). The following dates are associated with dividend payments:

❑ Declaration date: the date the Board of Directors announces the dividend;

❑ Record date: the date share transfer books are to be closed; and

❑ Payment date: the date dividend cheques are mailed out.

4   CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Explain the different theories of dividend policy
- Explain different approaches to dividend policy
- Identify the practical influences on the payment of a dividend
- Suggest alternatives to the payment of a cash dividend

Financing of projects

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B	Business analysis		
	5	Investment appraisal	
		c	Impact of financing on investment decisions
			Assess the worth of projects using adjusted net present value (ANPV).
C	Financing decisions		
	2	Estimating cost of capital	
		Evaluate and apply:	
		d	Project specific cost of capital; and
		e	Business and financial risk, asset and equity beta.
	3	Capital structure theories	
		a	Assess the traditional view of capital structure and its assumptions.
		b	Evaluate and apply Modigliani and Miller models 1 and 2 on capital structure. (Note: Calculations involving arbitrage not required)
		c	Discuss the limitations of Modigliani and Miller models 1 and 2 on capital structure.
		d	Discuss and evaluate pecking order theory.

Exam context

This chapter explains the different theories of the impact that capital structure has on cost of capital and hence market value. It explains the theories of Modigliani and Miller and continues to show how their ideas impacted the capital asset pricing model, specifically, the link between asset and equity betas. This allows the use of proxy companies to find a beta that reflects the risk appropriate to a project and hence project specific discount rates.

The last section explains the adjusted present value method of project appraisal.

By the end of this chapter, you should be able to:

- Describe gearing theories
- Apply the M and M equations
- Degear and regear betas and hence find project specific discount rates
- Explain and calculate adjusted present values

1 CHOOSING THE METHOD OF FINANCING AN INVESTMENT

<table>
<tr><td>Section overview</td></tr>
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■ Theories about selecting the financing method for an investment
■ Static trade-off theory
■ Pecking order theory
■ Market timing theory
■ Agency effects on capital structure
</td></tr>
</table>

1.1 Theories about selecting the financing method for an investment

Capital investments have to be financed, and management must choose which method of financing they will use. There are different theories about how the method of financing is decided. These include:

❑ Static trade-off theory;

❑ Pecking order theory;

❑ Market timing theory.

There is also a view that the choice of financing method is affected by agency costs.

These differing theories are considered in this section.

1.2 Static trade-off theory

Static trade-off theory argues that for each company there is an optimal capital structure, with an optimal level of gearing.

There is a trade-off between the benefits of taking on more debt and the costs of higher indebtedness.

❑ The benefits of taking on debt (rather than equity) are mainly in the tax relief that is obtained on debt interest. Modigliani and Miller have argued that although the cost of equity rises as gearing increases, the tax relief on debt means that the company's weighted average cost of capital falls as gearing rises. It is therefore beneficial to take in more debt and increase gearing up to the point where the marginal costs of extra debt start to exceed the marginal benefits of extra debt.

❑ The marginal costs of extra debt are related to the greater risks from 'financial distress.' If lenders perceive that a company with high levels of debt could be in financial distress (and in danger of failing to make payments of interest and repayments of loan capital on schedule), it becomes much more difficult to raise extra debt finance. The cost of debt might therefore increase substantially to compensate a lender for the high credit risk.

The optimal gearing level for a company is reached at a point where:

❑ the marginal benefits of taking on additional debt capital

❑ equals the marginal costs of taking on the extra debt.

The optimal gearing level varies between companies, depending on their profitability. A very profitable company can take on higher gearing because the marginal costs of financial distress will not become significant until the gearing level is very high.

For a company with low profitability, the situation is different. These companies provide low returns to their shareholders, and increasing the gearing level by borrowing more would increase the risks of bankruptcy and the cost of borrowing.

Companies with low profits will therefore try to avoid additional borrowing, and they will also be reluctant to incur the costs of making new equity issues. To finance an investment, they will therefore rely on retained profits. They might even decide against investing in a capital project with a positive NPV unless they can finance it with funds from retained profits.

Static trade-off theory summarised

Static trade-off theory therefore states that:

❑ Companies have an optimal level of gearing.

❑ In choosing the method of financing for a new investment, they will try to maintain or achieve the optimal gearing level.

❑ The optimal gearing level is higher for companies with high profits than companies with low profits.

❑ This means that there is a **positive** correlation between profitability and gearing level.

1.3 Pecking order theory

Pecking order theory takes a different view of gearing and methods of financing new investments. It was put forward by Myers in 1984 as a challenge to static trade-off theory.

This theory states that companies show preferences for the source of finance that they use. There is an order of preference or 'pecking order'.

❑ 1st. The source of finance that is preferred most is **retained earnings**.

❑ 2nd. **Debt capital** is the source of finance second in the order of preference.

❑ 3rd. **New equity capital** (an issue of new shares) is the least preferred source of finance for investment.

This means that if a company has an opportunity to invest in a capital project with a positive NPV, it will prefer to fund the project from retained profits. If it is unable to do this, it will look for debt capital to finance the investment. Only if retained profits and debt capital are unavailable (because cash flows are weak and profitability is low) will the company consider a new issue of shares.

Companies are likely to choose a long-term dividend policy that will allow them to finance future investments largely through retained earnings.

The reasons for the pecking order of preferences for sources of finance can be explained by practical considerations.

❑ Using retained earnings is convenient. If a company wants to finance a new investment with equity, it is much simpler and cheaper to use retained earnings than to arrange a new share issue. Retained earnings are also much more convenient than new borrowing.

❑ If a company cannot finance an investment with retained earnings, it will prefer new borrowing to a new issue of shares because borrowing is cheaper. It is cheaper to arrange a loan than to issue new shares. The cost of debt is also less because of the tax relief on interest payments.

Pecking order theory states that the gearing of a company is the result of a series of financing decisions based on these preferences for sources of finance. An optimal level of gearing does not exist, and companies do not try to achieve an optimal gearing level.

Pecking order theory summarised

Pecking order theory therefore states that:

❑ Companies do not have an optimal level of gearing.

❑ In choosing the method of financing for a new investment, they have an order of preference: retained earnings followed by new debt capital followed by an issue of new shares.

❑ Companies with high profits can rely on retained profits as a source of finance more than companies with low profits.

❑ This means that there is a **negative** correlation between profitability and gearing level.

1.4 Market timing theory

Market timing theory states that the choice of financing method for companies can be driven by opportunities in the capital markets. These opportunities occur because of 'asymmetries of information'. These occur when the managers of a company have more information and better information about the company than shareholders and other investors.

Management should know when the future prospects for the company are better than investors are expecting, and when the prospects for the future are worse than investors are expecting. Company management might therefore recognise occasions when the company's shares are currently under-valued or over-valued.

❑ Companies will therefore wish to make a new issue of shares when they consider the share price to be over-valued.

❑ They will consider share repurchases when they consider the share price to be under-valued.

Taking advantage of opportunities in the market to issue new shares or buy back existing shares affects the gearing level. A company therefore does not have a target optimal gearing level. Its financing decisions are determined more by market opportunity and market timing.

1.5 Agency effects on capital structure

Agency theory can be used to explain the capital structure of a company and its choices of financing for new investment. Agency theory, which was developed by Jensen and Meckling (1976), states that the governance of a company is based on conflicts of interest between the company's owners (shareholders), its managers and major providers of debt finance.

Each of these groups has different interests and objectives.

❑ The **shareholders** want to increase their income and wealth. Their interest is with the returns that the company will provide in the form of dividends, and also in the value of their shares. The value of their shares depends on the long-term financial prospects for the company. Shareholders are therefore concerned about dividends, but they are even more concerned about long-term profitability and financial prospects, because these affect the value of their shares.

❑ The **directors and managers** are employed to run the company on behalf of the shareholders. However, if the managers do not own shares in the company, they have no direct interest in future returns for shareholders, or in the value of the shares. Unless they own shares, or unless their remuneration is linked to profits or share values, their main interests are likely to be the size of their remuneration package, and other benefits from their job and position such as their status as company managers.

❑ The **major providers of debt** have an interest in sound financial management by the company's managers, so that the company will be able to pay its debts in full and on time. Major lenders will often be concerned that a company will borrow more because the cost of borrowing is fairly low, and invest the money in high-risk ventures.

These conflicts of interest can have implications for capital gearing and preferences for financing method.

❑ Shareholders might prefer debt finance as a new source of funding. When managers own shares in the company, a new issue of shares might dilute their interest in the company's equity, and other shareholders should want to prevent this from happening. Borrowing to finance growth rather than relying on equity also reduces the amount of free cash for managers to spend on personal interests and benefits.

❑ Providers of debt capital might be worried by the fact that debt capital gives shareholders an incentive to invest in high-risk projects. They might therefore oppose new borrowing by a company when they think that this will put their interest (the security of their investment and returns) at risk.

Jensen and Meckling argued that the 'optimal' capital structure for a company is obtained by trading off not just the marginal benefits and marginal costs of extra debt (as suggested by static trade-off theory) but also by trading off the 'agency costs' of additional debt and the 'agency costs' of additional equity.

2   COST OF CAPITAL AND GEARING

Section overview

- Introduction
- The traditional view of gearing and WACC
- The Modigliani-Miller propositions: ignoring corporate taxation
- The Modigliani-Miller propositions: allowing for corporate taxation

2.1   Introduction

For a given level of annual cash profits before interest and tax, the value of a company (equity + debt) is maximised at the level of gearing where WACC is lowest. This should also be the level of gearing that optimises the wealth of equity shareholders.

The question is therefore how does a change in gearing affect the WACC, and is there a level of gearing where the WACC is minimised?

The most important analysis of gearing and the cost of capital, for the purpose of your examination, is the analysis provided by Modigliani and Miller that allows for tax relief on debt interest.

However, the traditional view of WACC and gearing, and Modigliani and Miller's propositions ignoring tax relief on debt are also described briefly.

## 2.2   The traditional view of gearing and WACC

The traditional view of gearing is that there is an optimum level of gearing for a company. This is the level of gearing at which the WACC is minimised.

❑   As gearing increases, the cost of equity rises. However, as gearing increases, there is a greater proportion of debt capital in the capital structure, and the cost of debt is cheaper than the cost of equity. Up to a certain level of gearing, the effect of having more debt capital has a bigger effect on the WACC than the rising cost of equity, so that the WACC falls as gearing increases.

❑   However, when gearing rises still further, the increase in the cost of equity has a greater effect than the larger proportion of cheap debt capital, and the WACC starts to rise.

The traditional view of gearing is therefore that an optimum level of gearing exists, where WACC is minimised and the value of the company is maximised.

> **Illustration: Traditional view of gearing and the WACC**
>
>
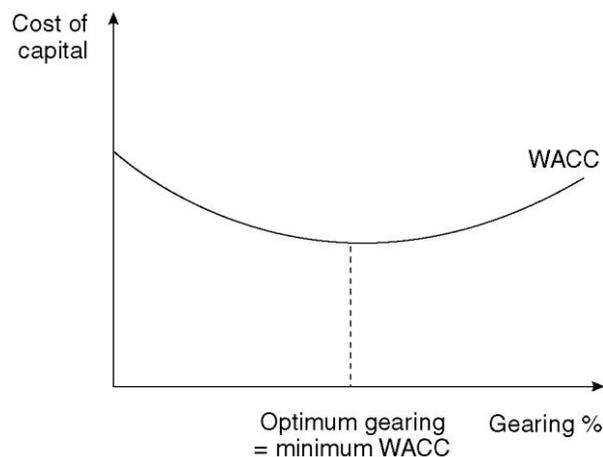
2.3 The Modigliani-Miller propositions: ignoring corporate taxation

Modigliani and Miller sought to explain the real world influences on gearing. Their objective was to build models that would aid financial managers in making decisions about gearing levels.

Their starting point was to construct a model based on a series of simplifying assumptions to see what would be expected in this simple world. The assumptions include the following:

❑ Capital markets are perfect:

- All investors value securities in the same way

- There are no dealing costs

- Perfect information (all participants know and understand any new information the instance it comes into existence)

❑ No taxation

❑ No bankruptcy risk

❑ Investors are indifferent between borrowing themselves or investing in companies that borrow for them.

Remember that they did not say the world was like this. The nature of mathematical modelling is such that the model is constructed to describe a simplified version of what is being studied. Predictions based on the model can then be compared with the real world in an attempt to understand the impact of real world influences. Often, people write that their model was incorrect or was open to criticism but the more accurate statement is that the model does not accurately describe the real world. However, they did not expect it to!

MM (no tax) predictions

You do not need to know Modigliani and Miller's arguments, only the conclusions they reached.

Their model predicted that if corporate taxation is ignored, an increase in gearing will have the following effect:

❑ As the level of gearing increases, there is a greater proportion of cheaper debt capital in the capital structure of the firm.

❑ However, the cost of equity rises as gearing increases.

❑ As gearing increases, the net effect of the greater proportion of cheaper debt and the higher cost of equity is that the WACC remains unchanged.

❑ **The WACC is the same at all levels of financial gearing.**

❑ The total value of the company is therefore the same at all levels of financial gearing

Modigliani and Miller therefore reached the conclusion that in this simple world, the level of gearing is irrelevant for the value of a company. There is no optimum level of gearing that a company should be trying to achieve.

Illustration: Modigliani-Miller view of gearing and the WACC: no taxation
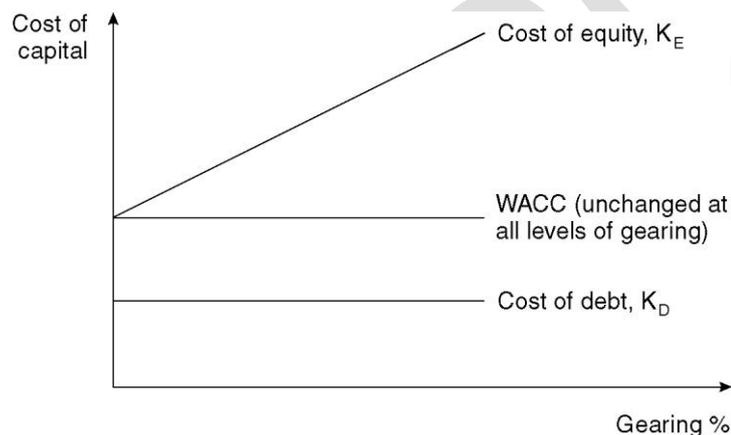

Modigliani and Miller's propositions: (no taxation)

Modigliani and Miller's arguments, ignoring taxation, can be summarised as two propositions.

❑ **Proposition 1**. The WACC is constant at all levels of gearing. For companies with identical annual profits and identical business risk characteristics, their total market value (equity plus debt) will be the same regardless of differences in gearing between the companies.

❑ **Proposition 2**. The cost of equity rises as the gearing increases. The cost of equity will rise to a level such that, given no change in the cost of debt, the WACC remains unchanged.

Modigliani-Miller formulae: ignoring taxation

There are three formulae for the Modigliani and Miller theory, ignoring corporate taxation. These are shown below.
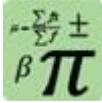
Formula: Modigliani and Miller's propositions: (no taxation)

Proposition 1:

The WACC in a geared company and the WACC in an identical (same size earnings and same risk class) but ungeared (all-equity) company are the same:

$$WACC_G = WACC_U$$

The total value of an ungeared company is equal to the total value of an identical geared company (combined value of equity + debt capital):

$$V_G = V_U$$

Proposition 2

The cost of equity in a geared company is higher than the cost of equity in an ungeared company.

The cost of equity in a geared company is equal to the cost of equity of an ungeared company plus a financial risk premium.

$$K_{EG} = K_{EU} + \frac{D}{E}\left(K_{EU} - K_D\right)$$

Where:

$WACC_G$ = Weighted average cost of capital of a geared company

$WACC_U$ = Weighted average cost of capital of an ungeared company

V_G = Total market value (E + D) of a geared company

V_U = Total market value (E + D) of an ungeared company

E = Market value of equity of the geared company

D = Market value of debt

KEU = Cost of equity of an ungeared company

KEG = = Cost of equity of a geared company

KD = Cost of debt

Example: M and M (no tax)

An all-equity company has a market value of ₦150 million and a cost of equity of 10%. It borrows ₦50 million of debt finance, costing 6%, and uses this to buy back and cancel ₦50 million of equity. Tax relief on debt interest is ignored.

Required

According to Modigliani and Miller, if taxation is ignored, what would be the effect of the higher gearing on

(a)   the WACC;

(b)   the total market value of the company; and

(c)   the cost of equity in the company?

Answer

According to Modigliani and Miller:

(a)   **WACC.** The WACC in the company is unchanged, at 10%.

(b)   **Total value.** The total market value of the company with gearing is identical to the market value of the company when it was all equity, at ₦150 million. This now consists of ₦50 million in debt and ₦100 million equity (₦150 million – ₦50 million of debt)

(c)   **Cost of equity.** The cost of equity in the geared company is

$$10\% + \left[\frac{50}{100} \times (10 - 6) \right]\% = 12.0\%$$

Example: M and M (no tax)

A company has ₦500 million of equity capital and ₦100 million of debt capital, all at current market value. The cost of equity is 14% and the cost of the debt capital is 8%.

The company is planning to raise ₦100 million by issuing new shares. It will use the money to redeem all the debt capital.

Required

According to Modigliani and Miller, if the company issues new equity and redeems all its debt capital, what will be the cost of equity of the company after the debt has been redeemed?

Answer

In the previous example, the Modigliani-Miller formulae were used to calculate a cost of equity in a geared company, given the cost of equity in the company when it is ungeared (all-equity). This example works the other way, from the cost of equity in a geared company to a cost of equity in an ungeared company. The same formulae can be used.

Using the known values for the geared company, we can calculate the cost of equity in the ungeared company after the debt has been redeemed.

$K_{EG} = K_{EU} + D/E [K_{EU} - K_D]$

$14.0 = K_{EU} + 100/500 [K_{EU} - 8.0]$

$1.2 \, K_{EU} = 14.0 + 1.6$

$K_{EU} = \textbf{13.0\%}$ (15.6/1.2).

2.4 The Modigliani-Miller view: allowing for corporate taxation

M and M model without tax leads to the conclusion that gearing is irrelevant. However, this is clearly not true in the real world as many companies are geared. This leads to the question of what is there in the real world which would cause the model to behave differently. One possibility is the existence of corporate taxes. The existence of tax relief on interest reduces the cost of debt and this puts an additional downward pressure on WACC.

Modigliani and Miller revised their model to include corporate taxes.

You do not need to know the arguments they used to reach their conclusions, but you must know what their conclusions were. You should also know and be able to apply the formulae described below.

Their model predicted that if corporate taxation is taken into account, an increase in gearing will have the following effect:

❑ As the level of gearing increases, there is a greater proportion of cheaper debt capital in the capital structure of the firm. However, the cost of equity rises as gearing increases.

❑ As gearing increases, the net effect of the greater proportion of cheaper debt and the higher cost of equity is that the WACC becomes lower. Increases in gearing result in a reduction in the WACC.

❑ The WACC is therefore at its lowest at the highest practicable level of gearing. (There are practical limitations on gearing that stop it from reaching very high levels. For example, lenders will not provide more debt capital except at a much higher cost, due to the high credit risk).

❑ The total value of the company is therefore higher for a geared company than for an identical all-equity company. The value of a company will rise, for a given level of annual cash profits before interest, as its gearing increases.

Modigliani and Miller therefore reached the conclusion that because of tax relief on interest, there is an optimum level of gearing that a company should be trying to achieve. A company should be trying to make its gearing as high as possible, to the maximum practicable level, in order to maximise its value.

Illustration: Modigliani-Miller view of gearing and the WACC: with taxation
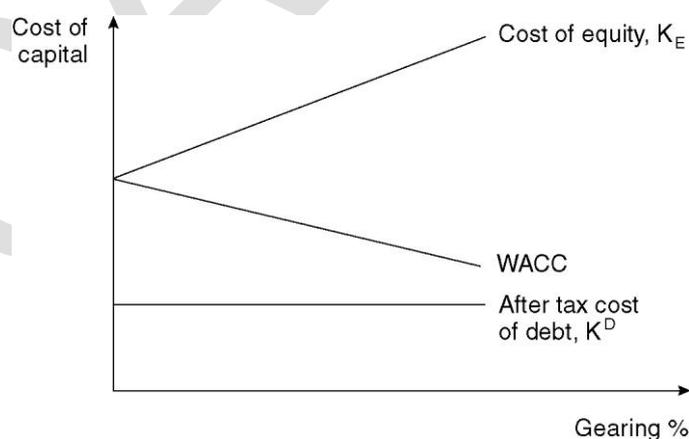
Modigliani and Miller's propositions: allowing for taxation

Modigliani and Miller's arguments, allowing taxation, can be summarised as two propositions.

❑ **Proposition 1**. The WACC falls continually as the level of gearing increases. In theory, the lowest cost of capital is where gearing is 100% and the company is financed entirely by debt. (Modigliani and Miller recognised, however, that 'financial distress' factors have an effect at high levels of gearing, increasing the cost of debt and the WACC.) For companies with identical annual profits and identical business risk characteristics, their total market value (equity plus debt) will be higher for a company with higher gearing.

❑ **Proposition 2**. The cost of equity rises as the gearing increases. There is a positive correlation between the cost of equity and gearing (as measured by the debt/equity ratio).
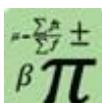
Formula: Modigliani and Miller's propositions: (with taxation)

Proposition 1:

The WACC in a geared company is lower than the WACC in an all-equity company

$$WACC_G = WACC_U \left[1 - \frac{Dt}{(D+E)} \right]$$

The total value of a geared company is greater than the total value of an identical ungeared company:

The total value of a geared company (equity + debt) is equal to the total value of an identical ungeared company plus the value of the 'tax shield'. This is the market value of the debt in the geared company multiplied by the rate of taxation (Dt).

$$V_G = V_U + Dt$$

Proposition 2

(The proposition is the same as without tax but the equation now includes a tax term)

The cost of equity in a geared company is higher than the cost of equity in an ungeared company.

The cost of equity in a geared company is equal to the cost of equity of an ungeared company plus a financial risk premium.

$$K_{EG} = K_{EU} + (1 - t)(K_{EU} - K_D)\frac{D}{E}$$

Where the terms are as given above.

Example: M and M with tax

An all-equity company has a market value of ₦60 million and a cost of equity of 8%. It borrows ₦20 million of debt finance, costing 5%, and uses this to buy back and cancel ₦20 million of equity. The rate of taxation on company profits is 25%.

According to Modigliani and Miller:

(a) **Market value**

The market value of the company after the increase in its gearing will be:

$$V_G = V_U + Dt$$

V_G = ₦60 million + (₦20 million × 0.25) = ₦75 million.

The market value of the debt capital is ₦20 million; therefore the market value of the equity in the geared company is ₦55 million (₦75 million – ₦20 million).

(b) **WACC of the geared company**

The WACC of the company after the increase in its gearing is calculated as follows:

$$WACC_G = WACC_U \left[1 - \frac{Dt}{(D + E)} \right]$$

$$WACC_G = 8\% \left[1 - \frac{(\$20\,million \times 25\%)}{(\$65\,million)} \right] = 8\%(0.9231) = 7.38\%$$

(c) **Cost of equity in the geared company**

$$K_{EG} = K_{EU} + (1 - t)(K_{EU} - K_D)\frac{D}{E}$$

K_EG = 8% + [(1 – 0.25) (8 – 5) 20/45] = 8% + 1% = 9%

Check: the WACC can now be calculated as follows:

Source of finance	Market value	Cost	Market value x Cost
	₦ million	r	MV x r
Equity	45.00	9.00	405
Debt (after-tax cost)	20.00	3.75	75
	65.00		480

$$WACC = \frac{480}{65.00} = 7.38\%$$

3 CHANGE IN GEARING, THE WACC AND CAPITAL INVESTMENT APPRAISAL

Section overview

- Modigliani and Miller with taxation: from one level of gearing to another
- The method
- Relevance for capital investment appraisal

3.1 Modigliani and Miller with taxation: from one level of gearing to another

When a company is considering a major new capital investment project (where the business risk is similar to the risk with the company's other business operations), the method of financing the investment might alter the company's gearing. For example, if a project is financed entirely by new debt capital, its gearing level will increase.

☐ A change in gearing will alter the cost of equity (Modigliani and Miller proposition 2).

☐ There might be a change in the cost of debt, where the gearing level rises to such a high level that 'financial distress' concerns make debt capital more expensive. However, at lower levels of gearing it is assumed that the cost of debt is unaffected by changes in the gearing level.

☐ There will be a reduction in the WACC (Modigliani and Miller proposition 1).

If the project is evaluated using the WACC to estimate the NPV, the new WACC should be used for the NPV evaluation.

This means that when a new capital project will result in a change in gearing, it is necessary to calculate a new WACC before going on to the NPV calculations.

The Modigliani and Miller formulae can be used to do this. The explanation that follows concentrates on the formula for the cost of equity, because this is the formula that you will be given in the examination.

3.2 The method

The approach should be as follows:

☐ **Step 1**. Start with the company at its original level of gearing. You should be given the value of the company (the value of its equity and the value of its debt capital) and the cost of its equity and debt capital.

☐ **Step 2**. Use these values to calculate the value of a comparable ungeared company, and the cost of equity in the ungeared company. Use the Modigliani and Miller formulae to do this. (You now have the cost of equity in a comparable ungeared company).

☐ **Step 3**. Use these values for the ungeared company to work out values for the company at its new level of gearing: total value, value of equity, WACC and cost of equity.

Example: M and M with tax

A company has a total current value of ₦100 million, consisting of ₦80 million equity and ₦20 million of debt capital.

The cost of equity is 10% and the pre-tax cost of the debt capital is 6%.

The rate of tax on company profits is 25%.

The company proposes to borrow an additional ₦20 million of debt capital, and use the money to buy back and cancel ₦20 million of its equity.

Required

According to Modigliani and Miller, what will be the following values for the company at its new level of gearing?

(a)   Its total value, divided into a value for the equity and a value for the debt capital

(b)   Its WACC

(c)   The cost of its equity capital.

This is a long example, but you should work through the solution carefully.

Answer

(a)   **Total value of the company**

    (i)   Step 1: Value of a similar all-equity company.

        We have the current value of the geared company, which is ₦100 million, consisting of ₦80 million equity and ₦20 million debt capital. We can calculate the value of a similar company that is all-equity financed.

$$V_G = V_U + Dt$$

        100 million = VU + (20 million × 0.25)

        VU = 95 million.

    (ii)   Step 2: Value of the company at the new level of gearing.

        The company will be replacing ₦20 million of equity with ₦20 million of debt capital, so in the new gearing structure, debt capital increases.

        The market value of the debt will be ₦20 million + ₦20 million = ₦40 million.

        We can calculate the total value of the company at its new gearing level, using the same MM formula.

$$V_G = V_U + Dt$$

        VG = 95 million + (40 million × 0.25) = 105 million.

        The total value of the company at the new gearing level will be ₦105 million. Of this, ₦40 million will be debt capital; therefore the value of the remaining equity will be ₦65 million.

Answer

(b)   **WACC**

(i) **Step 1: WACC of a similar all-equity company.**

The WACC of the company at its current level of gearing is calculated as follows:

Source of finance	Market value	Cost	Market value x Cost
	₦ million	r	MV x r
Equity	80.00	0.10	8.00
Debt (after-tax cost)	20.00	0.045	0.90
	100.00		8.90

WACC = 8.9/100 = 0.089 or 8.9%.

We can use the MM formula for WACC to calculate what the WACC would be in a similar ungeared company.

The WACC of a similar ungeared company is:

$$0.089 = WACC_U \times \left[1 - \frac{20 \times 0.25}{(20+80)} \right]$$

0.089 = 0.95 WACCU

WACCU = 0.09368

(ii) **Step 2: WACC of the company at the new level of gearing.**

Having established the WACC in an all-equity company, we can now use the same formula to calculate the WACC in the company at its new level of gearing, with ₦40 million debt and ₦65 million of equity.

(The value of equity and debt capital at the new level of gearing were calculated in (a)).

$$WACC_G = 0.09368 \times \left[1 - \frac{40 \times 0.25}{(40+65)} \right]$$

WACCG = 0.09368 × 0.90476

WACCG = 0.085 = 8.5%.

Answer

(c) **Cost of equity**

(i) **Step 1: Cost of equity of a similar all-equity company.**

A similar approach is taken for calculating the cost of equity. We start by calculating the cost of equity in a similar all-equity company, using the MM formula for Proposition 2. We know the value of KEG and we need to calculate a value for KEU.

In the original geared company, the value of equity is ₦80 million and the value of debt capital is ₦20 million.

The cost of equity in a similar all-equity company is calculated as follows:

$$K_{EG} = K_{EU} + (1-t)(K_{EU} - K_D)\frac{D}{E}$$

10 = KEU + [(1 – 0.25) (KEU – 6) 20/80]

10 = KEU + 0.1875 KEU – 1.125

1.1875 KEU = 11.125

KEU = 9.3684.

(ii) **Step 2: Cost of equity of the company at the new level of gearing.**

Having calculated the cost of equity in a similar all-equity company, we can now calculate the cost of equity in the company at its new level of gearing. Debt capital is ₦40 million and equity is ₦65 million.

(The value of equity and debt capital at the new level of gearing were calculated in (a).)

$$K_{EG} = K_{EU} + (1-t)(K_{EU} - K_D)\frac{D}{E}$$

KEG = 9.3684 + (1 – 0.25) (9.3684 – 6) 40/65

KEG = 9.3684 + 1.5546 = 10.923, say 10.9%.

3.3 Relevance for capital investment appraisal

The Modigliani and Miler formulae can be used to re-calculate the cost of equity and the WACC in a company where the level of gearing changes, provided there is no change in the overall business risk and the company is therefore similar in all respects except for its gearing.

When a company plans a new capital investment that will alter its gearing, without affecting its business risk profile, the MM formulae can be used to calculate the cost of equity and WACC at the new level of gearing. The new WACC can then be used as the discount rate for calculating the NPV of the proposed project.

Study the following example carefully.

Example: M and M with tax

A US company has a current total market value of ₦12 billion, consisting of ₦10 billion of equity and ₦2 billion of debt capital. The debt capital will mature in four years' time. The current weighted average cost of capital is 6.5%.

The company is considering a new investment costing ₦3 billion, which it would finance entirely by ₦3 billion of new ten-year bonds.

The yield curve for US government bonds (Treasuries) shows that the risk-free cost of four-year debt is 4% and the risk-free cost of ten-year debt is 4.25%. The credit rating on the company's current debt capital is AA, but if the new bond issue takes place there is a 75% probability that all the company's debt will be re-rated to AA- and a 25% probability that all the company's debt will be re-rated to A+. (This applies to both the existing debt and the new bonds.)

The spreads for yields on corporate bonds above the US Treasuries yield curve are as follows:

Credit rating	Spreads (basis points)	
	4-year bonds	10-year bonds
AA	30	50
AA -	40	60
A +	45	70

The rate of taxation on company profits is 30%

Required

Calculate the weighted average cost of capital in the company if the project goes ahead and is financed entirely by ten-year bonds. Assume that there will be no change in the company's business risk.

Answer

Total value of the company

In the previous example, it was possible to re-calculate the total value of the company using the Modigliani and Miller formula $V_G = V_U + Dt$.

In this example, this is not possible, because the company is raising additional debt capital. The MM formula applies only when the size of the company is unchanged, and equity replaces debt or debt replaces equity. The formula cannot be used when additional debt capital is raised.

An assumption will therefore be made (even though it is unsatisfactory) that when the company obtains its additional debt capital of ₦3 billion, the value of the equity will be unchanged at ₦10 billion.

Preliminary workings

We need to calculate the current cost of equity in the company, in order to use the MM formula for Proposition 2. We know the current WACC which is 6.5%. We also know that the current credit rating for the four-year debt capital is AA, which means that the pre-tax cost of debt is the risk-free yield of 4.00% plus a spread of 30 basis points. The pre-tax cost of debt is therefore 4.30% and the after-tax cost of debt is 4.30% (1 – 0.30) = 3.01%.

We now have enough data to calculate the current cost of equity.

The WACC, which is 6.5%, is calculated as follows:

Source of finance	Market value	Cost	Market value × Cost
	₦ billion	%	MV × r
Equity	10.0	r	10r
Debt	2.0	3.01	6.02
	12.0		10r + 6.02

WACC = 6.5% = $\dfrac{10r + 6.02}{12}$ %

6.5 (12) = 10r + 6.02

10r = 71.98

r = 7.198%

The current cost of equity is 7.198%.

We also need to calculate the cost of debt in the company after the new bond issue.

	If AA -		If A +	
	4 year	10 year	4 year	10 year
Risk-free	4.00	4.25	4.00	4.25
Spread	0.40	0.60	0.45	0.70
Pre-tax cost	4.40	4.85	4.45	4.95

Answer

We can calculate a weighted average pre-tax cost of the debt capital, as follows:

	Market value	AA -		A +	
	₦bn	Cost	Cost × MV	Cost	Cost × MV
4 year	2	4.40	8.80	4.45	8.90
10 year	3	4.85	14.55	4.95	14.85
	5		23.35		23.75

Weighted average before-tax cost of debt if credit rating is AA - = 23.35/5 = 4.67%.

Weighted average before-tax cost of debt if credit rating is A + = 23.75/5 = 4.75%.

Expected weighted average before tax cost of debt = (0.75 × 4.67) + (0.25 × 4.75)% = 4.69%.

Expected weighted average after-tax cost of debt = 4.69% (1 – 0.30) = 3.283%.

Calculate the cost of equity in the company after the new bond issue

Step 1. Calculate the cost of equity in an ungeared company at the current level of gearing. We know that the current cost of equity at the current level of gearing is 7.198%.

$$K_{EG} = K_{EU} + (1 - t)(K_{EU} - K_D)\frac{D}{E}$$

7.198 = KEU + [(1 – 0.30) (KEU – 4.30) 2/10]

7.198 = KEU + 0.14 KEU – 0.602

1.14 KEU = 7.8

KEU = 6.842.

Step 2. Calculate the cost of equity in the company at the new level of gearing, making the assumption about market value discussed above, but assuming no change in the cost of debt. (Changing the cost of debt in this calculation would produce an incorrect valuation for the cost of equity.)

$$K_{EG} = K_{EU} + (1 - t)(K_{EU} - K_D)\frac{D}{E}$$

KEG = 6.842 + 0.890 = 7.732.

Calculate the WACC at the new level of gearing

Source of finance	Market value	Cost	Market value × Cost
	₦ billion	%	MV × r
Equity	10.0	7.732	77.320
Debt (weighted average)	5.0	3.283	16.415
	15.0		93.735

WACC = 93.735/15 = 6.249, say 6.25%.

A discount rate of 6.25% should be used to calculate the NPV of the proposed new capital investment.

4 ASSET AND EQUITY BETA FACTORS

Section overview

- Asset betas, equity betas and debt betas
- Using the asset beta formula
- Project-specific discount rates
- Changing from one level of gearing to another
- Estimating an equity beta factor for a private company

4.1 Asset betas, equity betas and debt betas

Modigliani and Miller's theories are used to demonstrate that as the level of gearing in a company increases, assuming no change in business risk, the cost of equity also increases. This also means that as gearing increases, the beta factor of the company's equity must also increase, since there is no change in the risk-free rate of return or the returns on the market portfolio.

Companies that are otherwise identical except for their level of gearing will therefore have different equity beta factors and hence different costs of equity.

Similarly, if a company changes its gearing level without changing its business risk profile, there will be a change in its cost of equity and equity beta factor.

Asset beta

When a company has no debt capital and is ungeared, its beta factor reflects the business risk of its business operations. The beta factor is higher for ungeared companies with higher business risk.

The beta factor for a company's business operations is called its asset beta.

If the company continues with the same business operations, its business risk will not change and its asset beta remains constant.

An asset beta is the beta factor that would be applied to a company's assets if financing risk is removed from the calculation. It is therefore a beta factor that applies to entire companies or individual projects. It provides a measure of the underlying business risk faced by the entire firm regardless of its financing structure.

An asset beta is sometimes called unlevered beta or ungeared beta, and could be described as the beta of equity in a company that is totally equity-financed.

Equity beta and debt beta

When a company takes on debt capital and its gearing increases, there is financial risk as well as business risk. The cost of equity increases to compensate equity investors for the financial risk. The 'equity beta' a company is the beta factor of its equity capital, that allows for both business risk and financial risk.

- ❑ The equity beta in an ungeared company is lower than the equity beta in a geared company because there is no financial risk in an ungeared company.

- ❑ The equity beta in an ungeared company is equal to the asset beta: it allows for business risk only, with no financial risk.

- ❑ The equity beta in a geared company (known as its geared beta) is therefore higher than the company's asset beta (known as its ungeared beta.

Debt capital also has a beta factor (a 'debt beta'), although this is much lower than the equity beta.

There is a formula for the relationship between a company's asset beta, equity beta and debt beta.
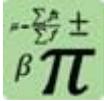
Formula: Asset beta, equity beta and debt beta

$$\beta_A = \beta_{EG} \times \frac{E}{E + D(1-t)} + \beta_D \times \frac{D(1-t)}{E + D(1-t)}$$

Where:

β_A = the company's asset beta: this is the same as the equity beta for an ungeared (all-equity) company

β_{EG} = the beta factor of equity in the company: if the company has debt capital, this 'equity beta' is the 'geared beta' for the company's equity capital

β_D = the beta factor for the debt capital in the company

D = the market value of debt in the company

E = the market value of equity in the company

Assumption that the debt beta is 0

It is often assumed that the beta factor of debt capital in a company is very small and it is therefore possible to assume that is actually 0. In other words, it is often assumed that a company's debt capital is risk-free.

If it is assumed that corporate debt is risk-free, this formula simplifies to:
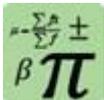
Formula: Asset beta and equity beta

$$\beta_A = \beta_{EG} \times \frac{E}{E + D(1-t)}$$

This formula can be used to **gear** and **ungear** betas when necessary.

Note that if the company is ungeared and is all-equity financed, the asset beta and the equity beta are the same, because D = 0.

Example: Asset beta and equity beta

Plassid Company has an equity beta of 1.25. The beta factor of its debt capital is 0.05.

The total market value of the shares of Plassid is ₦600 million and the total market value of its debt capital is ₦200 million. The rate of corporate taxation is 30%.

Required:

(a)   Calculate the asset beta of the company.

(b)   Re-calculate the asset beta of Plassid assuming that the debt capital is risk-free.

Answer

(a) $$\beta_A = 1.25 \times \frac{600}{600 + 200(1 - 0.30)} + 0.05 \times \frac{200(1 - 0.30)}{600 + 200(1 - 0.30)}$$

= (1.25 × 600/740) + 0.05 × 140/740)

= 1.0135 + 0.0095 = 1.023

(b)   If the debt capital is risk-free, the asset beta is 1.0135 (see workings above).

It is often assumed that debt capital is risk-free because the estimate of the asset beta is not affected significantly by this simplifying assumption.

Practice questions   **1**

A company is all-equity financed, and its equity beta factor is 1.05. Its total market value is ₦240 million. This includes debt capital with a market value of ₦80 million.

It is assumed that the debt capital is risk-free. The rate of tax is 30%.

Required

Calculate the asset beta for the company.

4.2 Using the asset beta formula

The asset beta formula might be used in the following circumstances:

❑ To estimate project specific discount rates:

- The asset beta is a beta factor that reflects the business risk of a particular business operation. It can be used to estimate a cost of equity capital for a specific capital investment project and so a project specific discount rate for use

- to estimate the beta factor for a capital investment project (a project beta), where the gearing will be different from the company's current capital structure

❑ When a company uses the CAPM to estimate a cost of equity and WACC, in a situation where a capital expenditure project will change the gearing of the company

❑ In order to estimate a cost of equity in a private company by comparing it with a similar public company.

4.3 Project-specific discount rates

The CAPM can be applied to capital expenditure appraisal. The cost of capital for a project can be determined according to the risk of the project. If the beta factor for a project can be determined, the CAPM can then be used to decide what the cost of capital for the project should be, allowing for its beta and systematic risk.

In addition, adjustments can be made for differences in gearing.Need for project specific discount rates

A specific discount rate should be used for DCF appraisal of capital projects where either:

❑ The business risk of the new project is different from the business risk of the company's other business operations, or

❑ The financial risk will be different because financing the project will involve a major change in the company's capital structure.

Proxy companies

To calculate a suitable cost of capital to use in DCF analysis for a specific project where business risk is different from the company's normal business operations, the first step is to estimate the business risk.

The business risk of a business operation or capital investment project can be measured by the asset beta for that type of business.

An estimate of the asset beta can be obtained from the beta factors of quoted companies that operate in the same industry and markets. For example if a house-building company is considering a project to construct a new road bridge, for which the business risk will be very different, it can estimate an asset beta for a bridge-building project by obtaining the beta factors of quoted companies in the bridge-building industry.

These companies that operate in the relevant industry and markets are called 'proxy companies' and the beta factors of their shares are called 'proxy equity betas'.

It is assumed that the business risk within the proxy equity betas of these proxy companies is similar to the business risk in the new capital investment project that the company is considering.

Estimating asset beta from proxy equity beta (de-gearing the asset beta)

For each of the proxy companies selected, an asset beta can be calculated using the asset beta formula. In your examination you might be told to assume that debt capital in the proxy companies is risk-free; therefore the asset beta for each company can be calculated using the formula:
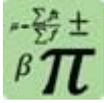
Formula: Asset beta and equity beta

$$\beta_A = \beta_{EG} \times \frac{E}{E + D(1 - t)}$$

You have seen this earlier. It is repeated here for your convenience.

The asset betas for the proxy companies will not be exactly the same, but they should be similar.

An asset beta for the capital investment project might therefore be estimated as the average of the asset betas of the proxy companies.

Example: Averaging asset betas

Three proxy companies have been selected with asset betas of 1.14, 1.20 and 1.22

An estimate of a suitable asset beta would be (1.14 + 1.20 + 1.23)/3 = 1.19.

Asset betas might also be averaged using the market values of the companies to which they belong as a weighting factor.

Using an asset beta to calculate an equity beta (re–gearing the asset beta)

An asset beta measures business risk but not financial risk. If a company is geared, or intends to finance a project with a mixture of equity and debt capital, the equity beta for the project will be higher than the asset beta.

The asset beta should therefore be re-geared, and converted into an equity beta, using the asset beta formula and data about the capital structure of the company.

Having calculated an equity beta, the CAPM can be used to calculate a cost of equity for the project.

❑ This cost of equity can then be used to calculate a weighted average cost of capital for the project, allowing for the capital structure of the company.

❑ Alternatively, an examination question might instruct you to assume that the project-specific cost of equity you calculate should be used as the discount rate (cost of capital) for capital investment appraisal of the project.

Summary of the steps for calculating a project-specific discount rate

The steps for calculating a project-specific discount rate for a project with different business risk can be summarised as follows.

1   Identify a proxy company.

2   Obtain the available market data about its capital structure and beta factors.

3   Use the formula to de-gear the equity beta to find the asset beta (which reflects the business risk of the proxy company).

4   If the project is all equity financed use this asset beta to calculate a discount rate using the CAPM equation.

5   If the project is not all equity financed convert this asset beta into a 'geared equity' beta for the project/company, using available data about its capital structure. The normal assumption is that the debt capital of the company is risk-free.

6   This geared equity beta should be used to calculate a cost of equity for the project, using the CAPM.

7   Use this cost of equity in the calculation of a weighted average cost of capital for the project.

Example: Degearing proxy betas

An all-equity company operates in an industry where its beta factor is 0.90. It is considering whether to invest in a completely different industry.

In this other industry, the average debt/equity ratio is 40% and the average beta factor is 1.25.

The risk-free rate of return is 4% and the average market return is 7%. If the company does invest in this other industry, it will remain all-equity financed. The rate of taxation is 30%. Assume that debt is risk-free.

Required

What cost of capital should be used to evaluate the proposed investment?

Answer

The appropriate discount rate should be one that applies to the industry in which the investment will be made. We know that the 'geared beta' in this industry is 1.25, with a debt: equity ratio of 40:60. We can calculate the asset beta for the industry as:

$$\beta_A = 1.25 \times \frac{60}{[60 + 40(1 - 0.30)]} = 1.25 \times \frac{60}{88} = 0.85$$

Since the company will be all-equity financed, the cost of equity to apply to the project is therefore:

4% + 0.85 (7 – 4)% = 6.55%.

Practice questions   2

An all-equity company operates in an industry where its beta factor is 0.90. It is considering whether to invest in a completely different industry. In this other industry, the average debt/equity ratio is 40:60 and the average beta factor is 1.25. The risk-free rate of return is 4% and the average market

return is 7%. If the company does invest in this other industry, it will remain all-equity financed. The rate of taxation is 30%. Assume that debt is risk-free.

Required

What cost of capital should be used to evaluate the proposed investment?

Practice question 3

A company is planning to invest in a project in a new industry where it has not invested before. The asset beta for the project has been estimated as 1.35. The project will be financed two-thirds by equity capital and one-third by debt capital. The rate of taxation on company profits is 30%.

Assume that the debt capital is risk-free.

The risk-free rate of return is 3% and the market return is 8%.

What cost of equity should be used to calculate the marginal cost of capital for this project?

Practice question 4

A company is considering whether to invest in a new capital project where the business risk will be significantly different from its normal business operations. The company is financed 80% by equity capital and 20% by debt capital.

It has identified three companies in the same industry as the proposed capital investment and has obtained the following information about them:

(1)   Company 1 has an equity beta of 1.05 and is financed 30% by debt capital and 70% by equity.

(2)   Company 2 has an equity beta of 1.24 and is financed 50% by debt capital and 50% by equity.

(3)   Company 3 has an equity beta of 1.15 and is financed 40% by debt capital and 60% by equity.

The risk-free rate of return is 5% and the market rate of return is 8%. Tax on company profits is at the rate of 30%. Assume that the debt capital in each company is risk-free.

Required:

Calculate a project-specific discount rate for the project, assuming that this is:

(a)   the project-specific cost of equity for the project, or

(b)   the weighted average of the project-specific equity cost and the company's cost of debt capital.

Summary: using the CAPM to obtain a project-specific discount rate

The WACC is often used as the cost of capital in capital expenditure appraisal because it is assumed that individual projects will not significantly affect the WACC. The WACC is therefore an acceptable measure of the marginal cost of capital.

A different situation arises when a new project will significantly affect the capital gearing or have significantly different business risk. In these cases, an appropriate cost of equity capital can be estimated using the asset beta formula, and assuming a

risk-free cost of debt capital. The CAPM can therefore be used to obtain a project-specific discount rate.

4.4 Changing from one level of gearing to another

A company might be planning a capital investment that will alter its level of gearing. In these cases, to work out the equity beta factor and cost of equity at the new level of gearing, it is necessary to calculate the asset beta first (the beta for a similar ungeared company).

To calculate a cost of equity using the CAPM, where the level of gearing changes, we can calculate the asset beta and then convert this asset beta to an equity beta on the basis of the new expected level of gearing.

The approach should be as follows:

❑ Start with the company at its original level of gearing. You should be given the value of the company (the value of its equity and the value of its debt capital) and the cost of its equity and debt capital, and the equity beta factor.

❑ You may assume, unless instructed otherwise, that the debt capital in the company is risk-free, and the simplified version of the asset beta formula can be used.

❑ Having calculated the asset beta, you can calculate a new equity beta for the company at its new level of gearing, using the same formula.

Example: Changing from one level of gearing to another

A company has a total current value of ₦80 million, consisting of ₦60 million equity and ₦20 million of debt capital. The cost of equity is 12% and the pre-tax cost of the debt capital is 7%. The rate of tax on company profits is 30%. The equity beta factor is 0.925. The debt capital is risk-free. The return on the market portfolio is 13.67%.

Required

What will be the equity beta factor and the cost of equity in the company, if the company issues new equity to raise ₦10 million and uses this money to repay ₦10 million of debt?

Answer

The equity beta of the company at its current level of gearing is 0.925.

The asset beta of the company (the equity beta of a similar ungeared company) will be:

$$\beta_A = \beta_{EG} \times \frac{E}{E + D(1 - t)}$$

βA = 0.925 × 60/[60 + 20 (1 – 0.30)]

βA = 0.925 × 60/74

βA = 0.75

We can calculate the total value of the company if it is ungeared, using the data for the company at its current gearing level.

Total value of an all-equity company:

VG = VU + Dt

₦80 million = VU + (₦20 million × 0.30)

VU = ₦74 million.

At the new level of gearing, the market value of the debt capital will be ₦10 million (₦20 million minus ₦10 million redeemed). We can calculate the total value of the company at the new gearing level, using the value of the company if it is ungeared.

VG = VU + Dt

VG = ₦74 million + (₦10 million × 0.30)

VG = ₦77 million.

Of this total value, ₦10 million is debt capital; therefore the value of the equity is ₦67 million.

We now have the information to calculate a beta factor for the equity at the new level of gearing. The asset beta was calculated earlier, and is 0.75.

$$\beta_A = \beta_{EG} \times \frac{E}{E + D(1 - t)}$$

$$0.75 = \beta_{EG} \times \frac{67}{67 + 10(1 - 0.30)}$$

0.9054 βEG = 0.75

βEU = 0.828, say 0.83.

Using the CAPM, we can calculate the cost of equity at the new gearing level as:

7% + 0.83 (13.67 – 7.0) = 12.5361, say 12.5%.

4.5 Estimating an equity beta factor for a private company

The asset beta formula can also be used to estimate the equity beta for a private company (and its cost of equity) where the private company is comparable in size, business mix and business risk to a public company whose shares are traded on a stock market.

Data for the public company can be used to estimate an asset beta, and the asset beta can then be applied to the private company to obtain an equity beta for the private company.

Since there is no market data for the private company, an assumption has to be made that accounting book b=values in the balance sheet are a reasonable approximation to market values, and the calculations use book values for equity and debt rather than market values.

Example: Estimating an equity beta factor for a private company

An investor is interested in acquiring Greenco, which is a private company with net assets of ₦240 million and debt capital of ₦160 million in its balance sheet.

Greenco can be compared to a public company Redco, which operates in the same industry and has a similar business mix and business risk. The following information is available about Redco:

Market value of equity	₦450 million
Equity beta	1.60
Debt capital	Risk-free (debt capital beta = 0)
Price to book value of equity	1.50 times
Gearing (total debt to equity value)	1.25

The rate of tax on profits is 30%. The risk-free rate of interest is 5% and the equity risk premium is 3%.

Required

Use this information to estimate a cost of equity in Greenco.

Answer

Greenco is a private company and estimating a cost of equity has to be based on a comparison with the similar public company, Redco.

The asset beta formula uses market values for debt and equity. Although we have these market values for Redco, we do not have them for Greenco. An assumption should therefore be that book values are a reasonable approximation for market values, and book values will be used in the calculations.

It is also assumed that debt in Greenco is risk-free.

Taking data about Redco and book values rather than market values, we can estimate an asset beta for Redco and then assume that the same asset beta applies to Greenco.

Market value of Redco equity = ₦450 million

Price to book value of equity = 1.5

Book value of equity = ₦450 million/1.5 = ₦300 million

Debt: equity ratio = 1.25 times

Book value of debt = ₦300 million × 1.25 = ₦450 million

$$\beta_A = 1.60 \times \frac{300}{300 + 450\,(1 - 0.30)}$$

βA = 1.60 × 0.4878 = 0.78

This asset beta can be used to estimate an equity beta for Greenco:

$$0.78 = \beta_{EG} \times \frac{240}{240 + 160\,(1 - 0.30)}$$

0.6818 βEG = 0.78

βEG = 1.14

The CAPM can now be used to estimate a cost of equity in Greenco:

KE = 5% + 1.14 (3%)

KE = 8.42%

Reasons why projects have different risks

We conclude this section by looking at why projects (even within a division) can have different risks.

There are two broad reasons why projects have different risks:

- different revenue sensitivity; and
- different operating gearing.

Revenue Sensitivity

The sales revenue generated by a new project may vary with changes in economic activity to a greater or lesser degree than existing sales.

For example, we may expect that, for a 10% rise in GDP, overall retail sales of a particular division increases by 7% whereas the sales of the new product may rise by 9%.

This magnifying effect is measured by the **revenue sensitivity factor** (RSF). The RSF is calculated as follows:

$$\text{RSF} = \frac{\text{sensitivity of project sales to economic changes}}{\text{sensitivity of divisional sales to economic changes}} = \frac{9\%}{7\%} = 1.29$$

Thus, RSF of a project reflects the sensitivity of the sales revenue from the investment project to variations in levels of economic activity, and the extent to which this differs from that of other activities within the division (or the company as a whole).

Operating gearing

The second source of additional project risk lies in the extent to which the project cost structure comprises fixed charges, i.e. **operating gearing**. The higher the proportion of fixed costs in the cost structure, the greater the impact of a change in economic conditions on the net cash flow of the project, thus magnifying the revenue sensitivity effect. Again, the individual project may exhibit a degree of operating gearing different from that of the division as a whole.

To illustrate the impact of operating gearing, consider the figures in the table below, where a firm applies a 50% mark-up on variable cost.

The effect of operating gearing			
Sales	Variable costs	Fixed costs	Net cash flow
₦900	₦600	₦50	₦250
₦600	₦400	₦50	₦250

In this example, an increase in sales revenue of 50% will lead to an increase in net cash flow of 67% because of the gearing effect. There is thus a magnifying of 1.34(67/50). This is called the project gearing factor (PGF) and may differ from the gearing factor(s) found elsewhere in the division.

To measure the relative level of gearing, the **operating gearing factor** (OGF) is used. This is defined as:

$$OGF = \frac{\text{project gearing factor}}{\text{divisional gearing factor}}$$

The second step in assessing the project discount rate brings together these two sources of project risk into a project risk factor (PRF).

The project risk factor is simply the compound of the revenue sensitivity factor and the operating gearing factor.

Project risk factor = RSF × OGF

In our example, this is equal to (1.29 × 1.34) = 1.73. In this case, the project is considerably more risky than the 'average' project within the division and merits the application of a higher Beta. Based on the Tomkins food division Beta, this is given by:

Project Beta = (1.73 × 0.65) = 1.12

This beta can now be inputted into the standard CAPM equation to compute the project's risk-adjusted required return.

We now round up this section with a comprehensive example.

Example

Opeyemi Plc (OP) is a diversified company with three operating divisions – Lagos, Kano and Aba. The operating characteristics of Lagos are 50% more risky than Kano; while Aba is 25% less risky than Kano. In terms of financial valuation, Kano is thought to have a market value twice that of Lagos, which has the same market value as Aba. OP is all – equity – financed. With a beta of 1.06. Market return is 25%, with a standard deviation of 16%. Risk-free rate is 10%.

Recently, Kano has been underperforming and OP's management plans to sell it and use the entire proceeds to purchase Zinco Ltd, an unquoted company. Zinco Ltd is all - equity- financed and OP's financial strategists reckon that while Zinco is operating in broadly similar markets and industries as Kano, Zinco has a revenue sensitivity of 1.4 times that of Kano, and an operating gearing ratio of 1.6 compared to the current operating gearing in Kano of 2.0.

Assume no synergistic benefits from the divestment and acquisition. You may ignore taxation.

Required:
a) Calculate the asset betas for the Lagos, Kano and Aba divisions of OP. Specify any assumptions which you make.
b) Calculate the asset beta for Zinco.
c) Calculate the asset beta for OP after the divestment and acquisition
d) What discount rate should be applied to any investment projects in Zinco division?

Solution
a) Since the asset beta is a weighted average of the component segment betas:

$$\beta_A = \left(\frac{1}{4} \times \beta_L\right) + \left(\frac{1}{4} \times \beta_A\right) + \left(\frac{1}{2} \times \beta_K\right) = 1.06, where$$

$\beta_L = beta\ of\ Lagos$
$\beta_A = beta\ of\ Aba$
$\beta_K = beta\ of\ Kano$

Since Lagos is 50% more risky than Kano, and Aba is 25% less risky than Kano, it follows that:

$$\frac{(1.5\beta_K)}{4} \times \frac{(0.75\beta_K)}{4} \times \frac{\beta_K}{2} = 1.06$$

When $\beta_K = 1, \beta_L = 1.50, \beta_A = 0.75$

b) The asset beta for Zinco (β_Z) is
$\beta_Z = \beta_K \times relative\ risk\ factor$
$\quad = \beta_K \times RSF \times OGF$
$\quad = 1.0 \times 1.4 \times 1.6/2.0 = 1.12$

c) The asset beta for OP after the divestment and acquisition is again a weighted average of the component asset betas:

$$Asset\ beta = \left(\frac{1}{2} \times \beta_Z\right) + \left(\frac{1}{4} \times \beta_A\right) + \left(\frac{1}{4} \times \beta_L\right)$$

$$= \left(\frac{1}{2} \times 1.12\right) + \left(\frac{1}{4} \times 0.75\right) + \left(\frac{1}{4} \times 1.5\right) = 1.12$$

d) If we evaluate projects in Zinco on the assumption of all - equity financing, the cut – off rate is
$R_f + \beta_z(R_m - R_f) = 10 + 1.12\ (25 - 10) = 26.8\%$

Weaknesses with this method

Using the asset beta formula to estimate a cost of equity in a private company, using data from a comparable public company, has some weaknesses and limitations.

❑ It is assumed that book values are a reasonable approximation for market values, but this assumption is questionable.

❑ It is assumed that the business risk faced by both companies is the same, which might not be true.

❑ It is assumed that the cost of debt and equity in the private company is not affected by factors such as greater default risk, its private company status, and its smaller size. This assumption is also questionable.

5 ADJUSTED PRESENT VALUE METHOD (APV METHOD) OF PROJECT APPRAISAL

Section overview

- Introduction to the APV method
- The decision rule for the APV method
- Base case NPV
- PV of other costs
- Present value of the tax shield (PV of the tax relief on interest costs)
- Summary of the APV method
- Reasons for using the APV method
- Comparison of NPV and APV methods

5.1 Introduction to the APV method

The most common method for a company to evaluate a proposed capital expenditure project is to discount the expected future cash flows of the project at the WACC. Where appropriate, the cost of equity and WACC may be adjusted to allow for the different systematic risk characteristics of the project.

An alternative approach to capital investment appraisal is the adjusted present value (APV) method.

The APV method may be used when a business entity is considering an investment in a project that will have **different business risks** and **different financial risks** from its current operations. For example, a business entity might wish to evaluate an investment in a different industry or a different market, and raise new capital to finance the investment.

The APV method is an alternative to calculating a new cost of equity and a new WACC, for example using the Modigliani-Miller formulae or the asset beta formula.

5.2 The decision rule for the APV method

A project is financially viable and should be undertaken if its adjusted present value (APV) is positive. The APV of a project contains three elements, and is calculated as follows:

Illustration: Adjusted present value

	₦
Base case NPV	X
minus: PV of other costs	(X)
plus: PV of tax relief on interest	X
Adjusted present value (APV)	X

To calculate the NPV of a project, we must therefore calculate three amounts: the base case NPV, the PV of other costs and the PV of tax relief on interest.

5.3 Base case NPV

The approach with the APV method is to calculate an NPV ignoring entirely the way in which the project will be financed. The cost of capital should therefore be calculated

using an asset beta that is typical for the industry or type of business in which the investment will be made. Having estimated an appropriate asset beta, a cost of equity (cost of equity in an ungeared company) can be calculated using the CAPM, and this is the discount rate.

The base case NPV is therefore calculated assuming the project is financed entirely by equity, so that the method of financing is ignored.

It is therefore necessary to calculate the cost of equity in an all-equity company in the same industry or the market in which the capital investment will be made. To do this:

❑ convert a geared beta for the industry to an asset beta (ungeared beta) for the industry, and then

❑ use this asset beta (ungeared beta) and the CAPM to establish the cost of equity in an ungeared company.

Normal DCF techniques are used to establish the expected cash flows for the project. Having established a cost of equity for an ungeared company, the expected project cash flows are discounted at this cost of equity to obtain the base case NPV.

Example: Base case NPV

A company operating in the insurance industry is considering whether to diversify by investing in a project in the transport industry.

The company has a gearing ratio of 30% debt and 70% equity, and its equity beta is 0.940. Its debt capital is risk-free.

The transport industry has an average equity beta of 1.362, and firms in the transport industry on average have a gearing ratio of 40% debt to 60% equity.

The risk-free rate of return is 5.3% and the expected market return is 8.3%.

The rate of taxation on profits is 23%.

The cash flows of the project after tax will be:

Year 0	₦(600,000)
Years 1–3	₦250,000

Required

Calculate the base case NPV.

The all-equity beta for the transport industry is calculated by un-gearing the equity beta for the transport industry.

$$\beta_A = 1.362 \times \frac{60}{60 + 40\,(1\text{-}0.23)} = 0.90.$$

This is input to the CAPM equation to calculate the cost of an all-equity financed company in the transport industry:

$$5.3\% + 0.90\,(8.3\% \text{-} 5.3\%) = 8.0\%.$$

This cost of capital is used to discount the project cash flows, to obtain the base case NPV.

Year	Cash flow	Discount factor at 8%	PV
	₦		₦
0	(600,000)	1.000	(600,000)
1 – 3	250,000	2.577	644,250
Base case NPV			+ 44,250

5.4 PV of other costs

Other costs are the costs arising as a consequence of the project, but not directly related to the project cash flows. Typically, these costs include the costs of raising new equity to finance the project, or the costs of obtaining debt finance.

Issue costs might be an allowable expense for tax purposes. When they are tax-allowable, the PV of issue costs must allow for the reduction in tax payments that will occur. The PV of the issue costs is therefore net of the present value of any tax relief on the costs.

Unless you are given other information, you should assume that the PV of other costs is calculated using the **risk-free cost of capital as the discount rate**.

Examination hint

If a company plans to raise new capital to finance a project, it will want to raise enough capital to finance the project after paying the issue costs. For example, suppose that a company intends to issue new equity to raise ₦20 million and issue costs are 5% of the amount raised. The company needs ₦20 million after paying the issue costs, and presumably the issue costs will be paid for out of the proceeds from raising the finance.

₦20 million is therefore 95% (100% – 5%) of the capital to be raised.

The capital to be raised = ₦20 million /0.95 = ₦21,052,632.

This means that the issue costs will be ₦1,052,632.

Since the finance will be raised at the beginning of the project, the PV of the issue costs for the equity is ₦1,052,632, minus the PV of the tax relief on the issue costs.

Example: PV of the issue costs

Assume that in the previous example, the investment of ₦600,000 would be financed by ₦400,000 of new equity and ₦200,000 of new debt.

Issue costs are 5% of the funds raised for equity and 2% of the funds raised for debt capital.

The risk-free cost of capital is 5.3%. The rate of taxation on profits is 23%. Issue costs are allowable for tax purposes.

Required

Calculate the PV of the issue costs for financing the project. Assume that tax is paid in the year following the year in which the taxable profit occurs.

Answer

The finance required is:

Equity: ₦400,000 after issue costs and ₦400,000/0.95 = ₦421,053 before issue costs.

Debt: ₦200,000 after issue costs and ₦200,000/0.98 = ₦204,082 before issue costs

Issue costs before tax:		₦
Equity	₦400,000 × 5/95	21,053
Debt	₦200,000 × 2/98	4,081
Total issue costs		25,134

The PV of issue costs is calculated using the risk-free rate of 5.3% as the discount rate. There is tax relief on the issue costs, which will be received one year in arrears.

Year	Item	Cash flow	Discount factor at 5.3%	PV
		₦		₦
0	Issue costs	(25,134)	1.000	(25,134)
1	Tax saved at 23%	5,781	1/(1.053)	5,490
PV of issue costs				(19,644)

5.5 Present value of the tax shield (PV of the tax relief on interest costs)

When a new project is financed wholly or partly with new debt finance, there will be tax relief on the interest. The PV of these tax benefits should be included in the APV of the project.

The PV of the tax relief on interest is calculated by:

❑ calculating the interest costs in each year

❑ calculating the savings in taxation arising as a consequence, for each year of the project

❑ discounting these savings in taxation to a present value, using the pre-tax (before-tax) rate of interest on the debt as the discount rate.

Calculating interest payments

The amount of interest costs in each year will depend on the terms of repayment of the debt capital.

❑ If the debt finance is repaid in full at the end of the term of the borrowing, the interest cost is calculated simply as:

Amount borrowed × Interest rate on the loan or the bonds

❑ If the loan is an amortising loan, and the debt is repaid gradually over the term of the loan, you will need to work out:

- the annual payment on the loan, principal repayment + interest, and

- separate this total annual payment into the principal repayment and the interest payment.

This separation of interest charges and the loan principal repayment is necessary because the tax relief applies to the interest payments only and not to the repayment of the loan principal.

Example: PV of the tax shield (PV of the tax relief on interest costs)

In the previous example, suppose that the company borrows ₦204,081 in the form of a three-year amortising loan at 5.3% interest.

The annuity factor for years 1 – 3 at 5.3% is 2.708.

The rate of taxation is 23% and tax is payable in the year following the profit to which the tax relates.

Required

Calculate the PV of the interest tax shield.

Answer

The annual payments on the amortising loan can be calculated using the annuity factor for Years 1 – 3 at 5.3%, which is the cost of borrowing:

$$\frac{\text{Amount borrowed}}{\text{Annuity factor at 5.3\%, Years 1 - 3}} = \frac{₦204,081}{2.708} = ₦75,362$$

The interest costs each year are calculated on the amount of the loan principal still unpaid at the beginning of the year.

The amount of principal repaid each year is the difference between the total annual payment and the interest charge. In this example, the figures are calculated as follows:

Year	Loan principal unpaid	Interest at 5.3%		Loan principal repaid
	₦	₦		₦
1	204,081	10,816	(75,362 – 10,816)	64,546
	(64,546)			
2	139,535	7,395	(75,362 – 7,395)	67,967
	(67,967)			
3	71,568	3,793	(75,362 – 3,793)	71,569
	(71,569)			
	(1)	(rounding error)		

Having calculated the interest payments on the debt finance, we can now calculate the tax relief on the interest payments, and the PV of this tax relief.

Year	Item		Cash flow	Discount factor at 5.3%	PV
			₦		₦
2	Tax relief on Year 1 interest	(23% × 10,816)	2,488	$1/(1.053)^2$	2,244
3	Tax relief on Year 2 interest	(23% × 7,395)	1,701	$1/(1.053)^3$	1,456
4	Tax relief on Year 3 interest	(23% × 3,793)	872	$1/(1.053)^4$	709
PV of tax shield					4,409

5.6 Summary of the APV method

Taking the three previous examples together, the APV of the investment project would be calculated as follows:

Example: Adjusted present value

	₦
Base case NPV	44,250
minus: PV of other costs	(19,644)
plus: PV of tax relief on interest	4,409
Adjusted present value (APV)	29,015

The APV of the project is positive; therefore on financial considerations (but ignoring the project risk) the project is worthwhile and should be undertaken.

5.7 Reasons for using the APV method

The APV method might be used in preference to adjusting the weighted average cost of capital (WACC) of the company using the Modigliani-Miller formulas. This is for several reasons.

❑ The APV method does not rely on assumptions about the new WACC of the firm if the project is undertaken.

❑ The APV method allows for the specific tax relief on the borrowing to finance the project, and does not assume that the debt will be perpetual debt.

❑ The APV method allows for other costs, such as the costs of raising new finance (issue costs).

It might be argued that APV is therefore the best method of estimating the effect of a new investment on the value of the business entity, and the wealth of its shareholders.

5.8 Comparison of NPV and APV methods

The NPV method of project evaluation and the APV method provide different valuations for proposed capital investment projects. It is possible that one method might indicate that a project is acceptable financially, whereas the other method indicates that the project is not viable.

The NPV and the base case NPV are calculated using the same cash flows, except that the cash flows for the base case NPV should exclude 'other costs' such as financing costs, whereas these are included in the calculation of APV.

Practice questions

5

Example:

A company is considering whether to invest in setting up a new business. The cost of the investment would be ₦9 million. The project would be financed by raising ₦4.5 million of new equity finance and the same amount of new debt finance. The ₦9 million would be used to purchase assets for ₦8 million. There would be an investment of ₦700,000 in working capital, and issue costs would be ₦200,000 for the equity and ₦100,000 for the debt finance.

The purchased assets would attract capital allowances in the form of a 25% annual writing down allowance on a reducing balance basis.

The pre-tax operating cash flows from the investment are expected to be as follows:

Year	Pre-tax operating cash flows
	₦000
1	1,800
2	2,100
3	2,400
4	2,700

Tax on profits is at the rate of 30%. Assume that tax payments occur in the same year as the profit or benefit to which they relate.

At the end of Year 4, the intention is to sell off the business as a continuing operation, and the expected receipts from the sale, net of tax, are ₦3.60 million.

The following information is also relevant:

(1) The investment will alter the company's gearing to 80% equity and 20% debt capital.

(2) The equity beta for the project is 1.25.

(3) The debt finance for the project will be the same as for the company's other debt, which is 7% before tax.

(4) The issue costs of raising the new equity and debt finance would not be allowable for tax purposes.

(5) The risk-free rate of return is 5% and the market return is 9%.

Required

(a) Calculate the NPV of the project.

(b) Calculate the APV of the project.

6   CHAPTER REVIEW

SOLUTIONS TO PRACTICE QUESTIONS

Solution 1

Using the asset beta formula and assuming a risk-free cost of debt.

(meaning that βD = 0):

$$\beta_A = 1.05 \times \frac{160}{160 + 80(1 - 0.30)}$$

βA = 1.05 × 0.74074 = 0.778

Solution 2

The appropriate discount rate should be one that applies to the industry in which the investment will be made. We know that the geared beta in this industry is 1.25, with a debt: equity ratio of 0.40. We can calculate the asset beta (ungeared equity beta) for the industry as:

$$\beta_A = 1.25 \times \frac{60}{[60 + 40(1 - 0.30)]} = 1.25 \times \frac{60}{88} = 0.85$$

Since the company will be all-equity financed, the cost of equity to apply to the project is therefore:

4% + 0.85 (7 – 4)% = 6.55%.

Note: If the company has proposed to finance the project with some debt, the asset beta could be used to calculate a new geared beta for the appropriate level of gearing, and a new cost of equity and new WACC could be calculated.

Solution 3

The asset beta of 1.35 allows for business risk only and assumes that the project will be all-equity financed. The asset beta can be converted into a 'geared beta' for the equity capital as follows:

$$1.35 = \beta_{EG} \times \frac{2}{2 + 1(1 - 0.30)}$$

βEG = (1.35 × 2.70)/2 = 1.8225.

The beta factor for the equity finance can be used to obtain a cost of capital for the equity, using the CAPM.

r = 3% + 1.8225 (8 – 3)% = 12.1125%, say 12%.

Since the debt capital is risk-free, its pre-tax cost is 3%. The cost of capital for the project, financed two-thirds by equity and one-third by debt, is:

[2/3 × 12%] + [1/3 × 3% × (1 – 0.30)] = 8.7%.

Solutions   **4**

Asset betas can be calculated for each proxy company as follows:

Company 1

$$\beta_A = 1.05 \times \frac{70}{\left[70 + 30(1 - 0.30)\right]} = 1.05 \times \frac{70}{91} = 0.81$$

Company 2

$$\beta_A = 1.24 \times \frac{50}{\left[50 + 50(1 - 0.30)\right]} = 1.24 \times \frac{50}{85} = 0.73$$

Company 3

$$\beta_A = 1.15 \times \frac{60}{\left[60 + 40(1 - 0.30)\right]} = 1.15 \times \frac{60}{88} = 0.78$$

The average of these asset betas is (0.81 + 0.73 + 0.78)/3 = 0.77.

The asset beta for the capital project is 0.77. This should now be re-geared to obtain an equity beta for the project.

$$0.77 = \beta_{EG} \times \frac{80}{\left[80 + 20(1 - 0.30)\right]}$$

β_{EG} = 0.77 [80 + 20(1 – 0.30)]/80

β_{EG} = 0.77 × 94/80 = 0.90.

The project-specific cost of equity is now calculated using the CAPM:

K_E = 5% + 0.90 (8 – 5)% = 7.7%

(a) If the **project-specific discount rate** is taken to be the project-specific cost of equity, the discount rate for the project should be 7.7%.

(b) If the **project-specific discount rate** is taken to be a weighted average cost of capital, this is calculated as follows:

Source of finance	Market value	After-tax cost	
		r	MV × r
Equity	80%	0.077	0.0616
Debt capital: cost = (5% × (1 – 0.30)	20%	0.035	0.0070
			0.0686

The project-specific cost of capital would now be 6.86%, say 6.9%.

Solutions 5

Workings: Capital allowances and tax relief

Year	Written down value	Capital allowance	Tax relief
		25%	30%
	₦000	₦000	₦000
	8,000		
1	(2,000)	2,000	600
	6,000		
2	(1,500)	1,500	450
	4,500		
3	(1,125)	1,125	338
	3,375		
4	(844)	844	253

There is no balancing charge, because it is assumed that the disposal value at the end of year 4, net of tax, includes the estimated tax effect of the disposal of the business.

Net present value

Cost of equity KE = 5% + 1.25 (9 – 5)% = 10%.

WACC = [80% × 10%] + [20% × 7% × (1 – 0.30)] = 8.98%, say 9%.

Year	0	1	2	3	4
	₦000	₦000	₦000	₦000	₦000
Investment	(9,000)				
Sale value					3,600
Operating cash flow		1,800	2,100	2,400	2,700
Tax (30%)		(540)	(630)	(720)	(810)
Tax relief (workings)		600	450	338	253
Net cash flow	(9,000)	1,860	1,920	2,018	5,743
Discount factor 9%	1.000	0.917	0.842	0.772	0.708
Present value	(9,000)	1,706	1,617	1,558	4,066
NPV					**– ₦53**

Solutions   **5**

Adjusted present value

The project will be financed 50% with equity and 50% with debt capital.

Asset beta = 1.25 × 4,500/[4,500 + (4,500 × 0.70)] = 0.7353.

Cost of ungeared equity KEU = 5% + 0.7353(9 − 5)% = 7.94%, say 8%.

The cash flows for discounting are the same as for the NPV method, with the exception that issue costs should be removed. These are ₦300,000 in Year 0.

Year	0	1	2	3	4
	₦000	₦000	₦000	₦000	₦000
Net cash flow	(8,700)	1,860	1,920	2,018	5,743
Discount factor 8%	1.000	0.926	0.857	0.794	0.735
Present value	(8,700)	1,722	1,645	1,602	4,221
Base case NPV					**₦490**

Other costs

There is no tax relief on the issue costs, so the PV of issue costs (all in Year 0) is ₦300,000.

PV of the tax shield

It is assumed that interest costs each year will be ₦4,500,000 × 7% = ₦315,000.

Tax relief on these interest costs at 30% will be ₦94,500 per year for 4 years.

This tax relief should be discounted at 7%.

PV of tax relief on interest = ₦94,500 × 3.387 = ₦320,000.

Summary

	₦000
Base case NPV	490
− PV of other costs	(300)
+ PV of tax relief on interest	320
= **APV**	**+ 510**

The APV is + ₦510,000, indicating that the project should be undertaken, whereas the NPV is negative, indicating that it should not be undertaken.

In this particular example, the APV and NPV methods give conflicting recommendations.

Professional level
Strategic financial management

17

International valuation standards

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B		Business analysis	
	2	**International Valuation Standards**	
		Carry out financial valuation in accordance with guidelines provided by International Valuation Standards (IVS) Council:	17
	a	IVS 200: Business and business interest;	17
	b	IVS 210: Intangible assets;	17
	c	IVS 410: Development property; and	17
	d	IVS 500: Financial instruments.	17

Exam context

This chapter explains the use of international valuation standards and those specifically that are examinable documents. The approaches provide background to the methods illustrated numerically in other chapters in this text (particularly the next two chapters on business valuations).

By the end of this chapter, you should be able to:

■ Understand the role of international valuation standards

■ Describe and apply the main features of those standards that are specifically mentioned in the syllabus

1 INTERNATIONAL VALUATION STANDARDS

Section overview

- Introduction
- General standards
- Valuation for financial reporting

1.1 Introduction

The International Valuation Standards Council (IVSC) is the global standard setter for valuation practice and the valuation profession.

It publishes International Valuation Standards (IVS) to guide valuation professionals when performing valuation assignments. The standards are based on generally recognised concepts and principles and aim to promote transparency and consistency in valuation practice.

The International Valuation Standards are arranged as follows:

❑ The IVS Framework;

❑ General standards; and

❑ Asset standards, including:

- IVS 200: Business and business interest;
- IVS 210: Intangible assets;
- IVS 410: Development property; and
- IVS 500: Financial instruments.

The standards apply to both assets and liabilities and to groups of assets and groups of liabilities.

1.2 General standards

The general standards are not examinable. Some of the content will be explained here as being relevant to an understanding of the examinable standards.

IVS 4: Bases of value

Bases of value describe the fundamental premises on which the reported values will be based.

There are many different bases of value that could be used but most share common elements including:

❑ an assumed transaction;

❑ an assumed date of the transaction; and

❑ assumed parties to the transaction.

Depending on the basis of value, the assumed transaction could take a number of forms including:

❑ a hypothetical transaction;

❑ an actual transaction;

❑ a purchase (or entry) transaction;

❑ a sale (or exit) transaction; or

❑ a transaction in a particular (or hypothetical market) with specified characteristics.

IVS define several different bases of value but also acknowledge the existence of others bases not defined in IVS.

The bases of value defined in IVS are as follows:

Bases of value	Definition
Market value	The estimated amount for which an asset or liability should exchange on the valuation date between a willing buyer and a willing seller in an arm's length transaction, after proper marketing and where the parties had each acted knowledgeably, prudently and without compulsion.
Market rent	The estimated amount for which an interest in real property should be leased on the valuation date between a willing lessor and a willing lessee on appropriate lease terms in an arm's length transaction, after proper marketing and where the parties had each acted knowledgeably, prudently and without compulsion.
Equitable value	the estimated price for the transfer of an asset or liability between identified knowledgeable and willing parties that reflects the respective interests of those parties.
Investment value	The value of an asset to a particular owner or prospective owner for individual investment or operational objectives
Synergistic value	The result of a combination of two or more assets or interests where the combined value is more than the sum of the separate values.
Liquidation value	The amount that would be realised when an asset or group of assets are sold on a piecemeal basis, that is without consideration of benefits (or detriments) associated with a going-concern business

Fair value (as defined in IFRS 13 is another bases described in the IVS).

Premises of value (assumed use)

A valuation might depend on how an asset is used. For example, the value of a holding of land would have a different value if it was held for commercial development instead of agricultural.

Different bases of value may require a particular premise of value or allow more than one to be considered.

IVS describes the following premises of value:

Premises of value	Comment
Highest and best use	The use that would produce the highest value for an asset. Usually relevant to valuation of non-financial assets.
	The usual assumption is that knowledgeable buyers and sellers are aware of the highest and best use and would transact at a price that reflects that use.
Current use/existing use	The way the asset is being used currently (may be its highest and best use).
Orderly liquidation	This reflects the value of a group of assets that could be realised in a liquidation sale, given a reasonable period of time to find a purchaser without the seller being compelled to sell.
Forced sale	Where a seller is under compulsion to sell preventing a proper marketing period.
	Buyers may not be able to undertake adequate due diligence in this case.

IVS 5: Valuation approaches and methods

There are different valuation approaches that might be used. No one method is suitable in every possible situation. A valuation should use the most appropriate method under the particular circumstances.

The main valuation approaches are as follows:

❑ market approach;

❑ income approach; and

❑ cost approach.

Each of these approaches includes different, detailed methods of application.

The market approach

The market approach is the preferred valuation approach when reliable, verifiable and relevant market information is available. It arrives at a value for an asset by comparing it with identical or comparable assets for which price information is available.

The approach is appropriate when:

❑ the asset has recently been sold in a transaction;

❑ the asset or substantially similar assets are actively publicly traded; or

❑   there are frequent and/or recent observable transactions in substantially similar assets.

Use of a market approach is more difficult to justify if the asset being valued differs from other assets or is not traded frequently. However, when the market approach is not used, the use of market-based inputs should be maximised in the application of other approaches. For example, discount rates are derived using models which make reference to returns available on the market.

Income approach

All methods under the income approach are effectively based on discounting future amounts of cash flow to present value.

The methods require:

❑   identification of relevant cash flows;

❑   definition of an explicit forecast period;

❑   estimation of a terminal value; and

❑   estimation of a discount rate.

The cost approach

This approach provides an indication of value by calculating the current replacement or reproduction cost of an asset and making deductions for physical deterioration and other relevant forms of obsolescence.

1.3   Valuation for financial reporting

The guidance in IVS is broadly consistent with that in IFRS but on occasion, IVS might require or allow an approach which would not be allowed in IFRS.

Do not be confused by this. Valuation for financial reporting must follow the rules in IFRS but valuation for other purposes (say to decide on an offer price for an asset) does not have to comply with those rules.

2 THE ASSETS VALUATION STANDARDS

Section overview
■ Introduction
■ IVS 200: Businesses and business interests
■ IVS 210: Intangible assets
■ IVS 410: Development property
■ IVS 500: Financial instruments

2.1 Introduction

The asset standards include requirements related to specific types of assets. They also include information on characteristics that influence value of each asset type with additional asset-specific requirements on common valuation approaches and methods.

2.2 IVS 200: Businesses and business interests

Business valuations are required for a number of different purposes including acquisitions, mergers and sales of businesses, taxation, litigation, insolvency proceedings and financial reporting.

They are also needed as an input to other valuations such as the valuation of stock options etc.

The valuation might be for an entire entity, shares or a shareholding in the entity, (whether a controlling or non-controlling interest), or a specific business activity of the entity.

There are different levels at which a value can be expressed, including:

❑ Enterprise value (the total value of the equity in a business plus the value of its debt or debt-related liabilities, minus any cash or cash equivalents available to meet those liabilities);

❑ Total invested capital value (the total amount of money currently invested in a business, regardless of the source, often reflected as the value of total assets less current liabilities and cash);

❑ Operating value (the total value of the operations of the business, excluding the value of any non-operating assets and liabilities); or

❑ Equity value (the value of a business to its equity shareholders).

The valuation must be carried out on an appropriate basis. The three principal valuation approaches may all be applied to the valuation of businesses.

The market approach is frequently applied with the three most common sources of data used to being:

❑ public stock markets in which ownership interests of similar businesses are traded,

❑ the acquisition market in which entire businesses or controlling interests in businesses are bought and sold, and

❑ prior transactions in shares or offers for the ownership of the subject business.

The income approach is also frequently applied. Income and cash flow can be measured on a pre-tax or post-tax basis but discount rate must be consistent with the type of income or cash flow used.

The type of income or cash flow used should be consistent with the type of interest being valued. For example:

❑ enterprise value is found by discounting cash flows **before** interest at the WACC; and

❑ equity value is found by discounting cash flows to equity (i.e. after interest) at the cost of equity.

It might be appropriate to make adjustments to the cash flows in order to reflect differences between the actual historic cash flows and those that a buyer expects to experience should the purchase go ahead.

The cost approach would not normally be applied but could be relevant in some circumstances, for example to value a business:

❑ at an early stage or start-up business where profits and/or cash flow cannot be reliably determined and comparisons to other businesses under the market approach is impractical or unreliable; or

❑ that is not a going concern.

2.3 IVS 210: Intangible assets

It is rarely possible to find market evidence about the value of intangibles.

The income approach is the most common method applied to the valuation of intangible assets and is frequently used to value intangible assets.

There are several income approach methods which could be used including:

❑ excess earnings method;

❑ relief-from-royalty method;

❑ premium profit method or with-and-without method; and

❑ greenfield method.

Excess earnings method

This method estimates the value of an intangible asset as the present value of the cash flows attributable to the intangible asset excluding cash flows arising from contributory assets (i.e. other assets required to generate the cash flows).

Contributory might include working capital, fixed assets, assembled workforce etc.

The necessary steps in applying this method are as follows:

❑ forecast future revenues and expenses from the intangible asset (and contributory assets);

❑ determine an appropriate rate of return on each contributory asset;

❑ deduct the required returns on contributory assets from the forecast profit to arrive at the excess earnings attributable to the intangible asset alone;

❑ discount this over an appropriate time period and at an appropriate discount rate.

> **Example: Intangible valuation – excess earnings method**
>
> X Ltd uses internally developed knowhow to make and sell a product.
>
> It has non-current assets of ₦10 million and average working capital of ₦5 million associated with the manufacture and sale of the product.
>
> Forecast over the next 5 years are as follows
>
> | | |
> |---|---|
> | Revenue from the sale of the product | ₦5 million |
> | Operating expenses | ₦2.5 million |
>
> | | |
> |---|---|
> | The company has estimated the following | |
> | Appropriate return on non-current assets | 10% |
> | Appropriate return on non-current assets | 5% |
> | Discount rate | 15% |
>
> The company estimates the remaining product life as five years. The value of the intangible asset can be estimated as follows:
>
> **Years 1 to** 5
>
> | | ₦m |
> |---|---|
> | Revenue | 5.00 |
> | Operating expenses | (2.50) |
> | Less return on: | 2.50 |
> | Non-current assets (₦10 million ⨯ 10%) | (1.00) |
> | Working capital (₦5 million ⨯ 5%) | (0.25) |
> | | 1.25 |
> | Discount factor (at 15%) | 3.35 |
> | Value of intangible asset | 4.19 |

Relief from royalty method

This method estimates the value of an intangible with reference to hypothetical royalty payments that would be paid to license the intangible asset from a third party.

The hypothetical expense can then be discounted to give a value for the intangible asset.

Example: Intangible valuation – Relief from royalty method

X Ltd uses internally developed knowhow to make and sell a product.

Forecast over the next 5 years are as follows

Revenue from the sale of the product	₦5 million
Estimated the hypothetical royalty rate on the use of the knowhow	5%

The company estimates the remaining product life as five years.

The value of the intangible asset can be estimated as follows:

	Years 1 to 5
Revenue	₦5.00m
Royalty (@5%)	₦0.25m
Discount factor (at 15%)	3.35
Value of intangible asset	₦0.84m

With-and without method

This approach estimates the value of an intangible by comparing:

❑ the value of the business with use of the intangible;

❑ to the value of the business without the use of the intangible.

Green field method

The value of the intangible is estimated using cash flow projections that assume the only asset of the business at the valuation date is the intangible. These are used to estimate a total business value.

All other tangible and intangible assets must be bought, built or rented and the cost of achieving this is deducted from the total business value.

2.4 IVS 410: Development property

For the purposes of IVS 410, development properties are defined as interests where redevelopment delivers the highest and best use, or where improvements are either being contemplated or are in progress at the valuation date.

The two main approaches to the valuation of development property:

❑ the market approach; and

❑ the *residual method* (a hybrid of the market approach, the income approach and the cost approach).

The market approach

In order to apply the market approach there must be reasonably frequent exchanges of similar assets. Development properties tend to differ from each other so the market approach cannot often be used.

On rare occasions some types of development property might be sufficiently homogenous and frequently exchanged in a market for there to be sufficient data from recent sales to use as a direct comparison where a valuation is required.

In most markets, the market approach may have limitations for larger or more complex development property, or smaller properties where the proposed improvements are heterogeneous.

Residual method

This estimates the value of the property by estimating the value of the completed property (gross development value) and deducting the estimated costs that will be incurred in order to achieve the completion and sale of the property.

The estimated future costs would include, construction costs, finance costs, marketing costs etc.

Example: Residual method for valuing development property	
	₦
Estimated value of the completed property	X
Less: all costs expected to be incurred to achieve the vale	(X)
	X

2.5 IVS 500: Financial instruments

A financial instrument is a contract that creates rights or obligations between specified parties to receive or pay cash or other financial consideration, or an equity instrument.

Financial instruments include financial assets and liabilities traded in their own right, structured products and those created through the combination of other financial instruments in a portfolio to achieve a specific net financial outcome.

Valuation requires a thorough understanding of the instrument being valued in order to identify and evaluate the relevant market information available for identical or comparable instruments.

A valuation must take the following into account:

❑   the class or classes of instrument to be valued;

❑   whether the valuation is to be of individual instruments or a portfolio; and

❑   the unit of account.

The three valuation approaches described in the general IVS standards may be applied to the valuation of financial instruments in given circumstances.

The market approach

A price obtained from trading on a liquid exchange (on or very close to the date of valuation) is normally the best indication of the market value of a holding of the identical instrument.

In cases where there have not been recent relevant transactions, the evidence of quoted or consensus prices, or private transactions may also be relevant.

It may be necessary to make adjustments to the price information if the observed instrument is dissimilar to that being valued or if the information is not recent enough to be relevant.

Comparable company multiples are often used as a market based approach to valuing unquoted equity. These include:

❑   Trading multiples: the use of published price information (e.g. NSE quote) of a comparable company peer. An example of such a multiple that is widely used is the PE ratio. Typically the PE ratio would be adjusted to reflect the fact that the shares of the unquoted company lack the liquidity of the shares of the quoted company. This is known as a lack of liquidity adjustment (LoL).

❑   Transaction multiples: use of the observed price established for an M&A transaction of a comparable company peer. This price will include a control (or joint control or significant influence) premium which may have to be adjusted for.

> **Example: Market approach to value unquoted equity using a trading multiple** An investor is interested in estimating the fair value of X limited.
>
> X Ltd's most recent profit after tax is ₦120,000 which is after a non-recurring expense of ₦30,000 (after tax).
>
> The investor has identified a comparable quoted company peer with a P/E ratio of 17.
>
> What is the value of X Ltd?
>
> A suitable approach would be to value X Ltd using:
>
> Suitable PE ratio ⫾ LoL adjustment ⫾ Future maintainable earnings (post tax) Possible valuations are as follows:
>
> | | ₦ |
> |---|---|
> | Future maintainable earnings (post tax) (120,000 + 30,000) = ₦150,000 | |
> | Implied values: | |
> | 17 × 0.9 (say) × ₦150,000 | ₦2,295,000 |
> | 17 × 0.9 (say) ×₦150,000 | ₦2,040,000 |
> | 17 × 0.9 (say) ×₦150,000 | ₦1,785,000 |

The income approach

If the market approach is not practicable an income approach might be used. Thus, the value of a financial instrument may be determined using a discounted cash flow method.

An appropriate discount rate should (as always) provide compensation for the time value of money and additional risks associated with the instrument, including:

❑ the terms and conditions of the instrument, e.g. subordination;

❑ the credit risk, i.e. uncertainty about the ability of the counterparty to make payments when due;

❑ liquidity and marketability of the instrument;

❑ the risk of changes to the regulatory or legal environment; and

❑ the tax status of the instrument.

Example: Market approach to value unquoted equity using DCF

An investor is interested in estimating the fair value of Y limited.

Y Ltd is expected to pay a dividend at time 1 and this is forecast to grow at 10% for two years and then at 5% in perpetuity.

The investor has identified a cost of capital of 8% from a proxy quoted company of similar risk and structure.

A value for Y Ltd can be found as follows:

	₦	₦	₦	₦
	1	2	3	4 – ∞
Dividend	10,000	11,000	12,100	12,705
PV of 4 – ∞ dividend at time 3 (12,705 × 1/(0.08 – 0.05)			423,500	
			435,600	
Discount factor (8%)	0.926	0.857	0.794	
Present value	9,260	9,451	345,793	
Value of Y Ltd			364,483	

3   CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Understand the role of international valuation standards

- Describe and apply the main features of those standards that are specifically mentioned in the syllabus

CHAPTER

18

Business valuations

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B	Business analysis		
	1	**Evaluate and assess the value of businesses and give advice based on business scenarios by determining the value of shares and business, in a given scenario, using:**	
		a	Dividend yield based valuation techniques;
		b	Price earnings ratio based valuation techniques;
		d	Asset-based measures of value;
		m	Efficient Market Hypothesis (EMH) and practical considerations in the valuation of shares.

Exam context

This chapter explains different approaches to business valuation. The use of the option based techniques has been left to a later chapter).

By the end of this chapter, you should be able to:

■   Estimate the market value of a business using dividend yield

■   Estimate the market value of a business price earnings ratios

■   Estimate the market value of a business using asset based methods

■   Estimate the market value of a business using the dividend valuation model

■   Estimate the market value of debt and preference shares

■   Explain the efficient market hypothesis

1 NATURE AND PURPOSE OF BUSINESS VALUATIONS

Section overview

- Reasons for business valuation
- Valuation models

1.1 Reasons for business valuation

This chapter describes various techniques for calculating a value for the shares of a company, or the value of an entire company (equity plus debt). There are several reasons why a valuation might be required.

Quoted companies - Quoted companies already have a share price valuation: this is the current market price of the shares. The main reason for making a business valuation for a quoted company is when there is a takeover bid. In a takeover bid, the bidder always offers more for the shares in the target company than their current market price. A valuation might be made by the bidder in order to establish a fair price or a maximum price that he will bid for the shares in the target company. The valuation placed on a target company by the bidder can vary substantially, depending on the plans that the bidder has for the target company after the takeover has been completed.

Unquoted companies - For unquoted companies, a business valuation may be carried out for any of the following reasons:

❑   The company might be converted into a public limited company with the intention of launching it on to the stock market. When a company comes to the stock market for the first time, an issue price for the shares has to be decided.

❑   When shares in an unquoted company are sold privately, the buyer and seller have to agree a price. The buyer has to decide the minimum price he is willing to accept and the seller has to decide the maximum price he is willing to pay.

❑   When there is a merger involving unquoted companies, a valuation is needed as a basis for deciding on the terms of the merger.

❑   When a shareholder in an unquoted company dies, a valuation is needed for the purpose of establishing the tax liability on his estate.

1.2 Valuation models

All valuation methods are based on estimates and assumptions.

Each method produces a different valuation, but each valuation can provide useful information and help with deciding what the offer price should be. You should be prepared to use each of the different valuation methods, and then discuss the assumptions and estimates on which the valuation is based. You might also be required to compare the different valuations produced by each method, and then recommend (with reasons) a valuation that you consider appropriate as a basis for making an offer to the target company shareholders.

There are several approaches to making a valuation of the shares in a company:

❑   Asset based valuation which as the name suggests are based on the asset value of the target company.

❑ Market-based valuations, using estimates of future earnings or dividends

❑ Cash-flow based valuations, using discounted cash flow of expected future returns from the acquisition. The expected value added (EVA) model is another form of cash flow-based model.

There are many different techniques within these three broad approaches and they lead to different valuations of the business.

All the valuation methods described in this chapter have a **rational basis**. This means that there is logic to the valuation, and the valuation is obtained through objective analysis and assessment.

Valuation methods can be used to decide on an offer price in a mergers and acquisitions scenario, or may be used to justify an offer price. The final price is often agreed through negotiation, and the management of the bidding company must use judgement in deciding how high a price they might be willing to pay. The only 'correct' valuation is the price that the bidder makes and the shareholders in the target company accept.

2   ASSET-BASED VALUATION MODELS

> ### Section overview
>
> - Net asset value ('balance sheet basis', taken from the statement of financial position)
> - Net asset value (net realisable value)
> - Net asset value (replacement value)

2.1   Net asset value ('balance sheet basis', taken from the statement of financial position)

Asset based valuation models use the net tangible assets of a business as a valuation. Different figures arise from the different valuation placed on the business assets and liabilities.

This approach uses the book values for assets and liabilities. These figures are readily-available from the accounts ledgers of the company. However, non- current assets might be stated at historical cost less accumulated depreciation, and this might bear no resemblance to a company's current value.

Some important intangible assets such as internal goodwill and the value of the company's human capital (e.g. the skills of its employees) are ignored because they are not included in the statement of financial position. At best this method will provide the minimum value of a target company.

In practice, a minimum valuation for a target company might be based on the book value of its assets. The minimum value of the equity would then be the book value of the assets minus the book value of the liabilities.

Some assets might be under-valued, but where non-current assets are re-valued regularly book value might be sufficient for an asset-based valuation without the need for further adjustments.

If you are required to make an asset-based valuation in your examination, you should be prepared to consider some adjustments to the valuation of certain assets, where information in the question indicates that the valuation of certain assets (particularly intangible assets) might be too high or too low.

A valuation based on the book value of net assets should be considered a minimum valuation, and not one that the target company shareholders are likely to accept. An offer price would have to be in excess of book value ('book value plus') for the bid to have any chance of success.

Example: Net asset value

The following information is available about a private company, Company Z.

	N000
Tangible non-current assets	250
Intangible non-current assets	75
Current assets	60
	385
Ordinary shares of N1	50
Revaluation reserve	80
Retained profits	145
	275
Bank loans	90
Current liabilities	20
	385

Required

Provide an asset-based valuation of the shares in Company Z.

Answer

The book value of the net assets is N275,000 or N5.50 per share. However, this valuation is based on the assumption that the tangible non-current assets are suitably valued, and that N75,000 represent a realistic value for the intangible non-current assets.

It is therefore unlikely that the target company shareholders will accept an offer below N5.50 per share, and the offer will almost certainly need to be higher than N5.50 if the takeover is to succeed.

Valuations based on other valuation methods should be compared with the asset-based valuation. There should be some concern (for the bidding company) if a valuation based on expected earnings, dividends or cash flows is lower than the asset-based valuation.

2.2 Net asset value (net realisable value)

The minimum value of a target company is the value of its net assets. (Net assets are the value of the company's total assets minus its liabilities.) If net assets can be valued according to the disposal value of the assets, this would indicate the amount that could be obtained for the shareholders of the company in the event that the company is liquidated and its assets sold off.

However the net disposal value (or 'break-up' value) of the target company's assets is usually irrelevant, unless asset value is higher than the value of the business as a going concern. A target company is usually acquired with the intention of continuing its business operations, and the value of assets in a going concern should be higher than their break-up value.

In a takeover bid, it is also impractical to estimate the disposal value of the target company's assets, except perhaps as a very approximate estimate.

However, this method may be used when the assets of the company are valuable, and their current disposable value might be worth more than the expected future dividends or earnings that the company will provide from using the assets. This valuation may be appropriate if the intention is for the business to be liquidated and the assets sold.

A company can never be worth less than its break-up value.

Example:

A company has assets that have been valued at ₦20 million. This valuation is based on the current disposal value of the assets. The company has ₦4 million of liabilities. It has share capital of 200,000 shares of ₦0.25 each.

A valuation of the shares based on the net asset value of the company would be:

$$\frac{₦(20 \text{ million} - 4 \text{ million})}{200{,}000 \text{ shares}} = ₦80 \text{ per share}$$

2.3 Net asset value (replacement value)

Replacement value measures the value of net assets at their cost of acquisition on the open market. Whilst this is likely to be a more accurate cost than book values it will still undervalue the company as intangible assets will be excluded. In addition it will be very difficult to identify and value individual assets and liabilities.

All asset-based valuation methods can be criticised, because unless there is an intention to sell off all or some of a company's assets, the value of a business comes from the expected returns it will generate, not the reported value of its assets.

3 INCOME BASED VALUATION METHODS

Section overview

- P/E ratio method
- Earnings yield method
- Dividend yield method

3.1 P/E ratio method

A price/earnings ratio or P/E ratio is the ratio of the market value of a share to the annual earnings per share. For every company whose shares are traded on a stock market, there is a P/E ratio. For private companies (companies whose shares are not traded on a stock market) a suitable P/E ratio can be selected and used to derive a valuation for the shares.

A simple method of estimating a value for a company in the absence of a stock market value is:

Value = EPS × Estimated P/E ratio.

- ❑ The EPS might be the EPS in the previous year, an average EPS for a number of recent years or a forecast of EPS in a future year

- ❑ The P/E ratio is selected as a ratio that seems appropriate or suitable. The selected ratio might be based on the average P/E ratio of a number of similar companies whose shares are traded on a stock market, for which a current P/E ratio is therefore available.

Example: P/E ratio method

The EPS of a private company, ABC Company, was ₦15 last year and is expected to rise to ₦18 next year. Similar companies whose shares are quoted on the stock market have P/E ratios ranging from 10.0 to 15.6. The average P/E ratio of these companies is 12.5.

A valuation of the company might be to take the prospective EPS and apply the average P/E ratio for similar companies:

Valuation = ₦18 × 12.5 = ₦225 per share.

An alternative evaluation might be to take the actual EPS last year and apply the lowest P/E ratio of any other similar stock market company, reduced by, say, 10% to allow for the fact that ABC Company is a private company and does not have a stock market quotation.

Valuation = ₦18 × (90% × 10) = ₦162.

Here, a P/E ratio of 9 (= 90% × 10) has been used in the valuation.

Another valuation might be to use the EPS for last year and a P/E ratio of 9. This would give a share value of ₦15 × 9 = ₦135.

From this example, it might be apparent that the P/E ratio valuation method has a number of weaknesses:

It is based on subjective opinions about what EPS figure and what P/E ratio figure to use.

❑ It is not an objective or scientific valuation method.

❑ It is based on accounting measures (EPS) and not cash flows. However, the value of an investment such as an investment in shares ought to be derived from the cash that the investment is expected to provide to the investor (shareholder).

However, the P/E ratio valuation method is commonly used as one approach to valuation for:

❑ The valuation of a private company seeking a stock market listing for the first time

❑ The valuation of a company for the purpose of making a takeover bid.

The main advantage of a P/E ratio valuation is its simplicity. By taking the annual earnings of the company (profits after tax) and multiplying this by a P/E ratio that seems 'appropriate', an estimated valuation for the company's shares is obtained. This provides a useful benchmark valuation for negotiations in a takeover, or for discussing the flotation price for shares with the company's investment bank advisers.

3.2 Earnings yield method

With the earnings yield method of valuation, a company's shares are valued using its annual earnings and a suitable earnings yield.

Formula: Earnings yield

$$\text{Earnings yield} = \frac{\text{Earnings per share}}{\text{Current market price per share}} \times 100$$

Using the earnings yield method of valuation, this formula is adapted as follows:

$$\text{Current market price per share} = \frac{\text{Earnings per share}}{\text{Earnings yield}}$$

A suitable earnings yield for a private company might be similar to the earnings yield on shares in similar quoted companies.

It might be more appropriate to select an earnings yield that is higher than the earnings yield for similar quoted companies, to allow for the higher risk of investing in private companies.

The earnings yield method of valuation is essentially a variation of the P/E ratio method of valuation and is subject to the same criticisms.

> **Example: Earnings yield method**
>
> The earnings of Kickstart, a private company, were ₦450,000 last year.
>
> Stock market companies in the same industry provide an earnings yield of about 9% to their shareholders.
>
> Using the earnings yield method of valuation, suggest a suitable valuation for the equity shares in Kickstart.

> **Answer**
>
> If an appropriate earnings yield for Kickstart is 9%, the valuation of its equity would be:
>
> ₦450,000/9% = ₦5,000,000.
>
> However since Kickstart is a private company, a higher earnings yield should possibly be used for the valuation. If an appropriate earnings yield for Kickstart is 10%, say, the valuation of its equity would be:
>
> ₦450,000/10% = ₦4,500,000.
>
> The valuation depends on arbitrary assumptions about a suitable earnings yield to apply, as well as assumptions about expected annual earnings.

3.3 Dividend yield method

With the dividend yield method of valuation, a company's shares are valued using its dividend for the year and a suitable dividend yield.
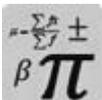
> **Formula: Dividend yield**
>
> $$\text{Dividend yield} = \frac{\text{Dividend per share}}{\text{Current market price per share}} \times 100$$
>
> Using the dividend yield method of valuation, this formula is adapted as follows:
>
> $$\text{Current market price per share} = \frac{\text{Dividend per share}}{\text{Dividend yield}}$$

A suitable dividend yield for a private company might be similar to the dividend yield on shares in similar quoted companies.

It might be more appropriate to select a dividend yield that is higher than the dividend yield for similar quoted companies, to allow for the higher risk of investing in private companies.

Dividend yield is used to value small shareholdings where the shareholder may have little say in the running of the business and is interested only in the income stream that it provides.

4   DIVIDEND VALUATION MODELS

Section overview

■   Dividend valuation model: constant annual dividends

■   Dividend valuation method: constant rate of growth in annual dividends

■   Retained earnings: the earnings retention valuation model

4.1   Dividend valuation model: constant annual dividends

The dividend valuation model is a more objective and cash-based approach to the valuation of shares. Like the P/E ratio method and earnings yield method, it is an income-based valuation method. However the valuation is based on expected future dividends rather than on total earnings.

The basic assumption with the dividend valuation models is that the value of shares to shareholders is the value of all the future dividends that they expect to receive from those shares in the future.

If the fair value of a share represents the value of all expected future dividends, this value can be estimated by discounting expected future dividends to a present value at the shareholders' cost of capital. All expected **future dividends 'in perpetuity'** are therefore discounted to a present value at the **cost of equity capital**.

Without going into the mathematics to prove the valuation model, it can be shown that if it is assumed that the company will pay a **constant annual dividend** every year into the foreseeable future, the present value of those dividends, and so the value of the shares, is:

Formula: Dividend valuation model (without growth)

$$MV = \frac{D_1}{r_e}$$

This is the present value of a perpetuity

Where:

r_E = the shareholders' required rate of return (cost of equity)

d = the expected future annual dividend (starting at time 1)

MV = the share price ex dividend

This valuation model assumes that the dividend is paid annually, and that the current year's dividend has just been paid. This is the assumption that is commonly used in examination questions. For an 'exact' valuation using this model, it should be assumed **the next dividend is payable in one year's time**.

If the annual dividend in the current year has not yet been paid, but will soon be paid, the value of the share is its value 'cum dividend'. You might be asked to suggest a cum dividend valuation, where an annual dividend will be paid in the near future. If so, you should estimate the ex dividend price using the dividend

valuation model, and then add the current dividend to arrive at a cum dividend valuation.

A company is expected to pay an annual dividend of ₦48 per share into the foreseeable future and the shareholders' cost of capital is 12%. The most recent annual dividend has just been paid.

Required:

(a)   Using the dividend valuation model, suggest what the value of the shares should be.

(b)   Show how this valuation would change if the expected annual dividend in future years is ₦54.

(c)   Show how this valuation would change if the expected annual dividend in future years is ₦48 but the cost of equity capital is 12.5%

Answer

(a)   Using the dividend valuation model, the value of the share (ex dividend) ought to be ₦48/0.12 = ₦400.

(b)   If expectations about future annual dividends change from ₦48 per share to ₦54 per share, the valuation of the share will be ₦450 (₦54/0.12). This a higher valuation than in (a) because the annual dividend is higher.

(c)   If future annual dividends are expected to be ₦48 per share, but the shareholders' cost of capital changes to 12.5%, the valuation of the share will fall to ₦384 (₦48/0.125). This is a lower valuation than in (a) because the cost of equity is higher.

The dividend valuation model therefore provides an explanation of how the value of shares will rise or fall when there are changes in either:

❑   the expected annual dividend, or

❑   the shareholders' required rate of return (the equity cost of capital).

4.2 Dividend valuation method: constant rate of growth in annual dividends

An alternative assumption in the dividend valuation model is that the annual dividend will grow in the future. A simplifying assumption is that the dividends will grow at a constant annual percentage rate.

Again, without going into the mathematics to prove the valuation model, it can be shown that if it is assumed that the company will pay an annual dividend that grows by a constant percentage amount every year into the foreseeable future, the present value of those dividends, and so the value of the shares, is:

Formula: Dividend valuation model (with growth)

$$MV = \frac{d(1 + g)}{r_e - g}$$

Note: this formula gives the present value of any cash flow which starts in one year's time and grows at a constant rate in perpetuity

Where:

r_E = the cost of equity

d = the annual dividend for the year that has just ended

g = the expected annual growth rate expressed as a proportion (4% = 0.04, 2.5% = 0.025 etc.)

Therefore, $d(1 + g)$ = expected annual dividend next year or d_1

MV = the share price ex dividend.

This is the valuation of the share ex dividend. Note that this valuation formula is based on the assumptions that:

❑ The dividend is paid annually; and

❑ The dividend for the current year has just been paid.

Example: DVM with growth

A company has just paid an annual dividend of ₦48. Dividends are expected to grow by 4% each year into the foreseeable future. The shareholders' cost of capital is 12%.

Using the dividend valuation model, the expected value of the share (ex dividend) is:

$$MV\,(ex\,div) = \frac{48(1.04)}{0.12 - 0.04} = ₦624$$

If there is no expected growth in annual dividends, and the company is expected to pay a constant annual dividend in the future, the share valuation would have been ₦400 (see the earlier example). Because the annual dividend is expected to increase every year, the valuation is much higher.

Using the dividend growth model, the valuation of shares changes with:

❑ changes in expected future dividends (for example, changes in the expected annual growth rate in dividends); or

❑ changes in the shareholders' required rate of return (the equity cost of capital).

Example: DVM with growth

In the previous example, if the expected growth rate in annual dividends falls from 4% to 3%, the valuation of the shares will fall to:

$$MV\,(ex\,div) = \frac{48(1.03)}{0.12 - 0.03} = ₦549$$

This is a lower valuation, because future dividends are expected to be lower.

An examination question might test your understanding of the dividend growth model by asking you to calculate the annual growth rate g, given an annual dividend and the current market price of the shares.

Example:

The share price of ABC Company is currently ₦400. The cost of equity capital is 12%.

The annual dividend has just been paid. It is expected that the annual dividend **next year** will be ₦20 per share and that annual dividends will then grow at a constant annual rate into the foreseeable future.

Required:

(a) Calculate the expected annual growth rate in dividends from next year onwards.

(b) Suppose that the stock market now receives new and unexpected information about the company that makes investors re-assess the future annual dividends. Investors now expect that the annual dividend next year will be 10% lower than previously expected, and that annual growth in dividends in subsequent years will be only 4%.

Calculate the price that should now be expected for shares in ABC Company.

Answer

(a) Let the annual growth rate in dividends be g.

$$400 = \frac{20}{0.12 - g}$$

400 (0.12 – g) = 20

48 – 400g = 20

400g = 28

g = 0.07 or 7%.

(b) The annual dividend next year is now expected to be ₦18.

$$MV \ (ex \ div) = \frac{18}{0.12 - 0.04}$$

0.8 MV (ex div) = 18

MV (ex div) = 225.

The share price should fall to ₦225.

Example:

A company has just paid an annual dividend of ₦63. This dividend is expected to remain constant for two more years, but from Year 3 it is expected to grow by 3% each year into the foreseeable future. The cost of shareholders' funds is 10%.

What should be the current market value of the company's shares?

> **Answer**
>
> The dividend valuation model and the dividend growth model calculate the present value of all expected future dividends by discounting them at the cost of equity capital. A valuation can be obtained in this example using discount tables.
>
> When dividend growth begins in Year 1, we can obtain a Year 0 valuation using the dividend growth model. In this example, we know that dividend growth is expected to begin in Year 3. We can therefore obtain a Year 2 valuation using the dividend valuation model.
>
> The expected value of the share (ex dividend) **at the end of Year 2** can be calculated using the dividend growth model as follows:
>
> $$P_2 = \frac{63\,(1.03)}{0.10 - 0.03} = 927$$
>
> The expected current value of the share is this valuation at the end of Year 2 discounted to a Year 0 value, plus the present value of the expected dividends at the end of Year 1 and Year 2.
>
> | Year | | Dividend /future valuation | Discount factor at 10% | Current valuation |
> |------|---|---|---|---|
> | | | ₦ | | ₦ |
> | 1 | Dividend | 63 | 0.909 | 57 |
> | 2 | Dividend | 63 | 0.826 | 52 |
> | 2 | End of Year 2 value | 927 | 0.826 | 766 |
> | | **Share value** | | | 875 |

4.3 Retained earnings: the earnings retention valuation model

Dividend growth can be achieved by retaining some profits (retained earnings) for reinvestment in the business. Reinvested earnings should provide extra profits in the future, so that higher dividends can be paid. When a company retains a proportion of its earnings each year, the expected annual future growth rate in dividends can be estimated using the formula:
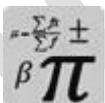
> **Formula: Gordon's growth model**
>
> $$g = br$$
>
> **Where:**
>
> g = annual growth rate in dividends in perpetuity
>
> b = proportion of earnings retained (for reinvestment in the business)
>
> r = rate of return that the company will make on its investments

> ### Example: Gordon's growth model
>
> A company has just achieved annual earnings per share of ₦50, of which 40% has been paid in dividends and 60% has been reinvested as retained earnings.
>
> The company is expected to retain 60% of its earnings every year and pay out the rest as dividends.
>
> The expected return on investments is 10%
>
> The cost of equity capital is 8%.
>
> The current annual dividend is 40% × ₦50 = ₦20.
>
> The anticipated annual growth in dividends = br = 60% × 10% = 6% or 0.06.
>
> Using the dividend growth model, the expected value per share is:
>
> $$\text{MV (ex div)} = \frac{20\,(1.06)}{0.08 - 0.06} = ₦1,060$$

Enterprise Value/EBITDA

Income based valuation: Enterprise value/EBIDA multiple method

Enterprise value

Definition

Enterprise value (EV) is a measure of a company's total value, often used as an alternative to market capitalisation. It is the price you would pay for the entire business based on the current market price of the company's shares and net debt.

EV represents the total value of a business or enterprise to all providers of capital, including equity investors, preference share investors, debt investors and minority interests. It can be calculated by adding the company's market capitalisation and the market value of its gross borrowings, and deducting any cash balances.

EV = Market Capitalisation of equity + Preference shares + Debt + Minority interest – Cash and cash equivalents

EV/EBITDA

Definition

The Enterprise value/EBITDA multiple is the enterprise value of the company divided by earnings before interest, tax, depreciation and amortisation. It is a widely used valuation multiple.

EV/EBITDA is often used in conjunction with, or as an alternative to, the P/E ratio to determine the fair market value of a company.

The formula for calculating the multiple is:

$$\textbf{Enterprise Value Multiple} = \frac{\textbf{Enterprise Value}}{\textbf{EBITDA}}$$

The benefit of EBITDA multiples is that they strip out depreciation and amortisation, which may vary substantially between companies. EBITDA therefore provides a better basis for comparison.

One very important point to note about multiples is the connection between the numerator and denominator. Since enterprise value (EV) equals equity value plus net debt, EV multiples are calculated using denominators that are relevant for both equity and debt holders (that is, before the inclusion of interest expense and preference dividends). An advantage of this is that the multiple can be used to directly compare companies with different levels of debt.

Example

The following financial information is available for Aka Ltd.

	2020 Historic ₦m	2021 Forecast ₦m
Revenue	39.60	42.1
Operating profit	8.70	9.2
Depreciation	0.50	0.6
Amortisation	0.30	0.3
Net asset value	24.40	
Book value of bonds – currently trading at ₦80	16.25	

The closest comparable company to Aka Ltd has been identified as its competitor Kemi Plc, for which you have been able to ascertain the following data.

	2020 Historic ₦m	2021 Forecast ₦m
Revenue	57.7	61.9
Operating profit	10.0	12.6
Depreciation	2.2	2.2
Amortisation	-	-
Net asset value	48.1	
Book value of bonds – currently trading at ₦125	20.0	

Today's share price for Kemi Plc is 175k. Kemi has 27,300,000 shares in issue.
Use the information to derive an equity value for Aka Ltd, based on an EBITDA multiple.

Solution

Step 1 - Calculate EBITDA multiple for Kemi Plc

Equity value = ₦1.75 × 27.3m = ₦47.8m

Enterprise value (EV) = ₦47.8m + ₦25.0m = ₦72.8m

	2020	**2021**
EBITDA multiples	72.8/(10+2.2) = 6.0x	72.8/(12.6+2.2)=4.9x

Step 2 – Apply multiple to value Aka Ltd

Valuation based on:

	2020	**2021**
EBITDA	6.0x × ₦9.5m = ₦57.0m	4.9x ×₦10.1m = ₦49.5m

Suggested range for EV of Aka: ₦49.5m – ₦57m

From this, the market value of Aka's debt (₦13m) will need to be deducted to obtain an equity valuation, giving a range between ₦36.5m and ₦44m.

These figures are before any discount that might be made for the non-marketability of Aka's shares. If we were to apply say a 25% discount, this would give a range of values between ₦27.38m and ₦33m.

An enterprise value multiple indicates how long it would take for an acquisition to earn enough to pay off its cost. For example, an EV/EBITDA multiple of six indicates that the acquirer will pay six times the acquisition target's EBITDA. Offering an EV/EBITDA multiple that is substantially higher than that paid for a comparable acquisition is an indication that the acquirer is paying too much.

Often, an industry average EV/EBITDA multiple is calculated on a sample of listed companies to use as a benchmark.

Higher quality businesses deserve higher valuation multiples, but finding a company on either a high or low multiple relative to its sector does not necessarily indicate whether or not the company is a good buy.

An expensive company may be on a high multiple due to expectations of growth arising from its strategies in the market. A cheap company may be on a low multiple because it has no distinguishing characteristics. It can be misleading to think that a company is 'cheaper' because it trades at an EV/EBITDA multiple of four times when compared with its peers that trade at six times EV/EBITDA. It may be that the stock market has failed to value the company correctly.

The multiple can change with various factors: capital intensity, the nature of the business, competitive position of the firm, and the sustainability of cash flows.

	2020 **Historic** **₦m**	**2021** **Forecast** **₦m**
Revenue	57.0	75.0
Operating profit	6.0	7.5
Depreciation	2.5	2.0
Amortisation	1.0	1.0
Book value of debt – currently trading at ₦125	16.0	
Share price	₦2.95	
Shares in issue	27,500,000	
Market share	8%	11%

The average EBITDA multiple for the home furnishings sector is 9. Using the available information, calculate the EBITDA multiple for each company, and comment briefly on the results.

Advantages of using the EV/EBITDA multiple
- It is unaffected by the capital structure of a company.
- It takes net debt into account.
- Ignoring capital expenditure and tax enables comparison of companies which have different levels of capex and tax planning.
- Ignoring depreciation and amortisation enables more direct comparison between companies which might have different policies.
- It is relevant – EBITDA multiples focus on the key statistics that are in common use by investors.

Disadvantages of using the EV/EBITDA multiple
- It is simplistic – a lot of information from many value drivers is distilled into a single number.
- Ignoring capex and tax could be a disadvantage in some circumstances – management, can for example, potentially add value through skilled tax management.
- It is static – the multiple reflects a point in time which ignores the evolution of the business. The multiple is only meaningful if the profit figure used is representative of the future.
- It can be difficult to compare – there are many reasons why multiples may differ between companies.

Income-based valuation: Dividend valuation method

A dividend valuation method is useful for the valuation of non-controlling interests (a small number of shares) in a company.

As we have seen, a future dividend stream can be valued using the following formula:

$$\text{Value} = \frac{d_0(1 + g)}{(k_e - g)}$$

where d_0 is the dividend at time 0

g is the expected annual growth rate in future dividends

k_e is the cost of equity

Example

Target paid a dividend of ₦250,000 this year. The current return to shareholders of companies in the same industry as Target is 12%, although it is expected that an additional risk premium of 2% will be applicable to Target, being a smaller and unquoted company. Compute the expected valuation of Target, if:
a) The current level of dividend is expected to continue into the foreseeable future,
b) The dividend is expected to grow at a rate of 4% p.a. into the foreseeable future, or
c) The dividend is expected to grow at 3% rate for three years and 2% afterwards.

Solution

Cost of equity (K_E) = 12% + 2% = 14%
a) No growth in dividend:
   V_E = D/K_E = ₦250,000/0.14 = ₦1,785,714
b) Constant growth to infinity
   V_E = D_0(1 + g)/(K_E - g)
      = ₦250,000(1.04)/(0.14 – 0.04)
      = ₦2,600,000
c) **2 – stage dividend growth model**
   First 3 years, when g = 3%:

		₦000
Year 1	250(1.03) × (1.14)$^{-1}$ =	226
2	250(1.03)2 × (1.14)$^{-2}$ =	204
3	250(1.03)3 × (1.14)$^{-3}$ =	184
		614

   Years 4 – infinity, when g = 2%:

   $$\frac{250(1.03)^3 \times (1.02)}{0.14 - 0.02} \times (1.14)^{-3} \qquad = \quad \underline{1,567}$$

   Total value   2,181

Further example

Pinky Plc and Perky Plc operate in the same industry, manufacturing children's clothes and toys, although Perky Plc also has interests in sportswears and equipment. Pinky Plc is planning to take over Perky Plc and the shareholders of Perky Plc do not regard it as a hostile bid.

The following information is available about the two companies:

	Pinky Plc	Perky Plc
Current earnings	₦650,000	₦240,000
Number of shares	5,000,000	1,500,000
Percentage earnings retained	20%	80%
Return on new investment	15%	15%
Return required by ordinary shareholders	21%	24%

Dividends have just been paid and the retained earnings have already been reinvested in new projects. Pinky Plc plans to adopt a policy of retaining 35% of earnings after the takeover and expects to achieve a 17% return on new investment.

Savings due to economies of scale are expected to be in the region of ₦85,000 per annum.

Required return to ordinary shareholders will fall to 20% due to portfolio effects. Neither company is quoted.

Required:
a) Calculate the existing share values of Pinky Plc and Perky Plc.
b) Find the value of Pinky Plc after the takeover.
c) Advise Pinky Plc on the maximum amount it should pay for Perky Plc.
d) What reasons might a company have for buying another company?

Note: Ignore taxation.

Solution

a) **Existing share price of Pinky Plc**

$g = r \times b$
$r = 15\%$
$b = 20\%$
$g = 0.15 \times 0.2$
$\quad = 0.03$

$$\text{Ex dividend market value} = \frac{\text{Next year's dividend}}{K_e - g}$$

$$= \frac{650,000 \times 0.8 \times 1.03}{0.21 - 0.03}$$

$= ₦2,975,556$
$= 59.5$ kobo per share

Existing share price of Perky Plc

$g = r \times b$
$\quad = 0.15 \times 0.8$
$\quad = 0.12$

$$\text{Ex dividend market value} = \frac{\text{Next year's dividend}}{K_e - g}$$

$$= \frac{240,000 \times 0.2 \times 1.12}{0.24 - 0.12}$$

$= ₦448,000$
$= 29.9$ kobo per share

b) **Value of Pinky Plc after the takeover**

Care must be taken in calculating next year's dividend and the subsequent growth rate. Next year's earnings are already determined, because both companies have already reinvested their retained earnings at the current rate of return. In addition, they will get cost savings of ₦85,000.

The dividend actually paid out at the end of next year will be determined by the new 35% retention and the future growth rate will take into account the increased return on new investment.

Growth rate for combined firm, g = 0.17 × 0.35

$$= 0.06$$

New cost of equity	= 20%
Next year's earnings	= 650,000 × 1.03 + 240,000 × 1.12 + 85,000
	= ₦1,023,300
Next year's dividend	= ₦1,023,300 × 0.65
	= ₦665,145

Market value $= \dfrac{665,145}{0.2 - 0.06}$

$$= ₦4,751,036$$

c) **Maximum Pinky Plc should pay for Perky Plc**

Combined value	= ₦4,751,036
Present value of Pinky Plc	= ₦2,975,556
Increase in value	= ₦1,775,480

This is the maximum price to pay.

Assumptions of dividend models

The dividend models are underpinned by a number of assumptions that should be borne in mind.

- Investors act rationally and homogenously. The model fails to take into account the different expectations of shareholders, nor how much they are motivated by dividends against future capital appreciation on their shares.

- The D_0 figure used does not vary significantly from the trend of dividends. If D_0 does appear to be a rogue figure, it may be better to use an adjusted trend figure, calculated on the basis of the past few years' dividends.

- The estimates of future dividends and prices used, and also the cost of capital are reasonable. As with other methods, it may be difficult to make a confident estimate of the cost of capital. Dividend estimates may be made from historical trends that may not be a good guide for the future, or derived from uncertain forecasts about future earnings.

- Directors use dividends to signal the strength of the company's position (however, companies that pay zero dividends do not have zero share values).

- Dividends either show no growth or constant growth, if the growth rate is calculated using g = br, then the model assumes that b and r are constant.

- Other influences on share prices are ignored.

- The company's earnings will increase sufficiently to maintain dividend growth levels.

- The discount rate used exceeds the dividend growth rate.

5 THE VALUATION OF DEBT AND PREFERENCE SHARES

Section overview

- Valuation of debt securities: the basic principle
- Valuation of irredeemable fixed rate debt
- Valuation of redeemable fixed rate debt
- Valuation of convertible bonds

5.1 Valuation of debt securities: the basic principle

The valuation of debt capital is based on the same basic principle as the valuation of shares using the dividend valuation model or dividend growth model.

The value of debt securities (bonds) is the present value of all future interest payments and the repayment of the debt principal, discounted at the cost of the debt.

Taxation is ignored in the valuation, because the personal tax positions of investors differ. The valuation is obtained by discounting interest payments and the eventual redemption value of the bonds at the pre-tax cost of the bonds.

Since the future investment income from fixed-rate bonds (interest and repayment of the principal) are known amounts, not estimates, the valuation model for bonds is more exact than the dividend valuation model for shares.

For fixed rate bonds, the present value of all future interest payments and the repayment of the debt principal is therefore calculated using DCF to obtain a present value of future cash flows from the bond.

Cost of debt securities and the valuation of debt securities

The earlier chapter on cost of capital explained how the cost of debt capital can be calculated from the future cash flows from the bond and the market value of the bond.

Here we are calculating the market value of a bond from the future cash flows from the bond and the (before-tax) cost of capital.

5.2 Valuation of irredeemable fixed rate debt

The value of irredeemable fixed rate debt is the present value of interest payments in perpetuity. The valuation model for irredeemable debt is similar to the dividend valuation model with constant annual dividends.
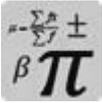
Formula: MV of irredeemable fixed rate debt

MV of debt using lender's required rate of return

$$MV = \frac{i}{r_d}$$

MV of debt using borrower's cost

$$MV = \frac{i\,(1 - t)}{\text{Post tax } r_d}$$

Where:

$r_{D=}$ the cost of the debt capital

i = the annual interest payable

t = rate of tax on company profits.

MV = Ex interest market value of the debt

Note that calculations are usually performed on a nominal amount of 100 or 1,000.

By convention, bonds are usually valued at an amount per ₦100 or ₦1,000 nominal value of the bonds.

Example: MV of irredeemable fixed rate debt

A 7% bond, denominated in naira, pays interest annually.

The interest yield required by the bond investors is 8%.

The value of the bonds (ex-interest) is therefore (₦100 × 7%)/8%) = ₦87.50 per ₦100 nominal value of the bonds.

Example: MV of irredeemable fixed rate debt

A 10% irredeemable bond of ₦1,000 each, pays interest **every six months**.

The interest yield required by investors in the bonds is 8% **per annum**. What is the market value of these bonds?

Answer

If the annual cost of debt is 8%, the six-month cost of debt will be about 4%.

$$\text{Valuation} = \frac{\text{Six-monthly interest}}{\text{Six-monthly cost of debt}} = \frac{₦50}{0.04}$$

= ₦1,250

5.3 Valuation of redeemable fixed rate debt

The value of redeemable fixed rate debt is the present value of all future interest payments on the bond to maturity, plus the present value of the principal repayment at maturity, discounted at the interest yield on the bond.

Example: Valuation of redeemable fixed rate debt

A dollar-denominated 6% bond pays interest annually, and has three years remaining to maturity. It will be redeemed at par.

The interest yield required by the bond investors is 5% per annum. An annual interest payment has just been made.

The value of the bond is calculated as follows, for each ₦1,000 nominal value of the bonds.

Year		Amount	Discount factor at 5%	Present value
		₦		₦
1	Interest	60	0.952	57.1
2	Interest	60	0.907	54.4
3	Interest and debt principal	1,060	0.864	915.8
	Bond value			1,027.3

The bond will have a market value of 1,027.3 and at this price investors in the bonds will receive an average annual return of 5% if they hold the bonds until maturity.

5.4 Valuation of convertible bonds

The market value of a convertible bond is the higher of:

❑ The value of the bond as a straight bond that will be redeemed at maturity, and

❑ The present value of future interest payments up to the time that the bonds can be converted into shares, plus the present value of the expected market value of the shares into which the bonds can be converted.

A convertible should therefore be valued by each of these methods, and its value will be the higher of these two valuations.

Example: Valuation of convertible bonds

A company has issued some 4% dollar-denominated convertible bonds. These are convertible into shares of the company in four years' time at the rate of 25 shares for every ₦1,000 bonds. Interest on the bonds is payable annually, and the current year interest has just been paid.

The current market price of the company's shares is ₦46, and shareholders expect annual dividends to grow by 5% per year into the foreseeable future. The dividend is paid annually and a dividend for the current year has just been paid.

The convertible bondholders require an annual return of 6% per year on their investment.

What is the current price of the convertible bonds likely to be?

Answer

The current price of the convertible bond will be the higher of the value of the bond as a straight redeemable bond redeemable in four years' time and the value of a bond that will be converted into shares in four years' time.

The current share price is ₦46, but if dividends are expected to rise by 5% per year into the foreseeable future, the share price will also be expected to rise at the same rate. The expected share price in four years' time is therefore: ₦46 $\times$ $(1.05)^4$ = ₦55.9.

Value of the convertible as a straight bond

Year		Amount	Discount factor at 6%	Present value
		₦		₦
1 - 4	Interest	40	3.465	138.6
4	Redemption value	1,000	0.792	792.0
	Value as straight bond			930.6

Value of the convertible if shares are converted

Year		Amount	Discount factor at 6%	Present value
		₦		₦
1 - 4	Interest	40.0	3.465	138.6
4	Value of shares (25 $\times$ ₦55.9)	1397.5	0.792	1,106.8
	Value			1,245.4

The convertibles should have a current price of about ₦1,245.4.

(Note: In this example, by comparing the cash flows of the convertible as a straight bond and the convertible if the bonds are converted into shares, it should be obvious which has the higher present value. In this example, it should therefore be unnecessary to calculate the PV of the convertible as a straight bond.)

6 EFFICIENT MARKET HYPOTHESIS (EMH)

Section overview

- The efficiency of capital markets and fair prices
- The nature of capital market efficiency
- The purpose of the efficient market hypothesis (EMH)
- Weak form efficiency
- Semi-strong form efficiency
- Strong form efficiency
- Implications of strong capital market efficiency
- Factors that may have an impact on the market value of shares

6.1 The efficiency of capital markets and fair prices

Investors in securities such as shares and convertible bonds want to be confident that the price they pay for their securities is a fair price. In order for market prices to be fair, it is important that the stock market should be able to process the relevant available information about companies and that investors should have immediate access to this information and act on it when making decisions about buying and selling shares.

The efficient markets hypothesis provides a rational explanation of how share prices change in organised stock markets. The hypothesis is based on the assumption that share prices change in a logical and consistent way, in response to new information that becomes available to investors. The **speed** with which share prices change depends on how quickly new information reaches investors, and this varies with the **efficiency** of the market.

6.2 The nature of capital market efficiency

There are four types of capital market efficiency:

❑ **Operational efficiency** - A capital market is efficient operationally when transaction costs for buying and selling shares are low, and do not discourage investors from taking decisions to buy or sell.

❑ **Informational efficiency** - A capital market is efficient 'informationally' when available information about companies is processed and made available to investors.

❑ **Pricing efficiency** - A market has pricing efficiency when investors react quickly to new information that is made available in the market, so that current share prices are a fair reflection of all this information. For pricing efficiency to exist, a capital market must also be operationally and informationally efficient.

❑ **Allocational efficiency** - When there is allocational efficiency in a capital market, available investment funds are allocated to their most productive use. Allocational efficiency arises from pricing efficiency.

Research into stock market efficiency focuses on pricing efficiency.

Efficiency therefore refers to the speed with which information is made available to the market, and the response of market prices to this information. In an efficient market, all investors are reasonably well informed at the same time about new developments that might affect market prices, so that some investors with 'insider knowledge' cannot exploit their knowledge to make profits at the expense of other investors.

If all relevant information is made available to all investors at the same time, all investors are able to make decisions at the same time about buying or selling investment, and about whether current prices are too high or too low.

Although the concept of market efficiency applies to all financial markets, it is probably most easily understood in the context of equity shares and the equity markets.

6.3 The purpose of the efficient market hypothesis (EMH)

The efficient market hypothesis (EMH) is a theory of market efficiency, based on research into share price behaviour in stock markets. The purpose of this research is to establish the extent to which capital markets show pricing efficiency.

According to this theory there are three possible levels or 'forms' of market efficiency:

❑ Weak form efficiency

❑ Semi-strong form efficiency, and

❑ Strong form efficiency.

Each financial market can be categorised as being weak form, semi-strong form or strong form efficient.

In equities markets, the way in which share prices move in response to available information varies according to the efficiency of the market.

6.4 Weak form efficiency

The efficient markets hypothesis states that when a market has weak form efficiency, share prices respond to the publication of historical information, such as the previous year's financial statements.

When the market displays a weak form, it also means that the current share price embodies all the historical information that is known about the company and its shares, including information about share price movements in the past. Until the next publication of more historical information about the company, there is no other information about the company that will affect the share price in any obvious way.

The weak form suggests that the current price reflects all past prices and that past prices and upward or downward trends in the share price cannot be used to predict whether the price will go up or down in the future. Share prices do rise and fall, with supply and demand in the market, but the next price movement is equally likely to be up as down.

Random walk theory (versus Chartism)

A weak form of stock market efficiency is consistent with the **random walk theory**. This is the theory that share prices move up and down randomly over time, in response to the arrival of favourable or unfavourable information on the market.

Random walk theory is opposed to the view that future share price movements can be predicted from patterns of share price movements in the past, since patterns repeat themselves, and historical trends can be used to predict future trends. Some stock market analysts believe that they can predict future movements in share prices from recognisable patterns of share price movement. These analysts are sometimes called **chartists**, because recognisable patterns of share price movements can be illustrated by graphs or charts of share prices over a period of time. Chartism does not have a rational justification.

6.5 Semi-strong form efficiency

When a market has semi-strong form efficiency, current share prices reflect all publicly-available information about the company and its prospects, in addition to historical information. For example, share prices might respond to a new announcement by a company about its trading prospects for the remainder of the year. Similarly, the share price might also respond to an announcement that the company is seeking to make a new acquisition, or a major new investment.

If a market displays semi-strong form efficiency, share prices should move when new information becomes available to the public, but not before. For example, if a company is planning a major acquisition, the share price should not be affected by unconfirmed rumours in the market. However, the share price will react to the official announcement of a takeover bid by a company.

It also means that individuals who have access to information that has not yet been made public ('**inside information**') will be able to buy or sell the shares in advance of the information becoming public, and make a large personal profit. This is because the inside information will indicate whether the share price is likely to go up or down, and the individual can buy or sell accordingly.

Using inside information to make a personal profit from trading in shares is called insider dealing, which is illegal in countries with well-established stock markets.

6.6 Strong form efficiency

When a market has strong form efficiency, current share prices reflect **all** relevant information about the company as soon as it comes into existence, even if it has not been made publicly-available. In other words, the share price reflects all inside information as well as publicly-available information. The market is so efficient that all information is immediately transmitted throughout the market instantly, and all investors have access to this same information.

If the stock market has strong form efficiency, it is impossible for individuals to profit from insider trading, because there is no inside knowledge that the market has not already found out about.

In practice, research suggests that most markets have weak form efficiency, but some well-developed markets such as the New York Stock Exchange and London Stock Exchange are semi-strong form efficient.

Example: Efficient markets hypothesis

A company decides to undertake a major capital investment. The investment will be in a five-year project, and over the course of the five years, the company's directors believe that the net profits will add ₦125 million to the value of the company's shares.

The company made the decision to invest on 1st October Year 1, and the first year of profits from the investment will be Year 2. It announces the investment and the expected benefits to the stock market on 1st December. It is assumed that the stock market investors believe the company's estimate that the project will add ₦125 million to share values.

Strong form efficiency

If the stock market has strong form efficiency, the company's share price should go up on 1st October, as soon as the decision to invest is made. The total increase in share value should be ₦125 million.

Semi-strong form efficiency

If the stock market has semi-strong form efficiency, the share price should go up on 1st December, when the investment and its expected benefits are announced to the market and so become public information. (Between 1st October and 1st December, the information is 'inside information').

Weak form efficiency

If the stock market displays weak form efficiency, the share price will not be affected by the announcement on 1st December Year 1. The share price will eventually respond, after each of the next five years, when the actual historical profits of the company, including the profits from the new investment, are announced.

6.7 Implications of strong capital market efficiency

There are several theoretical implications of market efficiency. If a capital market has strong efficiency:

❑ Share prices will be fair at all times and reflect all information about a company. This means that there is no 'good time' or 'bad time' to try issuing new shares or bonds.

❑ Companies will gain no benefit from trying to manipulate their financial results and present their performance and financial position in a favourable light. In a market with strong-form efficiency, investors will see through the pretence and will understand the true financial position of the company.

❑ For investors there will never be any 'bargains' in the stock market, where share prices are under-valued. Similarly there will be no over-priced shares that clever investors will sell before a share price fall.

❑ If the capital market has strong form efficiency, if a company invests in any new capital project with a positive net present value, the share price should respond by going up to reflect the increase in the value of the company represented by the project NPV.

6.8 Factors that may have an impact on the market value of shares

In practice, research suggests that most markets have either weak form or semi- strong form efficiency. Factors which may impact on the efficiency of the market include:

❑ The marketability and liquidity of shares. The greater the volume of shares traded the more opportunity there is to reflect new information in the share price.

❑ Availability of information. Not all information can be available to all investors at the same time. Shares which are traded more by professional dealers are more likely to reflect full information as they can afford to pay for better monitoring systems and may have better access to early information.

❑ Pricing anomalies. Share prices may be affected by investor behaviour at the end of the tax year.

7 CHAPTER REVIEW

> ### Chapter review
>
> Before moving on to the next chapter check that you now know how to:
>
> ■ Estimate the market value of a business using dividend yield
>
> ■ Estimate the market value of a business price earnings ratios
>
> ■ Estimate the market value of a business using asset based methods
>
> ■ Estimate the market value of a business using the dividend valuation model
>
> ■ Estimate the market value of debt and preference shares
>
> ■ Explain the efficient market hypothesis

Behavioural Finance

Section overview
- Why are some decisions not made on a rational basis?
- How do bias, emotions and different attitudes affect investors?

Introduction

Behavioural finance is an alternative view to the efficient market hypothesis. It attempts to explain the market implications of the psychological factors behind investor decisions and suggests that irrational investor behaviour may significantly affect share price movements.

These factors may explain why share prices appear sometimes to overreact to past price changes.

Investors are subject to a number of behavioural tendencies that can lead to decisions that are not rational. These behavioural tendencies impact investors' decisions which question the validity of the efficient markets hypothesis.

Overconfidence

Investors tend to overestimate their trading abilities and gloss over the areas in which they lack knowledge. This can lead to them making bad investments. They are also likely to over-estimate the accuracy of their forecasts, such as predicted earnings. Investors may then be surprised by (for example) earnings announcements, because their predictions were overambitious.

Over-confidence can be linked to self-attribution bias. This means that investors will attribute their successes to their own skills, but their failures will have been caused by bad luck rather than themselves. Over-confidence leads investors to think they can beat the market.

Representativeness

Representativeness occurs when judgments are based too heavily on a representative observation and don't take into account numerous other factors, such as statistical evidence. As an example, when there is a sharp decline in the stock market there will be articles showing that the fall in the index level is similar to that of the Wall Street crash of 1929. Although this statistic may be accurate, it may mislead investors to believe that there will be a repeat of the Great Depression of the 1930s. The fundamental economic differences between the two situations are overlooked in favour of the one similarity.

Representativeness can also explain why some investors think that past performance can be used to indicate future performance, when in reality the link is generally a poor one.

Narrow framing

Investors can suffer from 'narrow framing' if they are unable to look at the broader picture. For example an investor can focus on the price movement of a single share instead of looking at the whole portfolio. Similarly, investors may worry about short-term performance when their goal is to fund long-term retirement savings. Looking at the broader picture, it should be seen that in the long run, a well-diversified portfolio should grow in value, despite some short-term fluctuations.

Miscalculation of probabilities

Research has shown that investors attach too low a probability to likely outcomes and too high a probability to unlikely outcomes. This can help to explain stock market bubbles such as the 'dotcom' bubble as investors overestimated the potential of the internet start-ups and their ability to dominate their market segments.

Investors are afraid of areas where they do not have much information and instead they prefer the familiar, which they believe they know well. This can help to explain why investors avoid overseas shares, when, rationally, international diversification brings benefits to the investor.

Positive feedback and extrapolative expectations

Positive feedback investors buy shares after their prices have risen and sell them after prices fall. They build extrapolative expectations about the share prices, expecting prices to continue rising (or falling). Some informed traders use this behavioural tendency to their advantage by joining in and pushing rising prices higher and then selling at a profit before the price falls. This creates instability in the market and means the share price has diverged from its realistic value. This behaviour can create stock market bubbles.

Cognitive dissonance

If an investor has a long-held belief, they will continue to hold it even if evidence completely contradicts this belief. This can lead to investors holding shares that they believe will increase in value when the evidence overwhelmingly suggests otherwise.

This tendency contributes towards an effect known as 'post-earnings announcement drift' which shows that the reaction to unexpectedly good or bad earnings figures is slower than suggested by the efficient markets hypothesis.

Availability bias

Individuals may pay particular attention to one fact or event because it is freshest or most prominent in their minds. The bigger picture is ignored, though it is likely to be used on sound probabilities, and instead, the investor is influenced by the emotion attached to the one fact or event. For example, if some high-profile companies in the nuclear energy sector produce some poor results, then investors might abandon the entire sector and ignore the potential that there are some good companies available in the sector at attractive share prices.

Conservatism

Investors tend to be naturally conservative and resistant to changing an opinion. As a result, if profits turn out to be higher than expected, they will under-react and not adjust subsequent profits expectations. This means that one profits announcement surprise is followed by another.

Overall

Despite these behavioural tendencies, investors tend to be viewed as flawed rational thinkers rather than as completely irrational. Investors attempt to be rational, but have limitations in their memory, emotion and cognitive functions which lead them to repeat mistakes.

CHAPTER

19

Value based management and modern business valuation techniques

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B	Business analysis		
	1	**Evaluate and assess the value of businesses and give advice based on business scenarios by determining the value of shares and business, in a given scenario, using:**	
		c	Discounted cash flow based valuation techniques and free cash flow models;
		f	Value-based management;
		g	Shareholder value analysis;
		h	Short and long term growth rates and terminal values;
		i	Economic profit methods;
		j	Cash flow return on investment;
		k	Total shareholder return;
		l	Economic value added (EVA) and market value added (MVA); and

Exam context

This chapter explains several, more sophisticated methods of estimating the valuation of a company and also explains the meaning of value based management.

By the end of this chapter, you should be able to:

■ Explain the meaning of value based management

■ Explain and estimate, economic value added, cash flow return on investment and total shareholder return

■ Estimate the market value of a business using market value added

■ Explain and identify free cash flows

■ Estimate the market value of a business using discounted cash flow techniques

1   VALUE BASED MANAGEMENT

Section overview

- ■ Value-based management (VBM)
- ■ Shareholder value analysis

1.1   Value-based management (VBM)

VBM is a management approach based on the concept that the ultimate measure of a company's success is the extent to which it increases the wealth of shareholders.

Value is created when companies invest capital at returns that exceed the cost of that capital.

VBM adopts approaches that focus on how value creation is linked to management actions. The aim is to guide decision making at all levels in an organisation in a way that leads to value creation.

Value drivers

A value driver is any variable that affects the value of the company. They should be ranked in terms of their impact on value and responsibility assigned to individuals who can help the organisation meet its targets. Value drivers can be difficult to identify as it requires an organisation to think about its processes in a different way and existing reporting systems are often not equipped to supply the necessary information. It has been suggested that a good way of relating a range of value drivers is to use scenario analysis. It is a way of assessing the impact of different sets of mutually consistent assumptions on the value of a company or its business units.

No single manager can directly influence shareholder value. However, managers do have influence over aspects of the business that drive value.

Value drivers are variables that affect the value of the company or business unit. A widely used model comprises 7 drivers of shareholder value,[19] giving some guidance to managers:

- ❑   Revenue;
- ❑   Operating margin;
- ❑   Cash tax rate;
- ❑   Incremental capital expenditure;
- ❑   Investment in working capital;
- ❑   Cost of capital;
- ❑   Competitive advantage period.

Performance measures can be established directed at guiding management behaviour towards value enhancement, for example by controlling costs to improve margin.

The main advantage of SVA is that it encourages focus on value creating activities rather than on short term profit-related activities which may not create value

1.2 Shareholder value analysis

SVA is the process of analysing how certain decisions affect the net present value of cash to shareholders.

For example, it provides a framework for evaluating options for improving shareholder value by determining the trade-offs between investment policy and dividend policy.

There are several techniques associated with SVA. These include:

❑ Economic value added (EVA)

❑ Market value added (MVA – an extension of EVA)

❑ Cash flow return on investment (CFROI)

❑ Total shareholder return

EVA and MVA are covered in a later section.

Cash flow return on investment (CFROI)

This technique is an Economic Profit (Cash Flow) based valuation framework.

CFROI is a real rate of return measure that identifies the relationship between the cash generated by a business relative to the cash invested in it. In essence it is an internal rate of return (IRR).

CFROI is compared to a hurdle rate to determine if investment/product is performing adequately. The hurdle rate is the total cost of capital for the corporation calculated by a mix of cost of debt financing plus investors `expected return on equity investments. The CFROI must exceed the hurdle rate to satisfy both the debt financing and the investors expected return.

The cash flow return on investment (CFROI) measures a company's cash return on invested assets. It is determined by dividing a company's gross cash flow by its gross investment.

Total shareholder return
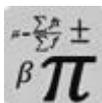
Formula: Cash flow return on investment

$$CFROI = \frac{\text{Cash flows}}{\text{Market value of capital employed}}$$

Total Shareholder Return (TSR) (or simply Total Return) is a measure of the performance of different companies' stocks and shares over time. It combines share price appreciation and dividends paid to show the total return to the shareholder expressed as an annualised percentage.

It is calculated by the growth in capital from purchasing a share in the company assuming that the dividends are reinvested each time they are paid. This growth is expressed as a percentage as the compound annual growth rate.

> **Formula: Total shareholder return**
>
> $$\text{Total shareholder return} = \frac{(\text{Share price at end - share price at beginning}) + \text{Cash paid to shareholders}}{\text{Share price at beginning}}$$

The cash pay-outs to shareholders include dividends, share buy-backs and any other cash payments.

2 ECONOMIC VALUE ADDED (EVA) AND MARKET VALUE ADDED (MVA)

Section overview

- The origins of the EVA method
- The concept of economic value added
- Calculating EVA
- Market value added: MVA
- The link between EVA and MVA
- EVA and MVA as a valuation method for companies
- Advantages and disadvantages of EVA and MVA for valuation

2.1 The origins of the EVA method

Economic value added or EVA is a measure of performance that provides a useful assessment of how much shareholder value has been added during a period.

❑ One method of measuring the creation of shareholder value is to take the change in the share price during the period and add dividend payments. However, this measure of the increase in shareholder value is unreliable and so unsatisfactory, because short-term movements in share prices are dependent on factors other than financial performance.

❑ It is usual to assess management performance by the profit earned during a period or the return on investment ROI (return on net assets RONA). However, accounting profit is an unsatisfactory measurement of shareholder value added. ROI is also criticised as a measure of performance because it can encourage management decision-making that is not in the best interests of the company – such as deferring capital investments and choosing not to invest in research and development, because these would reduce ROI in the short-term.

EVA was developed as a measure of performance that is closely correlated to shareholder wealth. In addition, when EVA is used as a basis for a management incentive scheme, it can encourage management to make decisions that are in the best interests of the company, such as investing for the longer term, in capital expenditure, research and development (innovation) and brand-building.

2.2 The concept of economic value added

Measuring EVA is a complex calculation, but the basic concept is very simple. (It is similar to the concept of residual income.)

❑ Managers should be charged for the capital that they use. This should include equity capital as well as debt capital.

❑ A company, and each operating division within a company, should make enough profits after tax to provide the returns that are expected by the providers of capital (equity and debt).

❑ A charge for the use of capital should therefore be deducted from operating profit after tax.

❑ If operating profit exceeds the capital charge, economic value has been added and shareholder value has been created.

❑ If operating profit is not sufficient to cover the capital charge, value has been lost. Providers of capital would be justified in wanting to move their capital to an investment yielding higher returns, or in wanting to replace the current managers with new management who are better at creating value.

The economic value added during a period is calculated as follows:
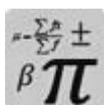
Formula: Economic value added

$$\text{EVA} = \text{Net Operating Profit after Tax (NOPAT)} - \text{WACC} \times \text{Capital Employed}$$

Where:

WACC = the weighted average cost of capital.

Capital employed is capital employed at the beginning of the financial year, with some adjustments (as described later).

The net operating profit figure is after deduction of a charge for tax (unlike normal measurements of ROI and residual income). The cost of debt interest is included in the capital charge; therefore interest costs are not deducted in arriving at the figure for net operating profit. NOPAT is operating profit before deducting interest charges but after deducting an amount for tax.

2.3 Calculating EVA

The concept of EVA was developed by the consultancy firm Stern Stewart.

It is argued that accounting measurements of operating profit and capital employed are unreliable and unrealistic in various respects. The figures that should be used are:

❑ The economic value of capital employed; and

❑ An estimate of economic profit.

These figures can be estimated by making adjustments to the accounting figures for capital employed and profit. Stern Stewart have identified a large number of adjustments that should be made to the accounting figures for profit and capital employed. Originally they identified 164 adjustments that should be made.
However making all these adjustments would be time-consuming and many of them would not have a material impact on the resulting figure for EVA.

In practice, companies using EVA therefore make about 5 to 15 adjustments, which affect EVA by a material amount. Some of these are explained here.

Adjustments to capital employed

Several adjustments should be made to the accounting (balance sheet) value of capital employed to arrive at an estimate for the economic value of capital employed.

❑ Expenditure on some 'intangible items' is treated as an expense in the income statement, and written off in the year that it is incurred. However, some spending on intangibles adds to the economic value of a company's assets. The expenditure should therefore be capitalised and amortised over a number of years. An important example is spending on research and development. It could also be argued that some spending on training and on advertising to develop a brand name are items that should be capitalised and amortised over several years.

❑ Provisions or allowances in the accounting balance sheet are not 'real' reductions in capital, and should be added back. In particular, any deferred tax reserve and allowance for doubtful debts should be added back to capital.

❑ On the other hand, long-term leases should not be capitalised. If they have been capitalised, they should be deducted from capital. The rent paid on a lease is a measure of its economic cost. Instead of including depreciation of a leased asset and a finance charge in the income statement, these should be replaced by the actual lease rental for the period.

Capital employed can be measured in either of two ways:

Assets method	Liabilities and equity method
Current assets minus non-interest bearing current liabilities (such as trade payables)	Interest-bearing current liabilities (for example, a bank overdraft)
Plus	**Plus**
Non-current assets net of depreciation and impairment	Interest-bearing non-current liabilities (for example, bonds and long-term loans)
Plus (or minus)	**Plus (or minus)**
Adjustments to assets/equity as described above	Adjustments to assets/equity as described above
Equals: Capital employed	**Equals: Capital employed**

Adjustments to NOPAT

Some adjustments must also be made to the accounting figure for NOPAT in order to reach an estimate of the economic profit before capital charge.

❑ Amounts charged as an expense in the income statement that should be capitalised (such as research and development expenditure) should be added back to profit, but an amortisation charge should be made to reflect the loss of economic value in the intangible asset during the period.

❑ Depreciation and finance charges for leased assets (finance leases) should be added back to profit, but the actual lease rental should be deducted.

❑ Any addition to the deferred taxation reserve should be added back to NOPAT (or any reduction in deferred tax should be subtracted from NOPAT). The tax charge in calculating NOPAT should be the actual amount of tax that the company expects to pay on its profits for the year.

❑ A calculation of NOPAT might also allow for the fact that the 'cash' tax charge includes tax relief on debt interest. The tax relief on debt interest is allowed for in the weighted average cost of capital; including tax relief in the tax charge would be 'double-counting'. The tax charge should therefore be increased by the amount of tax relief on debt interest.

Capital charge

The capital charge for the year is the economic value of capital employed multiplied by the company's weighted average cost of capital. Usually, the WACC is applied to the capital employed as at the beginning of the year.

EVA and depreciation and impairment of non-current assets

You might notice that the adjustments to capital employed and NOPAT do not include any adjustment for the depreciation and impairment of non-current assets.

Assets lose economic value each year, and it is appropriate to make a charge for the loss of economic value – economic depreciation or economic impairment. A figure for economic depreciation should be used in calculating EVA, and this should replace the accounting figure for depreciation.

❑ Economic depreciation must be recovered from the company's cash flows. It might help to think of this as cash that is needed for the essential replacement of worn-out assets. There must be a charge for economic depreciation in calculating EVA.

❑ It is often assumed that accounting depreciation is a reasonable approximation of economic depreciation of tangible non-current assets.

❑ For these reasons, there is no adjustment to EVA for accounting depreciation charges.

It is also appropriate to assume that any charge for impairment of assets (including goodwill) in the accounting balance sheet is an appropriate measure of the impairment of economic value.

As a result, no adjustments are made to the depreciation charge or the amounts written off for impairment of tangible non-current assets, goodwill or other intangible non-current assets in the accounting balance sheet.

Note

EVA is NOT an estimate of cash flow profits and should not be confused with cash flows or 'free cash flow'.

❏ NOPAT is an estimate of economic profit, and it includes charges for depreciation and amortisation.

❏ The charge for the cost of capital includes a charge for the cost of equity, which is not a cash item of cost.

A simplified example is shown below to illustrate how EVA might be calculated.

Example: EVA

At the beginning of a financial year, a company's balance sheet capital employed was ₦150 million (accounting measurements).

During the year, the company's profits were as follows in the financial accounts:

	₦ million	₦ million
Profit before interest and tax		24.0
Interest		4.0
		20.0
Taxation		
Tax on current year profits	6.0	
Deferred tax	2.0	
		8.0
Profit after tax		12.0
Dividends		5.0
Retained profit for the year		7.0

The following additional information is available:

(1) For the first time, the company has invested in research and development. Expenditure during the year was ₦5 million and the full cost has been written off as an expense in the income statement. To measure EVA, it should be assumed that the amortisation charge for R&D for the year should be ₦1 million.

(2) There was an increase in the allowance for doubtful debts from ₦1.5 million to ₦2 million.

(3) Taxation is 30% of profits.

(4) The company's weighted average cost of capital is 10%.

Required

(a) Calculate an estimate of economic value added for the year. Assume for the purpose of this example that the capital charge is calculated using the year-end value of capital employed, before adding EVA for the year.

(b) Calculate the economic value of the company's capital employed as at the beginning of the following financial year.

Answer

Capital employed	₦ million
At the beginning of the year (no adjustments)	150.0
Adjustments for:	
Allowance for doubtful debts	2.0
Research and development	4.0
(₦5 million minus ₦1 million amortisation)	
Year-end economic value of capital employed	156.0

Note: The capital charge will be calculated in this example on the year-end value of the capital employed before adding EVA. In practice, the beginning-of-the-year value of capital employed is normally used.

Method 1		**Method 2**	
	₦m		₦m
Profit before interest and tax	24.0	Accounting profit after tax	12.0
Tax charge on profit	(6.0)	Tax relief on interest	(1.2)
Plus tax relief on interest	(1.2)	Add back	
		Interest charge	4.0
		Deferred tax	2.0
	16.8		16.8
Adjustments		Adjustments for	
Increase in allowance for doubtful debts	0.5	Increase in allowance for doubtful debts	0.5
R&D expenditure capitalised	5.0	R&D capitalised	5.0
Amortisation of R&D	(1.0)	Amortisation of R&D	(1.0)
NOPAT	21.3	NOPAT	21.3

Economic value added	₦ m
NOPAT	21.3
Capital charge (₦156 million × 10%)	(15.6)
EVA	5.7

Economic value of capital employed	₦ m
Year-end value before adding EVA	156.0
EVA for the year	5.7
Dividends paid	(5.0)
At the beginning of the next financial year	156.7

2.4 Market value added: MVA

Market value added or MVA is a measurement of value that builds on the Stern Stewart EVA model. EVA measures the economic value that has been added to a company during a specific period of time, such as a financial year. MVA provides a link between EVA and the market valuation of companies.

Measuring MVA

MVA can be calculated as follows:

❑ Take the total amount of money that has been invested in the company, through share issues, borrowing and retained earnings. Make adjustments to retained earnings, to allow for differences between accounting profit and economic value. The resulting figure should be the economic book value of the capital employed in the company.

❑ Calculate the current total market value of the company's capital – equity and debt.

❑ Calculate the difference between these two amounts, to obtain MVA.
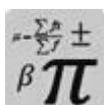
Formula: Market value added

$$\text{MVA} = \text{Market value of debt} + \text{Market value of equity} - \text{Book value of equity}$$

MVA is therefore the premium over the economic book value of the company's assets that investors have given to the company's securities.

❑ If MVA increases, value has been created.

❑ If MVA falls, value has been lost or destroyed.

❑ Over time, if a company adds shareholder value each year, and has a positive EVA, MVA should increase.

2.5 The link between EVA and MVA

If MVA is positive, it represents a premium that investors place on the company's securities, in excess of the economic book value of its assets. It therefore represents a value that investors give to the expected future growth opportunities for the company. This value can be defined as the present value given by investors to the expected EVA that the company will create in future years.

2.6 EVA and MVA as a valuation method for companies

EVA and MVA could be used as a method of putting a valuation to a company (public or private company) or to an operating division of a company. A valuation could be obtained as follows:

Illustration: MVA as a valuation method

	₦
Current economic value of assets	X
Estimated MVA	X
Valuation of company/division	X

Example: MVA valuation

ABC, a public limited company, is considering a takeover bid for XYZ, a private company. The takeover will be 'friendly', but ABC needs to decide a price that it is prepared to offer for the acquisition of the shares in XYZ.

The accounts of XYZ for the past few years have been analysed, and adjustments have been made to obtain an estimated economic book value of the assets of XYZ, which is ₦50 million. It has also been estimated that for each of the past five years, XYZ has made economic value added of ₦4 million.

ABC is prepared to pay for the economic value of XYZ's assets plus a premium based on MVA. It proposes to calculate MVA as the present value of expected annual EVAs for the next ten years. It is estimated that EVA will be ₦4.5 million per year in the future. A suitable cost of capital to apply to the valuation is 9%.

The price that ABC will offer is therefore calculated as follows:

	₦m
Current economic value of assets	50.0
Estimated MVA (see working)	28.9
Valuation of company	78.9

Working: Calculation of MVA

Annual EVA = ₦4.5 million

Discount factor, years 1 – 10, at 9% = 6.418

MVA = ₦4.5 million × 6.418 = ₦28.9 million

The MVA can be calculated by estimating the expected EVA for the company or division over a selected number of years into the future. These EVAs should then be discounted to a present value using a suitable cost of capital, to obtain a valuation for MVA.

Example: MVA valuation

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Working: Calculation of MVA

Annual EVA = ₦4.5 million

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MVA = ₦4.5 million × 6.418 = ₦28.9 million

2.7 Advantages and disadvantages of EVA and MVA for valuation

There are several advantages with the EVA/MVA valuation method.

❑ The concept is quite simple, although the calculation of EVA might be complex.

❑ It can be applied to private companies and also to divisions of companies.

❑ It links the valuation of companies to the creation of shareholder value. (Research appears to show that over time, changes in the MVA of companies have been closely correlated to EVA.)

There are several disadvantages with the EVA/MVA valuation method.

❑ To use EVA for a company valuation, we use estimates of EVA in future years. EVA was actually devised as a historical measure of past performance.

❑ It could be argued that a valuation based on the PV of free cash flows from the acquired company is more appropriate than a valuation based on a conceptual value such as EVA.

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3 CASH FLOW VALUATION METHODS

Section overview

- Discounted cash flow basis
- Net present value method
- Shareholder value analysis
- Measuring free cash flow to the firm

3.1 Discounted cash flow basis

A discounted cash flow basis might be used when a takeover of a company is under consideration, to value either

- ❑ the company in total (equity and debt capital); or
- ❑ the company's equity shares only.

The basic assumptions in a DCF-based valuation are as follows.

- ❑ The acquisition of the target company is a form of capital investment by the company making the acquisition.

- ❑ Like any other capital investment, it can be evaluated by DCF, using the NPV method.

- ❑ After the target company is acquired, its cash flows will come under the control of the company making the acquisition.

- ❑ A maximum valuation for the target company can therefore be obtained by estimating the future cash flows from acquiring the company, and discounting these to a present value at a suitable cost of capital (perhaps the acquiring company's WACC).

Valuation of a business using DCF

DCF can be used to estimate a present value of the future profitability of a company. Management might want to know the present value of expected profits of a business in future years. One reason for wanting this information is to enable management to put a current value on the business, possibly in order to:

- ❑ decide how much to offer for a target company in a takeover bid; or
- ❑ decide whether to accept or reject a takeover offer from another company.

The value of a business can be estimated by discounting expected future cash flows from the business over a number of years into the future. The cash flows that should be used for discounting are the expected **free cash flows** of the business. Forecasts of free cash flows might include growth (inflation) assumptions that are dealt with in the usual way.

The advantages of a cash flow basis for business valuation

There are several strong arguments in favour of a cash flow approach to valuation.

- ❑ Cash flows earned by a business are much more closely correlated to value and shareholder wealth than accounting profits. Valuations should therefore be based on expectations of future cash flows rather than expectations of profit or accounting return on investment.

❑ Returns on an investment, such as the acquisition of another company, must be sufficient to cover the costs of the finance used to make the acquisition. This includes the cost of equity finance as well as the cost of any debt finance. It is therefore appropriate to assess the value future cash flows from an acquisition in terms of whether they provide a return in excess of the total cost of financing.

A key point to note is that if the purchase price for an acquisition exceeds the value of the returns that will be obtained from the acquisition, allowing for the acquirer's cost of capital, the acquisition will destroy value. The value of the acquisition will be less than the acquirer pays for it.

This is a strong argument for suggesting that businesses should be valued on the basis of expected future cash flows and the cost of capital.

3.2 Net present value method

The net present value method is straightforward. The valuation of a company or a business should be calculated as the net present value of expected future cash flows from the business, discounted at an appropriate cost of capital.

The following steps are required to apply the NPV valuation method.

❑ Estimate the relevant incremental cash flows from the business to be acquired.

❑ Discount these cash flows at an appropriate cost of capital that reflects the risk of the investment.

❑ The maximum price that should be paid for the business is the present value (or net present value) of these future expected cash flows.

The NPV method might be appropriate where the future cash flows from an acquired business will be affected by the acquisition.

For example, the acquirer might have plans to invest extra capital in the acquired business after the acquisition has taken place. This additional investment will affect future cash flows, and so should affect the valuation.

Terminal value – a calculation complication

A DCF based approach requires an estimate of future cash flows. The cash flows of a business would be expected to continue into perpetuity.

Forecasts of cash flows become more difficult further into the future so in practice, it is common to divide the future into two periods:

❑ an explicit forecast period which is the smallest period for which it is possible to predict cash flows with reasonable accuracy (say the first five years); with

❑ cash flows expected after the end of this period are represented as a terminal value.

The terminal value is calculated as a "future" present value of all cash flows expected to arise after the end of the explicit forecast period. In other words, a present value is calculated in the future. This present value is a cash equivalent of all future cash flows arising after this point in time. It has to discounted back to give a "current" present value.

This is a little tricky to understand at first and is best seen with an example.

Example: Terminal value

A company is valuing an acquisition target and has made the following forecasts of its cash flows.

Year	Cash flows
1	10,000
2	15,000
3	20,000
4 ∞	21,000

The company's cost of capital is 8%.

Required

Calculate the NPV of the cash flows

Answer

Item	Year 1	Year 2	Year 3	Year 4 to infinity
	₦	₦	₦	₦
	10,000	15,000	20,000	21,000
Step 1: Calculate terminal value				
Multiply by 1/r (see below)				1/0.08
			262,500	↵
Cash flows	10,000	15,000	282,500	
Discount factors (at 8%)	0.926	0.857	0.794	
	9,260	12,855	224,305	
PV			246,420	

Discounting a cash flow by 1/r gives a present value, where the present is one year before the first cashflow.

Therefore, discounting the t4 to infinity cash flow by 1/r gives a present value, where the present is t3.

This is the same as a sum of cash at t3 of this size. This must be discounted back from t3 to t0 in the usual way

Terminal value with growth

In the above example the cash flows from 4 to infinity were expected to be constant. Usually a growth rate is expected and this must be built in to the calculation of the terminal value using the DVM (with growth) approach.
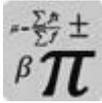
Formula: Discount factor for a cash flow expected to grow at a constant rate in perpetuity

$$MV = \frac{d(1 + g)}{r_e - g}$$

Note: this formula gives the present value of any cash flow which starts in one year's time and grows at a constant rate in perpetuity

Which can be re-expressed in general term as:

$$PV = \frac{\text{Cash Flow in one year's time}}{r - g}$$

Example: Terminal value

A company is valuing an acquisition target and has made the following forecasts of its cash flows.

Year	Cash flows
1	10,000
2	15,000
3	20,000

The cash flow at time 3 is expected to grow at 5% in perpetuity

The company's cost of capital is 8%.

Required

Calculate the NPV of the cash flows

Answer

Item	Year 1	Year 2	Year 3	Year 4 to infinity
	₦	₦	₦	₦
	10,000	15,000	20,000	21,000
Terminal value				
Multiply by 1/r (see below)				$1/_{0.08 - 0.05}$
			700,000	↵
Cash flows	10,000	15,000	720,000	
Discount factors (at 8%)	0.926	0.857	0.794	
	9,260	12,855	571,680	
PV			593,795	

Example: Terminal value with inflation

QX Company is considering the acquisition of an operating division from a multinational company. If it acquires the division, it will invest an additional ₦12 million immediately to modernise equipment.

It has been estimated that the annual after-tax cash flows after the acquisition and additional investment will be as follows:

Year	₦ million
1	6
2	8
3	10
4	8
5 onwards (per year)	4

An appropriate after-tax cost of capital for valuing the acquisition is 8%.

Required

Estimate the maximum amount that QX Company should be prepared to pay to acquire the operating division from the multinational company.

Answer

Item	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5 to ∞
	₦m	₦m	₦m	₦m	₦m	₦m
	(12)	6	8	10	8	4
						1/0.08
Terminal value					50	↵
	(12)	6	8	10	58	
Discount factors (at 8%)	1.000	0.926	0.857	0.794	0.735	
	(12)	5.556	6.856	7.940	42.63	
NPV					50.98	

	Practice question	**1**

Ruffin Company is considering the acquisition of 100% of Tread, a private company. It is expected that if the takeover bid is successful, it will be necessary to invest ₦6 million immediately in capital equipment which will qualify for capital allowances at an annual rate of 25% by the straight-line method. This equipment will have no expected residual value.

It is expected that annual cash profits of the acquired company would be ₦1 million in the first year, rising to ₦2 million in the second year, ₦ million in the third year and ₦4 million in the fourth and subsequent years.

Taxation is 30% and is payable in the same year as the profits to which they relate. The cost of capital for evaluating the acquisition is 14%.

Required

What is the maximum price that Ruffin Company should offer to acquire the whole of Tread?

	Practice question	**2**

Company WY is considering the acquisition of another company, Company BN. Company BN has 4 million shares in issue.

After the acquisition Company WY intends to invest a further ₦6 million for the purchase of new operating assets in Company B. It is expected that annual cash flows for equity will be ₦1.0 million in the first year following the acquisition, and that these will increase by 8% each year for the next four years, after which the rate of growth in annual cash flows will fall to 3%.

The cost of capital is 10%.

Required

Calculate a valuation of the equity capital of Company BN.

3.3 Shareholder value analysis

Shareholder value analysis estimates a value for the equity capital of a company by calculating the present value of all future annual free cash flows to obtain a valuation for the entire company and then deducting the value of the company's debt capital.

Illustration: SVA approach to valuation

	₦
Value of firm as a whole (PV of free cash flows)	X
Value of debt	(X)
Value of equity	X

Example: SVA approach to valuation

A company is expected to have a free cash flow of ₦2.5m per annum in perpetuity.

The weighted average cost of capital of the company is 8% (after tax). The current

market value of the company's debt is ₦7 million.

Using the SVA method, the fair value of the company's shares is estimated as follows:

	₦m
Value of firm as a whole (₦2.5m ⨯ 1/.08)	31.25
Value of debt	(7.00)
Value of equity	24.25

One way of estimating the cash profits or cash flows from a major acquisition is to estimate the **free cash flows** of the target company and discount these to a present value. Free cash flow is the annual cash flow after paying for all essential expenditures.

This method makes the following assumptions:

❑ **Free cash flow** can be defined in a variety of different, although similar ways. One definition is that free cash flow in each year is the total earnings before interest, tax, depreciation and amortisation, less essential payments of interest, tax and purchases of replacement capital expenditure. Another definition of free cash flow is explained later.

❑ The annual free cash flows that a company is expected to earn in perpetuity can be discounted to a present value, using the **company's weighted average cost of capital** (WACC) as the discount rate.

❑ This discounted value of future free cash flows gives a total valuation for the company's equity capital (shares) plus its debt capital.

❑ The fair value of the company's shares is therefore the present value of these free cash flows minus the current market value of the company's debt. This is known as shareholder value and the approach is known as **shareholder value analysis (SVA)**.

Definition of free cash flow

Free cash flow is the amount of cash that is available for management to use in any way they want (at their discretion), after all essential payments have been made.

Essential payments include taxation payments and capital expenditure to replace ageing non-current assets ('replacement' capital expenditure). Free cash flow is therefore the amount of cash generated by the company that management are able to decide how to use.

In other words, it is the amount that they are free to use.

A company might measure free cash flows for equity in order to value the share capital of the company. However, the usual approach is to use free cash flow for the firm to value the entire business (equity plus debt) and then to find the value of equity by deducting the value of debt.

Free cash flow to the firm

Free cash flow to the firm is the amount of free cash flow generated by the business as a whole, regardless of the source of finance. It is therefore calculated without deducting interest payments as an essential cash payment.

There are differing views about whether capital expenditure for expanding the business is an essential cash payment.

❑　One view is that only replacement capital expenditure should be deducted as essential cash payments.

❑　A different view is that replacement capital expenditure and capital expenditure to grow the business internally (organically) should both be deducted in calculating free cash flows, but that capital spending on acquisitions and cash received from business disposals should be excluded.

❑　A third view is that all capital expenditure (net of proceeds from disposals) should be included in the calculation of free cash flow.

There is no 'correct' answer. However, free cash flow is the amount of cash that management can decide how to use.

❑　If it is assumed that expanding the business is a free decision by management, only replacement capital expenditure should be deducted in calculating free cash flow.

❑　On the other hand, if it is assumed that capital expenditure to pay for expansion of the business is necessary to grow operating cash flows in future years, a better definition of free cash flow would be one where both replacement capital expenditure and capital expenditure to pay for growth and expansion are deducted.

3.4 Measuring free cash flow to the firm

There are two methods of calculating free cash flow to the firm, although they are closely connected.

One method starts with operating profit and the other starts with cash flow from operations (as given in the cash flow statement).

Method 1

Illustration: Free cash flows to the firm (method 1)	
	₦
Earnings before interest and tax (EBIT)	X
Less tax on EBIT	(X)
Add back: Depreciation (and any other non-cash expenditures)	X
	X
Less: Working capital increases	(X)
Plus: Working capital decreases	X
	X
Less: Replacement capital expenditure	(X)
Free cash flow to the firm	X
Minus: Interest payments	(X)
Equals: Free cash flow to equity	X

> **Example:**
>
> A company measures its free cash flow as follows:
>
> | | ₦ |
> |---|---|
> | Profit before interest and tax | 1,500,000 |
> | Interest | 600,000 |
> | | 900,000 |
> | Tax (30%) | 270,000 |
> | | 630,000 |
>
> There was an increase of ₦50,000 in working capital during the year and expenditure on fixed assets (non-current assets) was ₦250,000. The depreciation charge for the year was ₦180,000.
>
> The company's cost of capital is 11%. It expects free cash flow to increase by 6% each year for the foreseeable future.
>
> **Required**
>
> Estimate a total value for the company.

> **Answer**
>
> | | ₦ |
> |---|---|
> | EBIT | 1,500,000 |
> | Tax at 30% | 450,000 |
> | | 1,050,000 |
> | Depreciation | 180,000 |
> | Increase in working capital | (50,000) |
> | Expenditure on non-current assets | (250,000) |
> | Free cash flow | 930,000 |
>
> Using the growth model valuation formula, an estimate of the total value of the company is:
>
> $$P = \frac{930,000\ (1.06)}{(0.11 - 0.06)}$$
>
> $$= ₦19,716,000.$$

Method 2

Illustration: Free cash flows to the firm (method 2)

	₦
Cash flow from operations	X
Less:	
Tax payments on profit	(X)
Replacement capital expenditure	(X)
Free cash flow to the firm	X

Example: SVA valuation

X plc is considering buying Y plc and has made the following estimates

1. Y will generate operating cash flows of ₦1 million pa;

2. Synergistic benefits of ₦200,000 pa are expected;

3. X plc estimates terminal values at t5 as 5 x annual post tax cash flow in year 5;

4. All surpluses to be taxed at 30%

5. Y has surplus assets which can be sold for ₦2m;

6. Y has loan stock with a current market value of ₦1.5m;

7. An appropriate discount rate is 10%

Calculate how much should be paid for Target's equity

Answer

Item	Time 0 ₦m	Year 1 ₦m	Year 2 ₦m	Year 3 ₦m	Year 4 ₦m	Year 5 ₦m
Operating cash flows		1.00	1.00	1.00	1.00	1.00
Synergies		0.20	0.20	0.20	0.20	0.20
Sale of head office	2.00					
Tax at 30%	(0.60)	(0.36)	(0.36)	(0.36)	(0.36)	(0.36)
Terminal value (5 × 0.84)						4.20
	1.40	0.84	0.84	0.84	0.84	5.04
Discount factors (at 10%)	1.000	0.909	0.826	0.751	0.683	0.621
	1.40	0.76	0.70	0.63	0.57	3.12
NPV						7.19
Less the value of debt						(1.50)
Value of equity						(1.50)

4 CHAPTER REVIEW

> ### Chapter review
>
> Before moving on to the next chapter check that you now know how to:
> - Explain the meaning of value based management
> - Explain and estimate, economic value added, cash flow return on investment and total shareholder return
> - Estimate the market value of a business using market value added
> - Explain and identify free cash flows
> - Estimate the market value of a business using discounted cash flow techniques

SOLUTIONS TO PRACTICE QUESTIONS

Solutions   **1**

Workings

Capital allowances on the equipment purchased

Year	Tax WDV	Allowance claimed	Tax benefit (30%)
	₦	₦	₦
0 (Cost)	600,000		
1	(150,000)	150,000	45,000
2	(150,000)	150,000	45,000
3	(150,000)	150,000	45,000
4	(150,000)	150,000	45,000

Annual cash flows

Year	Capital equipment	Cash profits less tax at 30%	Tax benefit from capital allowances	Net cash flow
	₦	₦	₦	₦
0	(6,000,000)			(6,000,000)
1		700,000	45,000	745,000
2		1,400,000	45,000	1,445,000
3		2,100,000	45,000	2,145,000
4		2,800,000	45,000	2,845,000
5 onwards		2,800,000		2,800,000

The cash flows from Year 5 onwards in perpetuity are ₦2,800,000 per year. These can be converted into a Year 4 value by discounting them at the cost of capital 14%.

Year 4 value of ₦2,800,000 per year in perpetuity from Year 5 onwards

= ₦2,800,000/0.14 = ₦20,000,000

DCF valuation

The maximum amount at which Tread should be valued is calculated as follows:

Year	Net cash flow/ valuation	Discount factor at 14%	Present value
	₦		₦
0	(6,000,000)	1.000	(6,000,000)
1	745,000	0.877	653,365
2	1,445,000	0.769	1,111,205
3	2,145,000	0.675	1,447,875
4	2,845,000	0.592	1,684,240
wards	20,000,000	0.592	11,840,000
NPV			10,736,685

The maximum that should be offered for the entire capital of Tread is about ₦10.737 million, say ₦10.5 million.

Solutions   **2**

Item	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 to ꝏ
	₦000	₦000	₦000	₦000	₦000	₦000	₦000
	(6,000)						
		1,000					
Growing at 8%			1,080	1,166	1,260	1,360	
Growing at 3%							1,401
							$^{1}/_{0.1 - 0.3}$ ꝏ
Terminal value						20,014	
	(6,000)	1,000	1,080	1,166	1,260	21374	
	1.000	0.909	0.826	0.751	0.683	0.621	
	(6,000)	909	892	876	861	13,274	
NPV						10,811	

CHAPTER

20

Mergers and acquisitions

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

D			Mergers and acquisitions, organic growth and corporate restructuring
	1		**Acquisition and merger**
			Assess and advise on:
		a	The arguments for and against the use of acquisitions and mergers as a method of corporate expansion;
		b	The criteria for choosing an appropriate target for acquisition;
		c	The reasons for high failure rate of acquisitions;
		d	The use of the reverse takeover as a method of acquisition;
		e	Defensive strategies in hostile takeover bids;
		f	Valuation of an organisation in the context of a potential takeover;
		g	Due diligence during a merger/acquisition; and
	2		**Organic growth**
			Evaluate and discuss organic growth.

Exam context

This chapter explains the various aspects, characteristics, processes and features of mergers and acquisition mentioned above.

By the end of this chapter, you should be able to:

- Appraise a choice between organic growth and acquisition

- Explain the benefits of mergers and acquisitions to shareholders

- Explain the procedures to be complied with during an acquisition

- Describe methods of financing mergers and takeovers

- Explain the defence tactics used during a hostile takeover

- Explain the role of legal and financial due diligence during a merger/acquisition

1 MERGERS AND TAKEOVERS: STRATEGIC AND REGULATORY ISSUES

Section overview

- The distinction between acquisitions and mergers
- The objective of a merger or takeover
- Criteria for choosing an acquisition target
- Synergy
- The high failure rate of acquisitions
- The regulatory framework for acquisitions
- Defences against a hostile takeover bid
- Will shareholders in the target company accept an offer for their shares?
- Due diligence
- Reverse takeovers

1.1 The distinction between acquisitions and mergers

A company with a growth strategy might seek to grow by means of a merger or acquisition. Mergers and acquisitions involve the amalgamation of two companies.

❑ Typically, one company acquires the other and becomes the parent company. The second company becomes a subsidiary within the group.

❑ Occasionally, a new parent company might be created, and the two merging companies become subsidiaries of the new parent company.

A merger is an amalgamation of two companies of approximately equal size. In a takeover, a larger company usually acquires a majority of the share capital in a smaller 'target' company. In practice, business combinations are usually an acquisition of one company by another.

However the financial management issues are broadly the same for mergers as for acquisitions.

1.2 The objective of a merger or takeover

The objective of a takeover should be consistent with the overall objectives of the company making the takeover, which should be to increase the wealth of its shareholders. Similarly, the objective of a merger should be to satisfy the objectives of both companies – to increase the wealth of the shareholders of both companies. It is not always obvious, however, how a merger or takeover might add value and create wealth for shareholders.

More specifically, the purpose of an acquisition or a merger is to grow the company. In an acquisition, the acquiring company takes over the business of the target company – its net assets, its other resources, its sales and markets and (hopefully) its profits.

Alternatives to acquisitions

A company that is pursuing an expansion strategy might consider alternative expansion strategies. The main alternatives are:

❑ growth through internal development of the business

❑ Growth by means of a joint venture.

A comparison of growth by acquisition and internal growth

Advantages of acquisitions and mergers

Acquisitions and mergers have several advantages as a strategy for growth, compared with a strategy of internal development.

❑ Growth by acquisition or merger is much faster than growth through internal development.

❑ An acquisition can give the buyer immediate ownership of new products, new markets and new customers, that would be difficult to obtain through internal development.

❑ An acquisition enables an entity to enter new market where the barriers to entry are high, so that it would be very difficult to set up a new business in competition.

❑ An acquisition prevents a competitor from making the acquisition instead.

❑ It might result in cost savings and higher profits ('synergy'). This point is discussed in more detail later.

Disadvantages of acquisitions and mergers

❑ An acquisition might be expensive. The bid price has to be high enough to make the shareholders of the target company willing to sell their shares. The return on investment for the entity making the acquisition might therefore be very low.

❑ A merger or acquisition can result in a loss of proportional ownership of the entity. For example, if two entities with an equal total value are merged together, a shareholder who held say 10% of one of the companies before the merger might only own 5% of the merged company. (The actual change in proportional ownership will depend on the structure of the merger or acquisition, and how it is financed.)

❑ The two entities will have different organisation structures, different management styles, different cultures, different systems of salaries and wages. Bringing them together into a single entity will be extremely difficult. Naturally, many employees will feel threatened, as often takeovers are followed by the company seeking cost efficiencies (including redundancies). Many good employees could leave. Generally, the period of disruption following a takeover or merger will last around a year.

❑ When individuals from different 'cultures' are brought together into a single organisation, there will probably be a 'clash of cultures', and it may be difficult for individuals from the different cultures to work together easily. They will have a different outlook on business, and will have different ideas about the way that work should get done. The problems of a clash of cultures are particularly severe when companies merge, or when one company takes over another. There have been several well-publicised examples of a clash of cultures in the banking industry, when a commercial bank (a traditional 'lending bank') merges with an investment bank.

1.3 Criteria for choosing an acquisition target

The choice of acquisition targets might be based on any of the following criteria:

❑ **Strategic aims and objectives** - An acquisition target is usually selected because acquiring the target would help the acquiring company to achieve its strategic targets. For example, a company might be seeking to grow the business by expanding its product range for its existing markets, or moving into new geographical markets. Acquiring a suitable business would enable a company to expand its product range or move into new geographical markets. Some companies have pursued a strategy of buying up a large number of small companies in a fragmented market, with the intention of becoming the largest company and market leader.

❑ **Cost and relative size** - Although there are occasional examples of small companies acquiring much larger ones in a 'reverse takeover', target companies are usually selected because they are affordable.

❑ **Opportunity and availability** - In many cases, targets for acquisition are selected because of circumstances. An opportunity to acquire a particular company might arise, and the acquiring company might decide to take the opportunity whilst it is available.

❑ **Potential synergy** - Acquisition targets might possibly be selected because they provide an opportunity to increase total profits through improvements in efficiency. One reason for the success of private equity funds in acquiring target companies has been their ability to achieve additional efficiencies and economies that the previous company management had been unable to do. A strategy of private equity funds might be to look for target companies that they consider under-valued, with the intention of improving their operations and creating extra value.

1.4 Synergy

Synergy is sometimes called the '2 + 2 = 5' effect. It is the concept that the combined sum of two separate entities after a merger or acquisition will be worth more than their sum as two separate entities. When two separate entities come together into a single entity, opportunities might arise for increasing profits.

Synergies might be divided into three categories:

❑ Revenue synergies

❑ Cost synergies

❑ Financial synergies.

Revenue synergies

Revenue synergies are increases in total sales revenue following a merger or acquisition, by increasing total combined market share. For example, if Company A has annual sales revenue of ₦500 million acquires Company B which has annual sales revenue of ₦200 million, the combined revenue of the two companies after the merger might be, say, ₦750 million.

It is unusual for revenue synergies to occur, but they might occur in the following circumstances:

❑ The acquisition or merger creates an enlarged company that is able to promote its brand more effectively, and market share increases because customers are attracted by the new brand image.

❑ The acquisition or merger creates an enlarged company that is able to bid for large contracts, such as contracts to supply the government, which the two companies were unable to do before they combined due to their smaller size.

Cost synergies

Cost synergies are reductions in costs as a consequence of a merger or takeover. They might arise because it is possible to improve efficiency. For example, it might be possible to reduce the size and cost of administrative departments by combining the administrative functions of the two companies. It is not unusual for takeovers to result in staff redundancies, partly for this reason.

Cost synergies might also be possible by combining other activities, such as combining warehouse facilities.

Experience has shown, however, that companies often have difficulty in achieving planned cost synergies after a takeover, because combining the activities of the two companies after the takeover is often a long and complex process.

Financial synergies

A larger (combined) company or group might be able to raise finance in a cheaper way. The enlarged company might have access to financial markets, such as the bond market, that the two individuals companies could not access before the takeover, due to their smaller size.

The larger company might also be seen as a lower credit risk, so that it is able to borrow from banks at a lower rate of interest.

1.5 The high failure rate of acquisitions

Many acquisitions fail, and do not provide the value for shareholders that was expected when the acquisition was made. There are several reasons for failure.

❑ The purchase price paid for an acquisition is often too high.

❑ The expected synergies do not occur.

❑ There are serious problems with integrating the acquired company into the new group.

- Employees in the acquired company might find it difficult to accept the different culture of the acquiring company, and a new set of policies and procedures. The loss of staff might be high, and valuable knowledge and expertise might be lost.

- There might be problems with establishing effective management control in the acquired company. Control systems might have to be reviewed and changed.

❑ Senior management in the acquiring company might not give the acquired company sufficient time and attention to make the acquisition operationally and financially successful.

❑ Competitors might react to an acquisition with a new competitive strategy of their own. Increased competition might drive down the profits for all participants in the market.

1.6 The regulatory framework for acquisitions

Regulation of mergers and acquisitions in Nigeria

Mergers in Nigeria are guided by the provisions of the companies and Allied Matters Act (CAMA 2020). The details of all these legal provisions are beyond the scope of this pack.

However, according to the Act the conditions for a scheme of mergers to be effective and binding include the following:

❑ The special resolutions to be proposed at the court ordered meetings must be duly passed.

❑ Securities and Exchange Commission (SEC) must approve the terms and conditions of the scheme as agreed by the majority of the shareholders of both companies.

❑ The scheme must have been approved by a majority representing three - fourths in value of the shareholders of each of the two companies voting either in person or by proxy, at their separate meetings convened by order of the court.

❑ The court must sanction the scheme and confirm the cancellation of the target company, the merger of its assets and liabilities and undertakings, with those of the bidding company as provided in the scheme; and the dissolution of the target company without winding up.

❑ Delivery of the office copy of the court order to the Registrar - General of the Corporate Affairs Commission (CAC)

Securities and Exchange Commission

The body responsible with the smooth running of the Nigerian capital markets is the Securities and Exchange Commission.

The SEC has prescribed rules and regulations in order to effectively and efficiently carry out the objectives of securities regulation as embodied in the Investments and Securities Act.

These rules and regulations contain both rules of general and specific applications governing securities exchanges; capital market operators; securities offered for sale or subscription; mergers, acquisitions and combinations; collective investment schemes; borrowing by Federal, States, local Government and other Government agencies as well as Supra national bodies amongst other things.

These contain the following definitions:

❑ Acquisition means the take-over by one company of sufficient shares in another company to give the acquiring company control over that other company;

❑ Merger means any amalgamation of the undertakings or any part of the undertakings or interest of two or more companies and one or more corporate bodies;

The rules and regulations apply to:

❑ Public or private companies;

❑ Every merger, acquisition or combination between or among companies, involving acquisitions of shares or assets of another company.

Every merger acquisition or external restructuring between or among companies is subject to the prior review and approval of the Commission.

Such approval is given in cases where the merger is not likely to cause substantial restraint of competition or tend to create monopoly in any line of business enterprise. An exception to this is that although merger is likely to restrain competition, one of the parties to the merger has proved that it is failing.

The Commission regulates acquisitions in both private and public unquoted companies through the following process:

❑　　Filling requirements for acquisition by a corporate entity/individual:-

❑　　The acquirer shall file a letter of intent accompanied with the following documents; the filling shall be done by a registered capital market operator registered to function as an issuing house.

1.7　Defences against a hostile takeover bid

In a friendly takeover bid, the company wanting to make the acquisition makes a bid that the board of the target company will recommend to their shareholders. In this situation, the target company will allow the acquirer access to its accounts, records and management information, so that the acquirer is able to carry out 'due diligence' and satisfy themselves that they are offering a fair price for the business.

A hostile bid occurs when the board of the target company rejects a takeover offer and refuses to recommend it to the shareholders.

A hostile takeover bid is risky, because the bidder has to make the offer for the target company's shares without the benefit of management information about the company (for example, management accounting information about current financial performance). If the takeover bid is 'friendly' and welcomed by the board of directors of the target company, confidential information will probably be made available to the bidder.

The most important defence against a hostile takeover is to persuade the shareholders to reject the bid. There are several ways in which this might be done. In each case, the directors of the company must deal honestly with the shareholders, and should not give them information that is incorrect or misleading.

Methods of persuading the shareholders to reject a bid include the following:

❑　　Announcing that the company expects to increase its profits substantially in the future; therefore the offer price from the bidder is too low.

❑　　Announcing an intention to return a large amount of equity to the shareholders in the near future, in the form of an increased dividend or a share buy-back; therefore the offer price from the bidder is too low.

❑　　Explaining the future strategy of the board of directors for increasing the company's profits in the future.

When it is uncertain whether shareholders will be persuaded to reject the offer, other methods of defence include:

❑ To find a '**white knight**'. A white knight is another company that is prepared to make its own takeover bid for the company, at a higher price or on better terms.

❑ Using a poison pill defence. This involves establishing a contract whereby a large liability would crystallise if the business was sold (for example, if the business is sold every director receives a ₦ 10,000,000 bonus). This sort of defence would be open to legal challenge in most jurisdictions.

❑ Changing voting structures to require a larger majority to agree takeover bids. This would probably be OK if established before a bid was received but might be open to legal challenge if a change was made after a bid was received.

1.8 Will shareholders in the target company accept an offer for their shares?

A company making a takeover bid wants to win sufficient acceptances from shareholders in the target company that it acquires full control of the company. The willingness of shareholders to accept a bid for their shares will depend on several factors:

❑ The offer price (share price valuations were explained in an earlier chapter).

❑ The purchase consideration (cash, debt capital or shares in the bidding company: the significance of the purchase consideration is explained later).

❑ Job security (When the directors, managers and employees of the target company are major shareholders, job security might be relevant. These shareholders might reject an offer if they are concerned about their job security after a takeover).

❑ Alternative options (There might be the possibility of a rival and more attractive offer).

1.9 Due diligence

Whenever anybody buys something they run the risk that what they are actually buying is different to what they think they are buying.

Problems can arise where the seller has information denied to the buyer.

Example: Information asymmetry Suppose

A was buying a used car off B.

B might have information about the car that A does not. For example, B might know that he has had recent trouble with the gear box.

If A does not know this he may pay more for the car than it is actually worth.

A could reduce this risk by taking the car for test drive and having it checked over by a competent mechanic.

Buying a company is similar in some respects but of course there are much larger sums of money at stake.

Due diligence is a process which attempts to reduce the risk associated with a transaction. It is an investigation of a business or person prior to signing a contract. One example of due diligence is the examination of a potential acquisition target by a buyer.

Due diligence will thus attempt to achieve the following:

❑ Confirm the accuracy of information and assumptions on which a bid is based;

❑ Provide an independent assessment and review of the target business;

❑ Identify and quantify areas of commercial and financial risk; and

❑ Provide assurance to providers of finance.

There are many different aspects of a transaction that might be subject to due diligence.

Financial due diligence

Financial due diligence is a review of the target company's financial position, financial risk and projections.

Financial due diligence will examine:

❑ Financial statements

❑ Management accounts

❑ Projections

It will be particularly concerned with the assumptions upon which any projections are based.

Legal due diligence

This focuses on any legal matters which might be relevant to the value of the company or its continued success in the future. For example:

❑ Hidden warranties

❑ Security given on assets

❑ Legal disputes

❑ Break clauses in supply contracts that might result in loss of customers

1.10 Reverse takeovers

Reverse takeovers sometimes occur in acquisitions where the purchase price is paid in new shares issued by the acquirer.

A reverse takeover is a transaction in which an entity acquires another entity and the shareholders of the acquired entity end up with control of the combined entity.

Example: Reverse takeover Before

the transaction

X Plc has 10,000 ordinary shares in issue.

Y Ltd also has 10,000 ordinary shares in issue. **The**

transaction

X Plc buys the entire share capital of Y Ltd and pays for them by issuing 30,000 new ordinary shares to the owners of Y.

After the transaction

X Plc owns 100% of Y Ltd.

The original owners of Y Ltd own 75% (30,000 shares out of 40,000 shares) of the combined entity.

X Plc is the legal acquirer but in effect Y Ltd has taken over X Plc (because its original owners now control it).

Uses

A reverse takeover can be used by a private company to become publicly traded without going through an initial public offering. In the example above, Y Ltd is now part of a publically traded entity.

The legal acquirer (X Plc above) is often described as a shell company.

Benefits

The benefits to the reverse acquirer (Y Ltd) above are those associated with being a traded entity without the costs and delay of going through an IPO process.

❑ The shares now held by the original owners of the legal subsidiary are more liquid and that should make them more valuable.

❑ The company has greater access to capital markets.

❑ The company is better able to use share option schemes to incentivise its directors and other employees.

❑ The shares can be used to acquire other companies.

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2 VALUATION FOR MERGERS AND ACQUISITIONS

Section overview

■ The need for a valuation

■ Factors to consider in pricing a takeover bid

■ Valuation methods

■ Types of acquisition

2.1 The need for a valuation

Valuation and the offer price are key issues in a merger or acquisition. When a merger is negotiated, the two companies need to reach agreement on the valuation of shares in each company for the purpose of deciding the terms of the merger. In a takeover:

❑ The acquiring company needs to decide what price it is prepared to offer for the target company

❑ The directors of the target company need to decide whether the offer is acceptable and whether it should be recommended to the shareholder, and

❑ The shareholders in the target company need to decide whether they are willing to accept the offer made for their shares.

The target company might be a public company whose shares are already quoted on a stock market. In such cases the current share price is a useful guide to valuation, but a bidder will not succeed unless the offer price is higher than the current market price. Without a higher offer, the shareholders in the target company have no reason to accept and agree to sell their shares to the bidder.

When the target company is a private company, there is no market price that can act as a benchmark or guide to an offer price.

In bidding for both public and private companies, the acquiring company therefore needs to make estimates of the value of the target company, in order to decide what price it might be prepared to offer. The price should be sufficiently high to win acceptance from the target company shareholders, but not so high that the bidding company pays too much. When an acquisition is over-priced, the return on the investment will be low and the acquiring company will lose value for its shareholders.

It is not usual to make a bid to buy the debt capital or the preference shares of a target company. A valuation is required for the equity shares in the target company, and not a valuation for the company as a whole.

Valuation is an art, not a science

It is important to remember that the valuation of companies for the purpose of a merger or acquisition is not a science. Although there are valuation methods, these are all based on estimates and assumptions.

Valuation methods can be used to decide on an offer price, or may be used to justify an offer price. However, the final price is often agreed through negotiation, and the management of the bidding company must use judgement in deciding how high a price they might be willing to pay. The only 'correct' valuation is the price that the bidder makes and the shareholders in the target company accept.

A company preparing to make a takeover bid should consider several valuation methods and compare the different valuations they produce. Judgement should then be used to arrive at a price that should be offered for the target company shares.

2.2 Factors to consider in pricing a takeover bid

When a company is considering a takeover bid for another company, there a several important factors to consider before deciding what offer price might be appropriate.

These include:

❑ **Synergy**

❑ **Risk exposure** - An acquisition or merger might alter the exposure to market risk, and either increase or reduce the asset beta of the enlarged company. Before masking a takeover bid, or deciding on a suitable offer price, the company making the acquisition should consider what changes might happen to its risk exposures, and how significant they might be.

❑ **Real options** - An acquisition might create real options to expand operations or re-deploy at some time in the future. Real options are described in another chapter. Briefly, a real option is an option to take a course of action at some time in the future, often depending on how the business develops. If an acquisition creates a real option, such an option to expand into a new geographical market at some time in the future, this option has some value.

❑ **Financing** - An acquisition often requires substantial financing, and the acquiring company needs to consider how it might be able to raise the finance. It might be difficult to raise new debt finance to acquire a highly- geared target company (depending on conditions in the debt markets) when the acquiring company is also highly-geared. Using retained earnings to finance acquisitions might have implications for dividend policy.

❑ **Valuation assumptions -** In a takeover process, separate valuations for the target company are made by the company making the takeover bid and the directors of the target company. Shareholders in both companies might also have their own views on valuation. Valuations are based on assumptions, but many assumptions are based on judgements rather than 'hard evidence'. Estimates might be unreliable, such as estimates of the growth rate in future profits or free cash flows of the target company. To allow for negotiations on price, the directors of the company making the takeover bid should consider an initial offer price and a price that might be willing to go up to. The directors of the target company should consider whether to reject an initial offer from the bidding company, but then consider the minimum price they would be willing to agree to and recommend to their shareholders.

2.3 Valuation methods

You might be required in your examination to use several methods for valuation of a target company. Each method will produce a different valuation, but each valuation can provide useful information and help with deciding what the offer price should be. You should be prepared to use each of the different valuation methods, and then discuss the assumptions and estimates on which the valuation is based. You might also be required to compare the different

valuations produced by each method, and then recommend (with reasons) a valuation that you consider appropriate as a basis for making an offer to the target company shareholders.

There are several approaches to making a valuation of the shares in a company:

❑ A valuation based on the net asset value of the target company.

❑ Market-based valuations, using estimates of future earnings or dividends

❑ Cash-flow based valuations, using discounted cash flow of expected future returns from the acquisition

❑ A valuation based on an expected value added (EVA) model: this is another form of cash flow-based model.

Many of these were covered in chapters 23 and 24.

2.4 Types of acquisition

Risk profile

Acquisitions might impact the risk profile of the acquiring company. There are two aspects to the risk profile:

❑ Financial risk: the financial risk of the acquiring company might change because of a change in financial gearing due to the method used to finance the acquisition. For example, if gearing increases because the acquisition is financed largely by debt capital, the financial risk of the company will increase as a consequence of the acquisition.

❑ Business risk: The target company might operate in an industry or market sector where the business risk is very different from the business risk profile of the acquiring company. When this happens, the business risk profile of the company will change as a result of the acquisition.

Categorising acquisitions

Acquisitions can be categorised in terms of their impact on risk profile and this in turn can influence the valuation techniques used.

	Effect on risk profile	**Appropriate valuation method**
Type I acquisitions	None. Acquisitions that impact neither the acquiring company's exposure to financial risk nor to business risk	Asset based valuations Market-based valuations (dividends or earnings) Cash flow models (using free cash flows as covered earlier but also including EVATM and MVA which will be covered later in this chapter). As there is no change in the risk profile the company's current cost of capital can be used in valuations.
Type II acquisitions	Acquisitions that affect the acquiring company's exposure to financial risk but not to business risk.	Adjusted present value model.
Type III acquisitions	Acquisitions that affect the acquiring company's exposure to both financial risk and business risk.	Iterative valuation procedures.

Many of the methods used to value businesses have already been covered in chapter 12.

3 FINANCING ACQUISITIONS AND MERGERS

Section overview

- Purchase consideration
- All-share consideration
- Cash or debt finance in the purchase consideration

3.1 Purchase consideration

In a merger, one company might acquire the other company by issuing new shares. The shareholders in the other company exchange their shares for the new shares in the first company. For example, if company A and company B merge, company A might issue new shares in exchange for the shares in company B. The company B shareholders therefore become shareholders in the enlarged company A.

Similarly, a takeover might be paid for by issuing new shares to the shareholders in the target company, who will then become shareholders in the buying company after the takeover.

Cash to finance a takeover bid might be obtained from existing cash resources, or by issuing

Example: Purchase consideration

Company X makes a successful bid to acquire the shares in company Y. Company Y consists of 500,000 shares of ₦1 each. Company X offers 3 new shares for every 2 shares in company Y. Company X therefore issues 750,000 new shares to purchase the shares in company Y and the company Y shareholders become shareholders of company X. If the shares of company X are valued at ₦4 each before and after the takeover, the takeover price is ₦3,000,000 (750,000 shares × ₦4).

Instead of making an acquisition by exchanging shares, a company might pay for some or all of the acquisition:

1. in cash (which it might obtain by borrowing)

2. by issuing debt securities in exchange for some of the shares in the target company

In the example above for example, company X might have acquired the shares in company Y for ₦3 million by paying ₦2 million in cash and ₦2 of redeemable loan stock for every 1 share in company Y.

new shares to other investors, or by borrowing.

The purchase consideration – both the total purchase price for a takeover and the nature of the purchase consideration (shares, cash or debt securities) – are usually subject to negotiation in a friendly takeover.

In a friendly takeover, the directors of the target company negotiate terms that they then recommend to their shareholders for acceptance.

In a hostile takeover, the bidding company makes an offer to the shareholders in the target company, without the co-operation of the board of directors of the target company. With a hostile takeover bid, the bid is much more likely to succeed if it is an all-cash offer, because the shareholders in the target company might not want to retain any investment in the acquiring company.

3.2 All-share consideration

When a takeover is financed by issuing new shares as the purchase consideration, either the shareholders in the buying company or the shareholders in the target company will gain value at the expense of the shareholders in the other company.

Example: All-share consideration

Company A and company B are companies whose shares are traded on a stock market. Company A makes profits after tax of ₦800,000 each year and company B makes after-tax profits of ₦400,000. Both companies have 1 million shares in issue. Company A shares are valued on a price/earnings multiple of 10 and company B shares are valued on a P/E multiple of 9 (₦3.60 per share).

Suppose that company A makes an offer of ₦4.40 per share for company B, valuing company B at ₦4.4 million. This values the company on a P/E ratio of 11.

Its own shares are valued at ₦8 each (EPS ₦0.80 × P/E ratio 10). If company A makes an all-share offer, it would therefore propose to issue 550,000 new shares to the shareholders in company B (₦4.4 million/₦8 per share). The terms of its offer would therefore be 11 new shares in company A for every 20 shares in company B.

If the offer is accepted by the shareholders of company B, company A would consist of 1,550,000 shares after the takeover. The combined after-tax profits of the company might be ₦1.2 million (₦800,000 + ₦400,000), which is the sum of the profits of the individual companies before the takeover.

Does the takeover create wealth for the shareholders of company A?

The answer depends on what happens to the share price of company X after the takeover. Unless there is an increase in the P/E ratio, or an increase in the profits of the combined companies, a takeover will destroy value for the shareholders of the company making the takeover when all of the following conditions apply:

1. The purchase consideration is all shares.

2. The purchase price is on a higher P/E multiple than the P/E ratio of the company making the takeover.

3. There is no increase in the combined profits of the two companies after the takeover.

Example (continued): All-share consideration

In this example, if the P/E ratio of the company after the takeover is 10, the total value of the company will be ₦12 million (₦1.2 million × 10), which is ₦7.74 per share (₦12 million/1,550,000 shares).

The former shareholders in the two separate companies will therefore lose or gain value in their investment, as follows:

Shares owned by	Number of shares	Value at ₦7.74	Investment value before the takeover	(Loss)/gain in value
		₦m	₦m	₦m
Original shareholders in A	1,000,000	7.74	8.00	(0.26)
Former shareholders of B	550,000	4.26	3.60	0.66
		12.00	11.60	

There has been some increase in value in the combined company, because the earnings of company B are now valued on a higher P/E multiple. However, all the benefits are enjoyed by the former shareholders in company B. The original shareholders in company A have suffered a loss in value due to the takeover.

All-share consideration: the effect of synergy

If there is synergy, and total annual earnings and cash profits increase, the total value of the businesses should be expected to increase, adding value for the shareholders.

Example: All-share consideration

In the example above, suppose that after the acquisition of company B by company A, there are benefits from economies of scale and total annual earnings increase by ₦200,000 to ₦1,400,000. Suppose also that the P/E ratio of the enlarged company A is 10. The total value of company A will now be ₦1.4 million × 10 = ₦14 million. The price per share will be ₦9.03.

The former shareholders in the two separate companies will therefore gain value in their investment, as follows:

Shares owned by	Number of shares	Value at ₦7.74	Value before the takeover	(Loss)/gain in value
		₦m	₦m	₦m
Original shareholders in A Former	1,000,000	9.03	8.00	1.03
shareholders of B	550,000	4.97	3.60	1.37
		14.00	11.60	

Shareholders in both companies benefit from the takeover, because of the synergy and growth in combined earnings (or cash profits).

3.3 Cash or debt finance in the purchase consideration

Another way of providing extra value for shareholders in a takeover might be to pay for the acquisition in whole or in part with either cash (financed by borrowing) or debt securities. The benefit of paying in these ways is that there is tax relief on the interest cost.

The target company's shareholders might want to be paid in cash; therefore offering to buy the target company's shares for cash (financed by new debt) could be attractive to those shareholders, who will be cashing in their investment by accepting the takeover offer.

Example: Cash or debt finance in the purchase consideration

Returning to the previous example, suppose that a takeover price of ₦4,400,000 is agreed for company B, and that this purchase price is paid all in cash, with the money obtained from a bank loan at 8% interest.

The rate of tax is 25%, and after the takeover there is no synergy. The company's shares continue to be valued on a P/E multiple of 10.

The company's earnings and value after the takeover can be calculated as follows:

	₦	₦
Profits of 'old' company A		800,000
Profits of 'old' company B		400,000
		1,200,000
Interest on debt (₦4.4 million × 8%)	(352,000)	
Less tax relief at 25%	88,000	
Net cost of interest		(264,000)
Annual earnings after the takeover		936,000

Value of company A shares	₦
After the takeover (₦936,000 × 10)	9,360,000
Before the takeover	8,000,000
Gain to company A shareholders	1,360,000

Company A will now be geared, and its cost of capital might therefore change. If so, the P/E ratio would no longer be 10. Even so, financing a takeover with debt capital can add to the wealth of the shareholders because of the tax relief on debt interest.

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4 CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

■ Appraise a choice between organic growth and acquisition

■ Explain the benefits of mergers and acquisitions to shareholders

■ Explain the procedures to be complied with during an acquisition

■ Describe methods of financing mergers and takeovers

■ Explain the defence tactics used during a hostile takeover

■ Explain the role of legal and financial due diligence during a merger/acquisition

Corporate reconstruction and reorganisation

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

D				Mergers and acquisitions, organic growth and corporate restructuring
	1			**Acquisition and merger**
				Assess and advise on:
		h		Management buy-out (MBOs), management buy-in and buy-in management buy-out (BIMBO).
	3			**Corporate reconstruction and re-organisation**
		b		Financial reconstruction
			i	Assess the suitability of financial reconstruction as a survival strategy.
			ii	Assess market reaction to reconstruction schemes.
		c		Business re-organisation
			i	Advise on strategies for unbundling parts of a quoted company.
			ii	Evaluate the likely financial and other benefits of unbundling.
			iii	Advise on de-merger, equity carve out, equity carve in, spin off, asset stripping and liquidation.
			iv	Discuss the arguments for and against a quoted company going private.

Exam context

This chapter explains the meaning and process of group reconstructions and purchase of own shares. It further explains the rules on distributable profit and provides information on other types of change in ownership.

By the end of this chapter, you should be able to:

- Explain , execute and evaluate a group reconstruction

- Explain demergers and different types of divestment

- Explain and apply the rules on purchase of own shares (share buybacks)

- Explain MBOs and MBIs

1 CAPITAL RECONSTRUCTIONS

Section overview

- Definition of a reconstruction
- The purpose of a reconstruction
- The problems with a reconstruction scheme
- Examination questions on reconstructions

1.1 Definition of a reconstruction

A capital reconstruction is a major reorganisation of the capital structure of a company. When a reconstruction occurs, the reason is usually because the company is in financial difficulties. For example, its Z score (see chapter 27) might indicate that it is in danger of financial collapse. It is more probable however that cash flow projections, and possibly profit projections, indicate that the company cannot avoid financial collapse and liquidation unless urgent action is taken to reconstruct the company's finances.

A reconstruction might involve:

- Revaluation of assets;
- Raising new capital;
- The conversion of debt capital into equity; and
- Possibly the conversion of equity shares from one form to another.

Existing equity shareholders might be required to relinquish all their shares and accept a much smaller quantity of new shares in the reconstructed company.

The majority of the new shares on the reconstructed company might be held by lending banks or bond investors, who agree to exchange their loans or bonds for new shares in the reconstructed company.

1.2 The purpose of a reconstruction

The purpose of a capital reconstruction is to find a way of allowing the company to continue in business, and avoid insolvency and liquidation. A reconstruction is therefore only worth considering:

- If it is likely to be more beneficial to all the parties concerned than a liquidation of the company (and the sale of its assets); and
- The reconstructed company has a good chance of surviving and restoring itself to profitability.

A reconstruction will benefit all the parties if it is likely to result in them getting more cash or more value from the reconstruction than from an enforced liquidation of the company.

For example, the effect of a reconstruction scheme might be to:

- Reduce the total debt of the company (because some debt capital might be exchanged for new equity); and
- Defer the repayment obligations for other debt capital.

This reduction in total debt and deferral of interest payments and principal repayments might allow the company to make a profit and achieve positive cash flows.

If the company is able to recover, it should be able to pay back its outstanding debts and also create value (in the share price) for the former lenders who are now equity shareholders.

The parties who must agree to a reconstruction therefore include all the creditors of the company (or a sufficient number of them, in accordance with the requirements of national company law) and the shareholders.

1.3 The problems with a reconstruction scheme

There are some major problems with arranging a capital reconstruction. These are:

❑ Finding a reconstruction arrangement that will benefit all the parties; and

❑ Getting all the parties to agree to the proposal.

Each of the parties involved in a reconstruction (banks who are lending money, bondholders, unpaid trade creditors and the shareholders) need to believe that the reconstruction offers them the prospect of more cash or more value than a liquidation of the company.

Each of the parties will therefore compare what they will probably receive:

❑ If the construction scheme is agreed; and

❑ If the scheme is rejected and liquidation occurs.

Example: Scheme of reconstruction

A company has proposed the following scheme of reconstruction

1 Assets are to be revalued as follows:

	₦000
Property, plant and machinery	980
Goodwill	zero
Receivables	290
Inventory	350

2 Ordinary share capital is to be surrendered and reissued 250 for each 1,000 held.

3 The existing ordinary share holders are to subscribe new share capital with a nominal value of ₦250,000 at a consideration of ₦750,000.

4 Preference share capital is to be reduced by 25%

5 Debenture holders are to accept shares with a nominal value of ₦125,000 for debentures worth ₦250,000.

6 The accumulated loss is to be written off.

The statement of financial position before the reconstruction is as follows:

	₦000
Property, plant and equipment	1,000
Goodwill	500
Cash	-
Receivables	300
Inventory	400
	2,200
Ordinary share capital	1,500
Preference share capital	200
Accumulated loss	(300)
10% debenture (secured on property, plant and equipment)	500
Bank overdraft	300
	2,200

Required

Execute the scheme of reconstruction

The easiest way of doing this is to construct the new statement of financial position by including the new values for the assets and the liabilities and also to write the accumulated loss to zero.

A balancing figure can then be recognised as a capital reserve.

Example: Scheme of reconstruction

A company has proposed the following scheme of reconstruction

	Before	After	
	₦000	₦000	
Property, plant and equipment	1,000	980	
Goodwill	500	-	
Cash	-	450	**W2**
Receivables	300	290	
Inventory	400	350	
	2,200	2,070	
Ordinary share capital	1,500	750	**W1**
Preference share capital	200	150	
Share premium Accumulated loss		500	**W2**
Capital reserve (balancing figure)	(300)	- 420	
	1,400	1,820	
10% debenture	500	250	
Bank overdraft	300	-	**W2**
	2,200	2,070	

Workings:

W1: Ordinary share capital

Reduction of existing share capital (25% of 1,500)	375
New shares subscribed	250
Issued to debenture holders	125
	750

W2: Cash from new share subscription	₦000
Used to pay overdraft	300
Balance to cash account	450
Amount raised (NV = ₦250k therefore share premium = ₦500k)	750

1.4 Examination questions onreconstructions

An examination question might give you some details about a company that is in financial difficulties, and give details of a reconstruction scheme that has been proposed. You might then be asked to comment on the proposed scheme.

To answer this type of question, you should consider three aspects to the proposal.

Aspect 1

The first step is to make sure that you understand what the capital of the reconstructed company will be. How many shares will be in issue and who will own them? How much debt capital will the company have, and what will be the rate of interest payable on the debt?

Aspect 2

Having established what the new capital structure will be, you should make a financial analysis to decide whether the company is likely to become profitable and have positive cash flows after the reconstruction has occurred. If the company is unlikely to survive in its reconstructed form, the reconstruction proposal should not be supported or recommended.

Aspect 3

If you consider that the company will return to profits and positive cash flows if the reconstruction occurs, you should then look at each of the investor groups in the company. If any investor group is unlikely to benefit from the reconstruction, it will not support the reconstruction proposals. For each investor group – ordinary shareholders, preference shareholders, bondholders and banks – you should consider what will happen to them:

❑ If there is no reconstruction;

❑ If the company is reconstructed.

Those with most to lose should give up more in the capital reconstruction. The creditors would not be willing to reduce their rights unless they see that the shareholders are contributing to a greater extent.

2 BUSINESS REORGANISATION

Section overview

- Definition of a business reorganisation
- Demergers
- Divestments
- Other divestments methods
- Management buyouts and management buy-ins
- Going private

2.1 Definition of a business reorganisation

A capital reconstruction is a major change in the capital structure and ownership of a company in financial difficulties. A business reorganisation is similar, in the sense that it often involves a change in capital structure and a change in ownership. However, a reorganisation normally involves a company that is not in financial difficulties as the result of a business strategy decision, such as selling off a non-core part of the group's business operations, or de-merging two divisions of a company into two entirely separate and independent companies.

2.2 Demergers

A demerger is the splitting up of a group of companies into two (or more) separate and independent companies. Often, the group in a demerger is a conglomerate, consisting of widely-different businesses. For example, some years ago in the UK, there was a demerger of chemicals company ICI from pharmaceuticals company Zeneca. In 2007 Cadbury Schweppes proposed either to demerge its confectionery division (Cadbury) and soft drinks division (Schweppes) into independent companies, or to sell off its soft drinks division as part of a strategic review.

The shareholders in the company before the demerger receive shares in both demerged companies. They can choose to hold all the shares, and be a shareholder in both companies. Alternatively, they can sell their shares in one of the companies and remain a shareholder in just one of the demerged companies. (They could also sell their shares in both companies.)

If the company before the demerger has debt capital, it will have to negotiate with its banks or representatives of its bondholders, to agree which of the demerged companies should take on the debt obligations.

Purpose of a demerger

A demerger requires the consent of the company's shareholders, and the purpose of the demerger should be in the best interests of the shareholders. This means that a demerger is only justified if it is expected to increase the total wealth of the shareholders.

The reasons that may be put forward for a demerger are as follows:

❑ A conglomerate group of different businesses is often valued at less than the sum of the value of its separate businesses, if these were independent. This is because stock market investors often prefer 'specialised' businesses to conglomerates.

❑ 'Specialised' businesses can focus on their core competencies.

❑ Specialised businesses can develop their own strategies for the future and are more likely to be successful if they can decide their strategies independently.

❑ There might be some savings in head office costs, no longer incurred after the demerger.

2.3 Divestments

A divestment is the sale of a business by a company to an external purchaser (or external purchasers). The business that is sold might be a subsidiary company or a sub-group of subsidiary companies within the overall group.

Examples of divestments would be:

❑ The sale of a business to another company

❑ The sale of a business to a management team, in a management buy-out (MBO): the management team, often supported by venture capital finance, become the shareholders of the divested company

❑ The sale of a business to external buyers who become the management team as well as the shareholders (a management buy-in).

The company making the divestment should try to ensure that it obtains a satisfactory price for the subsidiary or division. The buyers should try to ensure that they pay a reasonable price and that the purchase is financed in the best way possible.

In contrast to a demerger, where the shareholders of the original company become shareholders in both demerged companies, a divestment (or 'spin-off') involves the sale of the ownership of a business.

The purchase consideration for a divestment:

❑ Normally consists mainly or entirely of cash

❑ Although the selling company might retain equity interest, and continue to hold a proportion of the shares.

Purpose of divestments

A divestment can have any of the following purposes:

❑ To raise cash for the company, when it needs additional funding or has liquidity difficulties;

❑ To get rid of a loss-making business;

❑ Because the company receives a very attractive offer price for selling the business; and

❑ For strategic reasons.

The strategic reason most commonly suggested for making a divestment is because the company is selling off a 'non-core' business. The company has a competitive advantage over rivals in businesses where it has 'core competencies', and it should therefore concentrate on these areas of business. In principle, the divestment should allow the company to invest all its resources in those parts of the business where it can make the greatest profits. This will benefit the shareholders.

2.4 Other divestments methods

Equity carve out

An equity carve-out is a type of corporate reorganisation, in which a company creates a new subsidiary and transfers part of its business to this new subsidiary. Shares in the new company are then sold to the public. The parent sells only a non-controlling interest in that new subsidiary to the public, thus maintaining control of the company.

The ultimate goal of the company may be to fully divest its interests, but this may not be for several years. The equity carve-out allows the company to receive cash for the shares it sells now.

This type of carve-out may be used if the company does not believe that a single buyer for the entire business is available, or if the company wants to maintain some control over the business unit.

Potential investors in the carved out subsidiary need to consider the reason for the carve-out and what would happen if the parent cut all ties from the subsidiary.

Sell-offs

These occur where one company sells part of its business to another company usually for cash or securities. It is expected that the disposal will create value. The decision criterion is whether the present value of the stream of future cash flows of the part sold will be less (if it remains) than the value received.

Spin off

An equity carve-out is a type of corporate reorganisation, in which a company divests a business unit by turning it into a stand-alone company. Shares in the new company are then issued to the parent company shareholders in proportion to their current holdings.

The spun off business unit is now an independent company with its own shareholders.
The original parent company may still own an equity stake.

Spin-offs may arise from:

❑ The need to carve out a separate identity for that part of the business.

❑ The need of the company to avoid its takeover. (Spinning off a valuable part of a company may make the remaining company unattractive to an acquirer).

Split offs

In a split-off, the parent company offers its shareholders the opportunity to exchange their parent company shares for new shares of a subsidiary.

This tender offer often includes a premium to encourage existing parent company shareholders to accept the offer. For example parent company might offer its shareholders ₦1,100 worth of subsidiary shares in exchange for ₦1,000 of parent company shares (a 10% premium).

Liquidations

This occurs where a company is brought to an end. This is usually preceded by a sale of its trade and asset.

Possible reasons for liquidation include:

❑　financial difficulty;

❑　the company was set up for a particular purpose which has now been met; or

❑　the liquidation would benefit the shareholders because the value of the company when liquidated is greater than the present values of its stream of future cash flows if not liquidated. The idea is that the assets when sold separately to individual buyers would have higher value than when sold as a whole as in merger.

Asset stripping

Asset stripping is the process of buying an undervalued company with the intent of selling off its assets to generate a profit for shareholders.

The individual assets of the company may be more valuable than the company as a whole perhaps due to poor management.

The result of asset stripping is often a dividend payment for investors and often leaves the stripped company in a poor position possible resulting in liquidation.

2.5　Management buyouts and management buy-ins

Management buyouts and management buy-ins are divestments for the company selling the business, but business ventures for the management team that buys it.

With a management buyout, the purchasers of the divested business include a team of managers who work for the subsidiary or division that is being sold off, and these managers will run the business (as entrepreneurs) after they have bought it.

A management buy-in involves the purchase of a divested business by an external management team, which run the business (as entrepreneurs) after they have bought it.

With both management buyouts and management buy-ins, it is usually the case that the management team do not have sufficient capital of their own to afford the business they are trying to buy, and they have to rely on the support of venture capital finance.

The structure of venture capital finance

A **venture capital firm** might be willing to provide capital support to a management buyout or a management buy-in if it believes that:

❑　The management team have a robust and realistic business plan for the company;

❑　The management team appear to have the capabilities to make the company a success;

❑　The management team makes a significant capital contribution to the purchase of the business, so that they have a strong financial motive for making the business a success; and

❑　The financial returns appear satisfactory, allowing for the high business risk in the project.

Venture capital firms expect a high return on their investments, because a proportion of them are not successful and the investment risk is high.

The financing of a management buyout or management buy-in might be as follows:

❑ The individual managers in the management team agree to subscribe some of their own money to buy shares in the company they are buying. (If the MBO or MBI involves setting up a new company, the managers agree to buy a quantity of shares in the new company);

❑ The venture capital firm also buys a quantity of equity shares, so that the proportions of shares owned by the management team and by the venture capital firm are in a satisfactory balance. The venture capital firm will want an equity stake in the company, but will not want its stake to be so large that there is no incentive or motivation for the management team to make the company a success;

❑ The venture capital firm will provide additional finance, possibly in the form of redeemable preference shares or unsecured lending. The intention should be that as the company grows and becomes more profitable and cash-rich, it will be able to redeem the preference shares or loan;

❑ The venture capital firm often negotiates additional loans, possibly secured bank loans, to bring the total capital available up to the amount needed to buy the company; and

❑ The management team may be given an incentive scheme (such as a share option scheme) that will allow them to take more equity if the company is successful.

An MBO or MBI cannot go ahead unless enough capital is provided to purchase the business, and the expected profits from the business must be sufficient to meet the costs of debt interest and preference share dividends, and achieve a profit for the equity shareholders.

2.6 Going private

A 'public company' might 'go private'. The public company must be a company whose shares are traded on a stock market. When it goes private, it abandons its stock market status and it shares are no longer traded on the market.

Going private usually involves a major change in the share ownership of the company. When its shares are traded on a stock market, the majority of the shares are probably held by institutional investors. When the company 'goes private', the shares are normally acquired by either:

❑ A small number of former managers in the company and venture capital organisations; or

❑ A private equity organisation.

Typically, the chairman or chief executive officer of the company, who might be a significant shareholder, decides to withdraw the company from the stock market. He seeks financial support from venture capitalists and banks, and makes an offer to the existing shareholders to buy their shares. The existing shareholders must be offered a sufficiently high price for their shares, to persuade them to sell.

Reasons for going private

When a company goes private, the reasons may be as follows:

❑ The company is obtaining no benefit from its stock market status. For example:

- The company might not want to use the stock market to raise new equity capital;

- Investors might be unwilling to support a new share issue, so that the company is unable to obtain new funding from the stock market; and

- The company either does not want to issue new equity to finance takeovers, or is unable to persuade the shareholders of target companies to accept its shares as the purchase consideration for a takeover.

❑ The chairman or chief executive officer, who is also a major shareholder, might think that the shares are under-valued. By taking the company private and acquiring more of the shares, he will expect to increase his own wealth.

When a significant number of companies revert to private status and give up their stock market status, this would be an indication that the stock market is not acting efficiently in providing capital to companies and that having a stock market status does not help to increase share values.

Private equity

Private equity organisations specialise in buying companies, often companies that are not as successful as they should be.

❑ The private equity firm has a fund for buying companies, and often borrows from banks to obtain large quantities of additional debt finance.

❑ A company acquired by a private equity firm may be a public company whose shares are traded on a stock market. If so, the private equity firm will buy the company and 'take it private'. This means that the company's shares are withdrawn from trading on the stock market, and the shares are 'de-listed'.

A new management team is appointed to run the company. These managers are usually offered large incentives to make the company successful. This is the key to a successful private equity venture: the acquired company must be changed from an under-performing company to a company with much more value.

In addition, the purchased company might have valuable assets such as land and buildings that the new owners use to raise more capital. For example, property might be sold and leased back or used as collateral for additional borrowing.

If the company is successful, the private equity firm may decide to 'cash in' its investment. One way of doing this is to re-list the shares and re-launch the company on the stock market. When the company is re-launched on the market, the private equity firm will sell its shares to other investors.

Private equity firms have been particularly successful in recent years. Some of this success has been due to the low cost of borrowing. A large proportion of the purchase price of target companies has been paid for with debt capital, on which the interest rate has been fairly low (and there is tax relief on the interest payments).

3 SUNDRY ISSUES

Section overview

- Share buy-back (purchase of own shares)
- Companies and Allied Matters Act
- Securities and Exchange Commission regulations
- Declaration of dividends

3.1 Share buy-back (purchase of own shares)

A share buy-back is the purchase by a company of some of its own equity shares, which are then cancelled.

- ❑ The shares might be purchased in the stock market at the current market price.

- ❑ Alternatively, the company might offer to buy back a quantity of shares at a fixed price from shareholders willing to sell them.

After a share buy-back, the company will have fewer shares in issue.

Purpose of a share buy-back

A share buy-back might be appropriate when the company has a large amount of surplus cash, and cannot find enough new investment opportunities for investing the money. Instead of holding the cash (and earning a low rate of interest), it would benefit shareholders if the cash is paid back to them.

An alternative to a share buy-back is a special dividend payment. A dividend would be paid to all the shareholders, and so all the shareholders would receive some cash. However, the company might wish to avoid giving the impression that higher dividends will continue to be paid in the future.

There might be a tax advantage for shareholders in selling back shares rather than receiving a higher dividend.

By reducing the number of shares in issue, the cash profits per share and earning per share after the buy-back should be higher, and the market value of the remaining shares should therefore increase. A share buy-back should therefore be expected to increase the wealth of the remaining shareholders.

Increasing the company's financial gearing

Another reason for a share buy-back is to increase the company's gearing. The company may borrow debt capital and use the money to buy back and cancel some of its shares. Replacing equity with low-cost debt may reduce the WACC and increase the value per share of the remaining shares.

Problematic motives

Unfortunately, some motivations for share buyback are undesirable.

A share buyback could allow shareholders to remove cash from a failing company to the detriment of the creditors.

A share buyback could also be used to try to support a company's share price. This would be contrary to the aims of the stock exchange in ensuring that securities are fairly priced and deal carried out in a transparent manner.

There are strict rules to counter these possibilities. These rules are found in:

❏ Companies and Allied Matters Act (1990) as amended; and

❏ Securities and Exchange Commission regulations.

3.2 Companies and Allied Matters Act

A company is not allowed to give financial assistance for the purchase of its own shares. This does not apply to say a bank who makes a loan in the ordinary course of its business.

Shares must only be purchased out of profits of the company which would otherwise be available for dividend or the proceeds of a fresh issue of shares made for the purpose of the purchase (or a combination of these).

Example: Share buy back

X Plc repurchases shares with a nominal value of 100,000 for 110,000.

	Debit	Credit
Share capital	100,000	
Retained profits Cash	10,000	
		110,000
Retained profits	100,000	
Capital redemption reserve		100,000

Example: Share buyback

X Plc repurchases shares with a nominal value of ₦100,000 for ₦110,000.

This was funded by the issue of ₦40,000 share capital at par.

	Debit ₦	Credit ₦
Share capital	100,000	
Retained profits Cash	10,000	
		110,000
Cash	40,000	
Share capital		40,000
Retained profits	60,000	
Capital redemption reserve		60,000

Redeemable shares must not be purchased at a price greater than the lowest price at which they are redeemable.

The transaction must not reduce the total number of its shares (or of its shares of anyone class) held by persons other than the company or its nominees to below less than 85 per cent of the total number of shares (or of shares of that class).

Redeemable preference

Redeemable preference shares cannot be redeemed unless they are fully paid. Redemption must be made only out of:

❑   Profits of the company which would otherwise be available for dividend; or

❑   The proceeds of a fresh issue of shares made for the purposes of the redemption.

Premium on redemption (if any) must be provided for out of the profits of the company or out of the company's share premium account.

If shares are not redeemed out of the proceeds of a fresh issue, the company must make a transfer out of profits into a capital redemption reserve fund. The amount transferred must be equal to the nominal amount of the shares redeemed.

Act relating to the reduction of the share capital of a company shall, except as provided in this section, apply as if the capital redemption reserve fund were paid up share capital of the company.

The capital redemption reserve fund may be used to fund bonus issues.

3.3 Securities and Exchange Commission regulations

These rules apply to publicly quoted companies;

Every company acquiring its own shares must file an application with the Commission for the approval of that acquisition.

This must be accompanied with detailed information about the transaction including the company's latest audited financial statements.

Every company acquiring its own shares must comply with the following:-

❑   The aggregate number of shares to be brought back must not exceed 15% of the existing issued and paid-up equity capital in any given financial year.

❑   No voting rights may be exercised by the company in respect of the acquired shares;

❑   The company and/or the directors must file details of the directors' shareholding before and after the acquisition.

❑   Buy back must be authorised by special resolution.

❑   Shares must only be purchased out of the profit of the company which would otherwise be available for dividends, or the proceeds of a fresh issue of shares made for the purpose of the purchase. These must be reflected in the latest audited accounts which must not be more than nine months old.

❑   The debt equity ratio must not exceed 2:1 after the buy-back.

❑   A declaration of solvency must be filed with the Commission by the board of directors stating that they believe that the Company would remain solvent in the foreseeable future;

❑   A buy-back cannot be made if the company is illiquid.

❑   Redeemable shares must not be purchased at a price greater than the lowest price at which they are redeemable

3.4   Declaration of dividends

Dividends are declared, in respect of a period, in a general meeting on the recommendation of the directors.

❑   A company may pay interim dividends;

❑   The general meeting can decrease but not increase the amount of dividend recommended by the directors.

Dividends are payable only out of the distributable profits of the company. These are:

❑   Profits arising from the use of the company's property although it is a wasting asset;

❑   Revenue reserves; and

❑   Realised profit on a fixed asset sold, but where more than one asset is sold, the net realised profit on the assets sold.

A company must not declare or pay dividend if there are reasonable grounds for believing that the company is or would be unable to pay its liabilities as they become due after the payment.

A dividend cannot be paid out of the share premium account or capital redemption reserve though these can be used to fund bonus issues.

4 CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

■ Explain , execute and evaluate a group reconstruction

■ Explain demergers and different types of divestment

■ Explain and apply the rules on purchase of own shares (share buybacks)

■ Explain MBOs and MBIs

Professional level
Strategic financial management

Financial performance and position

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B	Business analysis (continued)		
	4	Forecast and evaluate long term financial performance and position of a business using:	
		a	Statement of profit or loss;
		b	Statement of financial position; and
		c	Statement of cash flows

Exam context

This chapter provides information on how financial statements might be used to provide information to be used as input to decision making models and as a possible basis of assessing the suitability and acceptability of a strategy. The chapter also provides a reminder of key methodology for appraising financial performance and position.

By the end of this chapter, you should be able to:

■ Prepare a forecast of statement of profit or loss, statement of financial position and statement of cash flows

■ Calculate and interpret return on capital employed and similar ratios

■ Calculate and interpret profitability ratios, working capital ratios, liquidity ratios, debt ratios and gearing ratios

■ Analyse performance of a company from information provided

■ Use the suitability, feasibility, acceptability framework to appraise the financial strategy of an organisation

1 FORECAST FINANCIAL STATEMENTS

Section overview

- Introduction
- Forecast statement of profit or loss
- Forecast statement of financial position
- Forecast statement of cash flows
- Impact of suggested courses of action

1.1 Introduction

Forecast financial statements can be constructed from a starting point by following the guidance given and applying basic numeracy skills, financial accounting knowledge and knowledge of ratios and relationships within financial statements.

The worked example that follows will indicate the order of steps taken in constructing the forecast statement of profit or loss and the forecast statement of financial position. These of course will vary with the information provided to you.

It is difficult to demonstrate the best approach but when answering a question it is recommended that you set up a proforma answer and fill in the blanks as you proceed.

For example, in the following example there is information about the purchase of plant and a depreciation policy. When answering the question you would be recommended to calculate the depreciation for inclusion in the forecast statement of profit or loss and construct the carrying amount for inclusion in the forecast statement of financial position at the same time.

Example: Forecast financial statements

A company is preparing forecast financial statements for the year ending 31 December 20X2

The following statement of financial position was prepared the year ended 31 December 20X1

	20X1 ₦000
Non-current assets	300
Current assets	
Inventory	100
Trade receivables	200
Cash	200
	500
	800
Share capital	50
Retained earnings	350
	400
Non-current liabilities	100
	500
Current liabilities (all trade payables)	300
	800

The following information is relevant.

1   Revenue for 20X1 was ₦800,000 and is expected to grow by 25% in 20X2.
2   Gross profit margin will be 40% of sales.
3   Operating expenses (excluding depreciation) will be 20% of revenue.
4   Depreciation is to be charged at 10%.
5   A new item of plant will be purchased early in 20X2 at a cost of ₦100,000
6   The investment in plant is to be financed by a loan.
7   Interest of 7% is paid on all borrowing.
8   Closing trade receivables will be 3 months of revenue.
9   Closing inventory will be 3 months of cost of sales.
10   Closing trade payables will be 3 months of purchases.

1.2 Forecast statement of profit or loss

Example (continued): Forecast financial statements

Forecast statement of profit or loss for the year ended 31 December 20X2

	₦000
Revenue (₦800,000 ⊠ 125%)	1,000
Cost of sales	
Opening inventory (given)	100
Purchases (balancing figure)	650
	750
Closing inventory (3/12 ⊠ 600)	(150)
Cost of sales	(600)
Gross profit (40% ⊠ ₦1,000,000)	400
Operating expenses	
Depreciation (10% ⊠ (₦300,000 + ₦100,000))	40
Other (20% ⊠ ₦1,000,000)	200
	(240)
	160
Interest (7% ⊠ (₦100,000 + ₦100,000))	(14)
Profit for the year	146

The forecast statement of profit or loss was constructed in the following order:

1. Revenue
2. Gross profit
3. Cost of sales as a balancing figure
4. The detail of the cost of sales working (opening inventory, closing inventory and purchases as a balancing figure.
5. Operating expenses (other)
6. Depreciation – assuming that the depreciation rate applies in full to the new purchase and the assets held at the last year end.
7. Interest – assuming that the interest rate applies in full for the year in respect of the new borrowing.
8. Profit for the year.

1.3 Forecast statement of financial position

Example (continued): Forecast financial statements

Forecast statement of financial position for the year ended 31 December 20X2

	₦000
Non-current assets (₦300,000 + ₦100,000 ₦40,000)	360
Current assets	
Inventory	150
Trade receivables (3/12 (₦1,000,000)	250
Cash (balancing figure)	311
	711
	1,071
Share capital	50
Retained earnings (₦350,000 + ₦146,000)	496
	546
Non-current liabilities (₦100,000 + ₦100,000)	200
	746
Current liabilities (6/12 625,000)	325
	1,071

The forecast statement of financial position was constructed in the following order:

1. Share capital (given)
2. Retained earnings (using the profit calculated when constructing the forecast statement of profit or loss)
3. Loan (taking account of the information about the amount raised during the year).
4. Non-current assets (taking account of the information about the addition in the year and the depreciation already calculated when constructing the forecast statement of profit or loss).
5. Current liabilities
6. Total for equity and liabilities and thus total assets.
7. Current assets as a balancing figure
8. Trade receivables
9. Inventory (as already calculated when constructing the forecast statement of profit or loss).
10. Cash (balancing figure)

1.4 Forecast statement of cashflows

This can be constructed using information from the forecast statement of profit or loss and the forecast statement of financial position in the usual way.

Example (continued): Forecast financial statements

Forecast statement of cash flows for the year ended 31 December 20X2

	₦000
Cash flows from operating activities	
Operating profit	160
Add back: depreciation	40
	200
Working capital adjustments:	
Deduct increase in trade and other receivables	(50)
Deduct increase in inventories	(50)
Add increase in trade payables	25
Cash generated from operations	125
Interest charges paid	(14)
Cash flows from investing activities:	**111**
Purchase of property, plant and machinery	(100)
	100
Cash flows from financing activities:	
Proceeds from new loan	
Net increase/decrease in cash/cash equivalents	111
Cash/cash equivalents at the beginning of the year	200
Cash/cash equivalents at the end of the year	311

1.5 Impact of suggested courses of action

Another type of question involving forecasting might involve the construction of financial statements to help appraise different courses of action under consideration.

For example, a question might provide financial statements for which you could calculate key ratios and then ask you to show how the financial statements (and thus the ratios) might change if a certain investment was undertaken or if finance was raised in different ways.

Debt or equity

Example: Forecast financial statements

A company wishes to raise ₦100,000 either through issuing shares or by borrowing at 10% per annum, on the first day of the next accounting period.

The before column represents the forecast draft financial statements as at the end of the next accounting period.

The impact on the forecast, of raising equity or issuing debt is as follows. (Note that the following figures do not show the results of the investment of the amount raised and ignore taxation).

Example (continued): Forecast financial statements

The financial statements before and after each course of action are as follows:

	Before	After (equity issue)	After (debt issue)
	₦000	₦000	₦000
Non-current assets	300,000	300,000	300,000
Current assets	500,000	600,000	590,000
	800,000	900,000	890,000
Share capital of ₦1each **(1)**	50,000	150,000	50,000
Retained earnings	360,000	360,000	350,000
	410,000	510,000	400,000
Non-current liabilities **(2)**			
	90,000	90,000	190,000
(Capital employed **(3)**	500,000	600,000	590,000
Current liabilities	300,000	300,000	300,000
	800,000	900,000	890,000

	Before	After (equity issue)	After (debt issue)
	₦000	₦000	₦000
Revenue	650,000	650,000	650,000
Cost of sales	(350,000)	(350,000)	(350,000)
Gross profit	300,000	300,000	300,000
Operating expenses	(200,000)	(200,000)	(200,000)
Profit before interest and tax **(4)**			
	100,000	100,000	100,000
Interest	(20,000)	(20,000)	(30,000)
Profit for the year **(5)**	80,000	80,000	70,000
ROCE ((**4** ÷ **3**) ⬚ 100)	20.0%	16.67	16.9%
EPS (**5** ÷ **1**)	₦1.60	₦0.53	₦1.40
Gearing ((**2** ÷ **3**) ⬚ 100)	18.0%	15.0%	32.2%

Commentary

ROCE (calculated as profit before interest and tax divided by long-term capital employed) is lower in each case. This is simply due to the cash raised leading to an increase in capital employed. The forecast capital employed at the year-end if debt were to be issued is ₦10,000 lower than that for equity. This is due to the interest that would have to be paid on the debt.

Remember that the example has ignored the impact of investing the ₦100,000 raised. Companies do not raise cash without a reason. The ₦100,000 would earn a return which would push ROCE upward but this is ignored in the example.

EPS is lower in each case but much more so for the equity issue. For the equity issue this is because the same amount of profit is shared between a greater number of shares. For the debt issue, there is slight fall due to the interest payment reducing the profit. Again, remember that the numbers ignore the positive impact of the investment.

Gearing would fall due to the equity issue because there would more equity but the same amount of debt. Gearing increases due to the debt issue for the opposite reason.

2   EVALUATING FINANCIAL PERFORMANCE AND FINANCIAL POSITION

Section overview

- Introduction
- Introduction to analysis of financial statements
- Financial performance ratios
- Working capital efficiency ratios
- Liquidity ratios
- Debt ratios
- Investor ratios
- Using cash flow information

2.1   Introduction

Decisions about financial strategy must be based on relevant information.

Financial statements are a key source of financial information about a company and the main statements include:

❏   statement of profit or loss;

❏   statement of financial position; and

❏   statement of cash flows.

You should be very familiar with the structure of each of these statements so they will not be repeated here in any detail.

This syllabus requires that you be able to use these to evaluate and forecast long term performance of a business.

Information provided in the above financial statements might be used in a variety of ways. For example the statements might provide information that:

❏   Allows for evaluation of historical performance (perhaps to decide on whether an entity is an appropriate takeover target); or

❏   Could be used as inputs into an appraisal model (e.g. for business valuation); or

❏   Could be a basis of making forecasts of future performance before and after making a strategic change of some kind.

Information about revenues and costs in the statement of profit or loss is often used as a proxy for cash flows with or without adjustments. This is a reasonable approach as profits should equal cash in the long term with the year by year differences between profit and cash balancing out over time.

For example, information from the statement of profit or loss is used in business valuation techniques including valuations based on:

❏   PE ratios (see chapter 18); and

❏   free cash flow (see chapter 19).

The statement of profit or loss is structured to present a picture of the performance of an organisation.

This section continues to cover the main techniques that can be used to analyse a set of financial statements. The next section talks about the role of financial statements in evaluating courses of action.

2.2 Introduction to analysis of financial statements

Financial ratios can be used to help to understand the financial position and its financial performance of an entity.

Using ratios: comparisons

Financial ratios can be used to make comparisons:

❑ Comparisons within financial statements. (For example if revenue has increased by 10% it might be expected that gross profit increase by a similar amount).

❑ Comparisons over a number of years. By looking at the ratios of a company over a number of years, it might be possible to detect improvements or deterioration in the financial performance or financial position of the entity. Ratios can therefore be used to make comparisons over time, and to identify changes or trends.

❑ Comparisons with the similar ratios of other, similar companies for the same period.

❑ Comparisons with projections to take account of a proposed investment or financing strategy.

The basic financial ratios should already be familiar to you and can be divided into five categories:

❑ financial performance: return on capital, profitability and use of assets

❑ working capital 'turnover' ratios;

❑ liquidity ratios;

❑ debt ratios; and

❑ investor ratios.

2.3 Financial performance ratios

Return on capital employed

The aim of 'profitability ratios' is to assess the financial performance of a profit- making entity and the return that it makes on the capital invested.

Profit-making companies should try to make a profit that is large enough in relation to the amount of money or capital invested in the business. The most important profitability ratio is probably return on capital employed or ROCE.

For a single company:

Formula: Return on capital employed (ROCE)

$$\text{ROCE} = \frac{\text{Profit before interest and taxation}}{\text{(Share capital and reserves + long-term debt capital + preference share capital)}} \times 100\%$$

Capital employed is the share capital and reserves, plus long-term debt capital such as bank loans, bonds and loan stock.

Where possible, use the average capital employed during the year. This is usually the average of the capital employed at the beginning of the year and end of the year.

Example: Return on capital employed

The following figures relate to Company X for Year 1.

	1 January Year 1	31 December Year 1
	₦	₦
Share capital	200,000	200,000
Share premium	100,000	100,000
Retained earnings	500,000	600,000
Bank loans	200,000	500,000
	1,000,000	1,400,000

	₦
Profit before tax	210,000
Income tax expense	(65,000)
Profit after tax	145,000

Interest charges on bank loans were ₦30,000.

ROCE is calculated as follows:

ROCE = 240,000 **(W1)**/1,200,000 **(W2)** × 100 = 20%

W1	**Profit before interest and tax**	₦
	Profit before tax	210,000
	Add back interest deducted	30,000
	Profit before interest and tax	240,000

W2	**Capital employed**	₦
	Capital employed at the beginning of the year	1,000,000
	Capital employed at the end of the year	1,400,000
		2,400,000
		÷2
	Average capital employed	1,200,000

This ROCE figure can be compared with the ROCE achieved by the company in previous years, and with the ROCE achieved by other companies, particularly competitors.


Analysing return: profitability and asset utilisation

The size of the return on capital employed, or the size of the return on shareholders' capital, depends on two factors:

❑ the profitability of the goods or services that the entity has sold

❑ the volume of sales that the entity has achieved with the capital and assets it has employed: this is known as asset utilisation or asset turnover.

Profit/sales ratio (and cost/sales ratios)

The profit/sales ratio is the ratio of the profit that has been achieved for every ₦1 of sales.

Formula: Profit/sales ratio

$$\text{Profit/sales ratio} = \frac{\text{Profit}}{\text{Sales}} \times 100$$

Profit/sales ratios are commonly used by management to assess financial performance, and a variety of different figures for profit might be used.

The definition of profit can be any of the following:

❑ Profit before interest and tax

❑ Gross profit (sales minus the cost of sales) = 'gross profit ratio'

❑ Net profit (profit after tax) = 'net profit ratio'.

It is important to be consistent in the definition of profit, when comparing performance from one year to the next.

The gross profit ratio is often useful for comparisons between companies in the same industry, or for comparison with an industry average.

It is also useful to compare the net profit ratio with the gross profit ratio. A high gross profit ratio and a low net profit ratio indicate high overhead costs for administrative expenses and selling and distribution costs.

Example: Profit to sales ratios

The following figures relate to Company X for Year 1.

	₦
Profit before tax	210,000
Income tax expense	(65,000)
Profit after tax	145,000

Interest charges on bank loans were ₦30,000.

Sales during the year were ₦5,800,000.

Profit to sales ratios are calculated as follows:

a)   If profit is defined as profit before interest and tax:

$$= 240,000 \textbf{ (W1)}/5,800,000 \times 100 = 4.14\%$$

b)   If profit is defined as profit after interest and tax:

$$= 145,000 \textbf{ (W1)}/5,800,000 \times 100 = 2.5\%$$

W1   **Profit before interest and tax**

	₦
Profit before tax	210,000
Add back interest deducted	3 0,000
Profit before interest and tax	240,000

It is also useful to monitor the ratio of different types of cost to sales. The following ratios can be useful to highlight an unexpected change in a period or to indicate a difference between the company and another in a similar industry:

❑   Cost of sales/Sales) × 100%

❑   Administration costs/Sales) × 100%

❑   Selling and distribution costs/Sales) × 100%

Asset turnover ratio

The asset turnover ratio is the ratio of sales to capital employed.

It measures the amount of sales achieved during the period for each ₦1 of investment in assets.

Formula: Asset turnover ratio

$$\text{Asset turnover ratio} = \frac{\text{Sales}}{\text{Share capital + reserves + long term debt}} \times 100$$

It is measured as a multiple (so many times a year).

The asset turnover ratio is also the ratio of sales to (assets – current liabilities). This is because capital employed = total assets minus liabilities excluding long- term debt.

> **Example: Asset turnover ratio**
>
> The following figures relate to Company X for Year 1.
>
> Average capital employed (as given before)   ₦1,200,000
>
> Profit before interest and tax = 240,000 (as given before)
>
> Sales during the year were ₦5,800,000.
>
> ROCE = 240,000 /1,200,000 × 100 = 20% (as given before)
>
> **Asset turnover**
>
> Asset turnover ratio = ₦5,800,000/₦1,200,000 = 4.83 times.
>
> Note that: ROCE = Profit/sales ratio × Asset turnover ratio (where profit is defined as profit before interest and taxation).
>
> Using the figures shown earlier:
>
> | ROCE | = | Profit/sales | × | Sales/capital employed |
> |---|---|---|---|---|
> | $\dfrac{240,000}{1,200,000}$ | = | $\dfrac{240,000}{5,800,000}$ | × | $\dfrac{5,800,000}{1,200,000}$ |
> | 20% | = | 4.14% | × | 4.83 times |

Percentage annual growth in sales

It can be useful to measure the annual growth (or decline) in sales, measured as a percentage of sales in the previous year.

For example, if sales in the year just ended were ₦5,800,000 and sales in the previous year were ₦5,500,000, the annual growth in sales has been (₦300,000/₦5,500,000) × 100% = 5.45%.

2.4 Working capital efficiency ratios

Working capital efficiency ratios measure the efficiency with which the entity has managed its receivables, inventory and trade payables. The ratios are usually measured in terms of an average number of days.

The working capital ratios are a useful measure of whether the entity has too much or too little invested in working capital.

Excessive investment in working capital is indicated by a long cash cycle (a long working capital cycle) that appears to be getting even longer. When too much is invested in working capital, the return on capital employed and ROSC will be lower than they should be.

Under-investment in working capital is an indication of possible liquidity difficulties. When working capital is low in comparison with the industry average, this might indicate that current assets are being financed to an excessive extent by current liabilities, particularly trade payables and a bank overdraft.

(The cash cycle, also called the operating cycle and the working capital cycle) is explained later).

Average time to collect (receivables days or days' sales outstanding)

This ratio estimates the time that it takes on average to collect the payment from customers after the sale has been made. It could be described as the average credit period allowed to customers or the 'average collection period'.
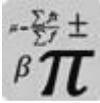
> **Formula: Average time to collect (average collection period or average receivables days)**
>
> $$\text{Average time to collect} = \frac{\text{Trade receivables}}{\text{Credit sales}} \times 365 \text{ days}$$

Trade receivables should be the average value of receivables during the year. This is the average of the receivables at the beginning of the year and the receivables at the end of the year.

However, the value for receivables at the end of the year is also commonly used.

Sales are usually taken as total sales for the year. However, if sales are analysed into credit sales and cash sales, it is probably more appropriate to use the figure for credit sales only.

The average time to collect money from credit customers should not be too long. A long average time to collect suggests inefficient collection of amounts due from receivables.

Average time for holding inventory (inventory turnover)

This ratio is an estimate of the average time that inventory is held before it is used or sold.

In theory, inventory should be the average value of inventory during the year. This is the average
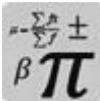
> **Formula: Average time for holding inventory (Inventory holding period or average inventory days)**
>
> $$\text{Average inventory days} = \frac{\text{Inventory}}{\text{Cost of sales}} \times 365 \text{ days}$$

of the inventory at the beginning of the year and the inventory at the end of the year.

However, the value for inventory at the end of the year is also commonly used, particularly in examinations.

Average time to pay suppliers

The average time to pay suppliers may be calculated as follows:
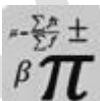
> **Formula: Average time to pay suppliers (Average payables days)**
>
> $$\text{Average time to pay} = \frac{\text{Trade payables}}{\text{Purchases}} \times 365 \text{ days}$$

Trade payables should be the average value of trade payables during the year. This is the average of the trade payables at the beginning of the year and the trade payables at the end of the year.

However, the value for trade payables at the end of the year is also commonly used.

When the cost of purchases is not available, the **cost of sales** should be used instead. This figure is obtained from the profit and loss information in the statement of comprehensive income.

Example: Working capital efficiency ratios

The following information is available for Company Y for Year 1.

	1 January Year 1	31 December Year 1
	₦	₦
Inventory	300,000	360,000
Trade receivables	400,000	470,000
Trade payables	150,000	180,000

Sales in Year 1 totalled ₦3,000,000 and the cost of sales was ₦1,800,000.

The Working capital efficiency ratios are calculated as follows:

Efficiency ratios

Average days to collect = [435,000/3,000,000] × 365 days = 52.9 days

Inventory turnover period = [330,000/1,800,000] × 365 days = 66.9 days

Average time to pay = [165,000/1,800,000] × 365 days = 33.5 days.

Workings

Average inventory = [₦300,000 + ₦360,000]/2 = ₦330,000 Average

trade receivables = [₦400,000 + ₦470,000]/2 = ₦435,000 Average

trade payables = [₦150,000 + ₦180,000]/2 = ₦165,000.

Cash operating cycle/working capital cycle

The cash operating cycle or working capital cycle is the average time of one cycle of business operations:

❑ from the time that suppliers are paid for the resources they supply; and

❑ to the time that cash is received from customers for the goods (or services) that the entity makes (or provides) with those resources and then sells.

The working capital ratios and the length of the cash cycle should be monitored over time. The cycle should not be allowed to become unreasonable in length, with a risk of over-investment or under-investment in working capital.

Example: Constructing a cash operating cycle

The following figures have been extracted from a company's accounts:

Statement of profit or loss	₦
Sales	1,200,000
Cost of sales:	
Opening inventory	250,000
Purchases	1,000,000
	1,250,000
Closing inventory	(250,000)
Cost of sales	(1,000,000)
Gross profit	200,000

Statement of financial position	
Trade receivables	400,000
Trade payables	166,667

Average inventory holding period:

$$\text{Average Inventory holding period} = \frac{\text{Average Inventory}}{\text{Annual cost of sales}} \times 365 \text{ days}$$

$$\text{Average Inventory holding period} = \frac{250,000}{1,000,000} \times 365 \text{ days} = 91 \text{ days}$$

Average receivables collection period:

$$\text{Average receivables collection period} = \frac{\text{Average trade receivables}}{\text{Annual sales}} \times 365 \text{ days}$$

$$\text{Average receivables collection period} = \frac{400,000}{1,200,000} \times 365 \text{ days} = 122 \text{ days}$$

Average payables period:

$$\text{Average payables period} = \frac{\text{Average trade payables}}{\text{Annual purchases}} \times 365 \text{ days}$$

$$\text{Average payables period} = \frac{166,667}{1,000,000} \times 365 \text{ days} = 61 \text{ days}$$

Cash operating cycle:	Days
Average inventory holding period	91
Average trade receivables collection period	122
Average period of credit taken from suppliers	(61)
	152

2.5 Liquidity ratios

The meaning of liquidity

Liquidity means having cash or access to cash readily available to meet obligations to make payments.

For the purpose of ratio analysis, liquidity is measured on the assumption that the only sources of cash available are:

❑ cash in hand or in the bank; plus

❑ current assets that will soon be converted into cash during the normal cycle of trade.

It is also assumed that the only immediate payment obligations faced by the entity are its current liabilities.

There are two ratios for measuring liquidity:

❑ current ratio; and

❑ quick ratio, also called the acid test ratio.

The more suitable ratio for use depends on whether inventory is considered a liquid asset that will soon be used or sold, and converted into cash from sales.

Current ratio

The current ratio is the ratio of current assets to current liabilities.

> **Formula: Current ratio**
>
> $$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

The amounts of current assets and current liabilities in the statement of financial position at the end of the year may be used. It is not necessary to use average values for the year.

It is sometimes suggested that there is an 'ideal' current ratio of 2.0 times (2:1).

However, this is not necessarily true and in some industries, much lower current ratios are normal. It is important to assess the liquidity ratios by considering:

❑ changes in the ratio over time;

❑ the liquidity ratios of other companies in the same period; and

❑ the industry average ratios.

Liquidity should be monitored by looking at changes in the ratio over time.

Quick ratio or acid test ratio

The quick ratio or acid test ratio is the ratio of current assets excluding inventory to current liabilities. Inventory is excluded from current assets on the assumption that it is not a very liquid item.
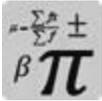
> **Formula: Quick ratio**
>
> Quick ratio = $\dfrac{\text{Current assets excluding inventory}}{\text{Current liabilities}}$

The amounts of current assets and current liabilities in the statement of financial position at the end of the year may be used. It is not necessary to use average values for the year.

This ratio is a better measurement of liquidity than the current ratio when inventory turnover times are very slow, and inventory is not a liquid asset.

## 2.6 Debt ratios

Gearing ratio (leverage)

Gearing, also called leverage, measures the total long-term debt of a company as a percentage of either:

❑ the equity capital in the company; or

❑ the total capital of the company.
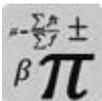
> **Formula: Debt to equity ratio**
>
> Debt to equity ratio = $\dfrac{\text{Long term debt}}{\text{Share capital} + \text{reserves}} \times 100$

Alternatively:
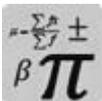
> **Formula: Gearing ratio**
>
> Gearing ratio = $\dfrac{\text{Long term debt}}{\text{Share capital} + \text{reserves} + \text{long term debt}} \times 100$

It is usually appropriate to use the figures from the statement of financial position at the end of the year. However, a gearing ratio can also be calculated from average values for the year.

A high level of gearing may indicate the following:

❑ The entity has a high level of debt, which means that it might be difficult for the entity to borrow more when it needs to raise new capital; and

❑ High gearing can indicate a risk that the entity will be unable to meet its payment obligations to lenders, when these obligations are due for payment.

Interest cover ratio

Interest cover measures the ability of the company to meet its obligations to pay interest.

Profit before interest and taxation is calculated by adding the interest charges for the year to the

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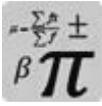
Formula: Interest cover

$$\text{Interest cover} \; = \; \frac{\text{Profit before interest and tax}}{\text{Interest charges in the year}}$$

---

figure for profit before taxation.

An interest cover ratio of less than 3.0 times is considered very low, suggesting that the company could be at risk from too much debt in relation to the amount of profits it is earning.

Example: Gearing ratios

The following information is available for Company Z for Year 6

At 31 December Year 6

	₦000
Total assets	5,800
Share capital	1,200
Reserves	2,400
	3,600
Long-term liabilities (Bank loans)	1,500
	5,100
Current liabilities	700
	5,800

For the year to 31 December Year 6	₦000
Profit before interest and taxation	700
Interest	(230)
	470
Taxation	(140)
Profit after taxation	330

The following ratios can be calculated to shed light on the company's gearing in Year 6 (compared to previous years or to other companies).

Gearing ratio: 1,500/5,100 ⅹ 100 = 29.4%

Debt to equity ratio: 1,500/3,600 ⅹ 100 = 41.7% **Interest**

cover: 700/230 = 3.04 times

2.7 Investor ratios

Earnings per share (EPS)

EPS is normally viewed as a key measure of an entity's financial performance. It measures the profit earned for each equity share of the entity.

Basic EPS is calculated as follows:
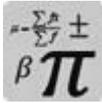
Formula: Basic EPS

$$\frac{\text{Net profit (or loss) attributable to ordinary shareholders during a period}}{\text{weighted average number of shares in issue during the period}}$$

Price-earnings ratio (P/E ratio)

The price/earnings (P/E) ratio measures how expensive or cheap a share is in relation to its annual earnings. A P/E ratio of 10, for example, means that investors are prepared to pay a price for the share equal to 10 years of earnings (at the level of EPS in the previous year). A high P/E ratio is usually a sign of confidence in an entity, because it suggests that its earnings are expected to grow in future years. A low P/E ratio usually means that an entity's future prospects for EPS growth are expected to be poor, so that investors do not put a high value on the shares.

The P/E ratio is calculated as follows:

Formula: Price earnings ratio

$$\text{P/E ratio} \quad = \quad \frac{\text{Market value of share}}{\text{Earnings per share}}$$

2.8 Using cash flow information

Cash generated from operations

Compare this figure to profit before tax/operating profit. How different are the two figures? Why are they different? Look at the items in the first part of the statement, particularly the movements in inventories, receivables and payables. If cash generated from operations is about the same as, or higher than operating profit, there is probably no cause for concern.

If cash generated from operations is much lower than profit, this may be a worrying sign. If there are also large increases in inventories, receivables and payables, possible reasons are that:

❑ The entity is expanding very rapidly and this is absorbing cash generated from operations; and

❑ Working capital management is poor.

Interest paid, taxation paid and dividends paid

Compare these with cash generated from operations. Remember that the entity **has** to meet its liabilities for interest and tax, but it does not have to pay an equity dividend.

Are tax, interest and dividend payments covered by cash generated from operations? The answer should normally be yes.

Investing activities

The main items here are usually the purchase of new non-current assets (an outflow) and the sale of non-current assets (an inflow). Has the entity invested a significant amount of cash during the year? If so, how has the purchase been financed? From existing cash balances, a share issue, long term borrowing or a combination of all three?

Capital investment is usually a good sign; the new assets will generate increased profits and cash flows in future. However, if the entity has financed the purchase mainly or wholly from short-term sources, such as an overdraft, this is normally not a good sign. It means that the entity may become dangerously short of cash to meet its normal day-to-day needs.

Financing activities

Has the entity raised finance during the year? If so, was this by a share issue, or by borrowing, or a combination of the two? The reason for raising finance is often clear; usually it is to finance investment and/or an expansion of the business.

If borrowings have increased, will the entity have enough cash available to meet additional interest payments in future?

Has the entity repaid borrowings during the year? When do the entity's existing borrowings have to be repaid? How easily will the entity be able to make repayments?

Increase/decrease in cash and cash balances

The overall increase or decrease in cash needs to be considered in the context of the statement of cash flows as a whole. A decrease is not necessarily a bad sign. For example, the entity may have had surplus cash in the previous year or may have repaid a loan.

In the same way, an increase in cash or a huge cash balance is not always a good sign, if the cash could have been invested elsewhere to generate profit.

Does the entity have a positive cash balance or a bank overdraft? If an overdraft, how close is it to its overdraft limit?

Does the entity have enough cash to meet both its immediate and its longer-term needs? Consider:

❑ current liabilities (especially income tax and interest);

❑ the current level of dividends;

❑ any plans for expansion of the business;

❑ any other spending commitments; and

❑ any liability to repay borrowings within the next twelve months.

3 EVALUATING PROPOSED STRATEGIES

Section overview

■ The basis for assessing business strategy

■ Example

3.1 The basis for assessing business strategy

You might be required to appraise a proposed strategy.

Johnson and Scholes suggested that when judging the strengths or weaknesses of a proposed strategy, the strategy should be evaluated for its:

❑ **Suitability**: does it address the strategic requirements, given the circumstances and the situation?

❑ **Acceptability**: does it address the strategic requirements in a way that will be acceptable to significant stakeholders?

❑ **Feasibility**: is it practical?

Included within an assessment of acceptability or feasibility should be a financial analysis of the proposed strategy. Strategies might be suitable, and they might succeed in achieving their business objectives. However, if the expected financial return is too low, or if the strategy could only be implemented at a loss, it should not be undertaken.

There are several aspects of 'acceptability'.

❑ Management will not regard a strategy as acceptable if the expected returns on investment are too low, or if the risk is too high in relation to the expected return.

❑ Investors might regard a strategy as unacceptable if they will be expected to provide a large amount of additional investment finance.

❑ Employees and investors might consider a strategy unacceptable if they regard it as unethical.

3.2 Example

A simple analysis of a proposed course of action might involve taking the figures from the financial statements and then adjusting them in line with a proposed course of action.

This section contains an example to demonstrate how you might assess the impact of different financing methods on gearing of a company and also on return on capital employed and earnings per share.

Example: Impact of issuing equity or debt

A company wishes to raise ₦100,000 either through issuing shares or by borrowing at 10% per annum, on the first day of the next accounting period.

The before column represents the forecast draft financial statements as at the end of the next accounting period.

The impact on the forecast, of raising equity or issuing debt is as follows. (Note that the following figures do not show the results of the investment of the amount raised and ignore taxation).

	Before	After (equity issue)	After (debt issue)
	₦000	₦000	₦000
Non-current assets	300,000	300,000	300,000
Current assets	500,000	600,000	590,000
	800,000	900,000	890,000
Share capital of ₦1 each **(1)**	50,000	150,000	50,000
Retained earnings	360,000	360,000	350,000
	410,000	510,000	400,000
Non-current liabilities **(2)**	90,000	90,000	190,000
(Capital employed **(3)**	500,000	600,000	590,000
Current liabilities	300,000	300,000	300,000
	800,000	900,000	890,000

Example (continued): Impact of issuing equity or debt

	Before	After (equity issue)	After (debt issue)
	₦000	₦000	₦000
Revenue	650,000	650,000	650,000
Cost of sales	(350,000)	(350,000)	(350,000)
Gross profit	300,000	300,000	300,000
Operating expenses	(200,000)	(200,000)	(200,000)
Profit before interest and tax **(4)**	100,000	100,000	100,000
Interest	(20,000)	(20,000)	(30,000)
Profit for the year **(5)**	80,000	80,000	70,000
ROCE ((**4** ÷ **3**) × 100)	20.0%	16.67	16.9%
EPS (**5** ÷ **1**)	₦1.60	₦0.53	₦1.40
Gearing ((**2** ÷ **3**) × 100)	18.0%	15.0%	32.2%

Commentary

ROCE (calculated as profit before interest and tax divided by long-term capital employed) is lower in each case. This is simply due to the cash raised leading to an increase in capital employed. The forecast capital employed at the year-end if debt were to be issued is ₦10,000 lower than that for equity. This is due to the interest that would have to be paid on the debt.

Remember that the example has ignored the impact of investing the ₦100,000 raised. Companies do not raise cash without a reason. The ₦100,000 would earn a return which would push ROCE upward but this is ignored in the example.

EPS is lower in each case but much more so for the equity issue. For the equity issue this is because the same amount of profit is shared between a greater number of shares. For the debt issue, there is slight fall due to the interest payment reducing the profit. Again, remember that the numbers ignore the positive impact of the investment.

Gearing would fall due to the equity issue because there would more equity but the same amount of debt. Gearing increases due to the debt issue for the opposite reason.

4 CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Prepare a forecast of statement of profit or loss, statement of financial position and statement of cash flows

- Calculate and interpret return on capital employed and similar ratios

- Calculate and interpret profitability ratios, working capital ratios, liquidity ratios, debt ratios and gearing ratios

- Analyse performance of a company from information provided

- Use the suitability, feasibility, acceptability framework to appraise the financial strategy of an organisation

Professional level
Strategic financial management

Corporate failure

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

D				Mergers and acquisitions, organic growth and corporate restructuring
	3			Corporate reconstruction and re-organisation
		a		Corporate failure
				Assess and advise on:
			i	Causes and symptoms of corporate failure; and
			ii	Corporate failure using Altman Z-score model.

Exam context

This chapter explains corporate failure. It explains different approaches that might be used to predict corporate failure.

By the end of this chapter, you should be able to:

- Identify the causes of corporate failure
- Explain different approaches to predicting corporate failure

1   PREDICTING CORPORATE FAILURE

Section overview

- Causes of corporate failure: two differing views
- Quantitative corporate failure prediction models: financial ratio analysis
- Quantitative corporate failure prediction models: the Z score model
- Altman: Z score model
- Predicting corporate failure: qualitative measures
- Other symptoms of failure
- Using failure prediction models to prevent corporate failure
- Other indicators of failure
- Avoiding failure

1.1   Causes of corporate failure: two differing views

Corporate failure occurs when a company becomes insolvent and goes out of business. Companies that fail have obviously performed badly. After a company has failed, it should be possible to analyse the reasons why failure happened and what went wrong.

Corporate failure prediction is concerned with trying to identify companies that are at risk of failure, before the failure actually happens. If management can identify the signs of failure in advance, they might be able to take action to deal with the problems and prevent failure from happening.

There are two differing views about predicting corporate failure.

❑   One view is that corporate failure is caused by financial problems, such as losses or an inability to pay creditors (liquidity problems).

❑   Another view is that the causes of failure are not financial. Financial problems are the consequences of other problems, and failure is caused by these other non-financial reasons.

Predicting the failure of companies may be based on either a quantitative approach or a qualitative approach. If failure can be predicted by the existence of financial problems, it should be possible to use financial ratios and quantitative analysis to predict the failure. On the other hand, if the causes of failure are non- financial, it might be necessary to use qualitative measures of performance – and judgement – to predict failure.

1.2   Quantitative corporate failure prediction models: financial ratio analysis

Financial ratio analysis is widely used to assess financial performance. For example:

❑   ROCE is used to assess profitability in relation to the amount of capital invested. A low ROCE or losses are an indication of a poor financial performance.

❑   Financial gearing is used to assess the size of a company's long-term debts in relation to equity capital. A high gearing ratio might indicate that the company could have difficulty in meeting its interest payment obligations.

❑ Liquidity ratios (the current ratio and quick ratio) can be used to assess the liquidity of a company, and whether it might be at risk from a shortage of liquidity (cash).

It is generally accepted that the key factors making the difference between firms that fail and firms that survive are:

❑ Profitability;

❑ Cash flow;

❑ Return on equity, including dividends;

❑ Gearing or debt levels; and

❑ Volatility in business revenue.

The purpose of quantitative corporate failure prediction models is to identify a financial ratio (on its own) or a number of financial ratios that can be used to decide whether a company is at risk of failure.

An early approach to the use of financial ratios to predict corporate failure was suggested by William Beaver in the 1960s. He studied a sample of companies that had failed and a sample of companies that had not failed. He studied whether the differences in any one particular financial ratio between these two samples of companies (failed and non-failed) were significant, so that the ratio would provide a reliable guide for failure prediction.

Beaver concluded that of the financial ratios that he examined, the ratio of cash flow to total debt was the most significant, and there were differences in this ratio between most failed and most non-failed companies.

A weakness in Beaver's approach was that he tried to identify whether any one financial ratio on its own was a good predictor of corporate failure. In reality however, individual financial ratios are probably not sufficient to provide reliable predictions of corporate failure.

❑ It is difficult to assess when an individual financial ratio is at a dangerous level.

❑ The ratios of a company change over time.

❑ Financial ratios might also give contradictory signals: for example, if a company has poor liquidity (a low current ratio) but good profitability (a high ROCE), what is the probability of corporate failure?

1.3 Quantitative corporate failure prediction models: the Z score model

A quantitative corporate failure prediction model is a formula that can be used to predict corporate failure. The formula consists of a number of key financial ratios and each ratio is given a weighting. It produces a 'score' from the ratios, and this score can be used to decide whether the company is at risk of corporate failure.

Creating a failure prediction model

A quantitative corporate failure prediction model is based on an objective statistical analysis of historical financial data. There are several statistical methods that might be used to construct a model, but the most commonly-used method is called Multiple Discriminant Analysis or MDA.

Researchers have developed different MDA models for different industries, and for different countries. The key financial ratios for predicting failure have been found to differ between industries, countries and size of company.

MDA models are constructed in the following way:

❑ A sample is taken of a number of different companies of the same type. These are grouped into two different categories: those that have failed and those that have not failed (and continue in business).

❑ Historical financial data is gathered for all the companies in the sample and a variety of financial ratios are calculated for each company.

❑ Statistical analysis is used to identify the ratios that appear to discriminate most between the two different groups or categories of company (failed companies and successful companies).

❑ Weightings are given to these key financial ratios according to how significant they appear to be in discriminating between failed and successful companies.

❑ A *Z score* model is established. This is the score obtained from the model.

A *Z score* can be calculated for any company. Statistical analysis is used to establish three categories of *Z score*.

❑ A *Z score* above a certain value indicates that the company is 'safe' and is not at risk of failure.

❑ A *Z score* below a certain value indicates that the company has a high risk of failure within a given period of time, such as within the next one or two years.

❑ A *Z score* between these two values (safe and high risk) indicates that the company is in a 'grey area'. There is some risk of corporate failure, but the risk is not (yet) high.

1.4 Altman: Z score model

Altman was the first person to develop a corporate failure prediction model using the MDA method. This model was developed in the 1970s, from a study of 22 US companies.

His first *Z score* model used five key accounting ratios. The model was as follows:

Formula: Altman's Z score

$$Z \text{ score} = 0.012X1 + 0.014X2 + 0.33X3 + 0.06X4 + 1.0X5$$

Where:

X1 = working capital/total assets X2 =

retained earnings/total assets

X3 = earnings before interest and tax/total assets X4 = market

value of equity/book value of total debt X5 = sales/total assets.

With this model, Altman predicted that:

❑ a *Z score* of 2.7 or higher indicated that the company was not at risk of failure

❑ a *Z score* below 1.8 indicated a high risk of failure

❑ a *Z score* between 1.8 and 2.7 was in the 'grey area' where failure was a possibility but not a high risk.

Z score has been used in practice to predict corporate failure.

Other Z score models

In 1991, the first industry-specific *Z score* model was developed for the airline industry. This is called the AIRSCORE model but is based on the Altman *Z score* model.

Researchers generally agree that their models are good for predicting corporate failure up to two years in the future, but are not reliable for longer-term predictions.

H score model

The *H score* model was devised by Company Watch. An *H score* is a percentage score between 0 and 100.

If a company has an *H score* of, say, 15 this means that only 15% of companies have financial characteristics that are more indicative of a company at risk of failure.

Similarly an *H score* of 80 means that 80% of companies have characteristics more indicative of a company at risk of failure.

Company Watch suggest that an *H score* of 25 or less puts a company into a high risk category.

The *H score* valuation is based on seven key financial ratios in three areas of management:

❑ Profit management (changes in profitability);

❑ Asset management (measured by liquidity, working capital and current asset cover; and

❑ Funding management (measured by adequacy of capital, reliance on debt and reliance on current liabilities).

1.5 Predicting corporate failure: qualitative measures

A criticism of *Z score* models is that they focus on financial performance. It can be argued that poor financial ratios are a symptom of corporate failure, but they are not the cause of failure. Analysing financial ratios does not help management to understand the nature of the problems that create the risk of corporate failure.

The factors that could be the real cause of corporate failure might be:

❑ Poor management for example, inexperienced management or autocratic management);

❑ An inability to retain key staff;

❑ Ownership of the company in the hands of a small number of individuals;

❑ Poor management information systems;

❑ The loss of a big client;

❑ A large increase in interest rates; and

❑ The launch of a big project (that does not go to plan).

Argenti: 'A score' model

Argenti developed a model for predicting corporate failure based on qualitative factors. His model produced a score that he called an *A score* which could be used to predict corporate failure, particularly in small and medium-sized companies.

Argenti assigned scores to qualitative factors under three main headings:

❑ **Defects**. These are weaknesses within the organisation and management structure, such as:

Management weaknesses

- an autocratic or inexperienced managing director/CEO (8 marks)

- failure to separate role of chairman and chief executive officer (4 marks)

- a passive board of directors (2 marks)

- a lack of balance in the skills of the management team – such as financial and marketing skills (4 marks)

- a weak finance director (2 marks)

- a lack of 'management in depth' (1 mark)

- poor ability to respond to change (15 marks).

Accounting deficiencies

- no budgetary control system (3 marks)

- no cash flow planning (3 marks)

- no costing system (3 marks).

The total mark for defects is 45, and Argenti suggested that a satisfactory score is 10 or less.

❑ **Mistakes that have been made** or 'errors in action'. These are mistakes that the company makes that could have been avoided. The three main mistakes are:

- expanding the business too quickly without the cash resources/capital to finance the expansion: this is 'overtrading' (15 marks)

- excessive borrowing from banks and high gearing (15 marks)

- 'the big project': undertaking a large and risky project, which subsequently fails (15 marks)

Argenti suggested that a satisfactory score for mistakes made is 15.

❑ **Symptoms of failure**. Symptoms are evidence of a position that is getting worse, but they are not the actual cause of the company's problems. Symptoms include:

- financial ratios getting worse, normally in the two years leading up to failure (4 marks)

- creative accounting: the use of 'window dressing' in the financial statements, to make the financial position appear better than it really is (4 marks)

- non-financial signs, such as frozen salaries for management, postponements of necessary capital expenditure, falling market share, increasing rate of staff turnover (3 marks)

- 'terminal signs' just before failure occurs: these are both financial and non-financial indicators showing even a casual observer that the company will soon fail (1 mark).

The overall 'pass mark' is an *A score* of 15 or less. Companies with a higher score should be concerned for their future and should consider measures that may be necessary to prevent failure in the future.

1.6 Other symptoms of failure

There is a wide range of non-financial as well as financial factors that could be an indicator of risk of financial failure. These may be grouped into:

❑ Company-specific factors, such as poor management, reliance on a single customer or a small number of customers or customers concentrated in a specific industry or region, reliance on a single supplier, the level of diversification of the business, or a qualified audit report

❑ General characteristics, such as the nature of the industry in which the company operates

❑ Environmental factors, such as the condition of the economy and the business cycle, and the availability of credit.

It has also been suggested that the fundamental reasons for failure may be explained as:

❑ **Poor business planning.** 'If you fail to plan, you plan to fail.' Many businesses fail because they do not have a clear and well-developed business plan, so that they know what they are ding and trying to achieve.

❑ **Poor financial planning**. The main problems are poor cash flow planning and, in the case of new and small companies, starting out with insufficient capital.

❑ **Poor marketing**. Companies that fail are often guilty of failing to promote themselves and their products, and ignoring the competition. In a competitive market, only those that compete successfully will survive.

❑ **Poor management**. The owners of small businesses in particular often fail to recognise their own weaknesses and do not look for help Management may also lack the experience and skills to make their company a success.

1.7 Using failure prediction models to prevent corporate failure

Corporate failure prediction models might be used 'after the event' to explain why companies failed. However, there is no practical value in analysing the problem after it is too late and corporate failure has already happened.

The value of corporate failure prediction models, if there is any at all, must lie in using a model to identify whether a particular company is at risk of failure, and if so:

❑ How serious the risk is: the size of the risk can be judged according to the value of the *Z score*; and

❑ What are the main causes of the problem.

Z score models can be criticised because they identify symptoms of the problem, but not the causes.

A score models can be criticised because they rely on subjective judgements of qualitative factors.

A company might also be unaware that it is at risk of failure, and so might not consider hiring a firm of specialist consultants to analyse their position using a failure prediction model.

1.8 Other indicators of failure

It does not require the use of a corporate failure prediction model to identify businesses at risk of failure. There will often be more than one indicator of potential failure.

The following measures of performance, taken together, may indicate that a business is at risk of failure.

❑ **Declining sales and loss of market share** - A company may be in a market or industry that is in decline, so that total sales in the market are failing. In addition, a company may be losing market share to its competitors. A falling market share in a declining market could be a strong sign of imminent failure.

❑ **Profitability** - Low and declining profits (or losses) may indicate that a business has a limited future, unless it can turn the position around and restore profitability to an acceptable level.

❑ **Cash flow** - A company can often remain in business when it is unprofitable, as long as it has sufficient liquidity (cash flow or access to cash). Evidence of financial collapse may be provided by a worsening cash position, with a bank overdraft near the limit agreed with the bank, or small amounts of cash and significant loans due for repayment in the near future

❑ **Lack of innovation -** In competitive markets it is often essential for companies to continue to innovate and develop new products. Many products have a limited 'life cycle' and need to be replaced or refreshed

regularly. A lack of innovation – i.e. a product range that has not changed for many years – could be an indicator of eventual collapse of the business as customer demand declines over time.

❑ **Age of non-current assets** - Viable businesses usually have a policy of regular replacement and updating of non-current assets, particularly plant, machinery and equipment. If a company has 'old' assets that it does not replace consistently and regularly, this could be an indication that it does not have the resources to reinvest in the business. Without reinvestment, a business will eventually decline.

❑ **Lack of adequate internal controls** - A sound system of internal control is needed to manage the risk of failures in financial, operational and compliance systems. Weak controls increase the probability of fraud or error, with resulting losses. When controls are not working effectively, possibly because they are ignored, a company is unlikely to have the ability to succeed long-term. Eventually, something serious could easily 'go wrong'.

❑ **Loss of key employees** - When a company is declining and becoming less successful, it is often the 'best' employees who identify the problems first. There could be a high rate of loss of experienced and important personnel, leaving to take a job with a more successful rival.

1.9 Avoiding failure

When a company is seen to be at risk of failure, measures should be taken to reduce the risk. The measures that are needed may be apparent from the indicators of failure.

A number of writers have put forward suggestions about what should be done to avoid failure. For example, Ross and Kami (1973), in an article on 'why the mighty fall', recommended Ten Commandments which should not be broken.
Breaking any of the following commandments could result in corporate failure:

1 You must have a strategy.
2 You must have controls.
3 The board of directors must participate.
4 You must avoid a system of 'one man rule'.
5 There must be management in depth.
6 You must keep yourself informed of change, and react to it.
7 The customer is king.
8 Do not misuse computers.
9 Do not manipulate your accounts.
10 Organise to meet the needs of your employees.

2   CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

■   Identify the causes of corporate failure

■   Explain different approaches to predicting corporate failure

CHAPTER

24

Foreign exchange risk and currency risk management

Contents

1 Foreign exchange rates

2 Foreign exchange risk

3 Exchange rate relationships

4 Forward FX contracts and forward rates

5 Hedging exposure to foreign exchange risk

6 Money market hedge

7 Chapter review

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

E		Management of financial risks	
	1	Assess and advise on:	
		a	Different types of foreign currency risk.
		b	The causes of exchange rate fluctuations (balance of payments, purchasing power parity theory and interest rate parity theory)
		d	The traditional and basic methods of foreign currency risk management, (currency of invoice, netting and matching, leading and lagging, forward exchange contracts, money market hedging, asset and liability management)

Exam context

This chapter explains foreign currency risk and some of the possible ways that it might be reduced or avoided.

By the end of this chapter, you should be able to:

■   Describe the different types of foreign exchange risk

■   Describe and apply purchasing power parity

■   Describe and apply interest rate power parity

■   Explain spot rates and what causes them to move

■   Adjust a spot rate to arrive at a forward rate

■   Explain and evaluate forward exchange contracts

■   Explain and evaluate forward money market hedges

1 FOREIGN EXCHANGE RATE

Section overview

- The need for foreign exchange
- Spot rates
- Quoting exchange rates
- Strong and weak rates
- Bid and offer prices

1.1 The need for foreignexchange

Many companies enter into foreign exchange transactions (transactions in a foreign currency). The need for foreign exchange arises from international trade and international investment.

❑ A company buying goods from another country might be required to pay in a foreign currency, such as the domestic currency of the supplier. It must therefore obtain the foreign currency to make the payment.

❑ A company selling goods abroad might price the goods in the buyer's domestic currency, or in another currency such as US dollars. When the customer pays in the foreign currency, the company might sell the currency received in exchange for its own domestic currency

❑ A company investing abroad might need to obtain foreign currency to acquire or to make the investment.

If a company in Australia wants to buy goods from a supplier in Germany, and the purchase price is in euros, the Australian company has to buy euros from its bank in order to make the payment to the supplier.

Similarly, if a company in Nigeria sells goods to a customer in the UK, and the price is paid in US dollars, the company will probably sell the dollars it has received to its bank, in exchange for naira. (Alternatively, the company could keep the dollars in a US dollar bank account, if it has one). The company in the UK would also need to buy dollars from a bank in order to pay its Nigerian supplier.

Many foreign currencies can be bought and sold freely in the foreign exchange markets (FX markets), which are operated world-wide by banks. On the other hand, some currencies do not have a liquid market, and foreign companies might be reluctant to accept payment in those currencies.

1.2 Spot rates

In the FX markets, banks trade currencies both spot and forward. A spot transaction is a transaction for the sale of one currency in exchange for another, for 'immediate' settlement. In practice, 'immediate' settlement usually means after two working days, so that if a company makes a spot transaction with a bank on a Monday, the actual exchange of currencies will happen two working days later on Wednesday. However, for the purpose of the examination, you can treat spot transactions as transactions for immediate settlement.

Currency can also be bought and sold at a pre-agreed future date at a pre- agreed rate. Such a rate is called a forward rate. Forward rate transactions are a

useful means of reducing risk. Forward rates are explained in more detail in a later section of this chapter.

1.3 Quoting exchange rates

The exchange rate is the price of one currency in terms of another, that is, the number of units of one currency that could be bought with one unit of another currency. Please note that 'price' refers to the price of the foreign currency that is being sold.

There are two methods of quoting exchange rates. The method used varies from country to country and, in some countries from currency to currency. The two methods are direct quotes and indirect quotes.

Direct quotes

This is the number of units of the domestic currency that will be exchanged for one unit of a foreign currency.

An example of a direct quote is between naira and GBP ₦260 can be exchanged for £1, usually expressed as ₦260/£1.

Nigeria's foreign exchange system uses this method.

Indirect quotes

This is the number of units of foreign currency that will be traded for 1 unit of the domestic currency. In London, for example, the exchange rate quotation between pounds and naira is normally expressed as a number of naira per that can be purchased or sold for a pound. For example, ₦260 per £1 and expressed as
£1/₦260.

This is an example of indirect quote and is also known as a reverse quote.

Comment

Note that a direct quote of one currency is the indirect quote of another.

Example: Direct and indirect

₦260/£1 is a direct quote of the naira price of a pound.

£1 = ₦260 is an indirect quote from a UK viewpoint.

This is a useful thing to know as you will see later when forward rates are explained.

Changing for direct quotes to indirect quotes and vice versa

It is easy to change a direct quote to an indirect by taking its reciprocal.

Example: Direct to indirect

Direct quote (in Nigeria)	Indirect quote (in Nigeria)
₦260/£1	Reciprocal is £1/260=0.000385
₦260 can be exchanged for £1	₦1 can be exchanged for £0.000385

This is only mentioned for completeness. It would be very unlikely that a Nigerian company would do this as quotes in Nigeria are direct.

1.4 Strong and weak rates

It is important to understand whether a currency is growing stronger or weaker against another.

As one currency strengthens then the other weakens. For example, if the naira is getting stronger against the dollar the dollar is weakening against the naira.

Example: Strong and weak rates (direct quote)

The naira/dollar exchange rate changes from ₦150/$1 to ₦160/$1.

In this case the naira is weakening against the dollar. It did take ₦150 to buy a dollar but now it takes ₦160.

Alternatively, this could be viewed as the dollar strengthening. Previously $1 could only buy ₦150 but now it can buy ₦160.

You need to be careful when deciding if a currency is weakening or strengthening. You may face a question involving currencies other than the naira.

Example: Strong and weak rates (indirect quote)

The GBP/dollar exchange rate changes from £1/$1.50 to £1/$1.60.

In this case the pound is strengthening against the dollar. Previously, £1 bought $1.50 but now it buys $1.60.

Alternatively, this could be viewed as the dollar weakening. Previously $1.50 could only buy £1 but now it takes $1.60.

1.5 Bid and offer prices

The above explanations assume that there is a single rate available between two currencies whether a contract is for a sale or purchase of the foreign currency.
This is not true.

In practice, banks quote two rates: a bid rate and an offer rate.

❑ The bid rate is the rate at which the bank will buy the foreign currency (this will be the weaker rate for that currency).

❑ The offer rate is the rate at which the bank will sell the foreign currency (this is the stronger rate for the currency).

Most exchange rates are quoted to four decimal places.

It is easy to get confused about which exchange rate should be applied to a particular transaction. The basic rule to remember is that the bank will use the rate that is more favourable to itself and less favourable to the customer.

❑ A bank sells foreign currency at the stronger rate.

❑ A bank buys foreign currency at the weaker rate.

Example: Bid and offer prices (direct quotes)

A Nigerian company needs $10,000 to pay a US supplier.

The bank's current rates for naira/US dollar are ₦150 – ₦160.

The company needs to buy US dollars in exchange for naira, in order to pay the US supplier.

The bank sells the foreign currency at its stronger rate. This is ₦160.

It will sell US dollars to the company at ₦160 with the company, because this rate gives it more naira.

The cost of buying the dollars is therefore ₦16,000,000 ($10,000 × ₦160).

Check

If the company immediately sold the $10,000 back to the bank, the bank would pay ₦150/$1. Thus the company would receive 15,000,000 ($10,000 × ₦150), losing ₦1,000,000.

If you perform this check and the company makes a gain then you have used the wrong rates. The bank always gains.

Example: Bid and offer prices

A UK company needs $10,000 to pay a US supplier. The bank's current rates for sterling/US dollar (US$/£1) are 1.50 – 1.60.

The bank sells the foreign currency at its stronger rate. This is $1.5.

It will sell US dollars to the company at $1.5 because this rate gives it more pounds.

The cost of buying the dollars is therefore £6,667 ($10,000/1.5).

Check

If the company immediately sold the $10,000 back to the bank, the bank would pay only £6,250 ($10,000/1.6). Thus the company would loss £417 (£6,667 – £6,250).

Practice question   **1**

a)   A French company has received Aus$7,000 from a customer in Australia. The current exchange rate for the euro and the Australian dollar (Aus$/€1) is 1.5230 – 1.5240.

         How much will the company receive in euros for selling the Australian dollars?

b)   An Australian company needs to buy €12,000 to pay a Spanish supplier. The exchange rate is the same as above. How much will it cost the company to obtain the euros that it needs?

2 FOREIGN EXCHANGE RISK

Section overview

- Exchange rates and volatility
- Translation risk
- Economic risk
- Currency transaction exposures
- Summary: currency risks
- Government measures to stabilise exchange rates
- Causes of exchange rate fluctuations

2.1 Exchange rates and volatility

Banks quote exchange rates at which they are willing to buy and sell currencies in the FX markets.

Exchange rates are quoted as a number of units of one currency (the variable currency) in exchange for one unit of the other currency (the base currency). As described earlier, the quote might be a direct quote (as used in Nigeria and most other countries) or as an indirect quote (as used in the UK).

Exchange rates can be very volatile. This means that exchange rates can move up or down by large amounts, within a fairly short period of time.

For example, since the euro was created in 1999, when its value was about €1 = $1.20, the exchange rate has ranged between about €1 = $0.75 to about €1 = $1.35.

Exchange rate volatility creates foreign exchange risk for anyone involved in buying, selling, borrowing or investing foreign currency.

Foreign currency risk can be classified into three types. These are:

- ❑ Translation risk;
- ❑ Economic risk; and
- ❑ Transaction risk

2.2 Translation risk

Translation risk arises in international companies with foreign subsidiaries. Income statements and statements of financial position (balance sheets) will be denominated in the local currency of the subsidiary and, on consolidation, will be translated into the currency of the holding company. On translation of financial statements from one currency to another, losses or gains arise due to exchange rate movements.

Translation risk is therefore the risk of losses (or gains) arising on the translation of the financial statements of a foreign subsidiary into the currency of the parent company, for the purpose of preparing consolidated accounts.

2.3 Economic risk

Economic risk refers to the long-term movement in exchange rates caused by changes in the competitiveness of a country.

For example, over the long term the euro might increase in value against the US dollar. If this happens, goods produced and paid for in US dollars will become cheaper relative to goods produced and paid for in euros. US companies will therefore become more competitive in terms of price, relative to companies in the Eurozone, because of the exchange rate movement.

Economic risk, in the context of foreign exchange, is therefore the risk that a company might choose to locate its operations in a country whose currency gains in value over time against the currencies of its competitors in world markets. The consequence of an increase in the value of the domestic currency is a loss of competitiveness.

2.4 Currency transaction exposures

Transaction risk is the foreign exchange risk that arises in transactions between two parties:

❑ when the normal transaction currency of each party is different; and

❑ when the transaction involves a **future receipt/payment** between the two parties.

Transaction risk is the risk that, for any future transaction in a foreign currency, the amount received or paid in domestic currency might be different from the amount originally expected because of movements in the exchange rate between the date of the initial transaction and the date of settlement (payment/receipt).

For example, transaction risk will arise when a UK company buys goods from a Chinese supplier when the price is in US dollars, and payment is required three months after the date of the purchase.

❑ For the UK buyer, there is a risk that the US dollar will increase in value against the British pound in the three months before settlement is required. If the dollar strengthens in value, the cost in pounds of obtaining the dollars to pay the supplier will be higher than originally expected.

❑ For the Chinese supplier, there is a risk that the US dollar will fall in value against the Chinese Renminbi in the three months before settlement. If the dollar falls in value, the dollar receipts will earn less in Renminbi that originally expected when the sale was made.

Volatile exchange rates increase transaction risk. Transaction risk can disrupt international trade, and make businesses more reluctant to trade internationally, because losses arising from adverse movements in an exchange rate reduce the profit on sales transactions, or increase costs of purchases. The transaction loss might even offset the amount of normal trading profit.

Example: Transaction risk

1 January

A Nigerian company sells sugar to a US buyer for US$100,000.

The exchange rate is ₦150/$1. Therefore, the Nigerian company expects to receive ₦15,000,000.

The US buyer is allowed three months' credit.

31 March

The Nigerian company receives $100,000 from the US buyer.

The exchange rate is ₦140/$1.

Therefore, the Nigerian company receives ₦14,000,000.

This is ₦1,000,000 less than expected when the transaction was entered into. (The company has made an exchange loss of ₦1,000,000).

This example illustrates several points about transaction risk.

❑   Currency risk arises from exposure to the consequences of a rise or fall in an exchange rate. Here, the Nigerian company was exposed to the risk of a fall in the value of the US dollar.

❑   Transaction risk arises only when the settlement of the transaction (and receipt/payment) will occur at a **future** date.

❑   Exchange difference only occurs in the above circumstances when there is a movement in the exchange rate (which almost always happens to a greater or lesser degree).

❑   An exposure lasts for a period of time. Here, the exposure lasts from when the goods were sold on credit until the time that the customer eventually pays.

Currency risk is a two-way risk, and exposure to risk can lead to either losses or gains from movements in an exchange rate. In the above example, the exchange rate could have moved the other way.

Example: Transaction risk

1 January

A Nigerian company sells sugar to a US buyer for US$100,000.

The exchange rate is ₦150/$1. Therefore, the Nigerian company expects to receive ₦15,000,000.

The US buyer is allowed three months' credit.

31 March

The Nigerian company receives $100,000 from the US buyer.

The exchange rate is ₦170/$1.

Therefore, the Nigerian company receives ₦17,000,000.

This is ₦2,000,000 more than expected when the transaction was entered into. (The company has made an exchange gain of ₦2,000,000).

Thus the exchange rate can have a big impact on the final outcome of the transaction. The Nigerian company above was presumably happy to sell its sugar for $100,000 or ₦15,000,000. However, the value of the transaction could fluctuate a great deal.

Example: Transaction risk: impact on final receipt

Referring to the numbers in the previous examples

	₦	₦
Original sale value in naira Exchange difference on settlement	15,000,000	15,000,000
Rate = 140/$1: Exchange loss	(1,000,000)	
Rate = 140/$1: Exchange gain		2,000,000
Final receipt	14,000,000	17,000,000

Trading profits for companies engaged in foreign trade can be significantly affected by currency movements. When exchange rates are volatile and unpredictable, the gain or loss on currency exchange could possibly be even bigger than the expected gross profit from the transaction.

Example: Transaction risk: impact on final margin

Referring to the numbers in the previous examples.

Suppose the Nigerian company operated on a 10% margin.

	₦	₦
Original sale value in naira	15,000,000	15,000,000
10% margin	1,500,000	1,500,000
Exchange difference on settlement		
Rate = 140/$1: Exchange loss	(1,000,000)	
Rate = 140/$1: Exchange gain		2,000,000
Final profit	500,000	3,500,000

As illustrated, risk is two way. Transaction risk means that a company could be worse off (downside risk) or better off (upside risk) depending on the way the exchange rates move.

Companies often use methods to remove or reduce the volatility (risk). This is described as hedging. There are a variety of hedging techniques that can be used. These are very important and will be explained later.

Most hedging techniques result in the company missing out on exchange gains in order to protect themselves from exchange losses. Some people find this surprising at first but remember, a trading company exists to produce its goods and sell them at what it believes to be an acceptable margin. Hedging techniques protect the margin by locking out volatility.

2.5 Summary: currency risks

Translation risk does not affect the cash flows of a group of companies. It is a risk of non-cash ('paper') losses or gains in preparing consolidated financial statements.

Transaction risk does affect cash flows, because movements in exchange rates affect the amount of cash received in domestic currency, or the amount paid in domestic currency, for at least one of the two parties to the transaction.

Economic risk is a strategic risk, affecting the competitiveness of a business entity over the longer term

2.6 Government measures to stabilise exchange rates

A government may try to stabilise the exchange rate for its currency. The purpose of having an exchange rate policy would be to create stable economic conditions for international trade. A stable exchange rate, with relatively little exchange rate volatility, should help to promote growth in the country's economy.

In the past, some governments were able to manage the exchange rate by dealing on the foreign exchange markets, using their official reserves of foreign exchange to either buy or sell domestic currency. By creating demand or supply for its currency in the markets, the government would try to move the exchange rate up or down against major currencies such as the dollar. However, the foreign exchange markets are now so large that very few countries are in a position to manage the exchange rate effectively in this way. (Countries such as China may be an exception.)

The most effective way for a government to manage its exchange rate today, if it wished to do so, would be to increase or reduce domestic interest rates on its currency. Raising or reducing interest rates should affect the demand for the currency from investors. For example, raising the interest rate should attract more investment into the currency, and by increasing demand for the currency, the foreign exchange value of the currency should increase.

There are several exchange rate policies that a government might adopt. These include:

❑ Free floating ('benign neglect' of the exchange rate);

❑ Managed floating of the currency;

❑ A fixed exchange rate policy, with the exchange rate fixed against a major currency or a basket of world currencies;

❑ A fixed exchange rate backed by a currency board system.

Free floating

With a policy of free floating, the government does not have a policy about the exchange rate. Instead, it allows the currency to find its own market value in the foreign exchange markets.

Managed floating

A policy of managed floating is to allow the currency to find its own level in the foreign exchange markets, but within target limits. (Targets may be set for the maximum and minimum exchange rate against, say, the US dollar or the euro.)

If the exchange rate threatens to go through the upper or lower target limit, the government will act to try to keep it within the policy limits, probably by raising or lowering interest rates.

Nigeria operates the managed float with a system known as the *Dutch Auction System* (DAS). The DAS is a public offering auction structure in which the price of the offering is set after taking in all bids and determining the highest price at which the total offering can be sold. The Wholesale DAS was introduced in Nigeria on February 20, 2006. It is a subset of the DAS whereby the CBN receives bids from Authorized Dealers for purchase of forex on behalf of Bureau De Change (BDCs) and other end users of forex (like companies and importers) during an auction.

In 2013, the WDAS was replaced with the Retail DAS which is a direct sale of forex by the CBN through the banks to the end users of forex. Unlike the WDAS, the RDAS is based solely on actual demand of forex by the end users. For example, if an Authorized Dealer has received only $1million of confirmed dollar requests from its BDC's and other end users it can only then bid for that $1million from the CBN auction unlike the WDAS where it can bid for more.

The CBN offers foreign currency twice a week to keep the naira within a range above or below the official exchange rate of say ₦306 per dollar.

Fixed exchange rate policy

A government might try to fix its exchange rate against:

❑　　Another currency, such as the US dollar, or

❑　　A basket of other world currencies, for example the US dollar, euro and yen.

The 'fixed rate' policy will normally permit some limited variations in the exchange rate.

For example, countries that wish to enter the eurozone in the European Community are expected to link their currency to the value of the euro for a period of time before they can be considered for 'eurozone membership'.

There are problems with fixing an exchange rate against another currency.

❑　　Economic conditions in the two countries must remain similar; otherwise there will be too much pressure on the exchange rate to change. For example, the rate of inflation in both countries must be similar over a long period of time.

❑　　The country's economy will be affected by any crisis in the economy of the other country, or by an increase in the volatility of the other country's currency.

Fixed exchange rate backed by a currency board

A currency board system is another fixed exchange rate system. The government fixes its currency against the value of another currency (a 'hard' currency, such as the US dollar). Any new issues of domestic currency have to be backed by an amount of the 'hard currency' in the country's official reserves.

For example, a country with a currency board system might fix the exchange rate at 4 local currency units (LCUs) to the US dollar. If the country wants to increase its money supply (which will be necessary for economic growth), it will need to hold reserves of one US dollar for every increase of 4 LCUs in the money supply.

This 'backing' of a hard currency should help to stabilise the exchange rate for the country's own currency, which in turn should help the country to achieve economic stability.

A problem with a currency board system is that on occasions:

❑   It might result in a shortage of domestic money supply, because of an insufficiency of the hard currency; or

❑   It might push up domestic interest rates (in order to attract more hard currency).

If the problem becomes too serious, the currency board system may break down. A currency board system has worked well for Hong Kong (whose dollar has been linked to the US dollar), but has not been so successful in other cases (such as Argentina).

2.7   Causes of exchange rate fluctuations

There are several approaches to explaining the causes of exchange rate fluctuations

❑   Supply and demand;

❑   Purchasing power parity theory; and

❑   Interest rate parity theory.

Supply and demand

Exchange rates are determined by supply and demand in the foreign exchange markets.

For example, the value of the British pound against other currencies is determined by supply and demand for the pound.

❑   The demand for pounds comes from buyers of British exports, who are required to pay in pounds. Pounds are also bought by British exporters who receive payments in foreign currencies and want to exchange their currency receipts into pounds.

❑   Demand for pounds is also created by flows of investment capital and savings. Foreign investors wishing to purchase investments in the UK must buy pounds to pay for their investments. UK investors selling their foreign investments might exchange their sale receipts (in a foreign currency) into pounds.

The supply of pounds comes from individuals and organisations who want to sell pounds in exchange for a foreign currency.

❑   UK buyers of foreign goods who must pay in a foreign currency will sell pounds and buy the currency they need to make the payment.

❑   Foreign investors who sell their UK investments and receive payment in sterling will want to sell the pounds in exchange for another currency. UK investors buying investments abroad must buy currency (and sell pounds) to pay for the investments.

A balance of trade deficit might affect the exchange rate. This is the difference between the value of a country's exports of goods and services and the cost of its imports. As a general rule if a country has a large balance of trade deficit, its currency is likely to depreciate in value because supply of its currency from international trading operations (e.g. from importers who need to pay in foreign currency) exceeds the demand (e.g. from foreign buyers of exported goods).

Supply and demand for currencies explain the continual fluctuations in currency values.

However, there are other theories that explain the underlying reasons for exchange rate movements, especially over the longer term, and an advantage of these other theories – purchasing power parity theory and interest rate parity theory – is that they can be used to make estimates of what exchange rates will be in the future.

3 EXCHANGE RATE RELATIONSHIPS

Section overview

- Four-way equivalence
- Purchasing power parity theory
- Interest rate parity theory
- Other relationships

3.1 Four-way equivalence

The term 'four-way equivalence refers to four concepts that together provide a consistent explanation of changes in foreign exchange rates, and a method of predicting future 'spot' exchange rates. These four concepts are:

- Purchasing power parity theory;
- Interest rate parity theory;
- The Fisher effect (which together with PPP theory makes the international Fisher effect); and
- Expectations theory.

Illustration: Four-way equivalence
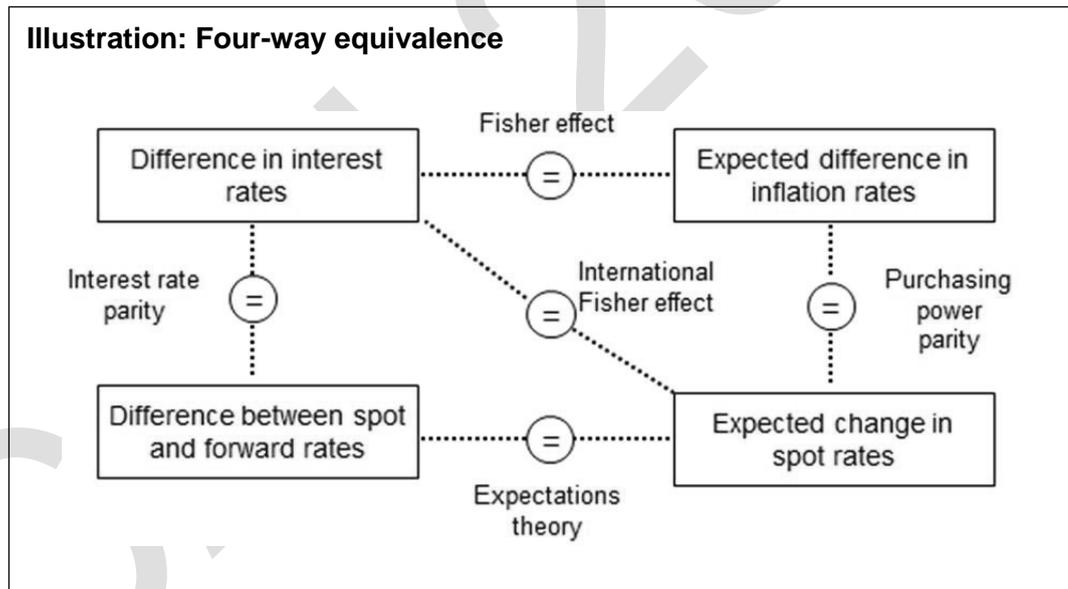
The above relationships should exist when the foreign exchange market is in equilibrium.

The model gives insight into what would happen if a variable in the equilibrium position were to change.

In circumstances of capital market perfection the model would readjust instantly if any input variable were to change. For example, if an interest rate were increased in a country.

3.2 Purchasing power parity theory

Purchasing power parity theory (PPP theory) attempts to explain changes in an exchange rate due to the relative rate of price inflation in each country. The theory is based on the assumption that the exchange rate will adjust to enable the same amount of goods to be purchased in any country with a given amount of money.

PPP theory therefore predicts that if inflation is higher in one country than in another, its exchange

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Example: Purchasing power parity

At the start of a year a basket of goods cost ₦25,000 in Nigeria. The same

basket of goods cost £100 in the UK.

This implies an exchange rate of ₦250/£1.

Annual inflation rates are expected to be 8% in Nigeria and 5% in the UK. **Analysis**

At the end of the year the basket of goods would cost ₦27,000 (25,000 ⨉ 1.08) in Nigeria and £105 in the UK, but the same amount of goods could be purchased with equivalent amounts of each currency.

This means that the exchange rate must be ₦27,000 = £105

Therefore, the exchange rate will be ₦27,000/105 = £1 ⨉ ₦257.14/£1

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rate value will fall so as to restore purchasing power parity.

In reality, an exchange rate does not change in the way predicted by PPP theory because other factors apart from price inflation affect the rate, especially in the short term. It might be argued, however, that PPP theory provides a useful guide to the likely direction and extent of exchange rate movements over a longer period of time.

Forecasting exchange rates with purchasing power parity theory

Purchasing power parity (PPP) theory states that the spot rates between two currencies will change over time in relation to the rate of inflation in the countries from which the currencies originate.

The following equations describe this relationship.
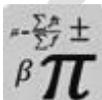
Formula: Purchasing power parity

If quotes are direct:

$$S_T = S_0 \times \frac{1 + i_d}{1 + i_f}$$

If quotes are indirect:

$$S_T = S_0 \times \frac{1 + i_f}{1 + i_d}$$

Where:

S_t = Estimated spot rate at end of period

S_0 = Current spot rate

i_f = period inflation rate in foreign currency

i_d = period inflation rate in domestic currency

This might look a little difficult to remember but the inflation rate in the numerator (the top of the fraction) always relates to S_T.

Example: Purchasing power parity

Nigerian view: The current exchange rate for the naira and GBP is ₦250 = £1.

Forecast annual inflation in Nigeria = 8% (i_d from the Nigerian viewpoint but i_f from the British viewpoint).

British view: The current exchange rate for the GBP and naira is £1 = ₦250.

Forecast annual inflation in the UK = 5% (i_d from the British viewpoint but i_f from the Nigerian viewpoint).

Nigerian viewpoint (direct)	British viewpoint (indirect)
$S_T = S_0 \times \dfrac{1+i_d}{1+i_f}$	$S_T = S_0 \times \dfrac{1+i_f}{1+i_d}$
$S_T = 250 \times \dfrac{1.08}{1.05}$	$S_T = 250 \times \dfrac{1.08}{1.05}$
₦257.14 = £1	£1 = ₦257.14

Example: Purchasing power parity (direct quote)

The current exchange rate for the naira and the US dollar is ₦150 = $1.

It is expected that the rate of inflation in Nigeria will be 3% per year for the next few years, and in the US the rate of inflation will be 5% per year.

Purchasing power parity theory would predict that the following movements in the exchange rate:

End of Year	Spot rate at start	Adjustment factor	Predicted exchange rate
1	150	$1.03^1/1.05^1$	147.13
2	150	$1.03^2/1.05^2$	144.34
3	150	$1.03^3/1.05^3$	141.59

An alternative approach would be to construct an annual adjustment factor and apply it periodically to each new spot rate.

Example: Purchasing power parity (direct quote)

Facts as above:

Purchasing power parity theory would predict that the following movements in the exchange rate:

End of Year	Spot rate at start	Adjustment factor	Predicted exchange rate
1	150	$1.03/1.05$	147.13
2	147.13	$1.03/1.05$	144.34
3	144.34	$1.03/1.05$	141.59

Example: Purchasing power parity (indirect quote)

The current exchange rate for the British pound and the US dollar is £1 = $2.

It is expected that the rate of inflation in the UK will be 3% per year for the next few years, and in the US the rate of inflation will be 2% per year.

Purchasing power parity theory would predict that the following movements in the exchange rate:

End of Year	Spot rate at start	Adjustment factor	Predicted exchange rate
1	2.00	$1.02^1/1.03^1$	1.9806
2	2.00	$1.02^2/1.03^2$	1.9614
3	2.00	$1.02^3/1.03^3$	1.9423

3.3 Interest rate parity theory

Interest rate parity theory is based on the assumption that exchange rates will adjust to eliminate differences in interest rates between countries.

Example: Interest rate parity

The current exchange rate between the naira and the GBP is ₦250/£1. (Therefore ₦25,000 = £100).

Annual interest rates are forecast to be 8% in Nigeria and 5% in the UK.

Analysis

An investor with 25,000 in Nigeria could also invest money for one year at 8% to receive interest and principal of 27,000 at the end of that time.

An investor with £100 in the UK could invest the money for one year to obtain principal plus interest of £105 after one year.

According to interest rate parity theory, the exchange rate after one year will be ₦27,000 = £105.

Therefore, the exchange rate will be ₦27,000/105 = £1 ⇒ ₦257.14/£1

The theory predicts that the currency of a country with a higher interest rate will depreciate in value over time against the currency of a country with a lower interest rate.

Like PPP theory, interest rate parity theory cannot explain all exchange rate movements, especially in the short term, but it might provide a useful guide to changes in the exchange rate over a longer period.

Forecasting exchange rates with interest rate parity theory

Interest rate parity theory states that changes in an exchange rate are caused by differences in interest rates between two currencies. If this is true, it should be possible to predict future spot exchange rates from differences in expected future interest rates between the currencies.

Formula: Interest rate parity

If quotes are direct:

$$F = S \times \frac{1 + i_d}{1 + i_f}$$

If quotes are indirect:

$$F = S \times \frac{1 + i_f}{1 + i_d}$$

Where:

F = Forward rate

S = Current spot rate

i_f = period interest rate in foreign currency

i_d = period interest rate in domestic currency

This formula is similar to the PPP theory formula, except that the forecast annual interest rate is used instead of the annual forecast rate of inflation.

Once again the interest rate in the numerator always relates to S.

The equation constructs a forward rate (explained in more detail later) rather than a future spot rate. However, if the markets are in equilibrium the forward rate would be the same as the expected future spot rate.

In practice the forward rate is a poor predictor of actual spot rates in the future

Example: Interest rate parity (direct quote)

The current exchange rate for the South African Rand against the US dollar is 7.4000 Rand = $1.

The forecast annual interest rate for the Rand is 6% for the next 3 years and the forecast interest rate for the US dollar is 2%.

Applying interest rate parity theory, we can predict the exchange rate at the end of the next three years as follows:

End of Year	Spot rate at start	Adjustment factor	Forward rate
1	7.4000	⮕ $1.06^1 / 1.02^1$	7.6901
2	7.4000	⮕ $1.06^2 / 1.02^2$	7.9918
3	7.4000	⮕ $1.06^3 / 1.02^3$	8.3052

Alternatively:

End of Year	Spot rate at start	Adjustment factor	Forward rate
1	7.4000	⮕ 1.06/1.02	7.6901
2	7.6901	⮕ 1.06/1.02	7.9918
3	7.9918	⮕ 1.06/1.02	8.3052

Example: Interest rate parity (indirect quote)

The current exchange rate for British pound against the euro £1/€1.2115. The forecast annual interest rate for the British pound is 5%.

The forecast annual interest rate for the euro is 2.5%.

Applying interest rate parity theory, we can predict the exchange rate at the end of the next three years as follows:

End of Year	Spot rate at start	Adjustment factor	Forward rate
1	1.2115	$1.025^1/1.05^1$	1.1827
2	1.2115	$1.025^2/1.05^2$	1.1601
3	1.2115	$1.025^3/1.05^3$	1.1273

Alternatively:

End of Year	Spot rate at start	Adjustment factor	Forward rate
1	1.2115	$1.025/1.05$	1.1827
2	1.1827	$1.025/1.05$	1.1601
3	1.1601	$1.025/1.05$	1.1273

3.4 Other relationships

Fisher effect

The economist Irving Fisher gave his name to the so-called Fisher effect and international Fisher effect.

The Fisher effect is simply that the real rate of return on an investment is the nominal rate of return adjusted for the rate of inflation:

You have seen the equation in an earlier chapter used to link money cost of capital and real cost of capital.
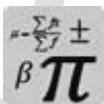
Formula: Fisher equation

$$1 + m = (1 + r)(1+i)$$

Where:

m = money cost of capital (the nominal rate)

r = real cost of capital (the real rate)

I = inflation rate

Example: Nominal rate to real rate

The nominal rate of interest is 4% and inflation is 2.5%

Therefore:

$$(1 + m) = (1 + r) \times (1 + i)$$
$$(1 + 0.04) = (1 + r) \times (1 + 0.025)$$
$$(1 + r) = 1.04/1.025$$
$$r = 1.04/1.025 - 1 = 0.0146 \text{ or } 1.46\%$$

Fisher argued that investors in all countries expect the same real rate of return, after allowing for inflation, and the difference in interest rates between two countries could be explained by differences in the rates of inflation in those countries. This is the so-called international Fisher effect.

Expectations theory

Expectations theory is the theory that all relevant information is reflected in the market rates of exchange. Therefore, the forward exchange rate between two currencies reflects market expectations about what the spot rate will be in the future.

Example: Expectations theory

The currency of Country X is the dollar and the currency of Country Y is the franc. The current spot exchange rate is $1 = 4.00 francs.

	Country X	Country Y
Forecast nominal interest rate	6%	8.02%
Forecast inflation rate	5%	7%

This information can be used with four-way equivalence to make the following predictions.

Purchasing power parity predicts that the spot rate in one year's time will be:

4.00 × (1.07/1.05) = 4.0762.

Interest rate parity predicts that the exchange rate in one year's time will be:

4.00 × (1.0802/1.06) = 4.0762.

The current one-year forward exchange rate is $1 = 4.0762 francs, and this is the expected spot rate in one year's time.

The real return on investment in Country X for the next year is:

(1.06/1.05) − 1 = 0.95%.

The real return in investment in Country Y for the same period is:

(1.0802/1.07) − 1 = 0.95%.

4   FORWARD FX CONTRACTS AND FORWARD RATES

Section overview

- Forward rates
- Forward contracts
- Premiums and discounts
- Forward contracts and hedging exposure to FX risk
- Cross rates

4.1   Forward rates

Banks trade in foreign currencies both for immediate delivery (either to or from the bank) at the spot rate or for future delivery (either to or from the bank) at a forward rate.

The forward rate is the rate at which a bank is willing to trade in foreign currency at a pre-agreed date.

Banks are able to quote forward exchange rates for currencies because of the money markets (short-term borrowing and lending markets). Forward exchange rates differ from spot rates because of the interest rate differences between the two currencies.

Forward rates are calculated by applying the interest rate differential to the spot rate using the interest rate parity equation. This was demonstrated earlier in this chapter.

A forward rate could be a stronger or weaker rate than the spot rate depending on whether the interest rate on the variable currency is higher or lower than the interest rate on the base currency.

❑   When the forward rate is stronger than the spot rate the foreign currency is said to be trading at a premium to the spot rate.

❑   When the forward rate is weaker than the spot rate the foreign currency is said to be trading at a discount to the spot rate.

Trading in foreign currency at the forward rate is through forward exchange contracts. These are a very powerful risk management tool as they allow companies to lock in future exchange rates.

For example, a Nigerian company can arrange a forward contract 'now' to sell a quantity of US dollars in exchange for naira in three months' time, at a rate of exchange that is agreed 'now'. This means that it knows exactly how many naira it will receive.

4.2 Forward contracts

A forward exchange contract is a contract entered into 'now' for settlement at an agreed future date (or at any time between two agreed future dates).

It is a contract between a customer and a bank for the purchase or sale of:

❑   a specified amount of;

❑   a specified foreign currency;

❑   for delivery at a specified future date; and

❑   at a specified rate.

The customer specifies the amount of foreign currency and the date and the bank specifies the rate at which it is willing to deal.

A bank will arrange a forward contract for settlement at any future date, but commonly-quoted forward rates are for settlement in one month, three months, six months and possibly one year.

Forward exchange transactions are available in all the major traded currencies of the world, although settlement dates of more than one year forward are very unusual in any currencies except the most heavily-traded currencies such as the dollar-euro.

4.3 Premiums and discounts

Forward rates are derived from current spot rates and interest rate differences between currencies but it is common practice to quote forward rates as adjustments to the spot rate.

The adjustment might be:

❑   a premium (designated pm) where the future rate is stronger than the spot rate; or

❑   a discount (designated dis) where the future rate is weaker than the spot rate.

The nature of the adjustment to the spot rate to achieve the strengthening or weakening of the foreign currency depends on whether the quotes are direct or indirect.

	Forward rate at a premium to spot	Forward rate at a discount
Direct quotes	Add premium	Deduct premium
Indirect quotes	Deduct a discount	Add discount

Example: Forward rate premiums and discounts (direct quote)

The following examples show how the forward rate is calculated and then how it is presented as an adjustment to the spot rate.

The example shows the foreign currency trading at a discount and at a premium.

	Foreign currency trading at a premium	Foreign currency trading at a discount
Spot rate	₦150/$1	₦150/$1
Nigerian interest rate	10%	5%
US interest rate	5%	10%

Forward rates calculated as:

$$F = S \times \frac{1 + i_d}{1 + i_f}$$

	Foreign currency trading at a premium	Foreign currency trading at a discount
	$F = 150 \times \dfrac{1.1}{1.05}$	$F = 150 \times \dfrac{1.05}{1.1}$
	F = ₦157.14/$1	F = ₦143.18/$1

Forward rates published as:

	₦	₦
Spot	150.00	150.00
Premium	7.14	
Discount		(6.82)
Forward rate	157.14	143.18

The next example shows the situation for a currency quoted indirectly and adds in further complications.

The first of these is that forward rates (shown as adjustment to spot) are quoted as spreads just like the spot rate. The correct rate to use depends on whether the foreign currency is being bought or sold.

The second complication is that the adjustments might be given in units which are a different order of magnitude for some quotes. For example, the adjustment to an indirect quote of dollars may be given in cents.

> **Example:**
>
> A UK company expects to receive US$75,000 in six months from a US customer and it wishes to hedge the exposure to currency risk by arranging a forward contract.
>
> The following rates are available (US$/£1):
>
> **GBP/USD**
>
> | | | | |
> |---|---|---|---|
> | Spot (£1=) | 1.7530 | - | 1.7540 |
> | Six months forward | 240 | - | 231 pm |
>
> The dollar is quoted forward at a premium. The premium is shown in 'points' of price, so that 240 – 231 means 0.0240 – 0.0231.
>
> The bank will apply the rate that is more favourable to itself. (If you need to work out which rate is more favourable, use the spot rates to do this).
>
> The company will be selling US dollars in exchange for pounds, and the higher rate will be used (the offer rate).
>
> | | |
> |---|---|
> | Spot rate | 1.7540 |
> | Forward points (deduct premium) | (0.0231) |
> | Forward rate | 1.7309 |
>
> The company can use a forward contract to fix its future income from the US dollars at £43,330.06 (75,000/1.7309).

4.4 Forward contracts and hedging exposure to FX risk

For companies, forward FX contracts can be used to hedge an exposure to currency risk (transaction risk). Currency risk will arise, for example, when a company expects to receive a quantity of a foreign currency in several months' time, which it will sell in exchange for its own domestic currency. If it plans to sell the foreign currency in a spot transaction, until it receives the currency, it is exposed to the risk that the exchange rate will move adversely and the currency will fall in value and be worth less than its current value.

For example, suppose that an Italian company expects to receive 5 million Japanese yen in three months' time, and the current exchange rate for euros against the yen (yen/€ 1) is 135.00. At this rate, the Italian company would be able to exchange the yen for €37,037 (5 million/135.0).

❑ However, there is a risk that the yen will fall in value during the three months, during which the company has an FX risk exposure arising from its future yen income. If the yen fell in value and after three months the spot rate is 150.00, the yen income would be worth only €33,333.

❑ On the other hand, if the yen strengthened in value, say to 120.00 spot after three months, the income would be worth €41,667.

Although foreign exchange rates can move favourably as well as adversely, companies engaged in international trade usually prefer to avoid exposure to currency risk. They can 'hedge' currency exposures by arranging forward contracts to buy or sell currency. By fixing the exchange rate 'now' for a future currency purchase or sale transaction, the uncertainty or risk in the exchange rate is eliminated.

> **Practice question** **2**
>
> A US company needs to pay a Mexican supplier in three months. It will have to pay the supplier 10 million Mexican pesos. The company wants to arrange a forward contract to hedge its risk exposure. A bank quotes the following rates (pesos/$1):
>
> **USD/MXP**
>
> | | | | |
> |---|---|---|---|
> | Spot | 11.2470 | - | 11.2485 |
> | Three months forward | 340 | - | 360 dis |
>
> Using a forward contract, what will it cost the US company in dollars to pay the Mexican supplier in three months' time?

4.5 Cross rates

The exchange rate for two currencies might be derived as a cross rate.

Example: Cross rates (direct quote)

The spot rate for the naira against the dollar is ₦150 = $1.

The spot rate for the US dollar against the Swiss franc is US$1 = SwFr1.2166.

The spot rate for the naira against the Swiss franc is found as follows:

US$1 = SwFr 1.2166

₦150 = $1.

Therefore ₦150 = SwFr 1.2166

Therefore the forward rate is ₦150/1.2166 = SwFr 1 = 123.29

Example: Cross rates (indirect quote)

The spot rate for the US dollar against the British pound is £1 = US$1.8610.

The spot rate for the US dollar against the Swiss franc is 1.2166 (US$1 = SwFr1.2166).

The spot rate of the GBP against the Swiss franc is found as follows:

US$1 = SwFr 1.2166

£1 = 1.8610

Therefore £1 = 1.2166 × 1.8610 = SwFr 2.2641.

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5 HEDGING EXPOSURE TO FOREIGN EXCHANGE RISK

Section overview

- The purpose of hedging risk
- Methods of hedging exposures to foreign exchange risk
- Leading and lagging
- Netting

5.1 The purpose of hedging risk

The purpose of hedging an exposure to risk is to eliminate or reduce the possibility that actual events will turn out worse than expected. The purpose of hedging an exposure to currency risk is to remove (or reduce) the possibility that a future transaction involving a foreign currency will have to be made at a less favourable exchange rate than expected.

Exchange rates can move up or down, and spot rates could move favourably as well as adversely. However, many companies prefer to hedge their currency risks by fixing an exchange rate now for a future transaction, even if this means that it will not be able to benefit from any favourable movement in the exchange rate.

5.2 Methods of hedging exposures to foreign exchange risk

The most important methods of hedging exposures to currency risk are:

- ❑ leading and lagging;
- ❑ netting receipts and expenditure (or netting assets and liabilities);
- ❑ forward exchange contracts (described earlier);
- ❑ creating a money market hedge;
- ❑ currency futures (described in later chapter);
- ❑ currency options (described later in later chapter); and
- ❑ currency swaps.

5.3 Leading and lagging

Leading means making a payment early, before the end of the credit period allowed. Lagging means making a payment as late as possible, possible by taking longer credit than allowed.

Leading or lagging might be used by a company when it believes that the exchange rate between two currencies will change significantly up or down during a credit period.

- ❑ The purpose of leading is to pay early in a currency that is expected to increase in value against the payer's own currency during the credit period.
- ❑ The purpose of lagging is to delay payment as long as possible in a currency that is expected to fall in value

> **Example: Leading and lagging**
>
> A company in Nigeria purchases goods from a supplier in Ghana.
>
> The Nigerian company is required to pay in Ghanaian cedis but has three months' credit from the supplier.
>
> When the goods are delivered the exchange rate is ₦51/¢1.
>
> The Nigerian company might believe that the naira will fall in value against the cedi over the next three months.
>
> If so, delaying payment means that the eventual cost of the payment in naira will increase.
>
> The Nigerian company might therefore decide to make the payment immediately, so that it is no longer exposed to the risk of a fall in the value of the naira against the cedi.

> **Example: Leading and lagging**
>
> A company in Japan has bought goods from a US supplier and payment in US dollars is required after two months.
>
> The US dollar has recently been falling in value against the Japanese yen and the depreciation of the dollar against the yen is expected to continue for some time.
>
> The Japanese company might therefore try to delay its payment to the US supplier as long as possible, perhaps by taking longer credit than the two months allowed, because if the dollar does fall in value, the eventual cost in yen of paying the US supplier in dollars will be lower.

5.4 Netting

Netting can be applied to cash flows in a foreign currency or to assets and liabilities denominated in a foreign currency.

Netting cash flows

When a company expects to have future cash receipts in a foreign currency and future cash payments in the same currency at about the same time, it can use the receipts to make some or all of the payments. To the extent that future receipts match future payments, the foreign exchange risk is eliminated.
Movements in the spot exchange rate will affect the netted receipts and payments equally.
The loss from the adverse movement affecting the cash receipts or payments will be offset by the gain from the favourable movement affecting the cash payments or receipts.

> **Example: Netting**
>
> A Nigerian company expects to receive US$400,000 in two months' time and to make payments of $600,000, also in two months.
>
> To hedge its currency exposures, the company can net $400,000 of receipts and payments, leaving a net exposure of just $200,000 in payments.
>
> This exposure might be hedged with a forward exchange contract.

6 MONEY MARKET HEDGE

Section overview
■ Definition of a money market hedge
■ Constructing a hedge for a future currency receipt
■ Constructing a hedge for a future currency payment

6.1 Definition of a money market hedge

A money market hedge is another method of creating a hedge against an exposure to currency risk. Instead of hedging with a forward exchange contract, a company can create a hedge by borrowing or lending short-term in the international money markets, to fix an effective exchange rate 'now' for a future currency transaction.

6.2 Constructing a hedge for a future currency receipt

A company might expect to receive an amount of foreign currency at a future date, which it intends to exchange into its domestic currency. It wants to hedge its exposure to currency risk.

One way of hedging the risk is to make a forward exchange contract with a bank, in which it sells the future foreign currency receipts to the bank in exchange for domestic currency, at an exchange rate fixed 'now' by the forward contract.

Another way of hedging the risk is to establish a money market hedge. The money market hedge works by arranging a lending or borrowing transaction now, with a settlement date the same as the date when the future currency receipt or currency payment will occur. In the case of a hedge for a future receipt of foreign currency, it needs to borrow 'now' in the foreign currency, so that when the currency receipt actually occurs, it will be sufficient to pay the amount borrowed 'now' plus interest.

❑ To create a money market hedge, the company should borrow an amount of the currency immediately, for repayment at the same time that the future currency income will be received. The income in the currency will be used to repay the loan with interest. The amount borrowed should therefore, together with the accumulated interest for the borrowing period, equal the amount of the future currency income.

❑ Having borrowed the quantity of currency, the company should exchange it immediately (spot) for its domestic currency.

❑ The domestic currency obtained in this way can be used in the company's business. However, for examination purposes, you might be expected to assume that the domestic currency will be invested or deposited for the same period as the currency loan.

❑ At the end of the loan period, when the company uses its currency income to repay the currency loan, the deposit plus accumulated interest is an equivalent amount in domestic currency. This can be used to calculate an effective forward interest rate for the hedge of the currency exposure.

A numerical example might help to clarify this technique.

Example: Money market hedge (future foreign currency receipt)

A UK company expects to receive US$800,000 in three months' time. It wants to hedge this exposure to currency risk using a money market hedge.

Spot three-month interest rates currently available in the money markets are: **Deposits**

Borrowing

	Deposits	Borrowing
US dollar	4.125%	4.250%
British pound	6.500%	6.625%

The spot exchange rate (US/£1) is 1.7770 – 1.7780. **Step 1**

The UK company will be receiving US dollars in three months' time. It should therefore borrow US dollars for three months. The borrowing rate will be 4.25% (the higher of the two quoted rates). This is an annual rate, and in answering an examination question, you should calculate the rate for the interest period as an appropriate fraction of the annual rate. Here, the interest for three months will be 4.25% × 3/12 = 1.0625% or 0.010625.

The borrowed dollars plus accumulated interest after three months needs to be $800,000, therefore the amount of dollars borrowed should be:

$$\frac{\text{Final amount}}{1 + \text{interest rate for the period}} = \frac{\$800,000}{1.01625}$$

Step 2

$$= \$791,589$$

The company should sell the borrowed $791,589 in exchange for British pounds. The appropriate spot rate is 1.7780. The company will receive £445,213.

We now assume that this will be placed on deposit for three months. The interest rate on deposits for sterling is 6.500%. This is an annual rate, and the interest for three months is assumed to be 6.5% × 3/12 = 1.625% or 0.01625.

After three months, the deposit plus accumulated interest will be £445,213 × 1.01625 = £452,448.

Step 3

At the end of three months, the company will receive US$800,000. Its three-month loan will mature, and the $800,000 is used to pay back the loan plus interest. The company has £452,448 from its deposit (its short-term investment in British pounds).

The money market hedge has therefore fixed an effective exchange rate for the dollar receipts, which is calculated as $800,000/£452,448. This gives an effective three-month forward rate of £1 = $1.7682.

6.3 Constructing a hedge for a future currency payment

To create a money market hedge for a future currency payment, a similar approach is required. To hedge a future payment in currency, a company should deposit an amount of the currency 'now' in the money market, so that the amount deposited plus interest will be sufficient to make the currency payment at the future date.

❑ A company with an obligation to make a payment in foreign currency at a future date should therefore buy a quantity of the currency now and place it on deposit until the payment is due to be made. The amount of currency placed on deposit, plus the accumulated interest, should equal the amount of the future payment.

❑ Buying the currency now spot will cost money. For the examination, it should usually be assumed that the company has to borrow in domestic currency to buy the foreign currency spot, and that the length of the loan period is the same as the deposit period for the foreign currency.

❑ At the end of the deposit period, the foreign currency deposit plus interest is used to make the currency payment. The domestic currency loan has accumulated interest, and the total amount now payable to settle the loan can be used to calculate the effective interest rate for the currency transaction.

Again, an example might help to clarify the method.

Example: Money market hedge (future foreign currency payment)

Suppose that a UK company is expecting to pay a supplier US$500,000 in six months' time, and it wants to fix an effective exchange rate for this transaction with a money market hedge.

Spot six-month interest rates currently available in the money markets are as follows:

	Deposits	**Borrowing**
US dollar	4.125%	4.250%
British pound	6.500%	6.625%

The spot exchange rate (US$/£1) is 1.7770 – 1.7780.

Step 1

The company should deposit US dollars for six months. The deposit rate will be 4.125% (the lower of the two quoted rates). This is an annual rate, and in an examination the rate for the interest period is calculated as an appropriate fraction of the annual rate. Here, the interest for six months will be 4.125% × 6/12 = 2.0625% or 0.020625.

The dollars placed on deposit plus accumulated interest after six months needs to be $500,000, therefore the amount of dollars placed on deposit for six months should be:

$$\frac{\text{Final amount}}{1+\text{interest rate for the period}} = \frac{\$500,000}{1.020625} = \$489,896$$

> **Example (continued): Money market hedge (future foreign currency payment)**
>
> **Step 2**
>
> These dollars should be bought with British pounds. The appropriate spot rate is 1.7770. The company will therefore pay £275,687 to obtain the dollars.
>
> We now assume that this money has to be borrowed for a six-month loan period. The interest rate on deposits for sterling is 6.625%. This is an annual rate, and the interest for six months will be 6.625% × 6/12 = 3.3125% or 0.033125.
>
> After three months, the loan plus accumulated interest will be £275,687 × 1.033125 = £284,819.
>
> **Step 3**
>
> At the end of six months, the US deposit plus interest is used to make the payment of $500,000. The sterling loan is repayable with interest, and the amount payable can be used to calculate an effective exchange rate for the money market hedge.
>
> The effective exchange rate is therefore £1 = $1.7555 ($500,000/£284,819).

Conclusion: forward exchange contracts and money market hedges

In practice, a money market hedge should result in an effective exchange rate similar to the forward exchange rate. In the examination, however, one method of hedging might well result in a more favourable exchange rate than the other.

An examination question might give you a set of exchange rates and interest rates for two currencies, and details of a transaction that creates a currency risk exposure. The question might then ask you to compare a forward exchange contract with a money market hedge, and recommend which method of hedging is better.

You might also be required to compare a money market hedge with other methods of currency hedging, such as currency options and currency futures. These are explained in later chapters.

7   CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Describe the different types of foreign exchange risk
- Describe and apply purchasing power parity
- Describe and apply interest rate power parity
- Explain spot rates and what causes them to move
- Adjust a spot rate to arrive at a forward rate
- Explain and evaluate forward exchange contracts
- Explain and evaluate forward money market hedges

SOLUTIONS TO PRACTICE QUESTIONS

Solution   **1**

Answer 1

(a)   The bank is buying Australian dollars and selling euros. It will offer the rate more favourable to itself, which is 1.5240. The company will receive $7,000/ 1.5240 = €4,593.18.

(b)   The Australian company needs to buy euros, and the bank will charge the rate most favourable to itself. To buy €12,000, the Australian company will have to pay 12,000 × 1.5240 = Aus$18,288.

Solution   **2**

The company will be given the more unfavourable rate (the more favourable rate to the bank). This is 11.2470 + discount 0.0340 = 11.2810.

The cost to the company of buying the pesos is 10,000,000/11.2810 = US$886,446.24.

CHAPTER

25

International investment decisions

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B	Business analysis			
	5	Investment appraisal		
		d	International investment decisions	
			i	Assess factors affecting foreign investment decisions and associated risks.
			ii	Apply interest rate parity and purchasing power parity to assess appropriate discount rate for foreign projects.
			iii	Evaluate NPV of foreign projects.

Exam context

This chapter discusses the risks of international investment decisions. It continues by illustrating the mechanics of the possible approaches calculating NPV of foreign investments and then explains the issues surrounding the choice of international costs of capital.

By the end of this chapter, you should be able to:

■   Explain the risks associated with cross border investment

■   Appraise cross-border investments using data provided (including the identification of cash flows and the derivation of a discount rate)

■   Explain the difficulties in arriving at an international cost of capital

1 FACTORS AFFECTING FOREIGN INVESTMENT DECISIONS

Section overview

- Factors restricting foreign investment
- Exchange rate risk (currency risk)
- Political risk

1.1 Factors restricting foreign investment

International companies invest in other countries because they hope to make a good financial return from their investment, and attractive opportunities might exist in other countries. Developing countries might be particularly attractive for foreign investment because these countries might be expected to achieve considerable economic growth in the future.

However, investments by private companies in developing countries might be restricted for several reasons.

- ❑ The country might not have an infrastructure of transport and communication systems to support commerce and trade. International companies might be reluctant to invest in capital projects in countries where the road network is inadequate for transporting heavy goods or large quantities of goods.

- ❑ The general standard of education of the local population might be low. International companies might need its employees to have certain basic skills, and if standards of education are low, these skills might not exist (and might be difficult to create with training programmes).

- ❑ **Political risk:** This refers to the possibility the government of the country will take measures which will adversely affect investors.

- ❑ **General economic risk:** This refers to the possibility that the economy of a developing country will not develop as well as expected. It might be difficult for a foreign company to make a good return on an investment in a country with a weak economy.

Companies considering a major capital investment in another country also need to consider:

- ❑ the exchange rate risk

- ❑ the risk of exchange controls and similar cash flow restrictions

- ❑ taxation on remittances to the parent company's country.

1.2 Exchange rate risk (currency risk)

Exchange rate risk, also called FX risk and currency risk, is the financial risk from the possibility (or probability) that foreign currency exchange rates will change.
The risk is greater when a foreign exchange rate is volatile, and moves by fairly large amounts over time, often both up and down.

This was explained in the previous chapter.

1.3 Political risk

Political risk is the risk for an international company that the government of a foreign country might take action that affects the operations or profitability of its investment in its country, or places restrictions on the ability of the foreign subsidiary to remit interest or dividends to the parent country.

Political action against an international company might include the nationalisation of some or all of the assets of its foreign subsidiary, additional tax charges or exchange controls. The government might simply pursue economic policies and other policies that are 'unfriendly' to businesses and to foreign businesses in particular.

Fiscal risk

Fiscal risk is the risk of changes to the tax system after a capital investment project has been implemented.

Higher tax payments could significantly affect the returns from a project.

Fiscal risk varies between countries. Some countries have a reputation for fiscal stability, so that any changes in tax are fairly insignificant. In other countries there is a much higher risk of tax changes.

Obviously, companies considering an investment in a country, even their domestic country, should take fiscal risk into consideration when deciding whether or not to invest in a project.

> **Example:**
>
> The oil and natural gas industry is an example of an industry where fiscal risk has had a significant impact on capital expenditure decisions.
>
> Oil companies purchase concessions to explore for oil or gas, and extract any that they find. If they fail to find any oil or gas, they will lose their investment. However, they face a risk that if they are successful in finding and extracting oil, the government will decide to tax their profits. One way of doing this is to charge a **windfall tax** on the profits of firms in the industry that operate in the country.

Fiscal risk is unavoidable for companies that pay tax on their profits. However, the risk might sometimes be reduced for large companies. A large company can try to negotiate with the government of a country before deciding whether to invest in the country. They might argue that they will not invest unless the government gives an assurance of fiscal stability.

The risk of an unexpected additional tax (windfall tax) cannot be removed simply by a government's promise, because promises might be broken. Another approach that might be used by some companies is to offer to pay a royalty tax on their output. For example, an oil company might undertake to pay a royalty on every barrel of oil that it extracts under a concession agreement. If the company pays tax in this way, so that the royalty payments increase with the volume of business, the government might be less inclined to charge additional tax on what it sees as excessive profits.

Taxation and international investment

Taxation affects investment decisions, and it is necessary to estimate the tax payments for a proposed capital investment project in another country. There are two important aspects to tax on the profits and distributions of foreign subsidiaries.

❑ **Withholding tax**. Some countries levy a withholding tax on interest or dividends paid by companies to foreign investors, including foreign parent companies. Withholding tax is additional tax, reducing the net cash flows for the parent company from its foreign subsidiary.

❑ **Double taxation agreements**. Many countries have double taxation agreements with each other. The purpose of a double taxation agreement is to prevent punitive taxation by taxing profits twice, once in each country. A double taxation agreement allows an international company to set off the tax payable in its own country on the profits of or income received from a foreign subsidiary, against the tax already paid by the subsidiary in its own country. The effect of double taxation agreements is to help to make international investments more attractive by avoiding excessive and punitive tax on the pre-tax returns that the investments make.

Exchange controls

Exchange controls are actions by a government that:

❑ restrict or prevent the ability of its own nationals to buy foreign currency in order to make payments to foreign suppliers

❑ restrict or prohibit the payment of interest or dividends to foreign investors, including payments from subsidiary companies to their foreign parent

❑ restrict the flow (payments) of capital out of the country.

2 INTERNATIONAL INVESTMENT APPRASIAL

Section overview

- Features of investment in a foreign country
- International DCF appraisal: Market perfection
- International DCF appraisal: Market imperfection

2.1 Features of investment in a foreign country

The features of investing in a foreign country include the following:

❑ The investment could be a very high-risk investment, and you might be required to establish a **special cost of capital for evaluating the project**, possibly using the CAPM and a beta factor for the project.

❑ Most of the cash flows for the foreign investment will be in the currency of the foreign country, although some cash flows might be in the currency of the parent company.

❑ If the foreign country is a developing country, there will probably be expectations of high rates of inflation in future years. If so, estimated cash flows should be calculated allowing for the expected inflation rates. (These cash flows including an allowance for inflation should be discounted at the money cost of capital.)

❑ If the foreign country is a developing country, there might be restrictions on the amount of payments that can be made from the foreign country, due to exchange control restrictions. This means that the cash profits from the project might not be payable immediately in full as dividends to the investing company.

2.2 International DCF appraisal: Market perfection

There are two methods for calculating the NPV of an overseas project. A Nigerian company investing overseas could either:

❑ discount the cash flows in the foreign currency using a foreign rate appropriate to that currency, and then convert the resulting NPV to naira at the spot exchange rate or

❑ convert the project cash flows into naira and then discount at a naira discount rate.

In conditions of capital market perfection the two methods would result in the same naira NPV. This is because the future spot rates would be linked to the current spot rates by the differential interest rates and inflation rates inherent in the discount rate.

Future spot rates might be found using interest rate parity, purchasing power parity or the international Fisher effect.

Example: Foreign investment appraisal

A Nigerian company is considering an investment in a project in Ghana. The current

exchange rate for the Ghanaian cedi is ₦50 = ₵1.

The discount rate for the project in Ghana would be 10%.

The discount rate for similar projects in Nigeria is 8%.

The project will require an initial investment of ₵100,000 and lead to cash inflows of ₵50,000 per annum for the next three years.

The NPV of the project in naira can be found as follows:

Method 1: Discount the foreign currency cash flows using the foreign currency rate and translate to naira at the spot rate

Present value

Year	Cash flow (₵)	Discount factor (10%)	(₵)
0	(100,000)	1.000	(100,000)
1	50,000	0.909	45,455
2	50,000	0.826	41,322
3	50,000	0.751	37,566
PV (₵)			₵24,343
Spot rate			50
PV (₦)			₦1,217,130

Method 2: Translate the future cash flows in naira using the future spot rate and then discount these using the naira discount rate.

Step 1: Estimate the future spot rates

End of Year	Spot rate at start	Adjustment factor	Estimated future spot rate
1	50	1.08/1.10	49.09
2	49.09	1.08/1.10	48.20
3	48.20	1.08/1.10	47.32

Step 2: Translate the future cash flows to naira and discount

Discount Cash flow

Year	(₵)	Spot rate	Cash flow (₦000)	Discount factor (8%)	Present value (₦000)
0	(100,000)	50.00	(5,000)	1.000	(5,000)
1	50,000	49.09	2,255	0.926	2,273
2	50,000	48.20	2,410	0.857	2,066
3	50,000	47.32	2,366	0.794	1,878
PV (₦)					1,217
					as before

2.3 International DCF appraisal: Market imperfection

In the above example, the two approaches give the same answer. However, this would not be the case if there were market imperfections, for example exchange controls. Market perfection does not exist in reality (though markets can be very efficient).

If there are imperfections DCF analysis should be carried out in two stages, and two net present values should be calculated.

❑ **Stage 1**. Calculate an NPV for the project on the basis of cash flows for the subsidiary in the foreign country. This should be an NPV based on foreign currency cash flows. If the NPV is positive and the risk seems acceptable, you should proceed to Stage 2.

❑ **Stage 2**. Consider the project from the viewpoint of the parent company, and estimate the cash payments and receipts for the parent company in its own currency. These might include costs incurred in the parent company's own country to set up the project. They will also include the dividend or interest payments received from the foreign subsidiary, in the currency of the parent company. These cash flows should be discounted at an appropriate cost of capital, which might be different from the cost of capital used in Stage 1.

The Stage 2 analysis uses different cash flows from the Stage 1 analysis.

❑ Stage 1 evaluates the cash flows and cash profits in the foreign country.

❑ Stage 2 evaluates the actual returns received by the parent company.

This approach to evaluating the NPV of a foreign investment therefore involves two separate NPV calculations:

❑ Calculating the NPV of the cash flows in the foreign country, at an appropriate cost of capital.

❑ If this NPV is positive, calculating a different NPV for the estimated cash flows for the project in the company's domestic currency, probably using the WACC as the discount rate.

The cash flows in the company's domestic currency will be different from the cash flows in the currency of the foreign country for several reasons:

❑ There may be some costs incurred in the company's domestic currency and outside the country where the investment is made. For example, the company's head office may incur costs in its own currency to establish the project in the foreign country.

❑ There may be restrictions on dividend payments and other cash transfers out of the country where the investment is made.

❑ The amount paid as dividends from the foreign country will also vary over time with changes in the foreign exchange rate between the currency of the investment country and the currency of the investing company.

The project is financially viable only if both NPVs are positive.

Example: Foreign investment appraisal

A Nigerian company is considering an investment in a project in Ghana. The current

exchange rate for the Ghanaian cedi is ₦50 = ₵1.

The discount rate for the project in Ghana would be 10%.

The discount rate for similar projects in Nigeria is 8%.

The project will require an initial investment of ₵100,000 and lead to cash inflows of ₵50,000 per annum for the next three years. However, the Ghanaian government has imposed a complete ban on repatriation of amounts to foreign investors. This ban is expected to last for two years. This means that all cash inflows will be repatriated to Nigeria in year 3.

The NPV of the project can be found as follows:

Stage 1: Discount the foreign currency cash flows using the foreign currency rate.

Present value

Year	Cash flow (₵)	Discount factor (10%)	(₵)
0	(100,000)	1.000	(100,000)
1	50,000	0.909	45,455
2	50,000	0.826	41,322
3	50,000	0.751	37,566
PV (₵)			₵24,343

Stage 2: Translate the future cash flows in naira using the future spot rate and then discount these using the naira discount rate.

Step 1: Estimate the future spot rates

End of Year	Spot rate at start	Adjustment factor	Estimated future spot rate
1	50	⟩ 1.08/1.10	49.09
2	49.09	⟩ 1.08/1.10	48.20
3	48.20	⟩ 1.08/1.10	47.32

Step 2: Translate the future cash flows to naira and discount

Year	Cash flow (¢)	Spot rate	Cash flow (₦000)	Discount factor (8%)	Present value (₦000)
0	(100,000)	50.00	(5,000)	1.000	(5,000)
3	150,000	47.32	7,098	0.794	5,636
PV (₦)					635

The project has a positive NPV for the Nigerian company so it should be accepted. Note, that the NPV is much smaller (at ₦635,000) than it was under conditions of market perfection (at ₦1,217,000).

3 INTERNATIONAL COST OF CAPITAL

Section overview

- CAPM revisited
- International cost of capital: Problems
- International CAPM

3.1 CAPM revisited

Evaluation of an investment requires a company to estimate future free cash flows, and discount these cash flows at an appropriate discount rate.

The appropriate discount rate is the opportunity cost of capital that will prevail over the life of the investment. Models used to estimate the cost of capital use capital markets as a basis of comparison to find the appropriate rate.

Investors on the market assess the risk of shares and decide the level of return that they require to compensate them for that level of risk. They then price the shares accordingly to equate their expectation of future cash flows from the shares to the return they demand.

The CAPM is based on the recognition of a single source of risk and one risk premium to be charged on a share. This is the systematic risk which is a measured using the β of the share. The formula for the CAPM is repeated here for your convenience.
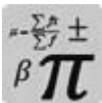
Formula: Capital asset pricing model (CAPM)

$$R_E = R_{RF} + \beta (R_M - R_{RF})$$

Where:

R_E = the cost of equity for a company's shares

R_{RF} = the risk-free rate of return: this is the return that investors receive on risk-free investments such as government bonds

R_M = the average return on market investments as a whole, excluding risk-free investments

β = the beta factor for the company's equity shares.

As can be seen above, using the CAPM involves estimating a risk free rate, identifying the market and identifying the average return on the market. It also involves comparison of a share's returns to those of the market in order to identify the β value of the share.

3.2 International cost of capital: Problems

The examples in the previous section showed the mechanics of international investment appraisal. The costs of capital used were either the cost of capital in the investor's country or that in the target's country.

In practice, there is no consensus whether either of these is the correct approach to use. It is not obvious which country's equity market premium should be used in an international investment appraisal. Also, the matter is further complicated by the existence of other dimensions of risk for which financial market participants require a premium but which are not taken into account by the CAPM.

The following examples illustrate key issues involved in arriving at a cost of capital for international investment appraisal.

Example: Problems in estimating a discount rate for international investment appraisal

A privately held South African conglomerate is selling a mining company called Target Plc.

A Plc, a Nigeria based firm, is interested in acquiring the company.

A Plc uses a discounted cash flow model using CAPM as the basis investment appraisal.

A Plc must address the following issues:

a) Which country's market should be used to derive a discount rate for this investment?

Commentary

This question would be irrelevant if capital markets were perfect. This is because whichever both rates would arrive at the same NPV (in currency equivalent terms).

However, capital market perfection does not hold in practice. The valuation might vary widely depending on whether the CAPM was applied to one market or another.

b) How should A Plc take South Africa's political risk into account?

The CAPM does not incorporate political risk, so how should the discount rate for the project be adjusted to account for this additional risk?

Commentary

There is no consensus on how to do this.

One approach might be to use a multi-factor version of the CAPM (perhaps like the arbitrage pricing model discussed in chapter 15) however, that would require quantification of the political risk and the required political risk premium. This is very difficult to do.

An alternative approach would be to adjust the future cash flows to take account of the political risk. Again, this is difficult to do in any exact sense.

> ### Example: Problems in estimating a discount rate for international investment appraisal
>
> A privately held South African conglomerate is selling a mining company called Target Plc.
>
> B Plc, an Australian based firm is also interested in acquiring the company.
>
> Would B Plc put the same value as A plc on the South African company?
>
> #### Commentary
>
> One of the facets of capital market perfection would be that the world markets would be fully integrated. This would mean that companies would be able to derive cost of capital with reference to a world-portfolio. This means that A Plc, and B Plc, would base their discount rates on the same beta, the same (world-wide) equity premium and the same risk free rate.
>
> Since both potential acquirers would measure the beta of Target Plc against the same world index, they would use the same discount rate for the cash flows.
>
> If the cash flows expected by each bidding firm were identical, A Plc and B Plc would come up with the same valuation for the South African firm.
>
> World markets are not fully integrated in practice. A Plc and B Plc may well arrive at different valuations for the South African company.

Example: Problems in estimating a discount rate for international investment appraisal

X Inc, an American company is considering investing in a hydro-electric power project located in India.

There is no comparable publicly-traded project in the Indian market from which to calculate a local β.

X Inc would need to address the following issues:

a) Should X Inc measure the beta using the returns of electric companies in the U.S.?

b) How should X Inc adjust those returns for the beta of India's market compared to the beta of the U.S. market?

c) If X Inc is able to arrive at a beta, should it use India's equity premium or the U.S. equity premium to arrive at a discount rate?

Commentary

This situation differs from that of the Nigerian company investing in South Africa in the previous example. In that case there was a South African discount rate available from the market for mining companies. In this case there is no Indian discount rate available for investment in hydro-electric companies.

There are no clear answers to the above questions.

If world markets were fully integrated there wold be no problem. X Plc would derive a discount rate in the usual way by using CAPM in reference to the world market.

However, as we have said above, this is not the case in practice so X Inc has to make a decision as to how to proceed. This might seem unsatisfactory but there is no single correct approach that might be used.

3.3 International CAPM

The capital asset pricing model is usually applied to a single stock market, and the market portfolio represents all the securities that are traded on that market. However, the same general principles of the CAPM can be applied to international investment.

International investors build a portfolio of investments that enables them to invest world-wide. The 'world market' consists of all the main securities, such as company shares, traded in different stock markets throughout the world.

International investors may wish to monitor returns from the 'world market', and may wish to assess returns from individual securities by comparing their return with the expected return from the world market as a whole.

The examples in the previous section make reference to whether world markets are fully integrated or not. Even if this were the case there would still be problems to address:

❑ A risk-free rate of return has to be selected, but which securities are risk- free? Returns on government securities vary between different countries. A risk-free security for an international CAPM might be the returns on government securities in a stable currency.

❑ The world market portfolio has to be identified. The world market may be based on an international (world market) stock index, but there may be different views about what should be in the portfolio.

❑ In practice, it is difficult for many investors to acquire a portfolio of investments that represents the world market. However, many institutional investors do attempt to do this, by:

- investing directly in stock markets around the world

- investing in international (global) companies, and

- possibly also investing in collective investments, such as mutual funds and open-ended investment companies (OEICs).

Integrated zone

The examples in the previous section make reference to whether or not. In practice, world markets are not fully integrated but some researchers claim that the markets of many countries are integrated. Perhaps, a portfolio could be defined for countries within the integrated group so that CAPM could be used for cross border investment between these countries.

Emerging economies

The problem would still exist for companies in countries with in the group appraising investments in countries outside the group. This is a particular issue for investment in emerging economies. Research has implied that the returns on emerging markets do not show good correlation with those of developed markets.

This would mean that the markets of developing economies would not be included in the group of countries whose markets are integrated as postulated above. In practice, companies must find a way around this. Again, this might seem to be an unsatisfactory statement but there is no single correct way to do this.

4   INTERNATIONAL SOURCES OF FINANCE

Section overview

- Currency borrowing to reduce the currency risk in capital investments
- Local capital markets for borrowing

4.1   Currency borrowing to reduce the currency risk in capital investments

International capital investment is similar in many respects to capital investment in a company's own country, although there are some extra risks. As explained earlier, a major additional risk is the currency risk. Changes in the value of a foreign currency relative to the investing company's currency could have a significant effect on a project NPV.

One way of reducing currency risk is to borrow in the currency of the investment to finance some or all of a proposed international project. Borrowing in the currency of the investment reduces risk in two ways.

- **It reduces the translation risk**. By borrowing in the currency of the investment, the parent company is able to match assets in a foreign currency with liabilities in the same currency. To the extent that the assets and liabilities are matched in value, any movement in the exchange rate will have an equal effect on the translated value of the assets and liabilities. For example, if a company invests in a project costing 20 million foreign currency units, and borrows 20 million foreign currency units to finance the project, assets and liabilities in the foreign currency are matched, and translation risk is eliminated.

- **It also reduces the transaction risk**. This is because when a company borrows in a foreign currency, it must pay interest and repay the loan in the same currency. It will use cash flows from the project to make the payments. In doing so, it is able to match some of its receipts in the foreign currency with payments in the same currency. To the extent that receipts and payments in the same foreign currency can be matched, transaction risk is eliminated

4.2   Local capital markets for borrowing

The ability of a company to borrow in the currency of an international investment depends on:

- whether there is a large and active local capital market, and

- if there is a large capital market for the foreign currency, whether the company is able to borrow in that market.

An international company might be able to borrow in the local currency from a bank, possibly through its foreign subsidiary. It is much less likely that the foreign country will have a well-developed corporate bond market for issuing bonds in the local currency. The international bond markets are also inappropriate for borrowing in any currency except the major international currencies (mostly the US dollar and the euro).

5   CHAPTER REVIEW

> ### Chapter review
>
> Before moving on to the next chapter check that you now know how to:
> - Discuss the issues in deriving public sector discount rates Explain the risks associated with cross border investment
> - Appraise cross-border investments using data provided (including the identification of cash flows and the derivation of a discount rate)
> - Explain the difficulties in arriving at an international cost of capital

CHAPTER

26

Duration and yield curves

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B	Business analysis		
	3	Bond valuation and analysis	
		a	Evaluate and advise on the worth of a bond using value of bond or yield to maturity.
		b	Assess an organisation's yield volatility using simple Macaulay duration and modified duration methods.
		c	Assess and apply terms interest rate (yield curves).
		d	Assess the benefits and limitations of duration including the impact of convexity. (Note: calculation of convexity not required)
E	Management of financial risks		
	1	Assess and advise on:	
		c	The causes of interest rate fluctuations (structure of interest rates and yield curves, expectations theory, liquidity preference theory, market segmentation, spot and forward interest rates)

Exam context

This chapter explains duration, yield curves and the measurement of default risk on debt.

By the end of this chapter, you should be able to:

■ Explain the concept of duration

■ Explain the shape of yield curves

■ Value a bond using a yield curve

■ Explain credit risk and credit ratings

■ Estimate cost of debt using the term structure of interest rates

1 DURATION

Section overview

- The concept of duration
- McCauley's duration
- Modified duration
- Characteristics of duration
- Duration of a portfolio
- Use of duration
- Convexity
- Project duration as a measure of risk

1.1 The concept of duration

Duration can be defined as the time to recover one half of the project value.

The concept of duration is widely used by analysts in the bond markets. It is a measure of how long an investor in bonds must wait before his investment in the bond is recovered.

Duration of bonds

Example: Duration of bonds – fact pattern

Two bonds X and Y, each with a maturity of four years give the following returns:

	Year 1	Year 2	Year 3	Year 4	Total return
	₦	₦	₦	₦	₦
Bond X	10	10	10	110	140
Bond Y	20	20	20	120	180

Investing in these bonds is a four-year capital investment.

If the investor is interested in how long he must wait to recover his investment, he could calculate the average time that this will take. Average time can be calculated as the weighted average number of years.

To calculate a weighted average period for obtaining the investment returns, the cash flows in each year should be given a weighting. For an investment with n years, the weighting for Year 1 should be 1, for Year 2 it should be 2 and for year 3 it should be 3, and so on. The weighting for the cash flow in Year n is n.

With four-year bonds, the weighting for the return in Year 1 is therefore 1, and so on.

Example: Duration

The duration of each bond is calculated as follows:

Bond X

Year	Return (R)	Weighting (W)	R × W
1	10	1	10
2	10	2	20
3	10	3	30
4	110	4	440
	140		500

The non-discounted average time to recover the investment is = 500/140

3.57 years

Bond Y

Year	Return (R)	Weighting (W)	R × W
1	20	1	20
2	20	2	40
3	20	3	60
4	120	4	480
	180		600

The non-discounted average time to recover the investment is = 600/180

3.33 years

1.2 McCauley's duration

The average times calculated above are similar to the calculation of a non- discounted payback period. The calculation fails to recognise the time value of money by discounting the returns in each year before weighting them.

A value for the duration of a bond, known as Macaulay's duration, is calculated using the present value of the returns in each year.

Example: Macauley's Duration

Following on from the previous example, suppose that the investor's cost of capital is 10%.

Macaulay's duration of each bond is calculated as follows:

Bond X

Year	Return (R)	Discount factor at 10%	PV of return	Weighting (W)	PV × W
1	10	0.909	9.09	1	9.09
2	10	0.826	8.26	2	16.52
3	10	0.751	7.51	3	22.53
4	110	0.683	75.13	4	300.52
	140		99.99		348.66

Average time to recover the investment is = 348.66/99.99 = 3.49 years

Bond Y

Year	Return (R)	Discount factor at 10%	PV of return	Weighting (W)	PV × W
1	20	0.909	18.18	1	18.18
2	20	0.826	16.52	2	33.04
3	20	0.751	15.02	3	45.06
4	120	0.683	81.96	4	327.84
	180		131.68		424.12

Average time to recover the investment is = 424.12/131.68 = 3.22 years

The significance of bond duration

The duration of a bond is an indication of the price sensitivity of the bond to a change in market yields on bonds. When there is a rise in interest rate, the fall in price of a bond (as a percentage) is greater for bonds with a higher/longer duration. The actual amount by which bonds will change in price following a change in market interest rates can also be calculated.

Investors in bonds can therefore manage the risk in their bond portfolio by selecting bonds with a suitable duration.

1.3 Modified duration

Modified duration measures the sensitivity of bond price to changes in interest rates.
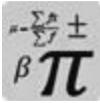
Formula: Modified duration

$$\text{Modified duration} = \frac{\text{Macauley's duration}}{1 + r}$$

Where: r = gross redemption yield of the bond

Example: Modified duration

Following on from the previous example

	Bond X	Bond Y
Macauley's duration	3.49	3.22
÷ 1 + r	1.1	1.1
Modified duration	3.17	2.93

The size of the modified duration determines how much the value of a bond or loan will change when there is a change in interest rates. The value of 3·17 above means that the value of Bond X will change by 3·17 times the change in interest rates multiplied by the original value of the bond or loan.

A higher modified duration means that the fluctuations in the value of a bond or loan will be greater. Thus, the price of Bond X is more sensitive to interest rate changes than the price of Bond Y.

Predicting change in value

The change in price of a bond brought about by a change in interest rates can be estimated using the following formula.
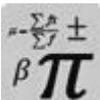
Formula: Change in value

$$\text{Change in price} = \Delta P = -D \times \Delta i \times P$$

Where:

ΔP = change in price of the bond

D = modified duration of the bond (this is used as a negative in the formula to reflect the inverse relationship between interest rates and bond price).

P = original price of the bond

Δi = change in interest rates

> **Example: Change in value**
>
> Returning to the above examples
>
> | | Bond X | Bond Y |
> |---|---|---|
> | Macauley's duration | 3.49 | 3.22 |
> | Modified duration | 3.17 | 2.93 |
> | Bond price | 99.99 | 131.68 |
>
> The change in price of each bond caused by a 0.5% change in interest rates is estimated as follows:
>
> Change in price of Bond X = −3.17 × 0.005 × 99.99 = ₦1.58
>
> Change in price of Bond Y = −2.93 × 0.005 × 131.68 = ₦1.93
>
> Note that the change in Bond X is proportionately larger than the change in Bond Y.

1.4 Characteristics of duration

The following statements are true for both Macauley's duration and the modified duration.

Statement 1: Bonds with longer terms have longer durations. This of course is obvious.

Statement 2: The duration of a bond is an indication of the price sensitivity of the bond to a change in market yields on bonds.

When there is a rise in interest rate, the fall in price of a bond (as a percentage) is greater for bonds with a higher/longer duration.

The actual amount by which bonds will change in price following a change in market interest rates can also be calculated using $\Delta P = \Box D \Box \Delta i \Box P$ as shown above.

Statement 3: Bonds with lower yields have longer durations. This can be demonstrated by looking at the impact on Bond X if interest rates were 5% instead of 10%.

Example: Macauley's Duration

Following on from the previous example, suppose that the investor's cost of capital is 10%.

Macaulay's duration of each bond is calculated as follows:

Bond X

Year	Return (R)	Discount factor at 5%	PV of return	Weighting (W)	PV × W
1	10	0.952	9.52	1	9.52
2	10	0.907	9.07	2	18.14
3	10	0.864	8.64	3	25.92
4	110	0.823	90.50	4	361.99
	140		117.73		415.57

	Years
Duration of Bond X (at interest rate of 5%) = 415.57/117.73	3.53
Duration of Bond X (at interest rate of 10%) = 348.66/99.99	3.49

Statement 4: Bonds with lower coupons have longer durations.

If two bonds have the same redemption date, the bond with the higher coupon will have a shorter duration.

This means that in effect, investment is returned sooner. This is because a higher coupon bond results in the investor receiving income sooner than if he held a lower coupon bond of the same redemption date.

This is demonstrated by the example above where Bond X paying lower interest has a higher duration than Bond Y.

Other features

Macauley's duration of a zero coupon bond is the same as the term of the bond.

Example: Macauley's duration of zero coupon bond

Bond Z:

Year	Return (R)	Discount factor at 5%	PV of return	Weighting (W)	PV ×W
4	146.41	0.683	100.00	4	400.00

Therefore, the duration of Bond Z = 400/100 = 4 years.

Macauley's duration falls over the life of a bond. The decrease in duration is less than the decrease in the lifespan.

<table>
<tr><td></td><td colspan="6">**Example: Macauley's duration over life of the bond**</td></tr>
<tr><td></td><td colspan="6">Bond X with three years to redemption (i.e. one year later than previously shown)</td></tr>
</table>

Year	Return (R)	Discount factor at 10%	PV of return	Weighting (W)	PV × W
1	10	0.909	9.09	1	9.09
2	10	0.826	8.26	2	16.53
3	110	0.751	82.63	3	247.93
	130		99.99		273.55

Therefore, the duration of Bond X = 273.55/99.99 = 2.74 years.

	Lifespan	Macauley's duration
Macauley's duration	4	3.49
Price	3	2.74
Change	1	0.75

1.5 Duration of a portfolio

The duration of a portfolio of bonds is measured as the weighted average of the durations of each constituent bond.

Formula: Duration of a portfolio

$$W_1D_1 + W_2D_2 + W_3D_3 + W_nD_n$$

Where:

W_1 = MV of Bond 1/Total MV of the portfolio

D_1 = Duration of bond 1

Example: Duration of a portfolio

An investor holds the following portfolio of bonds.

Bond	MV	Duration
1	20	2.5
2	30	3.6
3	50	3.0
	100	

The duration of the portfolio is calcualted as follows:.

Bond	MV	Duration (D)	Weighting factor (W)	WD
1	20	2.5	20/100	0.5
2	30	3.6	30/100	1.08
3	50	3.0	50/100	1.5
	100			3.08

The duration of portfolio calculated in this way is of limited use and should be used with care. For example, if the duration is used to estimate the change in market value of the portfolio due to a change in interest rates the underlying assumption is that all of the bonds in the portfolio will be affected by the change to the same degree (described as a parallel shift). However, this is not the case and a better approach would be to consider the impact on each bond individually.

This might seem like a major limitation but large investors (like major banks) will have a number of separate portfolios each containing bonds of similar characteristics. Duration calculated as above can be useful in such cases.

1.6 Use of duration

Duration allows bonds with different coupon rates and maturities to be compared directly. Investors in bonds can therefore manage the risk in their bond portfolio by selecting bonds with a suitable duration.

Duration can be used to estimate price change in response to changes in interest rates.

1.7 Convexity

Duration assumes that the relationship between the change in interest rates and the corresponding change in the value of a bond is linear. The actual relationship between interest rates and bond price is represented by a curve which is convex to the origin.

Illustration: Duration
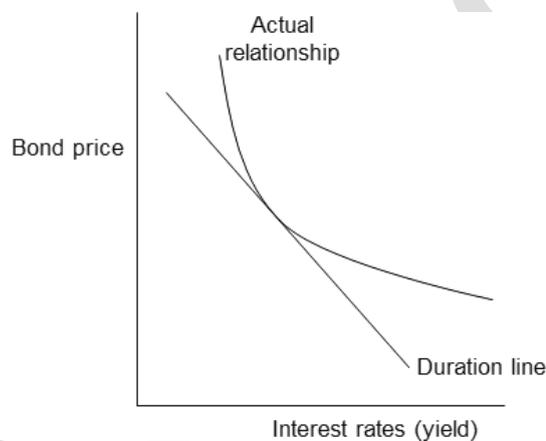
Therefore, duration only provides a reasonable estimation of the change in the value of a bond or loan due to small changes in interest rates.

Duration understates price movement in response to larger changes. This can be demonstrated using information for Bond X found above.

Example: Duration understates price movement x

	Bond X
Market value at interest rates of 10%	99.99
Market value predicted using duration	
Predicted change	
$-D \times \Delta i \times P = -3.17 \times -0.05 \times 99.99 =$	15.85
Predicted market value	115.84
Market value at interest rates of 5%	117.73

Another limitation is that duration is further distorted by changes in shape of the yield curve. Changes in interest rates caused by a change in the shape of the

yield curve will result in duration being a less accurate indicator of the price change.

The degree of convexity shows how much a bond's yield changes in response to a change in price.

Using duration and convexity together offers a better approximation of the percentage of price change resulting from change in a bond's yield than using duration alone.

Convexity can also be used to compare bonds with the same duration. For two bonds with same duration and yield, the one with greater convexity is less affected by interest rates than the other.

Other characteristics of convexity include:

❑　Bonds with greater convexity will have a higher price than bonds with lower convexity.

❑　The price-yield curve increases as yield decreases (and vice versa) and as market yields decrease, the duration increases (and vice versa).

❑　The lower the coupon rate, the higher a bond's convexity (and vice versa). Therefore, zero-coupon bonds have the highest convexity.

1.8　Project duration as a measure of risk

Duration can be calculated for a capital investment project in exactly the same way as for a bond. It is a measure of the average time to obtain the returns from the investment. Another way of saying this is that the duration of a project is the time required to cover one half of the value of the investment returns.

Duration can be used in capital investment appraisal to assess the payback on a project. Unlike payback and discounted payback, however, it takes into consideration the total expected returns from the entire project (at their discounted value), not just the returns up to the payback time.

❑　If the duration of a project is short relative to the life of the project – for example, if the duration is less than half the expected total life of the project
– this means that most of the returns from the project will be recovered in the early years.

❑　If the duration of a project is a large proportion of the total life of the project
– for example if the duration is 75% or more of the total life of the project – this means that most of the returns from the project will be recovered in the later years.

It could therefore be argued that duration is the best available method of assessing the time for an investment to provide its return on the capital invested.

Example: Duration

The cash flows and present values of a project are as follows:

Year	Annual cash flow	Discount factor at 10%	PV of cash flow
	₦		₦
0	(200,000)	1.000	(200,000)
1	(40,000)	0.909	(36,360)
2	30,000	0.826	24,780
3	120,000	0.751	90,120
4	150,000	0.683	102,450
5	100,000	0.621	62,100
6	50,000	0.564	28,200
NPV			71,290

To calculate duration for a project, the negative cash flows at the beginning of the project are ignored. Duration is calculated using cash flows from the year that the cash flows start to turn positive.

However, if there are negative cash flows in any year after the cash flows turn positive, such as in the final year of the project, these negative cash flows are included in the calculation of duration (as negative values).

In this example, the cash flows start to turn positive from Year 2, so duration is calculated using the present values of the cash flows from Year 2 to Year 6. The Year 2 cash flow is given a weighting of 2, the Year 3 cash flow a weighting of 3, and so on.

Duration is therefore calculated as follows:

Year	Annual cash flow	Discount factor at 10%	PV of cash flow	Weighting	PV × Weighting
	₦		₦		
2	30,000	0.826	24,780	2	49,560
3	120,000	0.751	90,120	3	270,360
4	150,000	0.683	102,450	4	409,800
5	100,000	0.621	62,100	5	310,500
6	50,000	0.564	28,200	6	169,200
			307,650		1,209,420

The duration of the project is 1,209,420/307,650 = 3.93 years.

2 YIELD CURVES

Section overview
■ Background
■ Shape of the yield curve (term structure of interest rates)
■ Bond valuation using the yield curve
■ Estimating the yield curve

2.1 Background

Each item of debt finance for a company has a different cost. This is because debt capital has differing risk, according to whether the debt is secured, whether it is senior or subordinated debt, and the amount of time remaining to maturity.

Furthermore, the cost of debt differs for different periods of borrowing. This is because lenders might require compensation for the risk of having their cash tied up for longer and/or there might be an expectation of future changes in interest rates. The relationship between length of borrowing and interest rates is described by the yield curve. This session looks at the derivation and use of yield curves.

An earlier chapter covered the relationship that exists between the market value of a bond, the cash flows that must be paid to service that bond and the cost of debt inherent in that bond.

The market value of a bond is the present value of the future cash flows that must be paid to service the debt, discounted at the lender's required rate of return (pre-tax cost of debt).

Thus, the lenders' required rate of return (the pre-tax cost of debt) can be calculated as the rate that equates the amount that the lender is willing to pay for the debt (i.e. its market value) to the future cash flows that the lender expects to receive from the investment in it.

In other words, the lenders' required rate of return (the pre-tax cost of debt) is the IRR of the cash flows (pre-tax) that must be paid to service the debt.

Example: Market value of bond

A company has issued a bond with a coupon rate of 6% that will be redeemed in 4 years. The market value of the bond can be calculated as follows for required rates of return of 5% or 6% or 7%.

Year		Cash flow	DF (5%)	PV (5%)	DF (6%)	PV (6%)	DF (7%)	PV (7%)
1	Interest	6	0.952	5.71	0.943	5.66	0.935	5.61
2	Interest	6	0.907	5.44	0.890	5.34	0.873	5.24
3	Interest	6	0.864	5.18	0.840	5.04	0.816	4.90
4	Interest + redemption	106	0.823	87.21	0.792	83.96	0.763	80.87
	MV			103.54		100.00		96.62

Note that there is an inverse relationship between the lender's required rate of return (the discount rates above) and the market value. If investors require an

increase in the rate of return for a given bond they simply offer less for the bond (as the cash flows paid to the investor do not change).

When the yield on government debt falls it is good news for a country. This means that the debt is in demand thus increasing the amount that they are willing to pay for a given bond. This in turn means that the government can borrow at a lower rate.

It follows from the above example, that if the market value of the above bond is ₦103.54, the required rate of return could have been calculated as the IRR of these amounts, i.e. 5%. This is the pre-tax cost of debt.

(Similarly, a market value of ₦100 would give a cost of debt of 6% and a market value of ₦96.62 would give a cost of debt of 7%).

The IRRs calculated in this way can be described in a number of ways including the lenders' required rate of return, the pre-tax cost of debt, the gross redemption yield and the level yield to maturity.

The implied yield for a market value of ₦103.54 is 5%. This implies that an investor in the bond discounts each of the future cash flows at 5% in order to arrive at the market value of the bond.

Though very widely used, this is a simplification. The 5% is an average required rate of return over the life of the bond.

In fact, an investor in this bond might require different rates for the year 1, year2, year 3 and year 4 cash flows and these different rates simply average to 5%. In other words, cash flows with different maturities are looked on differently by investors. 5% is simply the average of each of these required rates of return.

A plot of required rates of return (yields) against maturity is called a yield curve.

The normal expectation is that the yield curve will slope upwards (meaning that investors require a higher rate of return for cash flows that are further into the future) though this is not always the case.

This is an important idea so we will explore it further with another example.

Example: Market value of bond

The following information relates to two bonds with the same risk and maturity.

Bond A was issued when interest rates were low and Bond B was issued when interest rates were high. Both bonds mature in four years' time.

	Bond A	Bond B
Nominal value	1,000	1,000
Coupon rate	5%	10%
Yield	7.87%	7.77%
Market value	904.72	1,074.40

The yield equates the present value of the future cash flows to the market value of the debt. This can be proved as follows for each bond:

			Bond A		Bond B
Year	Cash flow	DF (7.87%)	PV (7.87%)	DF (7.77%)	PV (7.77%)
1	50	0.927	46.35	0.928	92.79
2	50	0.859	42.97	0.861	86.11
3	50	0.797	39.84	0.799	79.90
4	1,050	0.737	775.55	0.741	815.60
			904.72		1074.40

The bonds have the same risk and maturity but Bond A has a higher yield than bond A. This implies it is a better buy than Bond B. How can this be the case if both bonds are fairly priced by the market? The answer is that simply using the yield as above can be misleading because it is an average. We have to take account of the different rates of return that investors require for different dates of maturity.

Returning to the above example and assuming that investors want higher rate of returns for cash flows that are further into the future show how the market values can be explained in terms of the required return for each individual cash flow as follows:

Example: Market value of bond

Returning to the above example and given that investors require the following rates of return:

Cash flows in:	Required return
Year 1	5%
Year 2	6%
Year 3	7%
Year 4	8%

The market value of bond A can be calculated as follows:

Year	Cash flows	Required return	DF (for each required return)	PV (7.87%)
1	50	5%	0.952	47.62
2	50	6%	0.890	44.50
3	50	7%	0.816	40.81
4	1,050	8%	0.735	771.78
				904.72

The market value of bond B can be calculated as follows:

Year	Cash flows	Required return	DF (for each required return)	PV (7.87%)
1	100	5%	0.952	95.24
2	100	6%	0.890	89.00
3	100	7%	0.816	81.63
4	1,100	8%	0.735	808.53
				1074.40

Thus, each bond is fairly priced.

The higher yield for Bond A is because the bond pays lower cash flows in the earlier years and a relatively high cash flow in year 4 for which the required rate of return is highest.

Note that an investor in Bond A receives 85.3% (771.78/904.72) of his returns in year 4 where the equivalent figure for Bond B is 75.25% (808.53/1,074.4). The year 4 flows have a required rate of 8% leading to Bond A having the higher yield.

The yield to maturity (which is very useful) can be misleading as it assumes that every cash flow is discounted at the yield (5% in our example) where, in fact, the lenders require different rates for cash flows with different timings.

As stated above, but worth repeating, a plot of required rates of return (yields) against maturity is called a yield curve.

2.2 Shape of the yield curve (term structure of interest rates)

The cost of fixed-rate debt is commonly referred to as the 'interest yield'. The interest yield on debt capital varies with the remaining term to maturity of the debt.

Interest yields on similar debt instruments can be plotted on a graph, with the x- axis representing the remaining term to maturity, and the y-axis showing the interest yield. A graph which shows the 'term structure of interest rates' is called a yield curve.

Illustration: Normal yield curve
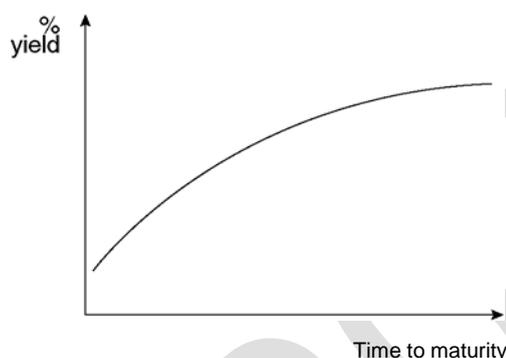
As a general rule, the interest yield on debt increases with the remaining term to maturity. For example, it should normally be expected that the interest yield on a fixed-rate bond with one year to maturity/redemption will be lower than the yield on a similar bond with ten years remaining to redemption. Interest rates are normally higher for longer maturities to compensate the lender for tying up his funds for a longer time.

(Another way of stating this is that the market value of a fixed-rate bond with one year to maturity/redemption will be higher than the market value of a similar bond with ten years remaining to redemption).

Yield curves are widely used in the financial services industry. Two points that should be noted about a yield curve are that:

❑ Yields are **gross yields**, ignoring taxation (pre-tax yields).

❑ A yield curve is constructed for **'risk-free' debt securities**, such as government bonds. A yield curve therefore shows 'risk-free yields'.

As the name implies, risk-free debt is debt where the investor has no credit risk whatsoever, because it is certain that the borrower will repay the debt at maturity. Debt securities issued by governments with AAA credit ratings (see later) in their domestic currency by the government should be risk-free.

As indicated above, a normal yield curve slopes upwards, because interest yields are normally higher for longer-dated debt instruments.

Sometimes it might slope upwards, but with an unusually steep slope (steeply positive yield curve).

However, on occasions, the yield curve might slope downwards, when it is said to be 'negative' or 'inverse'.

> **Illustration: Inverse yield curve**
>
>
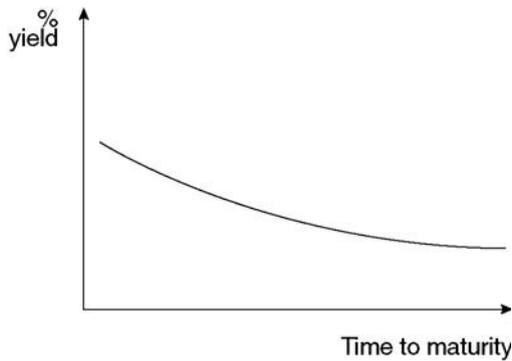
When interest rates are expected to fall in the future, interest yields might vary inversely with the remaining time to maturity. For example, the yield on a one- year bond might be higher than the yield on a ten-year bond when rates are expected to fall in the next few months.

When interest rates are expected to rise in the future, the opposite might happen, and yields on longer-dated bonds might be much higher than on shorter-dated bonds resulting in a steeper yield curve

There are different theories used to explain the shape of the yield curve:

❑   Expectation theory;

❑   Liquidity preference theory; and

❑   Market segmentation theory.

Before examining expectation theory we need to consider the relationship between spot interest rates and future interest rates.

Spot and future interest rates

This is best explained using an example.

> **Example: Spot and future interest rates**
>
> Annual spot yields on a bond are as follows:
>
> | Maturity | Yield |
> |----------|-------|
> | One year | 3.0% |
> | Two years | 3.5% |
>
> An investor could invest ₦1,000 for one year or for two years.
>
> The returns under each would be as flows.
>
> | | | |
> |---|---|---|
> | Invest for one year | $1,000 \times 1.03 =$ | 1,030 (at end of year 1) |
> | Invest for two years | $1,000 \times 1.035^2 =$ | 1,071.23 (at end of year two) |
>
> Thus, an investor prepared to invest for one year will receive 1,030 but if he invests for two years will receive 1,072.23.
>
> The extra return for investing for two years is:
>
> $$\frac{1,071.23 - 1,030}{1,030} \times 100 = 4\%$$
>
> The 4% is called the forward rate.

The relationship between spot rate and the forward rate can be expressed algebraically.
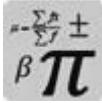
> **Formula: Relationship between spot and future interest rates**
>
> $$\frac{(1 + r_2)^2}{1 + r_1} = 1 + r_f$$
>
> or rearranging this: $(1 + r_2)^2 = (1 + r_1) + (1 + r_f)$
>
> **Where:**
> r_1 = 1 year spot rate
> r_2 = 2 year spot rate
> r_f = future rate

Expectation theory

Whether an investor would be happy to earn an extra 4% for investing for two years instead of for one year depends on whether the investor expects interest rates to change and to what extent.

If an investor expected interest rates to rise to say 5% for a one year yield he would invest in a one year bond and when that matured he would reinvest at the new rate of 5% (instead of having invested in the two year bond which only gives 4% in year two). If all investors shared the same view nobody would invest in the two year bond, causing its value to fall and the yield to rise until the new yield moved justified investment in the two year bond.

Therefore, if yields are expected to rise, the yield curve slopes more steeply upwards.

Liquidity preference theory

Longer term yields (and therefore price) are more volatile than shorter term yields. Therefore, investors want higher compensation for longer term issues.

This theory suggests that the yield curve would usually be upward sloping (as is the case in practice).

Market segmentation theory

This theory says that interest rates for a particular maturity sector are driven by the supply and demand in that maturity sector.

This can be used to explain every type of yield curve.

2.3 Bond valuation using the yield curve

Annual spot (valid on the day they are published) yield curves are published in the financial press.

The cost of new debt can be estimated by reference to a yield curve.

Example:

A company wants to issue a bond that is redeemable at par in four years and pays interest at 6% of nominal value.

The annual spot yield curve for a bond of this class of risk is as follows:

Maturity	Yield
One year	3.0%
Two years	3.5%
Three years	4.2%
Four years	5.0%

Required

Calculate the price that the bond could be sold for (this is the amount that the company could raise) and then use this to calculate the gross redemption yield (yield to maturity, cost of debt).

Answer

An investor will receive a stream of cash flows from this bond and will discount each of those to decide how much he is willing to pay for them.

The first year flow will be discounted at 3.0%, the second year flow at 3.5% and so on. (Note that the two year rate of 3.5% does not mean that this is the rate in the second year. It means that this is the average annual rate for a flow in 2 years' time).

Year		Cash flow	Discount factor	PV (4%)
1	Interest	6	$1/1.03 = 0.971$	5.83
2	Interest	6	$1/1.035^2 = 0.934$	5.60
3	Interest	6	$1/042^3 = 0.884$	5.30
4	Interest + redemption	106	$1/1.05^4 = 0.823$	87.21
	Market value			103.94

The company would need to issue a ₦100 nominal value bond for ₦103.94.

The cost of debt (gross redemption yield) of the bond can be calculated in the usual way by calculating the IRR of the flows that the company faces.

			Try 4%		Try 6%	
Year		Cash flow	Discount factor	PV	Discount factor	PV
0	Market value	(103.94)	1.000	(103.94)	1.000	(103.94)
1	Interest	6.00	0.962	5.77	0.943	5.66
2	Interest	6.00	0.925	5.55	0.890	5.34
3	Interest	6.00	0.889	5.33	0.840	5.04
4	Interest + redemption	106.00	0.855	90.61	0.792	83.96
	NPV			+ 3.32		(3.94)

Using interpolation, the before-tax cost of the debt is:

$4\% + 3.32/(3.32 + 3.94) \times (6 - 4)\% = 4.91\%$

The cost of the debt is therefore estimated as 4.91%. This is the average cost that the entity is paying for this debt.

2.4 Estimating the yield curve

A yield curve was provided in the previous section. The next issue to consider is how these are constructed.

This technique is called "bootstrapping".

Example: Estimating the yield curve

There are three bonds in issue for a given risk class.

All three bonds pay interest annually in arrears and are to be redeemed for par at maturity.

Relevant information about the three bonds is as follows:

Bond	Maturity	Coupon rate	Market value
A	1 year	6.0%	102
B	2 years	5.0%	101
C	3 years	4.0%	97

Required

Construct the yield curve that is implied by this data.

Answer

Step 1 – Calculate the rate for one year maturity

Work out the rate of return for bond A.

The investor will pay ₦102 for a cash flow in one year of ₦106.

This gives an IRR of (106/102) -1 = 0.0392 or 3.92%

Step 2 – Calculate the rate for two year maturity

The market value bond B is made up of the present value of the year one cash flow discounted at 3.92% (from step 1) and the present value of the two year cash flow discounted at an unknown rate.

This can be modelled as follows:

t		Cash flow	Discount factor	PV (4%)	
1	Interest	5	$1/1.0392$	4.81	
2	Interest + redemption	105	$1/(1+r)^2$	96.19	(Balancing figure)
	Market value (given)			101.00	

Therefore:

$105 \times 1/(1+r)^2 = 96.19$

Rearranging:

$105/96.19 = (1+r)^2$

$r = \sqrt{105/96.19} - 1 = 0.0448$ or 4.48%

A **Answer (continued)**

Step 3 – Calculate the rate for three year maturity

The market value of the three year bond is made up of the present value of the year one cash flow discounted at 3.92% (from step 1), the present value of the two year cash flow discounted at 4.48% (from step 2) and the present value of the three year cash flow discounted at an unknown rate.

This can be modelled as follows:

t		Cash flow	Discount factor	PV (4%)	
1	Interest	4	$1/1.0392$	3.85	
2	Interest	4	$1/1.0448^2$	3.66	
3	Interest + redemption	104	$1/(1+r)^3$	89.49	(Balancing figure)
	Market value (given)			97.00	

Therefore:

$104 \times 1/(1+r)^3 = 89.49$

Rearranging:

$104/89.49 = (1 + r)^3$

$r = \sqrt[3]{104/89.49} - 1 = 0.051$ or 5.1%

Step 4 – Summarise in a table

Maturity	Yield
1 year	3.92%
2 year	4.48%
3 year	5.1%

3   CREDIT RISK

> ### Section overview
>
> - Introduction
> - Credit ratings
> - Cost of debt from term structure and credit spreads
> - Expected loss

3.1   Introduction

The cost of a company's debt is the rate of return that lenders require for lending to that company. In other words, the interest yield on corporate debt is higher than the yield on risk-free debt with the same maturity.

The higher yield is to compensate investors in corporate bonds for the fact that the debt is not risk-free. The company might default.

> ### Example: Credit risk
>
> The interest rate on a sterling bond of ABC Company with two-years to maturity will be higher than the interest yield on a two-year UK government bond.
>
> The amount that a lender requires is made up of:
>
> Risk free rate (for debt of that maturity) + credit risk premium
>
> Credit risk (default risk) is the risk that a party to whom cash is loaned will not be able to service the debt. A lender demands an extra rate of return to compensate for this extra risk.
>
> The credit risk premium is called a 'spread'. The spread is the difference between the cost of debt under consideration and the risk-free rate of return. (Note that the credit spread can be estimated by comparing the cost of debt for a given bond to the risk free rate of the same maturity).

> ### Example: Credit spread
>
> A company wishes to issue a 5 year bond.
>
> The risk-free return on five-year government bonds is 5.4%.
>
> The spread for the company's five-year bonds is 80 basis points
>
> Therefore the yield on the company bonds is: = 5.40% + 0.80% = 6.20%.
>
> (Note: 1 basis point = 0.01% and 100 basis points = 1%, so 80 bp = 0.80%).

The size of spreads

The size of the spread allows for the additional risk in the debt that is not risk- free. The spread is therefore higher for debt that has a higher risk for investors or lenders.

3.2 Credit ratings

Many large companies are given a credit rating by a credit rating agency, such as Moody's, Standard & Poor's and Fitch. (Strictly, the company's debt is given a credit rating, but it is common to speak of companies having a credit rating rather than the debt having a credit rating.)

❑ The top credit rating is a 'triple-A' credit rating.

❑ Spreads are lowest for the top credit ratings, and higher for lower credit ratings.

Each credit rating agency uses its own credit rating system. The most well-known are the rating systems of Standard & Poor's and Moody's. Their ratings for bonds are set out in the table below.

Illustration: Credit ratings

	Standard & Poor's	Moody's
Investment grade		
Prime	AAA	Aaa
High grade:	AA+	Aa1
	AA	Aa2
	AA−	Aa3
Upper medium grade	A+	A1
	A−	A2
	AA	A3
Lower medium grade	BBB+	Baa1
	BBB	Baa2
	BBB−	Baa3
Sub-investment grade ('junk')		
Speculative	BB+	Ba1
	BB	Ba2
	BB−	Ba3
Highly speculative	B+	B1
	B	B2
	B−	B3
Substantial risks	CCC+	Caa1
Extremely speculative	CCC	Caa2
	CCC−	Caa3
In default/low prospect of recovery	CC	Ca
	C	
	D	D

Sub-investment grade debt, also called 'junk bonds', is a speculative investment for the lender or bondholder, and yields required by investors are normally much higher than on investment grade debt.

What drives credit ratings?

The rating agencies each employ their own risk models. These models assign a score in respect of variables which the agency has chosen as being vital indicators of credit risk. These are then multiplied by constants used to reflect the relative importance of each variable and the amounts totalled to give a credit score. This score is then expressed as a credit rating.

Key variables might include:

❏ firm size;

❏ financial gearing;

❏ the risk characteristics of the industry;

❏ the risk characteristics of the country;

❏ standing of the company compared to others in the same industry and country;

❏ perceived strength of management;

❏ asset backing of the company; and

❏ cash generating ability.

3.3 Cost of debt from term structure and credit spreads

Example: Cost of debt from term structure and credit spreads

Yield spreads on US bonds for companies in the construction industry are as follows:

Spreads: Rating	Years to maturity					
	1	2	3	5	7	10
AAA/ Aaa	2	4	10	15	20	25
AA+/Aa1	6	10	16	24	30	38
AA/Aa2	9	15	24	34	44	55
AA-/Aa3	15	24	30	40	**52**	64
A+/A1	24	35	45	60	75	88
A/A2	32	45	58	78	95	112
A-/A3	45	60	75	100	120	142

Example: Cost of debt from term structure and credit spreads

A US company wishes to issue a 7 year bond.

The credit rating for the bonds is expected to be AA−

The yield curve shows the risk-free rate on US government bonds ('Treasuries') to be 6.6%

The yield on the company's bonds will be 6.6% + 0.52% = 7.12%.

3.4 Expected loss

The degree of credit risk reflects the expected loss from a loan. The expected loss is a function of the loss given default (LGD) and the probability of default (p(d)). This is a simple expected value calculation.

The loss given default is the amount that could be lost if a lender defaults. It is not necessarily the amount of the loan as the lender might hold some form of collateral or the borrower may be able to pay a percentage of the amount owed.

Example: Expected loss

A bank has loaned ₦10,000,000 to X Inc.

The bank holds collateral worth ₦8,000,000.

The probability of default is estimated at 2%.

The expected loss is = LGD × p(d) = (10,000,000 − ₦8,000,000) × 2% = ₦40,000.

The loss given default might be presented as a percentage. The same information might be presented as a recovery rate (100% − LGD%).

Example: Expected loss

A bank has loaned ₦10,000,000 to X Inc. The expected recovery is 80% due to collateral held.

The probability of default is estimated at 2%.

The expected loss is = LGD × p(d) = (10,000,000 − (80% of ₦10,000,000) × 2% = ₦40,000.

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4 CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

■ Explain the concept of duration

■ Explain the shape of yield curves

■ Value a bond using a yield curve

■ Explain credit risk and credit ratings

■ Estimate cost of debt using the term structure of interest rates

CHAPTER

27

Interest rate risk:
Hedging with FRAs and swaps

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

E			Management of financial risks
	1		Assess and advise on:
		c	The causes of interest rate fluctuations (structure of interest rates and yield curves, expectations theory, liquidity preference theory, market segmentation, spot and forward interest rates)
		f	The appropriate derivative instruments for hedging interest rate risk, (forward interest rate agreement, interest rate futures, interest rate options, interest rate swaps)

Exam context

This chapter explains the use of forward rate agreements and swaps to hedge interest rate risk and the use of currency swaps to hedge foreign exchange risk.

By the end of this chapter, you should be able to:

■ Explain the nature of interest rate risk

■ Explain how FRAs can be used to hedge interest rate risk

■ Use FRAs to hedge interest rate risk

■ Explain how swaps can be used to hedge interest rate risk

■ Explain how currency swaps can be used to hedge foreign exchange risk

1 THE NATURE OF INTEREST RATE RISK

Section overview

- The effect of a change in interest rates
- Interest rate volatility and interest rate risk
- Short-term and long-term interest rates
- Money market interest rates: LIBOR

1.1 The effect of a change in interest rates

Interest rates can move up or down, although economists are often able to predict the direction of future movements. A movement in interest rates can affect companies in either a positive or a negative way.

❑ If a company has borrowed at a variable rate of interest, it will have to pay higher interest costs if the interest rate goes up, and lower interest costs if the rate goes down.

❑ If a company has borrowed at a fixed rate of interest, for example by issuing bonds, it will continue to pay the same rate of interest even if market interest rates go down. However, competitors who have borrowed at a variable rate of interest, or competitors who decide to issue fixed rate bonds after the rate has fallen, will gain a competitive advantage.

❑ An investor in fixed rate bonds who expects to sell the bonds before their maturity will also be affected by a change in interest rates. A rise in interest yields will result in a fall in the price of existing fixed rate bonds. A fall in the market interest rate will send bond prices up.

Changes in interest rates are particularly significant for organisations that deal in financial assets and liabilities, such as banks and investment institutions.
However, they can also be very important for other companies that borrow extensively, and have fixed rate or floating rate debts totalling hundreds of millions of dollars.

For example, if a company has borrowed $500 million from a syndicate of banks at a variable rate of interest, an increase in the annual interest rate of just 0.25% will result in higher interest costs of $1,250,000 each year.

1.2 Interest rate volatility and interest rate risk

Interest rate risk is particularly high when:

❑ Interest rate changes are frequent (and sometimes large); and

❑ It is uncertain whether the next movement in rates will be up or down.

In other words, interest rate risk increases with interest rate volatility. Volatility is likely to be higher when expected inflation rates are high than when expected inflation rates are low.

1.3 Short-term and long-term interest rates

A distinction is made between:

❑ short-term interest rates, which are money market interest rates; and

❑ long-term interest rates, which are bond yields.

Volatility in short-term rates affects short-term lending and borrowing, and also all variable rate lending, such as bank loans. Volatility in longer-term rates affects bond investors.

Note that yields on a corporate bond are affected by:

❑ Interest rates for risk-free bonds (domestic government bonds); and

❑ Changes in the perceived credit risk of the bond issuer.

For example, suppose that a company's bonds which have been rated AA by a credit rating organisation are now downgraded to a rating of A+. The yield on the bond will increase to reflect the lower credit rating, and the market price of the bonds will fall. However, the increase in the bond yield is due to a credit risk factor rather than to interest rate risk.

1.4 Money market interest rates: LIBOR

Short-term interest rates for borrowers are set at a margin above the base rate or official rate of the lending bank, or at a margin above a money market rate. The money markets are markets for wholesale borrowing and lending short-term, for periods ranging from overnight up to about 12 months. ('Wholesale' means borrowing and lending in large amounts.)

Each major financial centre has a money market and a 'benchmark' rate that the participants in the market use. In London, the benchmark rate of interest is the London Interbank Offered Rate or LIBOR.

❑ There are LIBOR rates for each maturity of lending, such as seven-day LIBOR, one-month LIBOR, three-month LIBOR and so on.

❑ London is a major international money market centre, and there are LIBOR rates in the major currencies as well as in sterling. For example, there is a US dollar LIBOR and a Swiss franc LIBOR. There is also a euro LIBOR, but the commonly-used benchmark rate for the euro is a rate called the **euribor rate.**

❑ In Paris, there are PIBOR rates; in Frankfurt there are FIBOR rates; and so on.

The Nigerian equivalent of LIBOR is the Nigerian Inter-Bank Offered Rate (NIBOR).

A company borrowing British pounds from a bank at a floating rate of interest might pay interest at a margin above LIBOR. For example, if interest is payable every six months, a borrower might pay interest at 1.50% above the six-month sterling LIBOR rate.

(**Basis points**: 1% = 100 basis points, and in the money market, interest rates may be stated as a number of basis points above LIBOR. So LIBOR plus 1.50% might be stated as 150 basis points above LIBOR.)

When a company borrows at a variable rate of interest, it pays interest at the end of each interest period, which might be each month, or every three months, or every six months, and so on. The rate of interest payable for the period is decided by reference to the benchmark rate, such as three-month LIBOR, at the **beginning** of the interest period. The interest payable in each interest period is reset at the start of each period.

Calculating the interest

There are rules in the money markets about how interest should be calculated. The rules differ between currencies.

❑　Interest on a sterling money market loan is calculated as:

Loan principal × Annual interest rate × ($^{\text{Number of days in the loan period}}/_{365}$)

❑　Interest on a US dollar money market loan is calculated as:

Loan principal × Annual interest rate × ($^{\text{Number of days in the loan period}}/_{360}$)

For your examination, you will normally be able to make the assumption that interest is calculated as:

Loan principal × Annual interest rate × (Number of months in the loan period/12).

2   HEDGING INTEREST RATE RISK: FRAS

Section overview

- Hedging methods
- Forward rate agreements (FRAs)
- The features of an FRA agreement
- How an FRA works

2.1   Hedging methods

Some organisations might wish to hedge their exposures to interest rate risk. They might also want to take advantage, if possible, from any favourable movements in interest rates. There are several ways in which risks can be hedged and opportunities to benefit from interest rate changes can be exploited.

Common methods include:

- ❑   Forward rate agreements or FRAs;
- ❑   Interest rate swaps;
- ❑   Interest rate options (described in a later chapter); and
- ❑   Interest rate futures (described in a later chapter)

All these methods can be used to deal with the possibility that 'spot' rates of money market interest will change, or current yields on bonds will change, and will be different at some time in the future.

2.2   Forward rate agreements (FRAs)

A forward rate agreement (FRA) is a forward contract for an interest rate. FRAs are negotiated 'over-the-counter' with a bank. In some respects, an FRA is similar to a forward exchange rate. It is a contract arranged 'now' that fixes the rate of interest for a future loan or deposit period starting at some time in the future. For example, an FRA can be used to fix the interest rate on a six-month loan starting in three months' time.

Banks are able to quote forward rates for interest rates because there is a large and active money market, and banks are able to borrow and deposit funds short- term. As a result, if a bank can borrow for nine months at one rate of interest and deposit funds for three months at another rate of interest, it can work out a rate to quote to a customer that wants to borrow between the end of month 3 and the end of month 9. A 'forward rate' can be fixed now that will guarantee the bank a profit on the transaction.

> **Example: FRA**
>
> A bank can borrow dollars for nine months at 5% and can deposit dollar funds for three months at 4.75%. Suppose that it borrows $1 million for nine months and places them on deposit for three months.
>
> After nine months, it will have to repay $1 million + ($1 million × 5% × 9/12) = $1,037,500. The interest payable is $37,500.
>
> After three months, its dollar deposit will grow to $1 million + ($1 million × 4.75% × 3/12 = $1,011,875. The interest received is $11,875.
>
> To break even by lending to a customer from the end of month 3 to the end of month 9 (six months), the bank would need to earn interest of $25,625 ($37,500 – $11,875).
>
> The (annual) interest rate on the 6-month lending would therefore have to be:
>
> $$\frac{25,625}{1,011,875} \times \frac{12}{6} \times 100\% = 5.06\%$$
>
> This is not what banks would do in practice, but the example is intended to show that banks are able to use spot money market rates (which are rates for borrowing or depositing funds 'now') to derive interest rates for a future interest period, knowing that they will make a suitable return.

2.3 The features of an FRA agreement

An FRA, like a forward exchange contract, is a binding agreement between a bank and a customer. It is an agreement that fixes an interest rate 'now' for a future interest period.

❑ An FRA for an interest period starting at the end of month 3 and lasting until the end of month 9 is a 3v9 FRA or a 3/9 FRA.

❑ Similarly, an FRA for a three-month period starting at the end of month 2 is a 2v5 FRA or a 2/5 FRA.

An FRA is an agreement that fixes a forward interest rate on a notional amount of money.

Buying and selling FRAs

FRAs are bought and sold.

❑ If a company wishes to fix an interest rate (cost) for a future borrowing period, it buys an FRA. In other words, **buying an FRA fixes a forward rate for short-term borrowing.**

❑ If a company wishes to fix an interest rate (income) for a future deposit period, it sells an FRA. **Selling an FRA fixes a forward rate for a short- term deposit.**

The counterparty bank sells an FRA to a buyer and buys an FRA from a seller.

Notional loans and deposits

A forward exchange contract for currency is an agreement to buy and sell currency at a future date, when there will be an exchange of currencies between the two parties.

An FRA is different. It is not an actual agreement to take out a loan or to make a deposit. An FRA is an agreement on a notional loan or deposit, not an actual loan or deposit. The size of the notional amount of principal (the notional loan or deposit) is specified in the FRA agreement.

2.4 How an FRA works

An FRA works by comparing the fixed rate of interest in the FRA agreement with a benchmark rate of interest, such as LIBOR. The comparison takes place at the beginning of the notional interest period for the FRA.

❑ If the FRA rate is higher than the benchmark rate (LIBOR), the buyer of the FRA must make a payment to the seller of the FRA, in settlement of the contract

❑ If the FRA rate is lower than the benchmark rate (LIBOR), the buyer of the FRA receives a payment from the seller of the FRA, in settlement of the contract.

The amount of the payment is calculated from the difference between the FRA rate and the benchmark rate (LIBOR rate), applied to the notional principal amount for the FRA and calculated for the length of the interest period in the agreement.

Example: FRA

Suppose that a company knows that it will need to borrow £5 million in three months' time for a period of six months.

The company can hedge its exposure to the risk of a rise in the six-month interest rate by buying a 3 v 9 FRA for a notional principal amount of £5 million.

If the bank's FRA rates for 3 v 9 FRAs are 5.40 – 5.36, the rate applied to the agreement will be 5.40%.

The company has fixed the rate that it will pay on the loan at 5.4%. **Settlement of the FRA**

Suppose that at the end of month 3, six-month LIBOR is 6.25%.

The FRA is settled by a payment from the bank to the buyer of the FRA. The difference

between the FRA rate and LIBOR is 0.85%.

The payment to settle the FRA will therefore be based on an interest difference of: 0.85% × £5 million × 6/12 = £21,250.

The actual payment will be less than this, because the FRA is settled immediately, at the beginning of the notional interest period, and not at the end of the period.

The £21,250 is therefore discounted from an end-of-interest period value to a start-of-interest period value, using the reference rate of interest as the discount rate.

This PV is the amount received in settlement of the FRA. **Suppose that at**

the end of month 3, six-month LIBOR is 4.75%.

The FRA is settled by a payment from the buyer of the FRA to the bank. The difference between the FRA rate and LIBOR is 0.65%.

The payment to settle the FRA will therefore be based on this interest rate difference: 0.65% × £5 million × 6/12 = £16,250.

Again, because the payment is at the beginning of the interest period and not at the end of the period, the £16,250 is discounted to a present value at the reference rate of interest.

This PV is the amount of the payment in settlement of the FRA.

Conclusion: using an FRA to hedge an interest rate risk exposure

An FRA fixes an interest rate in advance.

❑   An FRA can therefore be used by a borrower to hedge an exposure to a future increase in the spot interest rate, or to protect a depositor against a future fall in the interest rate.

❑   However, the user of an FRA cannot benefit from any favourable movement in the interest rate, because the FRA fixes the rate and is a binding contract.

Example:

A company has forecast that due to an expected cash shortage, it will need to borrow $20 million for three months in two months' time. A bank quotes the following rates for FRAs:

2 v 3	3.61 – 3.59
2 v 5	3.67 – 3.63
3 v 5	3.68 – 3.65

Required

What would be the FRA agreement with the bank, and what rate would apply to the agreement?

If the company can borrow at LIBOR + 50 basis points, what will be its effective rate of borrowing for the three months if US dollar LIBOR is 4.50% at the start of the notional interest period for the FRA?

Answer

The company needs a 2v5 FRA.

It needs to borrow; therefore the bank will quote the higher rate, 3.67.

In three months' time on the fixing data, if US dollar LIBOR is 4.50% the bank will pay the equivalent of (4.50% - 3.67%) = 0.83%.

	%
Three-month borrowing rate (4.50% + 50 basis points)	5.00
Less: settlement received in FRA agreement	(0.83)
Effective borrowing rate	4.17

The effective borrowing rate is the same as the FRA rate of 3.67% plus the 50 basis points borrowing margin that the company is required to pay on the money it borrows: 3.67% + 0.50% = 4.17%.

3   INTEREST RATE SWAPS

Section overview

- The features of an interest rate swap
- The effect of a coupon swap

3.1   The features of an interest rate swap

An interest rate swap is an agreement between two parties, such as a company and a bank that deals in swaps, for a period of time that is usually several years. Swaps are therefore usually **long-term** agreements on interest rates.

In a swap agreement, the parties agree to exchange 'interest payments' on a notional amount of principal, at agreed dates throughout the term of the agreement.

The interest rate payments that are exchanged in a 'coupon swap' are as follows:

❑   One party to the swap pays a fixed rate (the swap rate).

❑   The other party pays interest at a reference rate or benchmark rate for the interest period, such as LIBOR.

The purpose of an interest rate swap is often to:

❑   Swap a variable rate of interest payment (or receipt) into a fixed interest rate payment (or receipt)

❑   Swap a fixed rate of interest payment (or receipt) into a variable rate of interest payment (or receipt).

Example: 'plain-vanilla-swap'

For example, a company might arrange a four-year swap with a bank, for which the notional principal amount is $20 million and:

1. the company pays interest every six months at a fixed rate of, say, 4.25%

2. the bank pays interest every six months at the six-month LIBOR rate for the period.

Since both parties pay interest every six months, if the payment dates coincide, the swap payments will simply be settled by a net payment for the difference in rates from one party to the other.

Over the life of the four-year swap, there will therefore be eight exchanges of interest payments. However, in an interest rate swap, there is no exchange of principal. The interest relates to a notional amount of principal, not an actual asset or liability.

If the six-month LIBOR rate for one of the periods is, say, 5.00%, the exchange of payments would be settled by a payment from the bank to the company of 0.75% interest (5.00% – 4.25%) on $20 million for six months.

If the six-month LIBOR rate for one of the periods is, say, 3.00%, the exchange of payments would be settled by a payment from the company to the bank of 1.25% interest (4.25% - 3.00%) on $20 million for six months.

The payments in a plain vanilla swap are at the end of each notional interest period, therefore the amounts payable are not discounted (unlike an FRA).

3.2 The effect of a coupon swap

In a coupon swap, one party pays a fixed rate of interest and the other pays 'the floating', which is the variable reference rate of interest, such as six-month LIBOR. For a company with a loan or bonds in issue, the effect of arranging a swap can therefore be:

❑ To swap from fixed rate interest liabilities to floating rate liabilities, or

❑ To swap from floating rate liabilities to fixed rate liabilities.

Example:

A company has a bank loan of £10 million on which it pays variable rate interest at LIBOR + 1%. The loan has five more years to maturity. The company is worried about the risk that interest rates will soon rise, and it wants to set a limit on its interest costs.

It might therefore arrange a five-year swap with a bank, with interest rates to coincide with the interest payments on its bank loan.

The bank might quote rates of 5.34 – 5.39 for a five-year swap in sterling.

The company will receive the floating rate in the swap, to offset the floating rate payments on its bank loan. It will pay the fixed rate, and the rate will therefore be 5.39%.

The swap therefore alters the net interest payments for the company as follows:

	%
Loan payments	(LIBOR + 1)
Swap	
Receive the floating	LIBOR
Pay the fixed	(5.39)
Net interest cost	(6.39)

The company had a floating rate liability of LIBOR + 1%, and has now changed this into a net fixed interest liability of 6.39%.

On each interest payment date, the company will pay LIBOR + 1% in interest on its bank loan, and under the swap agreement will receive or pay the difference between LIBOR for the period and the fixed rate of 5.39%.

You might see that an interest rate coupon swap is similar in concept to an FRA, but is for a longer period of time and covers more than one interest period.

The company might subsequently change its mind. For example, after two years, it might decide that it wants a floating rate liability again. If so, it can go back to a floating rate liability by arranging with the bank to cancel the swap and agreeing a cancellation payment (for the value of the swap at the date of cancellation).

Example:

A company has 5% bonds in issue with a nominal value of 40 million euros. The bonds have ten more years to maturity. The company wants to exchange its fixed rate liability for a floating rate liability in euros. A bank quotes the following rate for a ten-year swap: 4.22 – 4.25.

By arranging a swap, what will be the effective interest cost for the company?

Answer

	%
Cost of the bonds	(5.00)
Swap	
Receive the fixed	4.22
Pay the floating	(LIBOR)
Net interest cost	(LIBOR + 0.78)

4 USING INTEREST RATE SWAPS

Section overview

- Swapping interest rate liabilities
- Obtaining fixed rate liabilities
- Credit arbitrage

Interest rate swaps are used to manage interest rates on liabilities (and assets, in the case of investment institutions and banks). They can therefore be a method of hedging exposures to interest rate risk.

4.1 Swapping interest rate liabilities

Some large companies use interest rate swaps to manage their net interest liabilities (in each currency). For example, a company that borrows extensively, through a combination of bank loans and bond issues, might have a policy that:

❑ 25% of its debts should be at a fixed rate

❑ 25% of its debt should be at a floating rate, and

❑ The remaining 50% may be at a fixed or floating rate, or a mixture of fixed and floating, depending on the judgement of the finance director or treasury department.

The company might then use interest rate swaps to alter its net liabilities, within the company's policy guidelines, between fixed rate and floating rate. It might move towards more floating rate liabilities if interest rates are expected to fall, and towards fixed rate liabilities when interest rates are expected to rise.

The advantage of using swaps is that a company can alter its net liabilities from fixed to floating rate or floating to fixed rate, without having to alter or re-negotiate its actual loans or bond issues. For example, a company with fixed rate bonds can swap from fixed to floating rate liabilities with a swap, without having to redeem the bonds early and negotiate a floating rate loan with a bank.

4.2 Obtaining fixed rate liabilities

Many companies are unable to obtain fixed rate debt. Fixed rate interest liabilities come from issuing bonds. Medium-term bank loans are invariably at a floating rate. If a company is too small to issue bonds, or does not have the credit status to issue bonds, it must borrow from banks to obtain debt finance.

If a company wants fixed rate liabilities, but can only borrow from a bank, it can obtain a loan at a floating rate and swap into a fixed rate net liability.

> **Example: Interest rate swap**
>
> A company borrows from its bank for five years at LIBOR plus 150 basis points. It wants its interest rate liabilities to be fixed, so it makes a five-year swap transaction with a bank, in which it pays a fixed rate of 5.8% and receives LIBOR.
>
> As a result of the swap, the company's net interest obligations are fixed at 7.3%.
>
> | | % |
> |---|---|
> | Loan payments | (LIBOR + 1.50) |
> | Swap | |
> | Receive the floating | LIBOR |
> | Pay the fixed | (5.80) |
> | Net interest cost | (7.30) |

4.3 Credit arbitrage

At one time, swaps were sometimes used to obtain a lower interest rate on borrowing. This was possible because swaps banks were able to identify opportunities for 'credit arbitrage'. These opportunities arose because of anomalies in the rates of interest at which different companies could borrow.

When an opportunity for credit arbitrage exists, one of the following situations will occur:

Situation 1

> **Example: Credit arbitrage – situation 1**
>
> Two companies want to borrow. T
>
> They can both borrow at either a fixed rate or a floating rate. Company A has to pay a higher rate of interest than Company B.
>
> However, the difference in borrowing costs between the two companies is less for fixed rate borrowing than for variable rate borrowing.
>
> | | Fixed rate borrowing cost | Variable rate borrowing cost |
> |---|---|---|
> | Company A | 7.25% | LIBOR +1.5% |
> | Company B | 6.50% | LIBOR +0.5% |
> | Difference | 0.75% | 1.0% |
>
> Credit arbitrage is possible using an interest rate swap if Company A wants to borrow at a variable rate of interest and Company B wants to borrow at a fixed rate.

> **Example: Credit arbitrage – situation 2**
>
> Two companies want to borrow.
>
> They can both borrow at either a fixed rate or a floating rate. Company C has to pay a higher rate of interest than Company D.
>
> However, the difference in borrowing costs between the two companies is more for fixed rate borrowing than for variable rate borrowing.
>
> | | Fixed rate borrowing cost | Variable rate borrowing cost |
> |---|---|---|
> | Company C | 7.75% | LIBOR + 1.5% |
> | Company D | 6.50% | LIBOR + 0.5% |
> | Difference | 1.25% | 1.0% |
>
> Credit arbitrage is possible using an interest rate swap if Company C wants to borrow at a fixed rate of interest and Company B wants to borrow at a variable rate.

5 INTEREST RATE FORWARDS FROM YIELD CURVES

Section overview

- Calculation of forward rates
- Interest rate forwards and SWAP valuation

5.1 Calculation of forward rates

Yield curves were covered in chapter 14. That chapter also explained how yield curves could be used to place a value on a bond and how a yield curve could be derived from information about bonds of a same risk class but of different maturities.

This session explains how the spot yield curve can be used to calculate forward rates of interest for use in constructing FRAs and in swap valuation.

This is best explained using an example.

Example: Forward rates from yield curves

The annual spot yield curve for bonds of a given risk class are as follows:

Maturity	Yield
One year	3.0%
Two years	3.6%
Three years	4.3%
Four years	5.1%
Five years	5.8%

A company whose bonds were in this risk class would have to pay interest at 3.0% for a one year loan, 3.6% for a two year loan and so on.

A company that wanted a two year loan might consider an alternative course of action. It could borrow an amount for one year and then borrow the same amount at the end of year 1 (beginning of year 2). The second amount would pay off the first loan in effect rolling it over into the second year.

A company that wished to do this would not know what interest rate it would face in one year's time but it would be able to lock a rate in with a 12v24 FRA. Common sense suggests that at the start date a bank would not offer deals where a two year loan was more favourable or less favourable than a one year loan followed by a fixed forward rate. This "equality" can be used to calculate the forward rate as:

12v24 FRA

Interest on a two year loan	=	Interest on a one year loan followed by locked in rate (r) for year two

The 12v24 FRA rate (r) is calculated from the spot yield curve as follows: $1.036^2 = (1.03)(1+r)$

$$1.036^2/1.03 = 1 +r \quad r =$$

$$0.042 \text{ or } 4.2\%$$

Example:

A similar approach can be used to calculate the 24v36, 36v48 and 48v60 FRA rates:

24v36 FRA

Interest on a three year loan	=	Interest on a two year loan followed by locked in rate (r) for year three

The 24v36 FRA rate (r) is calculated from the spot yield curve as follows:

$$1.043^3 = (1.036)^2(1+r)$$

$$1.043^3/1.036^2 = 1 + r$$

$$r = 0.057 \text{ or } 5.7\%$$

36v48 FRA

Interest on a four year loan	=	Interest on a three year loan followed by locked in rate (r) for year four

The 36v48 FRA rate (r) is calculated from the spot yield curve as follows:

$$1.051^4 = (1.043)^3(1+r)$$

$$1.051^4/1.043^3 = 1 + r$$

$$r = 0.0754 \text{ or } 7.5\%$$

48v60 FRA

Interest on a five year loan	=	Interest on a four year loan followed by locked in rate (r) for year five

The 48v60 FRA rate (r) is calculated from the spot yield curve as follows:

$$1.058^5 = (1.051)^4(1+r)$$

$$1.058^5/1.051^4 = 1 + r$$

$$r = 0.0865 \text{ or } 8.7\%$$

Summary

Maturity	Yield	Forward rates
One year	3.0%	3.0% (= spot)
Two years	3.6%	4.2%
Three years	4.3%	5.7%
Four years	5.1%	7.5%
Five years	5.8%	8.7%

5.2 Interest rate forwards and swap valuation

Any swap offered will be based on the yield curves appropriate to a company's debt.

The swap will be priced so that at the start of the SWAP the expected cash inflows to the company and outflows from the company will net to zero.

This is best explained using an example.

Example: Interest rate forwards and swap valuation

A company has variable rate debt of $100m repayable in 5 years.

It wishes to enter into a variable to fixed interest swap.

The bank has offered to enter into a swap with the company under which it will pay the company variable rate less 40 basis points (0.4%). In return the company will make a fixed rate payment to the bank.

A bank has compiled a yield curve for the company's bonds and derived forward rates from these as follows:

Maturity	Yield	Forward rates
1 year	3.0%	3.0%
2 years	3.6%	4.2%
3 years	4.3%	5.7%
4 years	5.1%	7.5%
5 years	5.8%	8.7%

Required:

Calculate the fixed rate that the bank will charge.

Answer

Maturity	Yield	Forward rates	Basis adjustment	Expectation at start of SWAI — Variable rate paid by bank to company	Cash flow paid to company
1 year	3.0%	3.0%	0.4%	2.6%	$2.6m
2 years	3.6%	4.2%	0.4%	3.8%	$3.8m
3 years	4.3%	5.7%	0.4%	5.3%	$5.3m
4 years	5.1%	7.5%	0.4%	7.1%	$7.1m
5 years	5.8%	8.7%	0.4%	8.3%	$8.3m

Present value of the variable rate receipts expected from the SWAP

Year	Cash flow	Discount factor	PV ($m)
1	$2.6m	$1/1.03 = 0.971$	2.52
2	$3.8m	$1/1.036^2 = 0.932$	3.54
3	$5.3m	$1/1.043^3 = 0.881$	4.67
4	$7.1m	$1/1.051^4 = 0.820$	5.82
5	$8.3m	$1/1.058^5 = 0.754$	6.26
			22.81

Let x be the fixed rate cash flow to the bank. The present value of these flows is given by the following:

Year	Cash flow ($m)	Discount factor	PV ($m)
1	x	$1/1.03 = 0.971$	0.971x
2	x	$1/1.036^2 = 0.932$	0.932x
3	x	$1/1.043^3 = 0.881$	0.881x
4	x	$1/1.051^4 = 0.820$	0.820x
5	x	$1/1.058^5 = 0.754$	0.754x
			4.358x

The swap will be priced so that at the start of the SWAP the expected cash inflows to the company and outflows from the company will net to zero. (Worth repeating)!

Therefore:

4.358x = 22.81

x = $5.23m

The fixed rate charged = $5.23m/$100m or 5.23%

6 CURRENCY SWAPS

Section overview

■ The nature of currency swaps

■ Reasons for using currency swaps

■ FX swaps

6.1 The nature of currency swaps

Interest rate swaps are swaps in the same currency, usually between a fixed rate and a floating rate of interest, with interest calculated on a notional amount of principal. Currency swaps are similar, but with some significant differences:

❑ The swap is between two different currencies. One party pays interest on an amount of principal in one currency. The other party pays interest on an equivalent amount of principal in a different currency.

❑ The interest rates that are swapped need not be a fixed rate in exchange for a floating rate. A currency swap can be between a fixed rate in one currency and a (different) fixed rate in the other currency.

❑ There is an actual exchange of principal. There must be an exchange of principal at the end of the swap, at a rate of exchange that is fixed at the beginning of the swap. (There might also be an actual exchange of principal at the beginning of the swap, but this is not usual.)

Example: Currency swaps

A UK company has taken an opportunity to borrow US$180 million in the bond markets, by issuing a seven-year bond. However, it wants to have its interest liabilities in sterling, not dollars. It might therefore arrange a seven-year currency swap in which the agreed exchange rate is £1 = US$1.80.

For the seven years of the swap, the UK company will receive fixed rate interest in US dollars from the swap counterparty. The interest received on each interest payment date will be interest for the period at the agreed swap rate for US dollars, on $180 million.

The UK company will pay interest in the swap on £100 million, also at a fixed rate agreed in the swap.

The interest received in US dollars can be used to meet the dollar interest liabilities on the bonds. This leaves the company with net interest obligations in sterling.

At the end of the swap, there is an exchange of principal. The UK company will receive US$180 million from the swap counterparty and in exchange must pay £100 million. It will use the US$180 million to redeem the dollar bonds.

The effects of the currency swap may be summarised as follows:

> **Example (continued): Currency swaps**
>
> | | **Interest** | **Principal payments (end of the swap)** |
> |---|---|---|
> | Bonds | Pay dollars | Pay dollars ($180 million) |
> | Currency swap | Receive dollars | Receive dollars ($180 million) |
> | | Pay sterling | Pay sterling |
> | Net effect | Pay sterling | Pay sterling |
>
> The effect of the currency swap has therefore been to borrow in one currency, but swap the interest and loan principal repayment liabilities into a different currency.
>
> Currency swaps are therefore used to hedge long-term currency risk.

6.2 Reasons for using currency swaps

As the previous example shows, currency swaps can be used to swap interest payment and principal repayments from one currency into another, and so are a method of hedging long-term currency risk exposures.

Companies can use currency swaps to borrow at a favourable interest rate in the international loans or bonds markets, and swap their liabilities into a currency of their preference. This could enable them to borrow more cheaply than borrowing directly in the currency of their preference.

If the currency swap involves an exchange of interest at a fixed rate in one currency for a floating rate in the other currency, the swap can also be used to hedge interest rate risk.

However, currency swaps are far less common than interest rate swaps. Interest rate swaps are used extensively in the financial markets, particularly by banks and other financial institutions.

6.3 FX swaps

An FX swap is similar to a currency swap, but with one important difference.

❑ In a currency swap, the two swap counterparties exchange a series of interest payments in the two currencies over the life of the swap.

❑ In an FX swap, there is no exchange of interest payments. There is an exchange of principal at the start of the swap and a re-exchange at the end of the swap, but there are no cash flows during the term of the swap.

The reason for having FX swaps is that a company might find it difficult to raise debt in a particular currency. For example, a company might want to issue bonds in a currency for which the bond market is illiquid and not popular with investors. The company might want to issue bonds to obtain a liability in the currency for the purpose of hedging its currency exposures.

To create its liability in the currency, the company might:

❑ Issue bonds in another currency, such as US dollars

❑ Arrange an FX swap for the immediate exchange of the dollars for the other currency. The company would then have a liability to repay the currency at the end of the term of the swap.

7 CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Explain the nature of interest rate risk
- Explain how FRAs can be used to hedge interest rate risk
- Use FRAs to hedge interest rate risk
- Explain how swaps can be used to hedge interest rate risk
- Explain how currency swaps can be used to hedge foreign exchange risk

Futures and hedging with futures

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

E			Management of financial risks
	1		Assess and advise on:
		e	The appropriate derivative instruments for hedging foreign currency risks, (forward contracts, **futures contracts**, currency options and currency swaps)
		f	The appropriate derivative instruments for hedging interest rate risk, (forward interest rate agreement, **interest rate futures**, interest rate options, interest rate swaps)

Exam context

This chapter explains how futures are used to hedge risk.

By the end of this chapter, you should be able to:

- Explain how futures are used to hedge risk
- Explain how interest rate futures are used to hedge interest rate risk
- Use interest rate futures to hedge interest rate risk
- Explain how foreign currency futures are used to hedge foreign exchange risk
- Use foreign currency futures to hedge foreign exchange risk

1 FINANCIAL FUTURES

Section overview

- The nature of futures contracts
- The role of the futures exchange
- Open positions and closing positions
- Ticks and tick values
- Basis and basis risk

1.1 The nature of futures contracts

A future is forward contract for the purchase or sale of a standard quantity of an item, for settlement or delivery at a specified future date. It is therefore a contract to buy or sell a quantity of an item at a future settlement date, at a price agreed 'now'. Futures contracts have some special features.

❑ They are standardised contracts. Every futures contract for the purchase/sale of a particular item is identical to every other futures contract for the same item, with the only exception that their settlement dates/delivery dates may differ.

❑ They are traded on an exchange, rather than negotiated 'over-the-counter'.

Commodity futures and financial futures

Commodity futures are futures contracts for the sale and purchase of standard quantities of standard commodities, such as wheat, oil, copper, gold, rubber, soya beans, coffee, cotton, sugar, and so on.

Financial futures are futures contracts for the sale and purchase of a financial item, such as a quantity of currency, a notional portfolio of shares, a quantity of notional government bonds, a notional three-month deposit, and so on. There are currency futures, short-term interest rate futures, bond futures and stock index futures.

Futures exchanges

Futures are traded on futures exchanges. Each futures exchange has its own particular futures contracts. Only in a few cases do two futures exchanges compete for business by offering trading in similar futures contracts.

The major futures exchanges include the Chicago Board of Trade (CBOT) and Chicago Mercantile Exchange (CME), Eurex and LIFFE.

Settlement dates

Futures are traded on a futures exchange for just four settlement dates each year. These are usually in March, June, September and December. Futures are therefore referred to by their settlement date, such as March Eurodollar futures or September S&P500 futures.

The actual settlement date for contracts in each month is specified by the futures exchange. In examination questions it is normally assumed (for simplicity) that contract settlement dates are at the end of the month.

Futures prices

The price for futures is the price at which buyers and sellers agree to make a transaction with each other.

Dealing in futures contracts continues throughout the trading day on the futures exchange, and the prices at which futures are bought and sold vary with each transaction. However, the exchange authorities receive information about the prices of transactions that have been made, and up-to-the minute price information is published to the market. Buyers and sellers of futures are therefore aware of what current market prices are.

1.2 The role of the futures exchange

Counterparty to all trades

The futures exchange regulates the market that it provides. It establishes rules of conduct and provides the systems in which trading can take place. In addition, the exchange provides security to the market by virtually eliminating credit risk for its participants.

An important feature of trading on a futures exchange is that when a buyer and seller agree a transaction in futures and report the transaction to the exchange, the exchange takes on the role of counterparty to the buyer and the seller in the transaction. This means for example that if X makes a transaction to sell 20 December currency futures to Y:

❑ The futures exchange will become the buyer of 20 December futures from X; and

❑ The exchange will also become the seller of 20 December futures to Y.

Both X and Y have a contract with the exchange, and not a contract with each other. X is therefore not relying on the good credit standing of Y to honour the contract, and Y is not relying on the good credit standing of X. They both rely on the credit standing of the exchange itself. Since the credit status of the exchange is high, the credit risk is minimised.

The exchange protects itself against credit risk from participants in the exchange, by means of a system of margin payments. Margin payments are explained below.

(Note: Strictly speaking, the exchange itself is not the counterparty to every transaction. The exchange is represented by a clearing house, that acts as counterparty to every transaction. For the LIFFE futures exchange in London, for example, the clearing house is the London Clearing House or LCH).

Margin

After someone has bought or sold futures at an agreed price, the market price of the futures will move up or down. The buyer or seller of the futures will make a gain or a loss on the futures position, depending on whether the market price has moved favourably or adversely. If the price moves adversely by a large amount, a person might have a large loss on his futures position. A problem for the futures exchange is how to prevent someone with a large loss from refusing to settle the contract and pay for the loss. This problem is overcome by a requirement for every position in futures to be covered by a cash deposit with the exchange. This cash deposit is called a margin.

❑ When two parties agree to the sale/purchase of a quantity of futures, both parties are required to pay a cash deposit, called an **initial margin**, to cover the risk of short-term losses on their position.

❑ If a position goes into loss because the market price moves adversely, the exchange will call for an additional cash payment of **variation margin** to cover the loss.

In this way, all loss positions have been covered by cash payments, and there is no credit risk for the exchange from non-payment of losses by the buyers or sellers of futures contracts.

Example: Margin

A company arranges to buy futures on coffee at a contract price of $2,000 per tonne. Having bought the futures, it must pay a deposit or initial margin to the futures exchange. The seller of the coffee futures must also pay initial margin.

If the 'spot' price of coffee then falls, and the price of coffee futures falls too, the company will be making a loss on its futures position. To cover these losses, the exchange will ask the company to pay an additional variation margin.

Margin protects the futures exchange against bad debt risk from buyers or sellers of futures who makes losses on their position.

1.3 Open positions and closing positions

Open positions: long and short positions

When a person has bought futures without previously having sold any, he establishes a **long position** in the futures. A long position in futures therefore represents an undertaking to buy a quantity of futures at a future date. For example, if a company buys 10 March US dollar-euro currency futures, it is 'long' 10 March futures.

It is possible to sell futures without having any (in other words, without having a long position). A position in which a person has sold futures, without previously buying them, has a **short position**. For example, someone can sell 100 September S&P500 Index futures, without already 'owning' 100 futures or even without owning an equivalent quantity of shares in companies in the S&P500 Index.

Short and long positions are both **open positions** in futures, and at any time, the total amount of long positions is always equal to the total of short positions. This is because the number of futures contracts sold and the number purchased must be equal.

Settlement

Someone with an open position in futures can keep the position open until the futures contract reaches its settlement date. At settlement, the holder of a long position will require the futures exchange to settle the contract for the purchase of the underlying items in the futures contract. Similarly, at settlement the holder of a short position will be required to make the sale of the underlying item to the futures exchange.

Some futures contracts are cash-settled, and some are settled by physical delivery. For example, short-term interest futures are always cash settled, whereas bond futures are settled by the actual delivery of a quantity of bonds from the seller to the buyer.

Closing positions

Open positions are not usually kept open until settlement, and so only a few futures contracts are actually settled at their settlement date. Instead, positions are usually closed before settlement.

❑ The holder of a long position can close the position by selling an equal number of the futures, for the same settlement date, before the settlement date. For example, a long position in 30 June Eurodollar futures can be closed at any time before settlement in June by selling 30 June Eurodollar futures.

❑ The holder of a short position can close the position by buying an equal quantity of the futures, at any time before settlement. For example, a short position of 25 September FTSE100 futures can be closed at any time before settlement in September by buying 25 September FTSE100 futures.

When a long position is closed, the original buying price and the selling price to close the position will be different, and there will be an overall gain or loss from the difference between the buying and selling prices. Similarly, when a short position is closed, the original selling price and the buying price to close the position will be different, and there will be an overall gain or loss from the difference between the selling and buying prices.

Dealing in futures therefore results in gains or losses on the futures position, which arise because of movements in the market price of the futures.

Example: Opening and closing

A company wants to hedge a currency transaction exposure. The exposure relates to a transaction that will occur in November, and the company needs to sell 20 euro currency futures. There are futures with settlement dates in September and December, but not November.

It should therefore sell futures for the next settlement date after the expected transaction, which in this example is December. Suppose the company sells 20 futures at a rate of 1.3500 ($1.3500 = €1).

In November when the transaction occurs, the company should close its position. It opened the position by selling 20 December futures, and it should close the position by buying 20 December futures. There will be a cash profit or loss on closing the position.

The company will use the spot market for the transaction in euros. The gain or loss on the futures position, taken with the spot price, will result in a net exchange rate close to (but probably not equal to) the rate of 1.3500 that was obtained in the futures contract.

This will be illustrated in more detail later.

1.4 Ticks and tick values

Ticks

A tick is the minimum price movement for a futures contract. For example:

❑ US dollar-euro currency futures are contracts for €125,000 in exchange for US dollars. They are priced at the EUR/USD rate ($ per €1), and the size of a tick is US$0.0001.

❑ Short-term interest futures are priced up to a theoretical maximum of 99.9999 and each tick is 0.0001 in price. A tick represents an interest rate of 0.01% per annum.

❑ Stock index futures are priced in terms of the stock index itself. For example, DAX Index futures might be priced at 8200 or the Hang Seng Index futures at 21750. Price movements are in units of the index itself.

The value of a tick

Since every futures contract is for a standard quantity of the underlying item, each movement in price of one tick has the same value, representing a gain or loss to a buyer and a corresponding loss or gain to a seller. For example:

❑ The value of one tick for a US dollar-euro currency future (€125,000 in exchange for US dollars) is: 125,000 euros × $0.0001 per euro = $12.50.

This can be proved easily. If the price of the contract is $1.2000, the cost of 125,000 would be $150,000. If the exchange rate rises by one tick to $1.2001, the cost of €125,000 would be $150,012.50. This upward price movement would represent a gain of $12.50 to someone with a short position in the futures and a loss to the holder of a long position.

❑ A Eurodollar future is a short-term interest future representing a three- month deposit of US$1,000,000. The value of one tick for a Eurodollar future is therefore:

$1,000,000 × 3/12 × 0.0001 = $25.

❑ For stock index futures, each one tick of price has a fixed value. The value of a tick for FTSE100 futures, for example, is £10.

Example: Tick value

Tick values can be used to calculate the gain or loss on a futures position. For example, suppose that a company buys 20 June Eurodollar futures at 9650 and sells 20 June futures later at 9672 to close the position. There is a gain of 0.0022 ticks on each contract, the value of each tick is $25, and the total gain is therefore:

20 contracts × 22 ticks × $25 per tick = $11,000.

1.5 Basis and basis risk

Basis

The futures price for an item is never the same as the spot market price or current market price, except at settlement date for the contract. For example, a company might sell September sterling/US dollar futures in April at a price of 1.9800 when the current spot exchange rate is 1.9600. The difference of 0.0200 or 200 points is called '**basis**'.

As a futures contract moves towards settlement, the basis should gradually reduce in size, until it is 0 at settlement date. If the basis is not 0 at settlement, dealers in the market would be able to make an instant guaranteed profit by:

❑ Buying or selling in the futures market, and simultaneously;

❑ Selling or buying in the cash market (spot market).

However, most futures positions are closed before settlement. When a futures position is closed, there will still be some basis, and the futures price and the current spot market price will be different.

For your examination, you might be required to estimate what the basis should be when a position is closed. To do this, we have to make the simplified assumption that the basis will reduce in a straight line from the time the futures position is opened to 0 at settlement date. Using this assumption, we can estimate the expected basis at the intended date for closing the position.

Example: Basis

A company sells September sterling/US dollar futures at the end of April at a price of 1.9800 when the current spot exchange rate is 1.9600. There are exactly five months to settlement date, assuming the settlement date for the September futures contract is at the end of that month. The company expects to close the position at the end of July, after three months.

The basis is 200 at the end of April. Assuming that basis falls to zero at a steady rate, it should be expected to fall by 200 between the end of April and the end of September, which is by 40 each month. (This is the total basis of 200 points divided by 5 months.) At the end of July, after three months, basis should have fallen by 120, and the expected basis when the position is closed in July would therefore be 80 (200 – 120). We would therefore estimate that the futures price will be higher than the spot rate by 80.

(The futures price will be higher than the spot rate because it was higher when the futures were originally sold and the short position in the futures was established.)

Basis risk

Basis risk is the risk that when a futures position is closed, the size of the actual basis will be different from the expectation of what the basis should be. In the example above, when the position in September currency futures is closed in July, the futures price might be 1.9790 and the current spot price might be 1.9740, giving a basis of 50. This is less than the expected basis of 80 that was estimated when the futures position was opened, by a difference of 30.

The significance of basis is explained later.

2   HEDGING RISK EXPOSURES WITH FUTURES

Section overview

- Introduction to how future hedges work
- Creating a hedge with financial futures
- Imperfect hedges
- Basis and imperfect hedging

2.1   Introduction to how future hedges work

This can be very confusing at first.

A company is interested in two transactions or positions:

❑   The exposure (for example, ownership of an asset or intention to buy an asset); and

❑   The future which hedges this exposure.

If the value of an asset falls, the company takes profit from its position in futures. It does this by dealing on the futures market. However, if the value of an asset rises, the company accepts a loss from dealing on the market.

Similarly, if the value of an asset that is to be purchased rises, the company takes profit from its position in futures. It does this by dealing on the futures market. However, if the value of an asset rises, the company accepts a loss from dealing on the market.

A company can deal on the market in one of two ways:

❑   Buying a future and then selling it later. This is called taking a long position.

❑   Selling a future (i.e. selling something it does not have) and buying it later. This is called taking a short position.

Whether a company takes a long or short position depends on the type of exposure.

The following illustrations should help you to understand this.

> **Example: Long or short positions?**
>
> The following explanations assume that there is no basis risk
>
> | | |
> |---|---|
> | Example 1 | |
> | Situation | A company owns 1,000 tonnes of coffee beans which are worth CU2,000 |
> | Exposure | The company is worried about the price of coffee beans falling. |
> | Hedging strategy | Sell futures now (and close the contract by buying them back later). |
> | Outcome | If the price of beans falls to CU1,800 the company's asset will fall in value (by CU200) but a similar movement will occur on the futures market. |
> | | Therefore, the company will close out the future and take profit (CU200) by having sold at CU2,000 and buying later at CU1,800. |
> | | However, if the price of beans rises from say CU2,000 to CU2,050 the company's asset will increase in value (by CU50) but a similar movement will occur on the futures market. |
> | | Therefore, the company will close out the future and accept loss (CU50) by having sold at 2,000 and bought at CU2,050. |
>
> | | |
> |---|---|
> | Example 2 | |
> | Situation | A company intends to buy 1,000 tonnes of coffee beans. The current market price of coffee beans is CU2,000. |
> | Exposure | The company is worried about the price of coffee beans rising. |
> | Hedging strategy | Buy futures now (and close the contract by selling them later). |
> | Outcome | If the price of beans falls to CU1,800 the company will pay CU200 less than expected for the beans, . A similar movement will occur on the futures market. |
> | | Therefore, the company will close out the future and accept loss (CU200) by having bought at CU2,000 and sold later at CU1,800. |
> | | However, if the price of beans rises from say CU2,000 to CU2,050 the company will pay CU50 more than expected. |
> | | Therefore, the company will close out the future and take profit by having bought at CU2,000 and sold later at CU2,050. |

Understanding whether to take a long or short position in currency trades can be a little tricky. Remember that the trade on the futures market is not for currency itself but for the future. Profit is taken or loss accepted based on the movement of the value of the future (which in turn is a based on the currency price).

Example: Long or short positions?

The following explanations assume that there is no basis risk

Example 1	
Situation	A British company owns $1,000.
	The exchange rate is £1 = $1.5.
Exposure	The company is worried about the price of dollar falling (say to £1 = $2)
	In this case the futures rate would move from $1.5 to $2.
Hedging strategy	Buy futures now (and close the contract by selling them later).
Outcome	If the rate falls to £1 = $2 the company's asset will fall in value (from £667 to £500).
	Therefore, the company will close out the future and take profit having bought $1,000 futures at $1.5 and selling them at $2. This will give a gain of £167. You will see how this is calculated later.
	However, if the dollar strengthens to £1 = $1 the company's asset will increase in value (from £667 to £1,000).
	Therefore, the company will close out the future and accept a loss having bought $1,000 futures at $1.5 and selling them at $1. This will give a loss of £333. You will see how this is calculated later.

The exact structure of a currency hedge depends on what you are trying to do, how the rates are constructed and the nature of the future contract. DO not use the above example to generalise. Rather, try to understand the underlying approach so that you can apply it on a case by case basis.

2.2 Creating a hedge with financial futures

Futures can be used to hedge a short-term exposure to currency risk, interest rate risk or market risk for share prices. They can hedge short-term exposures only, because virtually all futures trading is in contracts with a settlement date within the next 12 months.

The concept of hedging with futures is to create a position in futures that is the opposite of the exposure that is being hedged. By creating an opposite position in futures:

❑ Any loss on the position that is being hedged will be matched by a gain on the futures position;

❑ However, any gain on the position that is being hedged will be matched by a loss on the futures position.

A useful rule to remember is that:

❑ A **long position in futures** will gain from an increase in the futures price and lose from a fall in the price;

❑ A **short position in futures** will gain from a fall in the futures price and lose from a rise in the price.

The settlement date for the futures must be later than the date of the transaction that is being hedged. For example, if a company is hedging a position in interest rates for the euro, and intends to close the position in August, it should open a position in September futures. If it opened a position in June futures, the futures would reach settlement in June, and the position would no longer be hedged.

Example: Futures hedge

A US company expects to receive 2,000,000 Euros from a customer in April, in four months' time, and it wishes to hedge the exposure with currency futures. On receipt of the Euros in April, the company will exchange them into US dollars. The company's exposure is to a fall in the value of the euro.

Each US dollar/euro currency future is for €125,000. The US company will want to sell Euros in exchange for US dollars, therefore it will sell June futures to hedge its position. It will sell 16 contracts (which is €2,000,000/€125,000 per contract).

If the Euro falls in value against the US dollar, the value of the €2,000,000 receivable will fall. However, the price of the futures will also fall and since the company has a short position in the futures, it will gain from the fall in price. The gain on the futures position will offset the fall in value in the dollars.

2.3 Imperfect hedges

With futures, it is not usually possible to hedge a position exactly. Futures are contracts for a standard quantity of an underlying item, whereas the position for which the hedge is required might not be an exact multiple of the value of a futures contract.

Example: Futures hedge

A French company expects to receive US$1,200,000 in July, in three months' time, and it wants to hedge its exposure with currency futures. It will exchange the dollar income in July for Euros, and so will be selling dollars and buying Euros. Its exposure is therefore to a fall in the value of the dollar.

A futures contract is for 125,000 Euros. It will create a hedge with futures by purchasing September futures. We need to calculate the equivalent value of $1,200,000 in Euros. Suppose the company can buy September futures at 1.2350 ($1.2350 per €1).

This represents 971,660 Euros (US$1,200,000/1.2350).

971,660 Euros is equivalent to 7.8 contracts (€971,660/€125,000 per contract).

The company cannot buy a fraction of a future, and so must buy 7 or 8 contracts. If it buys 7 contracts, it will be hedging €875,000 and if it buys 8 contracts, it will be hedging €1,000,000. In both cases, the hedge is imperfect.

In this example, the company will probably buy 8 contracts, because 7.8 is nearer 8 than 7.

Having bought futures to create a long position, the company will gain from a rise in the futures price (a rise in the exchange rate, which means a weaker dollar). This will offset the fall in the value of the future dollar income of $1,200,000 due to a fall in the value of the dollar.

Note on buying or selling futures as a hedge

You need to understand how a hedge is created, by buying or by selling futures. The basic principle is that the futures position that provides a hedge against the risk must be the 'opposite' of the underlying position, so that a loss on the underlying position will be offset by a gain on the futures position (and a gain on the underlying position results in a loss on the futures position).

In the above example the company will receive US dollars. This is the underlying position. The risk is that dollars will fall in value against the euro. The hedge is created by paying US dollars in the futures contracts, which is the opposite of the underlying position. Paying US dollars means receiving/buying euros, so the hedge is constructed by purchasing dollar/euro futures.

2.4 Basis and imperfect hedging

A hedge with futures is also imperfect because of basis and basis risk. When a hedge is created with futures, the current spot price will differ from the futures price by the basis. Over time, since basis falls towards 0, changes in the futures price will be larger than changes in the current spot market price. This means that the hedge created by the futures position will not provide a gain or loss that matches exactly the loss or gain on the transaction or position that is being hedged.

The effect of basis on hedging is described in more detail later. Hedging with

currency futures: the approach summarised

You might find the following guidelines useful in deciding how to create a hedge with currency futures:

Step		Comment
1	Identify the underlying transaction that you are trying to hedge.	Does the company need to buy a quantity of a currency at the future date or sell a quantity of a currency? Which currency will the company need to buy or sell?
2	What is the currency risk in the underlying transaction?	Will the company have to pay more if a currency goes up in value, or if it goes down in value? Or will it receive less if a currency goes up in value or down in value? It is useful to think of the currency in which the futures are denominated.
3	Work out a futures position that creates a profit if there is a 'loss' on the underlying transaction.	What futures position is needed so that if a loss is incurred on the underlying transaction because of an adverse exchange rate movement, a profit will be made on the futures position? Or what futures position is needed so that if less income is obtained from the underlying transaction because of an adverse exchange rate movement, a profit will be made on the futures position?

3 CURRENCY FUTURES

Section overview

- Features of currency futures
- Hedging currency exposures with futures

3.1 Features of currency futures

Currency futures are contracts for the purchase/sale of a standard quantity of one currency in exchange for a second currency. Futures contracts are priced at the exchange rate for the transaction.

Most currency futures are contracts for the major international currencies. For example:

US dollar – euro

Currency future (CME)	Amount
	EUR 125,000
US dollar – yen	12.5 million yen
US dollar – British pound	£62,500
US dollar – Swiss franc	SFr125,000
US dollar – Canadian dollar	C$100,000

An examination question on currency futures should tell you the size of each futures contract.

3.2 Hedging currency exposures with futures

The principles of hedging with futures have been explained already. However, several examples will be used to illustrate how hedging works. Study each example carefully: they get progressively more difficult.

Example: Perfect hedge, no basis risk

It is July. A US company must pay 750,000 euros to a Spanish supplier in November, and wishes to hedge its currency exposure with currency futures. In this example, it is assumed that there is no basis, and the futures price and the current spot market exchange rate are always equal. The price of December futures in July is 1.2100 ($1.2100 per €1). The value of a tick is $12.50. (This is
€125,000 × $0.0001 per $1.)

The exposure is to the risk of a rise in the value or cost of the euro between July and November. The underlying position is that the US company will pay euros in November. So to create a futures hedge against the risk of a rise in the cost of the euro, it should buy euro currency futures. If the cost of the euro goes up, the company will have to pay more to obtain the 750,000 euros, but this higher cost will be offset by a gain on the futures position.

This logic can be set out in the three-step approach described earlier, as follows:

Step		Comment
1	Identify the underlying transaction that you are trying to hedge.	The US company will be paying 750,000 Euros
2	What is the currency risk in the underlying transaction?	The cost of obtaining the Euros will go up. The cost/value of the euro will rise against the dollar.
3	Work out a futures position that creates a profit if there is a 'loss' on the underlying transaction.	If a loss will be incurred on the underlying transaction if the value of the euro goes up, the futures position should create a profit if the value of the euro goes up.
		So buy euro currency futures, since a profit will be made if the value of the euro goes up and the futures can be sold at a higher price.

The US company should therefore buy 6 December contracts (€750,000/€125,000 per contract) at a price of 1.2100. The company is therefore 'long' 6 December contracts.

Example (continued): Perfect hedge, no basis risk

Suppose the spot exchange rate in November when the US company must make the payment in Euros is 1.2240. The cost of buying the Euros has gone up.

The long' futures position is closed by selling 6 December contracts at 1.2240, because in this example the futures price is also 1.2240. The position is closed at a profit, as follows:

Open futures position: buy at	1.2100
Close position: sell at	1.2240
Gain	0.0140

Gain = 140 ticks per contract at $12.50 per tick.

Total gain on futures position = 6 contracts × 140 ticks × $12.50 = $10,500.

The US company has to pay US1.2240 to obtain the euros to make the payment in November, but the net cost is calculated by taking the cost of the spot transaction and the gain or loss on the futures position.

$

	$
Spot market: buy €750,000 at 1.2240	918,000
Less gain on futures position	(10,500)
Net cost of €750,000	907,500

The net cost is $907,500, so the effective hedge = exchange rate secured by futures US$907,500/€750,000

= US$1.2100/€1.

This is the spot rate and the futures price at the time the position was opened. **Conclusion**

With a perfect hedge and no basis, futures can therefore fix the effective exchange rate at the spot rate when the hedge was created. However, in practice, the hedge is likely to be imperfect and there is basis.

> **Example: Imperfect hedge but no basis**
>
> It is June. A UK company expects to receive US$1,000,000 from a customer in August, and wishes to hedge its currency exposure with currency futures. In this example, it is assumed that there is no basis, and the futures price and the current spot market exchange rate are always equal. The price of September futures in June is 1.8200. The value of one tick is $6.25.
>
> The exposure is to the risk of a fall in the value of the US dollar between June and August. The company will receive US dollars. It can create a hedge with futures by selling dollars and buying British pounds. The UK company should therefore buy the currency futures, which are denominated in British pounds.
>
> | **Step** | | **Comment** |
> |---|---|---|
> | **1** | Identify the underlying transaction that you are trying to hedge. | The UK company will be receiving $1 million. |
> | **2** | What is the currency risk in the underlying transaction? | The value of the dollar will fall and the income will be worth less in sterling. Futures are denominated in sterling, so it is better to state that the risk is that the value of sterling will increase. |
> | **3** | Work out a futures position that creates a profit if there is a 'loss' on the underlying transaction. | If a loss will be incurred on the underlying transaction if the value of sterling goes up, the futures position should create a profit if the value of sterling goes up. |
> | | | So buy sterling currency futures, since a profit will be made if the value of sterling goes up and the futures can be sold at a higher price. |
>
> At a rate of 1.8200, the sterling equivalent of $1,000,000 is £549,451. Each futures contract is for £62,500, therefore the company would want to buy 8.79 contracts. The company will probably decide to buy 9 contracts, although the hedge is imperfect.

Example (continued): Imperfect hedge but no basis

Suppose that in August when the dollars are received, the dollar has actually strengthened in value and the exchange rate is 1.7800 (and the futures price is also 1.7800). The company will sell the $1,000,000 and close its futures position. The position for the company is as follows:

Open futures position: buy at	1.8200
Close position: sell at	1.7800
Loss	0.0400

Loss = 400 ticks per contract at $6.25 per tick.

Total loss on futures position = 9 contracts × 400 ticks × $6.25 = $22,500.

	$
Received from customer	1,000,000
Loss on futures	(22,500)
Net receipt in dollars	977,500
Sell dollars at 1.7800 (spot rate)	
Income in British pounds	£549,157

Effective exchange rate secured by futures hedge = US$1,000,000/£549,157 = $1.8210/£1.

This is close to the spot rate and futures price at the time the position was opened. Ignoring basis, the futures hedge has therefore fixed the effective exchange rate close to the spot rate and futures price when the hedge was created. However, in this example, the exchange rate moved favourably, and the gain from the increase in value of the dollar income was offset by a loss on the futures position.

Example: imperfect hedge and basis

A Netherlands company expects to pay US$1,200,000 to a US supplier in late November. It is now late July, and the current spot exchange rate is €1 = $1.2200. The current spot price for December dollar-euro currency futures is $1.2170. The company wants to hedge its exposure with currency futures.

The logic of establishing a hedge with currency futures can be set out in the three- step approach described earlier, as follows.

Step		Comment
1	Identify the underlying transaction that you are trying to hedge.	The European company will be paying $1.2 million.
2	What is the currency risk in the underlying transaction?	The cost/value of the dollar will increase and the cost in Euros will rise. Futures are denominated in Euros, so it is better to state that the risk is that the value of the euro will fall.
3	Work out a futures position that creates a profit if there is a 'loss' on the underlying transaction.	If a loss will be incurred on the underlying transaction if the euro falls in value, the futures position should create a profit if the value of the euro falls.
		So sell Euro currency futures, since a profit will be made if the value of the euro falls and the futures position can be closed by buying euro futures at a lower price than the futures were originally sold.

The company will sell futures to create a 'short position' to hedge the currency risk.

The equivalent value of $1,200,000 at the current futures price is 986,031 Euros ($1,200,000/1.2170).

The number of contracts required is therefore 7.9 contracts (€986,031/€125,000 per contract).

The company will probably create the hedge with 8 contracts (by selling 8 December futures).

In this example, the basis is 30 points in July (1.2200 – 1.2170). The December futures contract reaches settlement in five months' time, therefore basis should fall by 6 points each month (30 basis points/5 months).

By the end of November, four months later, the basis should therefore have fallen by 24 points, from 30 to 6.

Example: imperfect hedge and basis

Suppose that in November when the dollars are paid, the spot rate has moved to 1.2040 and the futures price is 1.2030. (The actual basis is 10.) The company will close its futures position.

Open futures position: sell at	1.2170
Close position: buy at	1.2030
Loss	0.0140

Gain = 140 ticks per contract at $12.50 per tick.

Total gain on futures position = 8 contracts × 140 ticks × $12.50 = $14,000.

	$
Payment to customer	1,200,000
Gain on futures	(14,000)
Dollars to be purchased spot	1,186,000
Buy dollars at 1.2040 spot	
Cost in Euros	€985,050

Effective exchange rate secured by futures hedge = US$1,200,000/€985,050 = US$1.2182/€1.

This is fairly close to the spot rate and futures price at the time the position was opened. In this example, the expected basis in November was 6 points and the actual basis was 10 points, and the gain on the futures position was therefore 4 points or ticks per contract more than expected. This has affected the value of the hedge by 8 contracts × 4 ticks × $12.50 = $400.

4 SHORT-TERM INTEREST RATE FUTURES (STIRS)

Section overview

- Features of short-term interest rate futures
- Hedging short-term interest rate exposures with STIRs
- Hedging examples

4.1 Features of short-term interest rate futures

A short-term interest rate future (STIR) is a contract for the purchase and sale of a notional deposit, usually a three-month bank deposit. An examination question should give you the contract size for any STIR and the length of the deposit period.

The most commonly-traded STIRs include the following:

Contract	Underlying amount three-month deposit of:	Tick value (0.0001 of price)
Eurodollar	US$1,000,000	$25
Euribor	€1,000,000	€25
Short sterling	£500,000	£12.50

Prices

The futures price for STIRs is the annual interest rate. However, the rate is deducted from 100, which means that:

- A rate of 4% per year is indicated by a futures price of 96.0000 (100 – 4)
- A rate of 5.2175% is indicated by a futures price of 94.7825
- A price of 93.5618 represents an annual interest rate for the three-month deposit of 6.4382%.

A reason for pricing STIRs in this way is that:

- when interest rates go up, the value of a future will fall, and
- when interest rates fall, the price of the future will rise.

In this way, prices for STIRs move in the same way as cash market prices for bonds and other interest products.

4.2 Hedging short-term interest rate exposures with STIRs

STIRs can be used to hedge exposures to the risk of a rise or fall in short-term interest rates. Using short-term interest rate futures is similar to using currency futures to hedge a currency exposure. However, the following rules need to be applied.

- If the aim is to hedge against the risk of an increase in the short-term interest rate, the hedge is created by **selling futures**. If the interest rate does go up, futures prices will fall, and there will be a profit on the short position in STIRs

❑ If the aim is to hedge the risk of a fall in the short-term interest rate, the hedge is created by **buying futures**.

Short-term interest rate futures are futures for three-month deposits. If a company wishes to hedge an interest rate risk for a different interest period, such as two months, four months or six months, the number of futures to create the hedge should be adjusted by a factor: (Interest period to be hedged/3 months).

Example: Number of futures for the hedge

It is now the end of October. A company expects to borrow $5 million for six months from February, in four months' time and is concerned about the risk of a rise in the Eurodollar interest rate. It decides to hedge the exposure with Eurodollar futures. Each Eurodollar future is for a three-month deposit of $1,000,000.

The company will hedge the position by selling March futures. The number of contracts required for the hedge for a six-month loan is:

$$\frac{\$5,000,000}{\$1,000,000 \, per contract} \times \frac{6months}{3months} = 10 contracts$$

If changes in the three-month interest rate and changes in the six-month interest rate are similar during the period that the hedge is in place, hedging with three-month STIRs will be an effective method of hedging exposures to movements in the six-month interest rate.

Example: Number of futures for the hedge

It is now the end of July. A company expects to borrow £10.5 million for two months from the end of October, in three months' time and is concerned about the risk of a rise in the sterling interest rate. It decides to hedge the exposure with sterling futures. Each future is for a three-month deposit of £500,000.

The company will hedge the position by selling November futures. The number of contracts required for the hedge for a two-month loan is:

$$\frac{\$10,500,000}{£500,000 \, per contract} \times \frac{2months}{3months} = 14 contracts$$

4.3 Hedging examples

Perfect hedge, no basis (3m)

> **Example: Perfect hedge, no basis**
>
> A company will need to borrow 8 million Euros from the end of May. It is now January.
>
> The company is concerned about the risk of a rise in the Euribor rate (the benchmark interest rate for the euro) and it wishes to hedge its position with futures.
>
> The current spot Euribor rate is 3.50% (for both three months and six months) and the current June Euribor futures price is the same, 96.50.
>
> The value of 1 tick for a Euribor futures contract is €25 (€1,000,000 × 0.0001 × 3/12).
>
> **Required**
>
> (a) How should the company hedge its interest rate exposure if it plans to borrow the 8 million Euros for three months?
>
> (b) Suppose that in May when the company borrows the 8 million Euros, the three-month and six-month spot Euribor rate is 4.25% and the June futures price is the same, 95.75 (100 – 4.25). Calculate the effective annual interest rate that the company has secured with its futures hedge if it borrows the 8 million Euros for three months.

Answer

The exposure is to the risk of a rise in the Euribor rate. Therefore the company should sell 8 June Euribor futures (€8,000,000/€1,000,000 per contract) if it is hedging a three-month loan exposure.

In May, the futures position will be closed. The selling price is 95.75.

Open futures position: sell at	96.50
Close position: buy at	95.75
Gain	00.75

Gain = 75 ticks per contract at €25 per tick.

Total gain on futures position = 8 contracts × 75 ticks × €25 = €15,000. The company

will borrow 8 million Euros at 4.25%.

	Hedging the three-month rate
	€
Interest cost: €8 million × 3/12 × 4.25%	85,000
Interest cost: €8 million × 6/12 × 4.25% Less gain on futures position	(15,000)
Net effective cost	70,000

The net effective cost can be converted into an effective annual interest rate that has been achieved by the hedge with futures.

Net effective interest rate for hedge of three-month rate =

$$\left(\frac{70,000}{8,000,000}\right) \times \frac{12}{3} = 0.035 \text{ or } 3.50\%.$$

Given a perfect hedge and no basis, the hedge fixes the effective interest rate at the interest rate when the futures position was opened.

Perfect hedge, no basis (6m)

> **Example: Perfect hedge, no basis**
>
> A company will need to borrow 8 million Euros from the end of May. It is now January.
>
> The company is concerned about the risk of a rise in the Euribor rate (the benchmark interest rate for the euro) and it wishes to hedge its position with futures.
>
> The current spot Euribor rate is 3.50% (for both three months and six months) and the current June Euribor futures price is the same, 96.50.
>
> The value of 1 tick for a Euribor futures contract is:
>
> €25 (€1,000,000 × 0.0001 × 3/12).
>
> **Required**
>
> (a) How should the company hedge its interest rate exposure if it plans to borrow the 8 million Euros for six months.
>
> (b) Suppose that in May when the company borrows the 8 million Euros, the three-month and six-month spot Euribor rate is 4.25% and the June futures price is the same, 95.75 (100 – 4.25). Calculate the effective annual interest rate that the company has secured with its futures hedge if it borrows the 8 million Euros for six months.

Answer

The exposure is to the risk of a rise in the Euribor rate. Therefore the company should sell 16 June contracts (8 contracts × 6 months/3 months) if it is hedging a six-month loan exposure.

In May, the futures position will be closed. The selling price is 95.75.

Open futures position: sell at	96.50
Close position: buy at	95.75
Gain	00.75

Gain = 75 ticks per contract at €25 per tick.

Total gain on futures position = 16 contracts × 75 ticks × €25 = €30,000. The company

will borrow 8 million Euros at 4.25%.

	Hedging the six-month rate
	€
Interest cost: €8 million × 3/12 × 4.25%	
Interest cost: €8 million × 6/12 × 4.25%	170,000
Less gain on futures position	(30,000)
Net effective cost	140,000

The net effective cost can be converted into an effective annual interest rate that has been achieved by the hedge with futures.

Net effective interest rate for hedge of six-month rate =

$$\left(\frac{140,000}{8,000,000}\right) \times \frac{12}{6} = 0.035 \text{ or } 3.50\% .$$

Given a perfect hedge and no basis, the hedge fixes the effective interest rate at the interest rate when the futures position was opened.

Imperfect hedge, no basis

Example: imperfect hedge and no basis

A UK company will need to borrow £4.75 million for three months from the beginning of September. It is now April. The company is concerned about the risk of a rise in the LIBOR rate and wishes to hedge its position with futures. The current spot three-month LIBOR 5.45% and the current futures price is the same, 94.55.

Required

How should a hedge for the interest rate exposure be created, and what will be the effective interest rate for the loan from September if the spot LIBOR rate is 5.14% in early September and the September futures price is the same, 94.86?

The value of one tick for a 'short sterling' future is £12.50 (£500,000 × 0.0001 × 3/12).

Answer

The exposure is to the risk of a rise in the LIBOR rate; therefore the company should sell September short sterling futures. The number of contracts to sell is
9.5 contracts (£4.75 million/£500,000 per contract).. The company should sell either 9 or 10 futures, but the hedge will be imperfect. In this example, the company sells 10 September contracts.

The selling price in April is 94.55. In early September, the futures position will be closed.

Open futures position: sell at	94.55
Close position: buy at	94.86
Loss	00.31

Loss = 31 ticks per contract at £12.50 per tick.

Total loss on futures position = 10 contracts × 31 ticks × £12.50 = £3,875 The company will

borrow £4.75 million for three months at 5.14%.

	£
Interest cost: £4.75 million × 3/12 × 5.14%	61,037.50
ADD: loss on futures position	3,875.00
Total effective cost	64,912.50

Effective interest rate for hedge of three-month rate

$$= \left(\frac{64{,}912.50}{4{,}750{,}000} \right) \frac{12}{3} = 0.0547 \text{ or } 5.47\%$$

Given an imperfect hedge and no basis, the hedge fixes the effective interest rate at a rate close to the interest rate when the futures position was opened (5.45%).

Perfect hedge and basis

Example: perfect hedge and basis

A company will need to borrow US$20 million for three months from the end of October. It is now the end of June. The company is concerned about the risk of a rise in the US$ LIBOR rate and wishes to hedge its position with futures. The current spot three-month US$ LIBOR is 4.30% and the current December Eurodollar futures price is 96.30.

The value of 1 tick for a Eurodollar future is $25.

Required

How should a hedge for the interest rate exposure be created, and what will be the effective interest rate for the loan from October if the spot US$ LIBOR rate is 4.10% and the December futures price at this date is 96.06?

Answer

The exposure is to the risk of a rise in the US$ LIBOR rate; therefore the company should sell December Eurodollar futures. The number of contracts to sell is $20 million/$1,000,000 per contract = 20 contracts.

The selling price at the end of June is 96.30. The current spot three-month interest rate is 4.30%, equivalent to 95.70. The basis is therefore 60 points. This should be expected to reduce in size by 10 points each month in the six months between the end of June and the end of December when the futures reach their settlement date.

By the end of October when the futures position is closed 4 months later, the expected basis should be 20 points. (This is 60 points minus (4 months × 10 points per month.)

At the end of October, the futures position will be closed.

Open futures position: sell at	96.30
Close position: buy at	96.06
Gain	00.24

Gain = 24 ticks per contract at $25 per tick.

Total gain on futures position = 20 contracts × 24 ticks × $25 = $12,000. The company will borrow $20 million for three months at 4.10%.

	$
Interest cost: $20 million × 3/12 × 4.10%	205,000
Less: Gain on futures position	(12,000)
Net effective cost	193,000

Effective interest rate for hedge of three-month rate $= \left(\dfrac{193{,}000}{20\,\text{million}} \right) \times \dfrac{12}{3}$

= 0.0386 or 3.86%.

At the end of October, the actual basis is 16 points, because the spot three-month rate is 4.10% (95.90) and the futures price is 96.06. (96.06 – 95.90 = 0.16 or 16 points).

The value of 16 points or ticks on the futures position would be 20 contracts × 16 ticks × $25 = $8,000. This represents an effective interest rate on borrowing $20 million for three months of [($8,000/$20 million) × (12/3) =] 0.0016 or 0.16%. This is the difference between the effective interest rate secured by the futures position and the interest rate in the futures contract when the position was opened in June (3.70%).

Conclusion

The effectiveness of a hedge is reduced when the hedge is imperfect and because of basis and basis risk.

Perfect hedge and basis

> **Example: perfect hedge and basis**
>
> A company will need to borrow £60 million for four months from the end of April. It is now the end of November. The company is concerned about the risk of a rise in the LIBOR rate and wishes to hedge its position with futures. The current spot three-month LIBOR is 5.50% and the current June sterling interest rate futures price is 94.85. The company is able to borrow at LIBOR + 0.75%.
>
> One tick is 0.01% and the value of a tick is £6.25. The nominal three-month deposit in a sterling futures contract is £500,000.
>
> **Required**
>
> (a)   How should a hedge for the interest rate exposure be created?
>
> (b)   What will be the expected effective interest rate for the loan from the end of April? The expected basis at the close-out date should be estimated, but basis risk should be ignored for the purpose of this example.
>
> (c)   What will be the actual effective cost of borrowing the £60 million at the end of April if LIBOR at that time is 5.75%?

> **Answer**
>
> (a)   The exposure is to the risk of a rise in the LIBOR rate; therefore the company should sell June futures. The number of contracts to sell is:
>
> $$\frac{£60 \text{ million}}{£500,000 \text{ per contract}} \times \frac{4 \text{ months}}{3 \text{ months}} = 160 \text{ contracts}$$
>
> The company should sell 160 June STIRs at 94.85, which 'fixes' the interest rate at 5.15% for the end of June.
>
> (b) Basis at the end of November is the difference between the futures price (94.85) and the LIBOR spot rate (5.5% or 94.50). Basis is therefore 35 points (94.85 – 94.50).
>
> There are seven months from the end of November to settlement of the futures contract at the end of June, so basis is expected to fall at the rate of 5 basis points (0.05) per month. By the end of April when the futures position will be closed, expected basis is 0.10 (2 months × 0.05) and the futures price is expected to be higher by the spot rate by this amount.
>
> Selling the futures contracts therefore 'fixes' the LIBOR interest rate at a rate close to 5.25% for the end of April (the 5.15% in the futures price plus the expected basis of 0.10%).
>
> Since the company can borrow at LIBOR + 0.75% the total effective borrowing rate for the four months that the company hopes to 'lock in' with the futures – given no basis risk – is 5.25% + 0.75% = 6.00%.

Answer (continued)

(c)   If the spot LIBOR rate at the end of April is 5.75% or 94.25, the expected futures price will be 94.35 (10 basis points higher, given no basis risk).

The futures position will be closed as follows:

	%
	%
November: sell at	94.85
April: buy to close at	94.35
Profit	0.50

Profit per contract = (0.50/0.005 per tick) × £6.25 per tick = £625. Profit on 160 contracts = £625 × 160 = £100,000.

The company will borrow £60 million for 4 months at an interest rate of 6.50% (LIBOR + 0.75%).

The interest cost of the loan will be £60 million × 6.50% × 4/12 = £1,300,000.

£

Interest cost of loan	1,300,000
Gain on futures position	(100,000)
Net borrowing cost	1,200,000

The effective net interest cost is £1,290,000. On a loan of £60 million for four months, this represents an effective interest rate of:

$$\frac{£1,200,000}{£60 \text{ million}} \times \frac{12}{4} = 6.00\%$$

This actual effective borrowing rate of 6.00% is the same as the expected effective borrowing rate calculated in part (b).

5 CHAPTER REVIEW

Chapter review
Before moving on to the next chapter, check that you now know how to: ■ Explain how futures are used to hedge risk ■ Explain how interest rate futures are used to hedge interest rate risk ■ Use interest rate futures to hedge interest rate risk ■ Explain how foreign currency futures are used to hedge foreign exchange risk ■ Use foreign currency futures to hedge foreign exchange risk

CHAPTER

29

Hedging with options

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

E		Management of financial risks	
	1	Assess and advise on:	
		e	The appropriate derivative instruments for hedging foreign currency risks, (forward contracts, futures contracts, **currency options** and currency swaps)
		f	The appropriate derivative instruments for hedging interest rate risk, (forward interest rate agreement, interest rate futures, **interest rate options**, interest rate swaps)

Exam context

This chapter explains how options can be used to hedge interest rate and currency exposures

By the end of this chapter, you should be able to:

- ■ Define and explain the terminology used when talking about options

- ■ Explain how options can be used to hedge foreign exchange risk

- ■ Use options to hedge foreign exchange risk

- ■ Explain how options can be used to hedge interest rate risk

- ■ Use options to hedge interest rate risk

- ■ Explain caps, floors and collars

1   FEATURES OF OPTIONS

Section overview

- Definition of an option
- Financial options, commodity options and real options
- Call options and put options
- Expiry date: American, European and Bermudan options
- OTC and exchange-traded options

1.1   Definition of an option

An option is something that gives its holder the right, but not the obligation, to take a particular course of action at some time in the future. Typically, an option gives its holder the right, but not the obligation, either to buy or to sell a quantity of a particular item on or before a specified date in the future, at a price that is fixed in the contract.

1.2   Financial options, commodity options and real options

There are different types of option.

- A **financial option** is a contract that gives its holder the right, but not the obligation, either to buy or to sell a quantity of a financial item on or before a specified date in the future, at a price that is fixed in the contract. There are financial options in currencies, interest rates, share prices and stock index values. For example, an option in shares of company Z might give its holder the right to sell 1,000 shares in company Z on 31st March at a price of ₦100 per share.

- With a **commodity option**, the option holder has the right to buy or sell a quantity of a specified commodity, such as a quantity of wheat, or a quantity of a metal such as gold or copper.

Real options are somewhat different. Real options relate to the choices facing a company when it is considering whether to invest in a new capital project. The company has the following **choices (which are not obligations)**:

- **To make a further investment** or additional investment if the project is a success;

- **To abandon the investment** after it has been started, if it now appears that it will not be successful;

- **To wait before investing**, instead of investing immediately.

These types of option are called real options, which will be described in more detail later.

1.3 Call options and put options

Financial options are either call options or put options.

❏ A **call option** gives its holder the right to **purchase** the underlying item in the option agreement.

❏ A **put option** gives its holder the right to **sell** the underlying item in the option agreement.

For example, a call option on 1,000 shares in company Z gives its holder the right to buy 1,000 shares in company Z at the price agreed in the option contract, and a put option on 1,000 shares in company Z would give its holder the right to sell 1,000 shares in company Z at the agreed price.

1.4 Expiry date: American, European and Bermudan options

An option agreement has an expiry date, after which the option lapses and the agreement comes to an end.

❏ An American-style option can be exercised by its holder at any time on or before the expiry date.

❏ A European-style option can be exercised only at the expiry date for the option and not before.

❏ A Bermudan option can be exercised on a restricted series of dates.

The terms do not refer to the countries where these types of option are available. All three types of option agreement are made throughout the world.

For example, if a company holds an American-style call option to buy US$500,000 in exchange for euros at a rate of 1.2000 (US$/€1) with an expiry date of 20 September, the company can exercise its right to buy the $500,000 at the agreed rate at any time up to and including 20th September. However, if the option is not exercised by that date, it will lapse (cease to exist).

1.5 OTC and exchange-traded options

Some financial options are arranged directly between buyer and seller. Directly- negotiated options are called over-the-counter options or OTC options. Examples of OTC options include borrowers' and lenders' options, caps, floors and collars. Currency options might also be arranged in OTC agreements.

Some options are traded on an exchange. Traded share options and some currency options are exchange-traded. In addition, there are options on futures contracts, and all options on futures are traded on the futures exchange where the underlying futures are traded.

2 BUYING AND SELLING (WRITING) OPTIONS

Section overview

- Exercise price or strike price
- Rights and obligations of buyer and seller
- Option premium = option price
- Options: a zero-sum game
- Exercising options

2.1 Exercise price or strike price

The exercise price for an option is the price at which the holder can:

❑ Buy the underlying item, in the case of a call option, or

❑ Sell the underlying item, in the case of a put option.

With OTC options, the exercise price is agreed between the option buyer and the option seller. With exchange-traded options, options are available for buying or selling at a limited range of fixed strike prices, and buyers and sellers agree on the price at which they will make a transaction in the options at one of these prices.

For example, the following table shows exercise prices that might be available on the CME exchange for US dollar/euro currency options on a day in the past, and the prices of the most recent transactions in those options.

Illustration: Option prices

	CALLS			PUTS		
Expiry:	Sep	Dec	Mar	Sep	Dec	Mar
Strike price:						
12200	0.34	2.03	3.22	1.62	3.15	3.91
12300	0.18	1.62	2.81	2.16	3.53	4.49
12400	0.09	1.33	2.44	3.06	4.20	5.12
12500	0.04	1.18	2.11	3.66	4.90	-

Notes

(a) A strike price of 12200 indicates an exchange rate of €1 = $1.2200.

(b) At this date, currency options were being traded at just four strike prices, for expiry dates in September, December and March.

2.2 Rights and obligations of buyer and seller

Options are bought and sold. The seller of an OTC option is often called the **option writer**. Selling an OTC option is often called 'writing an option'. For exchange-traded options, it is more usual to refer to 'sellers' of options, who have a short position in the options.

❑ The option buyer or option holder has the right to exercise the option but is not obliged or contractually required to do so.

❑ On the other hand, the seller or writer of the option is contractually obliged to sell or buy the underlying item if the option is exercised by its holder.

2.3 Option premium = option price

Options are bought and sold at a price, which is called the option premium. This is paid by the buyer of the option to the option seller/writer when the option agreement is made. The option writer therefore receives the premium no matter whether the option is subsequently exercised or not.

The table of currency options above shows current prices for US dollar/euro traded currency options. For example, September call options at a strike price of $1.22 in $/€ were being traded at a price of 0.34. In this particular example, this premium price is stated in US cents per euro. Each traded option on the CME exchange is for 125,000 euros in exchange for US dollars, and the cost of one September call option was therefore $425 (125,000 × $0.0034).

Similarly, the premium for a December put option at a strike price of $1.25 was $6,125 (125,000 × $0.0490).

2.4 Options: a zero-sum game

Dealing in options is sometimes described as a zero-sum game between the option buyer and the option seller. Any gain for the buyer is matched by an equal loss for the seller. Similarly, any gain for the seller is matched by an equal loss for the buyer. The combined sum of their profits and losses is always zero.

Example: Options

A company buys a European-style call option on 1,000,000 euros at a strike price of 1.2500 (US$/€1).

The option premium is 2.4 US cents per euro, therefore the cost of the option is $24,000.

What would be the net gain or loss for the option buyer and the option writer if the exchange rate at expiry is:

(a) $1.2350 = €1,

(b) $1.2670 = €1, and

(c) $1.2930 = €1.

Answer

(a) The option will not be exercised, because it is cheaper to buy the 1 million Euros at the spot market price of $1.2350. The option will lapse.

(b) The option will be exercised, because it is cheaper to buy Euros at the strike price of $1.2500 than the spot rate of $1.2670.

(c) The option will be exercised because it is cheaper to buy Euros at the strike price of $1.2500 than the spot rate of $1.2930.

Option buyer	(a) spot price 1.2350	(b) spot price 1.2670	(c) spot price 1.2930
		$	$
Spot price	Not	1.2670	1.2930
Exercise price	exercised	1.2500	1.2500
Gain from exercising option (per €1)		0.0170	0.0430
	$	$	$
Total gain on option (€1,000,000)	0	17,000	43,000
Cost of option	(24,000)	(24,000)	(24,000)
(Loss)/gain to the buyer	(24,000)	(7,000)	19,000

The **option writer** would make a gain of $24,000 if the spot rate at expiry is $1.2350, a net gain of $7,000, if the spot rate is 1.2670 and a net loss if the spot rate is 1.2930.

2.5 Exercising options

Terminology

Options are in-the-money, at-the-money or out-of-the-money.

❑ An option is **in-the-money** when its exercise price (strike price) is more favourable to the option holder than the current market price of the underlying item.

❑ An option is **at-the-money** when its exercise price (strike price) is exactly equal to the current market price of the underlying item.

❑ An option is **out-of-the-money** when its exercise price (strike price) is less favourable to the option holder than the current market price of the underlying item.

An option will only be exercised if it is in-the-money.

When an option is exercised, the value of the option is the difference between the exercise price and the current market price of the underlying item.

Exercising call options

A call option will only be exercised if the market price of the underlying item is higher than the exercise price for the option. For example, a European call option on 1,000 shares in company Z with a strike price of ₦100 per share will only be exercised if the market price of the share is above ₦100 at expiry.

Exercising put options

Similarly, a put option will only be exercised if the market price of the underlying item is lower than the exercise price for the option. For example, a European put option on 2,000 shares in company XY with a strike price of ₦80 per share will only be exercised if the market price of the share is below ₦80 at expiry.

3   HEDGING WITH OPTIONS

Section overview

- Main features of hedging with options
- Creating a hedge

3.1   Main features of hedging with options

Financial options can be used to hedge exposures to the risk of adverse movements in exchange rates, interest rates, bond prices and share prices. Hedging with options differs from hedging with forward contracts, money market hedges, FRAs and futures, in several important ways.

❑   The hedge has a cost. A hedge should normally be created by buying options rather than selling/writing options, and the option buyer must pay the premium to obtain the options to create the hedge.

❑   An option does not have to be exercised. It will only be exercised if it is in-the-money. If it is out-of-the-money, the option holder will let the option lapse and buy or sell the underlying item in the cash market, at the more favourable market price. This means that an option holder can use the options as a protection against adverse movements in the market rate, but can take advantage of any favourable movement in the market rate.

> **Example: Hedging with options**
>
> An investor holds 5,000 shares in another company, XYZ, which have a current market price of $6.00. The investor will want to sell the shares in a few months' time, in April, but not before then. He is concerned that the share price might fall between now and April, but is also aware of the possibility that it could rise.
>
> The investor can hedge the exposure to market risk (share price risk) by purchasing a put option on 5,000 shares in XYZ, for expiry in April. Suppose the strike price of the option is $6.00, so that the option is at-the-money when written.
>
> If the share price falls below $6.00 before April, say to $5.50, the investor can exercise the option and sell at the strike price of $6.00.
>
> On the other hand, if the share price rises above $6.00, say to $7.00, he can let the option lapse and sell the shares at the market price of $7.00.

3.2   Creating a hedge

The **rule for creating a hedge with options** is as follows:

❑   To hedge against the risk of a rise in the price of the underlying item, buy call options

❑   To hedge against the risk of a fall in the price of the underlying item, buy put options

4 CURRENCY OPTIONS

Section overview

- ■ Features of currency options
- ■ Hedging with currency options
- ■ Gains or losses on options and the effective exchange rate
- ■ Imperfect hedges

4.1 Features of currency options

The main features of currency options have already been described.

❑ A currency option gives its holder the right to buy (call option) or sell (put option) a quantity of one currency in exchange for another, on or before a specified date, at a fixed rate of exchange (the strike rate for the option).

❑ Currency options can be purchased over-the-counter or on an exchange. Currency options are traded on some exchanges, notably the Philadelphia Stock Exchange, and options on currency futures are traded on the CME exchange in Chicago.

❑ Traded currency options are for a standard quantity of one currency in exchange for another currency, and strike prices are quoted as exchange rates. The premiums are normally quoted as an amount in one currency per unit of the other currency. For example, traded options on currency futures for US$ - £ are for £62,500 and are priced in US cents per £1.

4.2 Hedging with currency options

The rules for using exchange-traded currency options to hedge an exposure to currency risk are as follows:

❑ Establish what the exposure is. The company will have a future intention or obligation to buy or sell a quantity of currency in exchange for another. Establish whether the currency will be bought or sold, how much will be bought or sold, and when.

❑ Decide whether a call option or a put option is required to hedge the exposure.

❑ Decide on the strike price for the option. For exchange-traded options, there will normally be a small range of strike prices to choose from.

❑ Calculate how many option contracts must be purchased to create the hedge.

> ### Example: Currency option
>
> A US company expects to pay 1 million Euros to a supplier in Belgium. It is now November and the payment is due in March. The company wants to use currency options to hedge the exposure. Each currency option is for 125,000 Euros.
>
> The company will need to buy Euros to make the payment to the supplier; therefore it wants to hedge against the risk of a rise in the value of the Euro (= a fall in the value of the dollar). The company should therefore buy call options.
>
> We shall suppose that the company chooses a strike price of 1.2400 (US\$/€1) for the options, and that the premium for a March call option at this strike price is 3.43 US Cents per Euro.
>
> The company should buy 8 call option contracts (€1,000,000/€125,000 per contract). The cost of the premium will be \$34,300 (1,000,000 × \$0.0343).

4.3 Gains or losses on options and the effective exchange rate

The effective exchange rate that is obtained from a hedge with options on currency futures depends on what happens when the settlement date arrives, and whether the option is exercised or not.

The following example illustrates this point:

> ### Example:
>
> Continuing the previous example, a US company expects to pay €1 million at the end of March and buys 8 call options on March euro currency futures at a strike price of 1.2400.
>
> We can look at the position of the US company if the spot exchange rate (US\$/€1) in March is:
>
> (a)   \$1.2000
>
> (b)   \$1.2200
>
> (c)   \$1.2500
>
> (d)   \$1.2800
>
> (e)   \$1.3000

Answer

The call option will be exercised if the futures price at the end of March is over 1.2400. At the end of March when the futures contract reaches settlement, the futures settlement price should be the current spot exchange rate.

Spot rate at expiry

	1.2000 Do not exercise	1.2200 Do not exercise	1.2500 Exercise	1.2800 Exercise	1.3000 Exercise
	$	$	$	$	$
Cost of buying €1 million	1,200,000	1,220,000	1,240,000	1,240,000	1,240,000
Cost of premium	34,300	34,300	34,300	34,300	34,300
Total cost	1,234,300	1,254,300	1,274,300	1,274,300	1,274,300
Effective exchange rate	$1.2343	$1.2543	$1.2743	$1.2743	$1.2743

The hedge has enabled the company to fix a maximum effective exchange rate of $1.2743 for buying the Euros, but at the same time allowing the company to obtain a lower effective exchange rate if the spot price is below the strike price, and the option is not exercised.

4.4 Imperfect hedges

When a hedge is created with exchange-traded currency options, the hedge is often imperfect, for reasons similar to those already explained for hedging with futures.

When a hedge with exchange-traded currency options is imperfect, and the options are exercised, the un-hedged or over-hedged amount of currency should be bought for sold in the spot currency market, at the spot rate, at the same time that the options are exercised.

Example: Imperfect hedge

A company in Belgium expects to pay US$2 million to a supplier in Arabia. It is now November and the payment is due in March. The current spot rate is 1.2100. The company wants to use currency options to hedge the exposure. Each currency option is for 125,000 Euros and the value of 1 tick (0.0001) is $12.50.

The company will need to buy US dollars and sell Euros to make the payment to the supplier; therefore it wants to hedge against the risk of a rise in the value of the dollar and a fall in the value of the euro. Since the contracts are for Euros, the company should therefore buy put options.

We shall suppose that the company chooses a strike price of $1.2200 = €1 for the options, and that the premium for a March put option at this strike price is
2.75 US cents per Euro.

At a strike price of $1.2200, $2,000,000 is the equivalent of 1,639,344 Euros.

To hedge 1,639,344 Euros, the company needs to buy 13.1 put options (1,639,344 Euros/125,000 Euros per contract).

The company will probably buy 13 put options. The cost of the premium will be 13 contracts × 125,000 × $0.0275 = $44,687.50. The company will buy these dollars spot at $1.2100, and so the cost of buying the options (in Euros) will be
€36,931.82.

(a) The spot exchange rate moves in the option holder's favour

Suppose that the exchange rate moves in the time to expiry such that the company does not want to exercise the options to sell futures at 1.2200 because the Euro is worth more than 1.2200. In this example, suppose that the spot rate in March when the dollars must be paid is $1.2500 = €1. The company will let the option lapse and purchase the dollars spot at $1.2500. The effective exchange rate is as follows:

€

	€
Purchase $2,000,000 at $1.2500	1,600,000.00
Cost of option premium	36,931.82
Total cost	1,636,931.82
Effective exchange rate for $2 million ($2 million/€1,636,931.82)	$1.2218 = €1

Example (continued): Imperfect hedge

(b) The spot exchange rate moves adversely

Suppose that the exchange rate moves in the time to expiry such that the company wants to exercise the options. In this example, suppose that the spot rate in March when the dollars must be paid is $1.1800 = €1. The company will exercise the option to sell the 13 futures contracts at $1.2200.

	$
November: sell options at	1.2200
March: close by buying at	1.1800
Profit per contract	0.0400

Profit on futures position = 13 contracts × 400 ticks × $12.50 per tick = $65,000

	$
Payment to be made in $	2,000,000
Gain on futures	(65,000)
Dollars to be purchased at the spot rate	1,935,000

	€
Cost of buying $1,935,000 spot at 1.1800	1,639,830.51
Original cost of option premium	36,931.82
Total cost	1,676,762.33
Effective exchange rate for $2 million ($2 million/€1,676,762.33)	$1.1928 = €1

5 INTEREST RATE OPTIONS

Section overview

- Features of interest rate options
- Types of interest rate option
- Borrowers' options
- Lenders' options
- Swaptions

5.1 Features of interest rate options

An interest rate option is an option on a notional loan or deposit (or an option on an interest rate future), where the loan or deposit period begins:

❑ On the expiry date for the option for a European-style option; or

❑ On or before the expiry date for the option, for an American-style option.

The option guarantees a maximum or a minimum rate of interest for the option holder, and interest rate options are therefore sometimes called **interest rate guarantees** or **IRGs**.

❑ A call option guarantees a maximum rate of interest.

❑ A put option guarantees a minimum rate of interest.

The maximum or minimum rate of interest guaranteed by the option is the strike rate for the option, in comparison with an agreed benchmark rate of interest, such as LIBOR or Euribor.

An interest rate option is for a notional loan or deposit. If it is exercised, an actual loan or deposit is not created. Instead, the option is 'cash-settled' by a payment from the writer of the option to the option holder.

5.2 Types of interest rate option

Many interest rate options are arranged over-the-counter (OTC). These include:

❑ Borrowers' options and lenders' options; and

❑ Caps, floors and collars.

Options on interest rate futures are traded on the futures exchanges where the interest rate futures are also traded.

5.3 Borrowers' options

A borrower's option guarantees a maximum borrowing rate for the option holder. The strike rate for the option is compared with an agreed reference rate or benchmark interest rate, such as LIBOR.

❑ It the reference rate of interest is higher than the strike rate when the option reaches expiry, the option will be exercised. The option writer must make a payment to the option holder for the difference between the actual interest rate (reference rate) and the strike rate for the option.

❑ It the reference rate of interest is lower than the strike rate when the option reaches expiry, the option holder will let the option lapse.

The premium for the option might be expressed either:

❑ As an actual percentage of the notional principal amount, or

❑ As an annual rate of interest on the notional principal amount.

A borrower's option can be used to fix a maximum effective borrowing rate for a future short-term loan, but allow the option holder to benefit from any fall in the interest rate up to the expiry date for the option.

Example: Interest rate option

A company intends to borrow US$10 million in four months' time for a period of three months, but is concerned about the volatility of the US dollar LIBOR rate.

The three-month US$ LIBOR rate is currently 3.75%, but might go up or down in the next four months.

The company therefore takes out a borrower's option with a strike rate of 4% for a notional three-month loan of US$10million.

The expiry date is in four months' time. The option premium is the equivalent of 0.5% per annum of the notional principal. For simplicity, we shall suppose that the company is able to borrow at the US dollar LIBOR rate.

(a) If the three-month US dollar LIBOR rate is higher than the option strike rate at expiry, the option will be exercised. If the three-month LIBOR rate is 6%, the company will exercise the option, and the option writer will pay the option holder an amount equal to the difference between the strike rate for the option (4%) and the reference rate (6%). The payment will be based on 2% of $10 million for three months. (This payment is discounted because a borrower's option is settled at the beginning of the notional interest period, and not at the end of the interest period).

(b) If the three-month US dollar LIBOR rate is lower than the option strike rate at expiry, the option will not be exercised. For example, if the LIBOR rate after four months is 3%, the option will not be exercised and will lapse.

These possible outcomes are summarised in the table below, assuming (for the purpose of illustration) a spot LIBOR rate at the option expiry date of (a) 6% and (b) 3%.

	LIBOR rate at expiry	
	6%	3%
	Exercise the option	Do not exercise
	%	%
Borrow for three months at	6.00	3.00
Receive from option writer	(2.00)	-
Cost of option premium	0.50	0.50
Effective interest cost (% annual rate)	4.50	3.50

If the borrower can borrow at the reference rate of interest, a borrower's option sets the maximum borrowing cost at the strike rate plus the option premium cost.

5.4 Lenders' options

A lender's option guarantees a minimum deposit rate (savings rate) for the option holder. In all other respects, it is similar to a borrower's option. The strike rate for the option is compared with an agreed reference rate or benchmark interest rate, such as LIBOR.

❑ It the reference rate of interest is lower than the strike rate when the option reaches expiry, the option will be exercised. The option writer must make a payment to the option holder for the difference between the actual interest rate (reference rate) and the strike rate for the option.

❑ It the reference rate of interest is higher than the strike rate when the option reaches expiry, the option holder will let the option lapse.

5.5 Swaptions

A swaption is an option on a swap. It gives its holder the right, but not the obligation, to enter into a swap agreement at a future date, on terms that are fixed now.

Swaptions are not commonly used, particularly by companies, because of the cost of the option premium.

6 CAPS, FLOORS AND COLLARS

Section overview
■ Caps
■ Floors
■ Collars
■ Zero cost collars

6.1 Caps

Caps, floors and collars are OTC interest rate options that allow a company to hold interest rate options for a series of consecutive interest periods, instead of having to arrange a number of separate single-period borrowers' or lenders' options.

An interest rate cap is a borrower's option on a series of consecutive interest periods. For example, a company might buy a cap fixing the maximum six-month LIBOR rate at the strike rate for the option, for nine consecutive interest periods, each expiring at six-monthly intervals.

Example: Caps

A company borrows £8 million for five years from a bank at a variable rate of interest, with interest payable every six months at six-month LIBOR plus 0.50%. The LIBOR rate for the first six months of the loan is 5%, therefore the company pays interest for this first six months at 5.5%.

If the company wants to hedge the risk of a rise in the LIBOR rate for the next nine interest periods, it can arrange a cap for a notional principal amount of £8 million. It might select a strike rate of 5%. Alternatively, it might select a strike rate of 6%, because the premium would be cheaper.

Suppose the strike rate for the cap is 5%, for the next nine interest periods. The exercise dates for the cap can be arranged to coincide with the start of each six- month interest period for the loan. The cap will fix the maximum effective rate of interest on the loan for the next nine periods.

The cap fixes the maximum effective LIBOR rate at 5%.

The company will borrow at an effective maximum rate of 5.5% (strike rate + 0.50%).

However, the company has to pay the premium for the cap. This might be 1% per year of the notional principal amount. The cost of the premium would make the total maximum effective rate 6.50% peryear.

For each notional interest period of the cap, the cap operates in a very similar way to a borrower's option.

If the reference rate of interest for the interest period (LIBOR or Euribor) is higher than the strike rate for the cap, the writer of the option must make a payment to the option holder for the difference.

If the reference rate of interest for the interest period is lower than the strike rate for the cap, the option in the cap will not be exercised.

Example: Cap

Returning to the previous example, suppose that the six-month LIBOR rates at the first five exercise dates in the cap are as follows:

2nd interest period, Year 1 (1)	LIBOR = 4.0%
1st interest period, Year 2 (2)	LIBOR = 4.5%
2nd interest period, Year 2 (3)	LIBOR = 5.25%
1st interest period, Year 3 (4)	LIBOR = 5.75%
2nd interest period, Year 3 (5)	LIBOR = 6.0%

The strike rate for the cap is 5%. The outcome for each interest period will be as follows:

Interest period/ expiry date	LIBOR		Borrow at LIBOR + 0.50%	Receipt from cap	Net interest rate
(1)	4.0%	Do not exercise	4.50%	-	4.50%
(2)	4.5%	Do not exercise	5.00%	-	5.00%
(3)	5.25%	Exercise	5.75%	(0.25)%	5.50%
(4)	5.75%	Exercise	6.25%	(0.75)%	5.50%
(5)	6.0%	Exercise	6.50%	(1.00)%	5.50%

The cap therefore sets an effective interest rate of 5.50% (the strike rate + 0.50%) and also allows the option holder to benefit from a lower LIBOR rate, by choosing not to exercise the option when this rate is more favourable than the strike rate for the option. However, the effective interest rates are actually higher than in the table above, because the cost of the option premium needs to be added.

With interest rate caps (and also with floors and collars), the **payment by the option writer** when a cap is exercised is **at the end of the notional interest** period, not when the option is exercised. The payment is therefore not discounted. In the example above, the payment by the option writer for the fifth expiry date would be:

(6.00 – 5.00) % × £8 million × 6/12 = £40,000. This would be made at the end of the six-month interest period.

6.2 Floors

Interest rate floors are similar to caps, except that they are a series of successive lenders' options. They can be used to fix a minimum interest rate for a series of interest rate periods.

6.3 Collars

A major disadvantage of caps and floors is the high cost of the premiums. A company might want to hedge its exposure to the risk of a rise or fall in an interest rate for a number of consecutive interest periods, but might not want to pay the cost of the premium for the cap or the floor.

This can be done by arranging an interest rate collar.

❑   As an **alternative to a cap**, a company can arrange a collar in which it:

-    buys a cap at one strike rate, and simultaneously

-    sells a floor at a different, lower strike rate.

The effect of this collar is to fix a maximum interest cost through the mechanism of the cap, but also to fix a minimum interest cost through the mechanism of the floor.

The cost of the cap premium and the income from the sale of the floor are the net premium cost for the collar.

Collar premium = Cap premium cost – Floor premium income.

❑   Similarly, as an **alternative to a floor**, a company can arrange a collar in which it:

-    buys a floor at one strike rate, and simultaneously

-    sells a cap at a different, higher strike rate.

The effect of this collar is to fix a minimum interest income through the mechanism of the floor, but also to fix a maximum interest income through the mechanism of the cap.

The cost of the floor premium and the income from the sale of the cap are the net premium cost for the collar.

Collar premium = Floor premium cost – Cap premium income.

A collar therefore has the effect of fixing the reference rate of interest between a high and a low limit.

6.4   Zero cost collars

Even the cost of a collar can be quite high. However, it might be possible to arrange a zero cost collar. This is collar for which the premium is zero.

For example, if a collar consists of buying a cap and selling a floor, the premium value of the cap and the premium value of the floor would be equal, leaving no premium to pay for the collar.

When a zero cost collar is possible – and it is by no means always possible to arrange a collar for no cost – the strike rate for the cap and the strike rate for the collar will be very close to each other, if not the same. In effect, this would fix the interest period at a single rate for the full term of the collar, or would restrict the range between maximum and minimum interest rate to a very narrow limit.

7   CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

- Define and explain the terminology used when talking about options
- Explain how options can be used to hedge foreign exchange risk
- Use options to hedge foreign exchange risk
- Explain how options can be used to hedge interest rate risk
- Use options to hedge interest rate risk
- Explain caps, floors and collars

CHAPTER

30

Option pricing theory

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

B	Business analysis			
	1	**Evaluate and assess the value of businesses and give advice based on business scenarios by determining the value of shares and business, in a given scenario, using:**		
		e	Option-based techniques;	
	5	**Investment appraisal**		
		e	Real options in investment appraisal	
			i	Identify possible embedded real options within a project.
			ii	Advise on the value of options to delay, expand, abandon and redeploy using the Black-Scholes option pricing model.
E	Management of financial risks			
	2	Assess and apply financial options in capitalisation:		
		a	Value of call and put options using Black-Scholes option pricing model and the Binomial option pricing model; and	
		b	Option sensitivities (delta, gamma, rho, theta, and vega)	

Exam context

The subject matter of this chapter might seem to be out of place as much of it is specified in much earlier sections of the syllabus. However, the content of this chapter is perhaps the most difficult in the book so it has been decided to include this topic after you have become familiar with most of the rest of the syllabus.

This chapter explains the nature of options and the factors that influence option value. It goes on to explain the very influential Black Scholes option pricing model and how this can be applied to incorporate real options into investment appraisal.

The parts of this chapter which concern real options relate to investment appraisal decisions which were covered in chapter 4.

The parts of this chapter entitled "Further applications of the Black Scholes OPM" relate to business valuations which were covered in chapter 19.

By the end of this chapter, you should be able to:

■   Estimate the market value of a business using option based techniques

■   Use the binomial option pricing method to value options

■   Explain how the binomial option pricing method can be used to arrive at an option price

■   Explain how the Black Scholes option pricing model can be used to arrive at an option price

■   Use the Black Scholes option pricing model to value options

■   Explain put-call parity

■   Explain the nature of real options and provide examples

■   Use the Black Scholes option pricing model to value real options

■   Estimate the market value of a business using option based techniques

1 FACTORS INFLUENCING OPTION VALUES

Section overview

- Option premium and option value
- Intrinsic value and time value
- The main factors affecting time value
- The five factors affecting option prices

1.1 Option premium and option value

The option premium is the price paid by an option buyer to the option seller for an option. The premium represents the value of the option at the time it is written.

Between the time the option is written and the option's expiry date, the value of the option will change. The value will go up or down, according to changes in the likelihood that the option will be exercised, and if it is exercised, what the size of the gain for the option holder is likely to be.

Every option that has not yet expired therefore has some value, unless it is deeply out-of-the-money.

❑ The value of an option can be calculated by the option writer when the option is written, and this value is the premium charged for the option to the option buyer.

❑ The value of an option can be calculated after the option has been written but before its expiry. This is important for decision making by treasury managers and is necessary for financial reporting (IAS 39/IFRS 9 require that derivatives within the scope of the standard be measured at fair value).

The *Black-Scholes option pricing model (BSOPM)* can be used to calculate the value of a European-style call option.

The *binomial option pricing model* can be used to calculate the value of a European-style call option.

These models are explained later.

1.2 Intrinsic value and time value

The value of an option can be analysed into an intrinsic value and a time value.

Formula: Options: Components of value

Intrinsic value + Time value = Total value of the option

Only in-the-money options have intrinsic value. **Intrinsic value** is the difference between the strike price for the option and the market price of the underlying item. If an option is at-the-money or out-of-the-money, its intrinsic value is 0.

Time value is the value placed on the option that relates to the probability that the option will become in-the-money before expiry, or will become even more in- the-money before expiry, and if so by how much it is likely to be in-the-money at expiry.

1.3 The main factors affecting time value

Several factors influence the time value of an option:

❑ **The length of time remaining to expiry**. If there are two identical options with the same strike price but different times to expiry, the option with the longer time to expiry is more valuable. This is because there is more time for the option to become in-the-money, or to become even more deeply in- the-money in the period remaining to expiry.

❑ **The size of the difference between the strike price for the option and the current market price of the underlying item.** An option that is at-the- money will be worth more than a similar option that is out-of-the-money. This is because in the time remaining to expiry, an at-the-money option is more likely than an out-of-the-money option to become in-the-money. For the same reason, an option that is slightly out-of-the-money is worth more than an option that is deeply out-of-the-money.

❑ **The volatility in the market price of the underlying item**. An option is more valuable when there is higher volatility in the price of the underlying item. This is because when volatility is greater, the probability is greater that the market price will move up or down by a large amount in the remaining time to expiry of the option.

❑ **The risk-free rate of interest**. Another factor in the calculation of an option price is the risk-free rate of interest. This is included in the Black-Scholes option pricing model.

Example: Factors affecting time value

Compare the following two call options on shares:

	Option on shares of Company X	Option on shares of Company Y
Exercise price	850	750
Current market value of shares	825	500
Time remaining to expiry	1 year	3 months
Volatility of share price (annual)	35%	10%

The value of the options on shares of Company X will be worth much more than the options on shares of Company Y, even though both options are currently out-of-the-money.

The strike price on the Company X options is only 25 higher than the current market value, and the annual volatility is quite high relative to the current market price. There is also one year to the expiry date, during which time the price of the shares might rise.

The strike price on the Company Y options is much higher than the current market price, indicating that the options are deeply out-of-the-money. The share price volatility is much lower than for Company X and there are only three months to expiry of the options. It is difficult to imagine that these options will be in the money by the expiry date, and the options are probably worthless.

1.4 The five factors affecting option prices

There are five factors that affect options prices:

❑ the current price of the underlying item (such as the current market price of the share);

❑ the strike price or exercise price for the option;

❑ the volatility in the market price of the underlying item;

❑ the time remaining to expiry of the option; and

❑ the risk-free interest rate.

These five factors are all elements in the Black-Scholes option pricing model.

Information about the market value of traded options in company shares are published regularly in the financial press. The published prices indicate the significance for the option price of the current market price of the underlying, the exercise price and the time to expiry

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Example: Option price

Traded options in shares of publishing company Pearson Group were being traded at the following prices during early June, when the actual share price on the London Stock Exchange was 866 pence. Premium prices are shown in pence per share.

Expiry:	CALLS			PUTS		
	Jun	Sep	Dec	Jun	Sep	Dec
Strike price:						
860	17.5	34.0	44.5	10.0	22.0	29.5
880	8.0	23.5	33.5	21.0	32.0	39.0

Notes

(a) The premium varies with the difference between the strike price and the current market price for the shares. Call options with a higher strike price have a lower value. Put options with a higher exercise price have a higher value.

(b) Premiums vary with time to expiry. For each exercise price, the premium for both call options and put options is higher for a later expiry date.

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2 INTRODUCTION TO VALUING OPTIONS

Section overview

- Problems in valuing options
- Introduction to the binomial option pricing method
- Expected increase and decrease in share price
- Making the model more realistic
- Binomial option pricing model

2.1 Problems in valuing options

The usual valuation approach is to estimate future cash flows and discount these by the risk adjusted cost of capital that relates to these cash flows. Options cannot be valued in this way.

For example a person who buys a call option on a share has taken a position on that share without paying its full price. This is a riskier position (more variable) than a position in the underlying share.

Example: Risk of option on a share being greater than the risk of the share

		Increase in share price by:		Decrease in share price by:	
	Start	10%	20%	10%	20%
Share price	100	110	120	90	80
Exercise price	70	70	70	70	70
Intrinsic value	30	40	50	20	10

Percentage change in intrinsic value (from start)					
10/30 =	33.33%				
20/30 =		66.67%			
10/30 =			33.33%		
20/30 =				66.67%	

As the share price falls the option moves closer to becoming out of the money. Thus, as a share price falls, a call option on the share becomes more risky.

Day to day share prices change in an unpredictable way (following a random walk) so the risk of options change unpredictably. Therefore, a discount rate to value an option cannot be found.

It took a while for somebody to solve the problem of how to value options.

Two researchers (Black and Scholes) realised that an option could be valued by setting up an option equivalent. An option equivalent is an investment in a share or part of the share upon which the option is written together with an amount of borrowing. This is known as a *replicating portfolio*.

The value of a replicating portfolio is the same as the option value. Shares and borrowing are relatively straightforward to value and this presents a means of valuing the option.

This approach to valuing options has evolved into two valuation methods:

❑ The binomial option pricing model; and

❑ The Black Scholes option pricing model

2.2 Introduction to the binomial option pricing method

This section uses the example of a call option issued at the money (i.e. it was issued at an exercise price equal to its share price at the date of issue) to show how an option value can be calculated.

This, in turn, provides a basis for the explanation of the binomial option pricing model.

The example is based on the simplified assumptions that the option's life can be represented by a single interval and that the value of the share upon which the option is written can only take one of two values at the end of this interval. Thus, the use of the term "binomial".

It is assumed that the share value can either rise by a given percentage or fall by a given percentage. These percentages are not chosen randomly. They are a function of the standard deviation of the annual returns on the share. The percentages will be provided at first but we will show you how to calculate them later.

The option's life starts at t0 and ends at t1. There are a series of steps which must be followed to find the option value at t0. This will not make a great deal of sense to you at first but the steps will be explained with an example.

Step 1: Calculate the two possible share values at the end of the interval (t1 = the exercise date) by applying the percentage increase/decrease to the share value at the start of the interval.

Step 2: Use these values to calculate the possible payoffs on the option at the end of the interval. (These will be the possible option values at this point in time.

Step 3: Identify the spread in option values (highest less the lowest) and the spread in share values (highest less the lowest) at this point in time.

Step 4: Construct the option delta. This is the ratio of the spread in option values to the spread in share values at a point in time. The option delta is used to construct the replicating portfolio.

Step 5: Construct the replicating portfolio. This is done by assuming a portfolio constructed of a fraction of a share (1 share ◻ option delta) and the repayment of borrowing which results in the payoff from the replicating portfolio at t1 being the same as that from the option at t1.

Note that the repayment of borrowing is the amount borrowed plus interest for the period.

Step 6: The option value at t0 is found by valuing the replicating portfolio at this date. It is the value of the fraction of the share used valued at the t0 share price less the value of the amount borrowed. The amount borrowed is the present value of the borrowing repayment found at step 6.

Example: Option valuation

A person buys a call option on a share in X Plc. The following information is relevant:

Share price at the start	50
Exercise price	50
Option period	6 months
Standard deviation of the annual returns on the share	40%
Expected increase in share value over option period	32.7%
Expected decrease in share value over option period	24.6%
Annual interest rate	4%

Step 1: Possible share values at the end of 6 months (t1)

t0   ₦50

× 0.754   × 1.327   (This is called a lattice diagram)
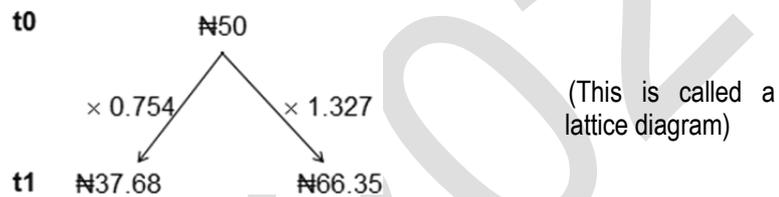
t1   ₦37.68   ₦66.35

Step 2: Payoffs based on possible share values at t1

	₦	₦
Share price	37.68	66.35
Exercise price	(50.00)	(50.00)
Payoff	nil	16.35

Step 3: Spread in option values and spread in share values at t1 Spread in option values:

$$16.35 - 0 = 16.35$$

Spread in share values: $66.35 - 37.68 = 28.67$

Step 4: Calculate the option delta at t1

Option delta   = spread in option values ÷ spread in share values

= 16.35/28.67 = 0.5703

Step 5: Construct the replicating portfolio at t1 (assumes the purchase of 0.5703 shares)

|	₦	₦
Share price	37.68	66.35
Fraction of share in replicating portfolio	0.5703	0.5703
Value of fraction of share	21.48	37.83
Borrowing repayment necessary to make the payoff equal to the amount at step 2	(21.48)	(21.48)
Payoff	nil	16.35

Example (continued): Option valuation

Step 6: Option value at t0 (by calculating the value of the replicating portfolio at t0)

	₦
Share price (50 ⃞ 0.5703)	28.52
PV of borrowing (21.48 ⃞ 1/1.02)	(21.06)
Option value at t0	7.46

2.3 Expected increase and decrease in share price

The above example provided information about the standard deviation of the annual returns on a share and also information about the expected increase and decrease in value of that share.

The expected increase and decrease in value are derived from the standard deviation using the following equation.
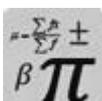
Formula: Expected value change in share price

$$u = 1 + \text{upside change} = e^{\sigma\sqrt{d}}$$

$$d = 1 + \text{downside change} = \frac{1}{u}$$

Where:

σ = Standard deviation of the annual returns on the share

d = The size of the interval (fraction of the year expressed as a proportion)

This will be demonstrated using the information provided in the previous example.

Example: Expected value change in share price

Option period	6 months
Standard deviation of the annual returns on the share	40%
Expected increase in share value over option period	32.7%
Expected decrease in share value over option period	24.6%

u = 1 + upside change	$= e^{\sigma\sqrt{d}} = e^{0.4\sqrt{0.5}} = 1.327$
Therefore, upside change	$= 1.327 - 1 = 0.327 \text{ or } 32.7\%$
d = 1 + downside change	$= \frac{1}{u} = \frac{1}{1.327} = 0.754$
Therefore, downside change	$= 0.754 - 1 = -0.246 \text{ or } -24.6\%$

2.4 Making the model more realistic

The example at paragraph 2.2 showed how an option could be valued by assuming that there only two possible price changes by the end of the option period (which was 6 months). This is clearly not a very realistic assumption.

The calculation can be made more realistic by splitting the 6 month period into two intervals of 3 months each. Note that in this case the expected percentage increase and decrease would change. This is because the formula used to calculate these includes a function for the length of the interval.

The calculation can be made more realistic still by splitting the 6 month period into six intervals of 1 month each and more realistic again by splitting it into 183 intervals of a day. Each change in interval size would require a recalculation of the expected increase and decrease in share price for that interval.

Splitting the option period into a greater number of intervals results can be represented by lattice diagrams which increase in complexity as the number of intervals increase.

Illustration: Lattice diagrams for an option with a 6 month life

2 × 3 months
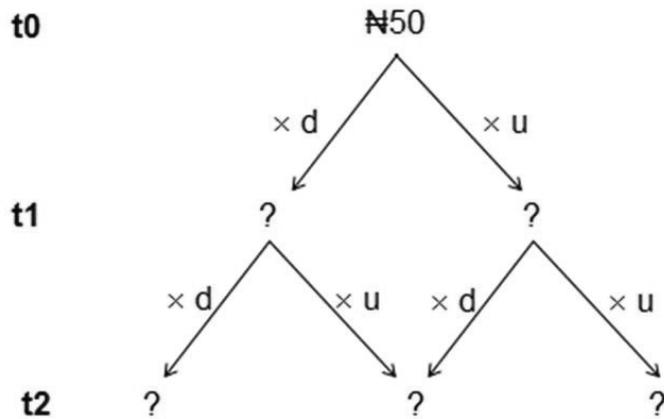
6 × 1 month
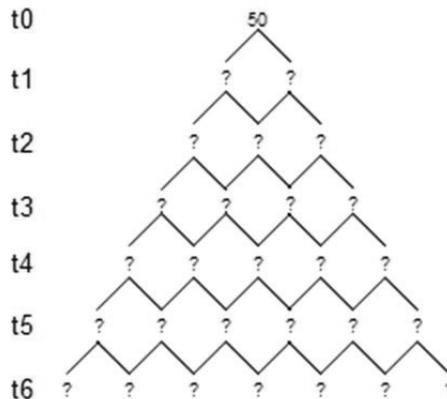
2.5 Binomial option pricing model

The calculation of an option value at the start of the option period becomes more complicated as the period is split into a greater number of intervals.

The option valuation approach described above involves constructing a replicating portfolio at the end of a period and then calculating the value of that portfolio at the beginning of a period to give the option value.

In order to calculate the option value at the start of an interval we need to know what the option value is at the end of the period so that we can calculate the spread in option values as an input to the delta.

If the option life is split into a number of intervals this has to be done for each interval.

❑ In order to calculate the option value at t0 we need to know the option values at the end of the t1 so that we can identify the spread in option values in order to calculate the option delta in order to build the replicating portfolio.

❑ In order to calculate the option values at t1 we need to know the option values at the end of the t2 so that we can identify the spread in option values in order to calculate the option delta in order to build the replicating portfolio which can then be used to provide an option value at t1 which can be used to find the spread in option values at t1 in order to build a replicating portfolio at t1

This is quite but is represented diagrammatically below.

Illustration: Valuation process with more than one interval.

Consider on option's life split into 2 intervals.

The following process is necessary in order to find the option value at t0.

> Find the spread of option values at t2
> ↓
> Calculate the option delta at t2
> ↓
> Construct the replicating portfolio at t2
> ↓
> Find the option value at t1
> ↓
> Find the spread of option values at t1
> ↓
> Calculate the option delta at t1
> ↓
> Construct the replicating portfolio at t0
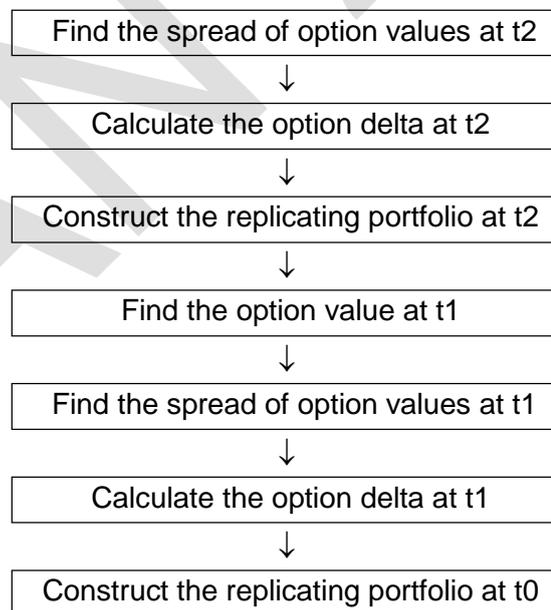
In other words, the valuation must proceed backwards through the lattice. This involves finding the spread of option prices at each point based on the possible share prices.

This becomes more complicated as the number of intervals increases, but computer programmes are available to perform the calculations.

Example: Option valuation

A person buys a call option on a share in X Plc.

The following information is relevant:

|	
Share price at the start	50
Exercise price	50
Option life	6 months
Number of intervals	2 × 3 months
Standard deviation of the annual returns on the share	40%
Annual interest rate	4%

Step 1: Estimate u and v

u = 1 + upside change $\qquad = e^{\sigma\sqrt{d}} = e^{0.4\sqrt{0.25}} = 1.221$

Therefore, upside change $\quad = 1.221 - 1 = 0.221 \text{ or } 22.1\%$

d = 1 + downside change $\quad = \dfrac{1}{u} = \dfrac{1}{1.221} = 0.819$

Therefore, downside change $\quad = 0.819 - 1 = -0.181 \text{ or } -18.1\%$

Step 2: Possible share values at end of the intervals
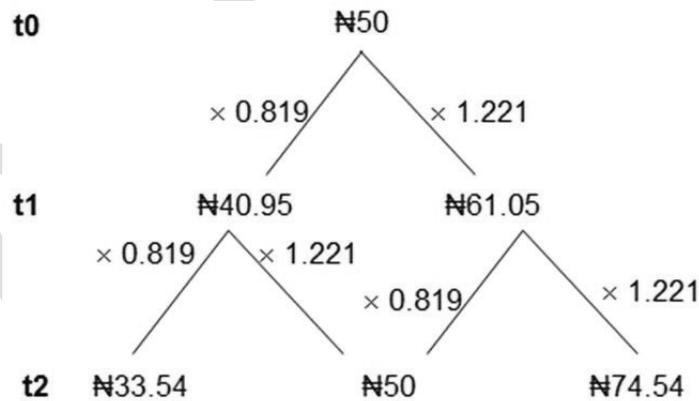
Step 3: Payoffs at the end of the last interval (t2)

	₦	₦	
Share price	33.54	50.00	74.54
Exercise price	(50.00)	(50.00)	(50.00)
Payoff	nil	16.35	24.54

Example (continued): Option valuation

Step 4: Spread in option values and spread in share values at t2 If share price is 61.05 at t1 the spreads at t2 are as follows:

Spread in option values:	24.54 ◻ 0 = 24.54
Spread in share values:	74.54 ◻ 50.00 = 24.54

Step 5: Calculate the option delta at t2

If share price is 61.05 at t1 the delta value at t2 is as follows:

Option delta	= spread in option values ÷ spread in share values
	= 24.54/24.54 = 1.0

Step 6: Construct the replicating portfolio at t2

If share price is 61.05 at t1 the replicating portfolio at t2 is as follows:

	₦	₦
Share price	50.00	74.54
Fraction of share in replicating portfolio	1.00	1.00
Value of fraction of share	50.00	74.54
Borrowing repayment necessary to make the payoff equal to the amount at step 2	(50.00)	(50.00)
Payoff	nil	24.54

Step 7: Option value at t1 (by calculating the value of the replicating portfolio at t1)

If share price is 61.05 at t1 the value of the replicating portfolio at t1 is as follows:

	₦
Share price (61.05 ◻ 1.00)	61.05
PV of borrowing (50.00 ◻ 1/1.01)	(49.50)
Option value at t0	11.55

This is the option value at t1 if the share price at t1 was 61.05.

We must also consider all other possibilities in order to arrive at a spread of option values at t1.

In this case it is easy. If the share price was 40.95 at t1 the option value at t1 = 0

Step 8: Spread in option values and spread in share values at t1 Spread in

option values:	11.55 ◻ 0 = 11.55
Spread in share values:	61.05 ◻ 40.95 = 20.10

Example (continued): Option valuation

Step 9: Calculate the option delta at t1

Option delta = spread in option values ÷ spread in share values

= 11.55/20.10 = 0.575

Step 10: Construct the replicating portfolio at t1 (assumes the purchase of 0.575 shares)

	₦	₦
Share price	40.95	61.05
Fraction of share in replicating portfolio	0.575	0.575
Value of fraction of share	23.55	35.10
Borrowing repayment necessary to make the payoff equal to the amount at step 2	(23.55)	(23.55)
Payoff	nil	11.55

Step 11: Option value at t0 (by calculating the value of the replicating portfolio at t0)

	₦
Share price (50 ⬜ 0.575)	28.75
PV of borrowing (23.55 ⬜ 1/1.01)	(23.32)
Option value at t0	5.43

All of the examples so far have assumed a need to value the option at t0. However, the process can be used to arrive at a value at any point in the lattice (i.e. at any time in an option's life).

3 THE BLACK-SCHOLES OPTION PRICING MODEL

Section overview

- The model formulae
- Notes on the model
- Using the Black-Scholes model

3.1 The model formulae

The Black-Scholes option pricing model is used to derive the price of a European-style call option. This model, or variants of it, is used by banks to calculate the premium for an over-the-counter (OTC) option.

Formulae for the Black-Scholes model are as follows:
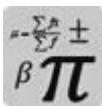
Formula: Black-Scholes model

$$c = P_a\,N(d_1) - P_e\,N(d_2)\,e^{-rt}$$

Where:

$d_1 \quad = \quad \dfrac{\ln(P_a/P_e)+(r+0.5s^2)t}{s\sqrt{t}}$

$d_2 \quad = \quad d_1 - s\sqrt{t}$

c	=	Price of the call option (call option value)
P_a	=	the price of the underlying item, such as the current share price (stock option) or current exchange rate (currency option)
N(d)	=	a normal distribution probability density function – the probability that the value is less than d standard deviations above the mean.
P_e	=	the exercise price or strike rate for the option
e	=	the constant e. You will need a calculator that calculates values to the power of e.
r	=	the risk-free interest rate (as an annual rate: for example, 5% = 0.05)
t	=	time to expiry of the option, in years. For example, if the option has three months to expiry, t = 0.25.
s	=	standard deviation of the value/returns of the underlying item. This should be the annual volatility, for consistency with the values of r and t.

3.2 Notes on the model

If you are not familiar with mathematics, the following notes might be useful.

❑ To calculate the price of a European-style call option, it is necessary to calculate values for d_1 and d_2. To calculate d_2, it is necessary to know the value of d_1. The starting point is therefore to calculate the value of d_1.

❑ The first item in the formula for the value of d_1 is $\ln(P_a/P_e)$. The letters 'ln' mean 'natural logarithm of'. Natural logarithms are logarithms to the base of the constant e. You need a calculator that can work out natural logarithms, and you need to make sure that you can use the natural logarithm function on the calculator.

(Note: a natural logarithm is a number expressed as a value to the power of e. The constant 'e' has a value of 2.71828. This means, for example, that the natural logarithm of 4 is 1.3863 because 4 is equal to 2.71828 to the power of 1.3863).

The standard deviation is a measurement of volatility of the price of the underlying item. In the case of a stock option, it is the standard deviation of the annual returns from the share. An annual standard deviation of 15%, for example, would be 0.15 in the formula. Remember that the standard deviation is the square root of the variance. If an examination gives you the variance of the returns, remember to take the square root to obtain the standard deviation.

Having calculated values for d_1 and d_2, the final step is to calculate the option price. To do this, you need to establish values for $N(d_1)$ and $N(d_2)$. These are values obtained from normal distribution tables. These statistical distribution tables are provided in the examination, as a standard normal distribution table. These tables also explain how the tables should be used to find the values for $N(d_1)$ and $N(d_2)$.

The rules are as follows:

❑ Having established a value for d_1 (or d_2), find the corresponding value in the normal distribution tables. For example, if d_1 = 1.75, look for the value in the row 1.7 and the column 0.05 - this value is 0.4599.

❑ If the value of d_1 is positive, add 0.5 to the value you have obtained from the table. Similarly, if the value of d_2 is positive, add 0.5 to the value you have obtained from the table.

❑ If the value of d_1 is negative, subtract the value you have obtained from the table from 0.5. Similarly, if the value of d_2 is negative, subtract the value you have obtained from the table from 0.5.

This gives you the value for $N(d_1)$ (or $N(d_2)$). The **call**

option price is calculated as:

❑ The value of P_a multiplied by the value for $N(d_1)$

❑ Minus the value of P_a multiplied by the value for $N(d_2)$ and multiplied by the value of e^{-rt}.

The value of e^{-rt} is the inverse of the constant e to the power of rt. In other words, e^{-rt} is $1/e^{rt}$. Use your calculator to calculate the value of e^{rt}, then calculate the inverse of your answer.

It is not immediately obvious but this a discount factor. The normal discount factor to calculate a present value say at 5% for 5 years would be $1/(1.05)^5$. However this assumes that the amount being discounted arises at a single point

in time at the end of five years. The Black Scholes Model assumes that values change on a continuous basis (rather than suddenly arrive as is normally assumed in DCF). In this case the discount factor must be constructed on a continuous basis. In other words an equivalent period rate must be calculated for an infinite number of tiny time periods. This all sounds quite tricky but it is quite easy to do by using e^{rt}. In truth, you do not really need to think about this as it is a component of the formulae provided in the exam.

3.3 Using the Black-Scholes model

The formulae might seem very complex. The following example shows how they should be applied:

Example: Using the Black-Scholes model

The current share price of BS Company is ₦170.

What should be the price of a European-style call option on the company's shares at an exercise price of ₦165, if the expiry date is in six months, the standard deviation of annual returns on the share is 12% and the risk-free rate of return is 7% per year?

Answer

Step 1. List the variables

P_a	=	170
P_e	=	165
r	=	7% (= 0.07)
t	=	six months to expiry, t = 0.50.
s	=	0.12

Step 2. Calculate d_1

$$d_1 = \frac{\ln(P_a/P_e) + (r + 0.5s^2)t}{s\sqrt{t}}$$

$$d_1 = \frac{\ln(170/165) + [0.07 + (0.5 \times 0.12^2)]\,0.5}{0.12\sqrt{0.5}}$$

$$d_1 = \frac{\ln(1.0303) + [0.07 + 0.0072]\,0.5}{0.08485}$$

$$d_1 = \frac{0.02985 + 0.0386}{0.08485}$$

$$\mathbf{d_1} = \frac{0.06845}{0.08485} \mathbf{= 0.8067 \text{ (say 0.81)}}$$

A 🔍 **Answer**

tinue3. Calculate d_2

$d_2 = d_1 - s\sqrt{t}$

$d_2 = 0.8067 - 0.12 \sqrt{0.5}$

$d_2 = 0.8067 - 0.08485$

$d_2 = 0.7219$ (say 0.72)

Step 4. Obtain values for $N(d_1)$ and $N(d_2)$

$N(d_1)$.

When $d_1 = 0.81$ the corresponding value in the normal distribution table is 0.2910.

The value of d_1 is positive, so add 0.50.

$N(d_1) = 0.2910 + 0.50 = 0.7910$.

$N(d_2)$.

When $d_2 = 0.72$, the corresponding value in the normal distribution table is 0.2642.

The value of d_2 is positive, so add 0.50.

$N(d_2) = 0.2642 + 0.50 = 0.7642$.

Step 5. Calculate the option price (for a call option)

$c = P_a N(d_1) - P_e N(d_2) e^{-rt}$

Tip – calculate the value of e^{-rt} first

$\quad rt = (0.07)(0.5) = 0.035$.

$\quad e^{-0.035} = 1/e^{0.035}$

$\quad e^{0.035} = 1.0356$

$\quad$ Therefore $1/e^{0.035} = 0.9656$.

Option price $= P_s N(d_1) - P_e N(d_2) e^{-rt}$

$\quad = 170(0.7910) - 165 (0.7642) (0.9656)$

$\quad = 134.5 - 121.8 = \textbf{12.7}$

Practice question 1

In this similar example, the values of d1 and d2 are negative.

The current share price of CB Company is 400.

What should be the price of a European-style call option on the company's shares at an exercise price of 440, if the expiry date is in six months, the standard deviation of annual returns on the share is 30% and the risk-free rate of return is 6% per year?

4 VALUE OF A PUT OPTION: PUT-CALL PARITY

Section overview

- Value of a put option: put-call parity pricing model
- Value of a put option: alternative put-call parity pricing model

4.1 Value of a put option: put-call parity pricing model

The Black-Scholes model calculates the value of a European-style call option. It can also be used to calculate the value of a European-style put option with the same expiry date and exercise price, using the put-call parity pricing model:

> **Formula: Put-call parity**
>
> | Value of put | + | Current market price of underlying item | = | Value of call | + | Present value of the exercise price. |
> |---|---|---|---|---|---|---|
> | Value of put | = | Value of call | + | Present value of the exercise price. | − | Current market price of underlying item |

Remember that the present value of the exercise price is measured using continuous discounting. The discount rate to find the present value of the exercise price found using e^{-rt}.

> **Example: Put-call parity**
>
> Shares in BS Company have a current market value of ₦170.
>
> The value of a call option with an exercise price of ₦165 and an expiry date in six months is ₦13.
>
> The risk-free rate of return is 7% per year.
>
> The present value of the exercise price is:
>
> ₦165 × $e^{-(0.07 \times 0.5)}$ = ₦165 × 0.9656 = ₦159.3.
>
> Applying the put-call parity pricing model:
>
> Value of put = ₦13 + ₦159.3 − ₦170
>
> Value of put = ₦2.3.

4.2 Value of a put option: alternative put-call parity pricing model

There is an alternative formula for put-call parity.

Allowing for rounding differences, it gives the same valuation for a put option as the formula described above.

The alternative formula is:

Formula: Put-call parity alternative

$$p = c - P_a + P_e\, e^{-rt}$$

Where:

p = the price of a put option

c = the price of a call option with the same exercise price and expiry date

Pa = the current market price of the underlying item

Pe = the exercise price of the option

r = the risk free rate of interest

t = the time to expiry in years

Example:

Shares in BS Company have a current market value of ₦17.

The value of a call option with a strike price of ₦16.50 and an expiry date in six months is ₦1.27.

The risk-free rate of return is 7% per year, and the option has six months to expiry, so rt = (0.07)(0.5) = 0.035. The value of e0.035 is 1.03562 so e- 0.035 is 0.9656.

p = c – Pa + Pe e-rt

p = 1.27 – 17 + (16.5)(0.9656)

p = 0.22.

This differs from the valuation above using the alternative formula by 0.01, due to mathematical rounding differences.

---

5 REAL OPTIONS

Section overview
■ Definition of a real option ■ Real options theory ■ Real options: the theoretical framework ■ Different types of real option ■ The valuation of real options

5.1 Definition of a real option

Options are normally associated with financial market derivative instruments and share options of companies. A different type of option is a real option, sometimes called an 'embedded real option'.

A real option is an alternative or choice that exists with an investment project or investment opportunity. They are real choices that management will be able to make at some stage during the life of the project. For example, if a company undertakes a particular project, there might be a real option (a choice, and not an obligation) to take one or more of the following courses of action at some stage during the project's life:

❑ Make a further incremental investment, and increase the total amount invested in the project.

❑ Abandon the project early because it is losing money.

❑ Defer the investment in the project, instead of having to invest immediately.

For example, a mining company might be negotiating a ten-year lease on a mine, and it might want to include a 'break clause' (an option) in the lease contract that will enable it to cancel the lease after five years. The option to cancel the lease and abandon the investment would be a real option. The company would have to consider how much it would be prepared to pay for the break clause to be included in the terms of the lease.

They are called 'real' options because they are generally associated with choices in relation to 'real' tangible assets.

Real options provide flexibility by giving choice – the flexibility for example to avoid losses and to take opportunities that unexpectedly emerge.

5.2 Real options theory

Real options theory can be used for investment appraisal, as an alternative to simple net present value analysis.

❑ Like NPV analysis, investment appraisal with real options analysis calculates a present value for a project by discounting future cash flows.

❑ Unlike NPV analysis, a real options approach also puts a financial value to the real options that are embedded in the investment opportunity, and which have some value. The value of the real options is taken into consideration in deciding whether to invest, or which of two or more alternative projects to invest in.

There are two aspects to real options theory:

❏ Providing a theoretical framework for the valuation of real options in investment appraisal

❏ Developing methods of measuring the value of real options for the purpose of investment appraisal.

5.3 Real options: the theoreticalframework

When a company decides to invest in a capital project, it faces the risk that actual results will be different from what was expected when the investment decision was made. The risk in a project comes from a combination of:

❏ The uncertainty about the future, and the different situations that might arise, and

❏ The means that management have at their disposal to deal with any of these situations if they arise.

There are many different sources of uncertainty in a project. They include the risks from:

❏ Changes in the condition of the overall economy

❏ Technological change

❏ A change in regulations

❏ Unforeseen actions by a competitor.

Any of these events or changes in situation could affect the value of the investment.

Management deals with uncertainty in two stages.

❏ **Stage 1**. At the **project selection stage**. When the investment decision is made, management considers the different possible outcomes and assesses the risk in the project. Different investment options are considered, and management decides to invest in the projects that appear to offer the best prospects for a good return.

❏ **Stage 2**. **Project management**. After the decision has been made to invest in a project, the project is managed. Management takes action to reduce the risks and uncertainty in the project, and seeks to enhance the positive effects of unexpected events.

Using the NPV method of project selection, the financial analysis focuses entirely on the project selection stage. All the different possible outcomes for the project are considered, and these are aggregated into a single expected value of future cash flows. The NPV analysis does not consider all the future decisions that might be made during the project management stage that will be contingent or dependent on how the project develops.

> ### Example: Real option
>
> A simple example is a management decision about whether to invest in Project A or Project B, which are mutually exclusive projects. Both projects would last for ten years. Estimated cash flows have been prepared and evaluated for each project and Project A has a higher NPV.
>
> However, with Project B there would be an opportunity to withdraw from the project after five years if the returns are poor and the project is value-destroying. This option does not exist with Project A.
>
> Simple NPV analysis would not consider the real option with Project B to withdraw after five years, and Project A would be selected. With a real options analysis, the comparison between Project A and Project B would put a value on the real option with Project B, and take this option into consideration when making the choice between the two projects.

**Real options: analysing project management risk and flexibility**

The NPV approach to project appraisal helps management with the project selection process but is not concerned with active risk management. In making choices between alternative projects for investment, it does not allow for the different amounts of flexibility (real options) that each project provides. For example, one project involving the use of more expensive but more flexible technology might have a lower NPV than an alternative investment involving the use of cheaper but more rigid technology. The flexible use of the more expensive technology provides a real option with value, but with simple NPV analysis this factor would be ignored.

An approach to project appraisal using real options considers all the different possibilities that might arise during the project management stage of a capital investment project. Instead of starting with an 'aggregate' or 'expected value' scenario of what might happen in the future, real options analysis starts by trying to identify all the future events or developments that might occur that would affect the project's value. The differing 'volatilities' of alternative investments are critical, and some projects will involve more uncertainty than others.

Once the risk profile of each investment alternative has been understood, the next step in the analysis is to identify the major project management decisions that could be made (the real options available with each investment alternative). Real options provide flexibility for project management, and these real options should be evaluated and taken into consideration (both at the project selection stage and during project management).

5.4 Different types of real option

There are different types of real option. A more detailed analysis of the types of real option is set out below.

Invest/grow options	Scale up	Make sequential, incremental investments as the markets grow. This type of real option includes start-up options.
	Switch up	A speedy commitment to a first-generation of a technology might give a company an advantage if the opportunity eventually occurs to switch to a next-generation of the technology. This might be called a 'market power option'.
	Scope up	Real option that provides an opportunity to increase the scope or range of activities, for example, investing in one industry might give a company the opportunity to invest in another industry at the same time and at a low cost.
Defer/delay/learn options	Sundry start	Option to delay an investment until new information is available or new skills are acquired; a deferral option.
Divest/withdraw/ reduce options	Scale down	Option to reduce the size of a project part-way through its life, or to disinvest entirely and withdraw from the investment. This option might be used if new information changes the expected payback from the project.
	Switch down	Where the company has invested in flexible assets, there might be an option to switch to a more cost-effective use of the assets
	Scope down	There might be an option for a company to reduce the scope of its operations at a low cost if it is discovered that there is no potential for further business development.

5.5 The valuation of real options

To estimate the value of a project using a real options approach, it is necessary to identify when and under what conditions each real option would be exercised, and a value has to be calculated for each option. For each real option that is identified for a particular project, the following data should be obtained:

❑ When the option will be available during the project life, and for how long.

❑ How the option might have a positive effect on the value of the project, and what that effect might be.

❑ What additional investment would be needed to exercise the option.

❑ Whether any additional investment is needed now to make the option available in the future.

❑ Whether the exercise of the option will then make other follow-up options available at a later time.

Each investment project should be assessed both for their NPV and the value of the future opportunities they might provide during the project management stage, such as the opportunity to expand in the same or related markets, or the flexibility to change the level or scale of operations, or for the ease of halting further expenditure or withdrawing entirely from an investment at a low cost.

Real options analysis puts a financial value to flexibility in the management of projects, and the value of real options is therefore higher when the project risk and uncertainty is high.

However, the real options approach has an important weakness. A considerable amount of academic research has been carried out into the valuation of real options, but a simple and satisfactory approach to valuation has not yet been established. Some academics believe that real options can be valued using a model based on the Black-Scholes option pricing model.

Some companies have also used a real options approach to project evaluation, particularly where real options can have a significant impact on capital investment project selection – for example in the pharmaceuticals industry and other industries where expenditure on research and development is high, and also in mining (where mining leases might include important real options for the mining company).

Example: Real option valuation

X Plc is considering a major investment to build and operate social housing in the capital city of Ruritania.

The project would require an initial investment of ₦300m. The project would result in positive cash inflows with a present value of ₦310m giving an NPV of ₦10m.

In order to encourage investment of this type the Ruritanian government have agreed that X Plc can sell the project back to the government without recourse for ₦200m after 4 years.

The risk free rate is estimated to be 5% in the foreseeable future. A cash flow simulation of similar investments has shown a standard deviation of 30%

Calculate the value of the abandonment option and hence the total NPV of the project. (Note that this is a put option)

Answer

Step 1. List the variables

P_a = ₦310m (this is the value of the underlying asset at the start of the project)

P_e = ₦200m

r = 5% (= 0.05)

t = 4 years to expiry ($t = 4$)

s = 0.30

Step 2. Calculate d_1

$$d_1 = \frac{\ln(P_a/P_e) + (r + 0.5s^2)t}{s\sqrt{t}}$$

$$d_1 = \frac{\ln(310/200) + [0.05 + (0.5 \times 0.30^2)]\,4}{0.3\sqrt{4}}$$

$$d_1 = \frac{\ln(1.55) + [0.05 + 0.045]\,4}{0.6}$$

$$d_1 = \frac{0.4383 + 0.38}{0.6}$$

$$\mathbf{d_1} = \frac{0.8183}{0.6} = \mathbf{1.368\ (say\ 1.37)}$$

Answer

Step 3 - Calculate

d2 $d_2 = d_1 - s\sqrt{t}$

$d_2 = 1.368 - 0.3\ \sqrt{4}$

$d_2 = 1.368 - 0.6$

$d_2 = 0.7638$ (say 0.76)

Step 4 - Obtain values for $N(d_1)$ and

$N(d_2)$ $N(d_1)$.

When $d_1 = 1.37$ the corresponding value in the normal distribution table is 0.4147.

The value of d_1 is positive, so add 0.50.

$N(d_1) = 0.4147 + 0.50 = 0.9147$.

$N(d_2)$.

When $d_2 = 0.76$, the corresponding value in the normal distribution table is 0.2764.

The value of d_2 is positive, so add 0.50.

$N(d_2) = 0.2764 + 0.50 = 0.7764$.

Step 5 - Calculate the option price (for a call

option) $c = P_a N(d_1) - P_e N(d_2) e^{-rt}$

Tip – calculate the value of e^{-rt} first

$\quad\quad\quad$ $rt = (0.05)(4) = 0.2$.

$\quad\quad\quad$ $e^{-0.2} = 1/e^{0.2}$

$\quad\quad\quad$ $e^{0.2} = 1.2214$

$\quad\quad\quad$ Therefore $1/e^{0.035} = 0.8187$

Option price $\quad = P_s N(d_1) - P_e N(d_2) e^{-rt}$

$\quad\quad\quad\quad\quad\quad = 310(0.9147) - 200\ (0.7764)\ (0.8187)$

$\quad\quad\quad\quad\quad\quad = 283.56 - 127.12 = \mathbf{156.44}$

Step 6 - Calculate the option price (for a put

option) $p = c - P_a + P_e e^{-rt}$

$p = 156.44 - 310 + 200\ (0.8187)$

$p = 10.18$

Conclusion

The value of the option to abandon the project is ₦10.18m. This gives an overall project value of ₦10m + ₦10.18 = ₦21.18m.

Practice questions   2

X Plc is considering a major investment to build and operate social housing in the capital city of Ruritania.

The project would require an initial investment of ₦300m. The project would result in positive cash inflows with a present value of ₦310m giving an NPV of ₦10m.

Currently there is a major offshore oil and gas exploration project in Ruritania. If X Plc were to accept the project under consideration they would be well placed to secure a further government construction project if and when oil and gas production commences.

Initial investment in the future project would be ₦400 in 4 years' time. The present value of cash inflows from the project is estimated at ₦240m but there is a great deal of uncertainty associated with this. An analyst has estimated volatility on the cash inflows could be as high as 30%. Risk free rate is 5%

Calculate the value of the follow on opportunity. (Note that this is a call option)

6 FURTHER APPLICATIONS OF THE BLACK-SCHOLES OPTION PRICING MODEL

Section overview

- Introduction
- BSOP and equity valuation
- BSOP model and equity valuation – firms in financial distress
- BSOP model and debt – debt characteristics
- BSOP model and debt – default
- BSOP model and warrants

6.1 Introduction

The Black-Scholes option pricing model can be used to value equity and also to help assess default risk of debt.

These applications are based on the idea that when a company borrows money the shareholders acquire a call option and a put option written by the lenders, on the underlying assets of the business, with an exercise price equal to the face value of the debt.

Corporate bonds must be serviced with a higher rate of interest than government bonds. Government bonds are often considered to be risk free (or of very low risk though this depends on the country) whereas corporate bonds carry credit risk.
Therefore, lenders require a higher rate of return for lending to corporates than they would for lending to countries.

There is another way of looking at this. Governments do not have an option to default (though it does happen occasionally). When a firm borrows money it has an option to default on that loan. The option to default must be paid for so corporate rates of interest are higher than the rates available on government borrowing.

Call option

When a firm borrows money, in effect the lender acquires the firm's assets and the shareholders acquire an option to buy them back by paying off the debt. They have a call option on the assets with an exercise price being the face value of the debt.

This implies that if the debt is repaid the shareholders can take the full value of the assets of the business.

At the exercise date (date of redemption of the date):

❑ If the value of the assets is worth more than the face value of the debt (the exercise price) the shareholders will exercise the option by paying the debt.

❑ If the value of the assets is worth less than the face value of the debt (the exercise price) the shareholders will allow the option to lapse. They can do this by walking away and allowing the company to slip into bankruptcy.

Put option

If the firm's assets are worth less than face value of the debt the shareholders will not exercise the call option. They can walk away from the investment. The lenders will be left with a situation where they will not receive the face value of the debt but will receive the firm's assets instead. In other words, when a company borrows money the shareholders acquire a put option on the assets of the firm. The exercise of this put option is the face value of the debt. (They exercise the option by walking away from the company thus forcing the lender to take the assets instead of the redemption proceeds).

6.2 BSOP and equity valuation

Formulae for the Black-Scholes model were given in an earlier chapter. They are

repeated hear for your convenience.

Formula: Black-Scholes option pricing model

$$c = P_a\, N(d_1) - P_e\, N(d_2)\, e^{-rt}$$

Where:

d_1	=	$$\dfrac{\ln(P_a/P_e)+(r+0.5s^2)t}{s\sqrt{t}}$$
d_2	=	$d_1 - s\sqrt{t}$
c	=	Price of the call option (call option value)
P_a	=	the price of the underlying item, such as the current share price (stock option) or current exchange rate (currency option)
$N(d)$	=	a normal distribution probability density function – the probability that the value is less than d standard deviations above the mean.
P_e	=	the exercise price or strike rate for the option
e	=	the constant e. You will need a calculator that calculates values to the power of e.
r	=	the risk-free interest rate (as an annual rate: for example, 5% = 0.05)
t	=	time to expiry of the option, in years. For example, if the option has three months to expiry, t = 0.25.
s	=	standard deviation of the value/returns of the underlying item. This should be the annual volatility, for consistency with the values of r and t.

Example: Black-Scholes option pricing model

A firm has assets less current liabilities of ₦100m. This figure varies with a standard deviation of 0.4.

The face value of the outstanding debt is ₦80m. This debt is zero coupon and is to be paid in 5 years' time.

The risk free rate is 5%

Required:

Calculate the value of equity.

Answer

Step 1 - List the

P_a	=	₦100m
P_e	=	₦80m
r	=	5% (= 0.05)
t	=	5 years to expiry
s	=	0.40

Step 2 - Calculate d_1

$$d_1 = \frac{\ln(P_a/P_e) + (r + 0.5s^2)t}{s\sqrt{t}}$$

$$d_1 = \frac{\ln(100/80) + [0.05 + (0.5 \times 0.40^2)]\,5}{0.4\sqrt{5}}$$

$$d_1 = \frac{\ln(1.25) + [0.05 + 0.08]\,5}{0.8944}$$

$$d_1 = \frac{0.2231 + 0.65}{0.8944}$$

$$\mathbf{d_1} = \frac{0.8731}{0.8944} = \mathbf{0.9762\ (say\,0.976)}$$

Step 2 - Calculate d_2

$d_2 = d_1 - s\sqrt{t}$

$d_2 = 0.9762 - 0.4\sqrt{5}$

$d_2 = 0.9762 - 0.8944$

$\mathbf{d_2 = 0.0818\ (say\ 0.082)}$

Answer

Step 3 - Obtain values for $N(d_1)$ and $N(d_2)$ $N(d_1)$.

When $d_1 = 0.976$ the corresponding value in the normal distribution table is 0.3355.

The value of d_1 is positive, so add 0.50.

$N(d_1) = 0.3355 + 0.50 = 0.8355$.

$N(d_2)$.

When $d_2 = 0.082$, the corresponding value in the normal distribution table is 0.0326.

The value of d_2 is positive, so add 0.50.

$N(d_2) = 0.0326 + 0.50 = 0.5326$.

Step 4- Calculate the option price (for a call option) $c = P_a N(d_1) - P_e N(d_2) e^{-rt}$

Tip – calculate the value of e^{-rt} first

$rt = (0.05)(5) = 0.25$

$e^{-0.25} = 1/e^{0.25}$

$e^{0.25} = 1.284$

Therefore $1/e^{0.25} = 0.7788$

$$
\begin{aligned}
\text{Option price} \quad &= P_s N(d_1) - P_e N(d_2) e^{-rt} \\
&= 100(0.8355) - 80(0.5326)(0.7788) \\
&= 83.55 - 33.183 = \mathbf{50.37}
\end{aligned}
$$

Conclusion: The value of equity is ₦50.37m.

6.3 BSOP model and equity valuation – firms in financial distress

The option has no intrinsic value when the value of the assets is less than the face value of the debt. This does not mean the equity is worthless. Out of the value options still have value which reflects the possibility that the option will move into the money in the future.

Example: BSOP model and equity valuation

A firm has assets less current liabilities of ₦50m. This figure varies with a standard deviation of 0.4.

The face value of the outstanding debt is ₦80m. This debt is zero coupon and is to be paid in 5 years' time.

The risk free rate is 5%

Required:

Calculate the value of equity.

Answer

Step 1- List the variables

P_a	=	₦50m
P_e	=	₦80m
r	=	5% (= 0.05)
t	=	5 years to expiry
s	=	0.40

Step 2 - Calculate d_1

$$d_1 = \frac{\ln(P_a/P_e) + (r + 0.5s^2)t}{s\sqrt{t}}$$

$$d_1 = \frac{\ln(50/80) + [0.05 + (0.5 \times 0.40^2)]5}{0.4\sqrt{5}}$$

$$d_1 = \frac{\ln(0.625) + [0.05 + 0.08]5}{0.8944}$$

$$d_1 = \frac{-0.47 + 0.65}{0.8944}$$

$$\mathbf{d_1} = \frac{0.18}{0.8944} \quad \textbf{= 0.2012 (say 0.2)}$$

Step 2 - Calculate d_2

$d_2 = d_1 - s\sqrt{t}$

$d_2 = 0.2 - 0.4 \sqrt{5}$

$d_2 = 0.2 - 0.8944$

$d_2 = ⎕0.6944$ (say ⎕0.69)

Step 3 - Obtain values for $N(d_1)$ and $N(d_2)$ $N(d_1)$.

When d_1 = 0.2 the corresponding value in the normal distribution table is 0.0793. The value of d_1 is positive, so add 0.50.

$N(d_1)$ = 0.0793 + 0.50 = 0.5793. **$N(d_2)$.**

When d_2 = ⎕0.69, the corresponding value in the normal distribution table is 0.2549. The value of d_2 is negative, so subtract 0.2549 from 0.50.

$N(d_2)$ = 0.50 ⎕ 0.2549 = 0.2451

Answer

Step 4 - Calculate the option price (for a call

option) $c = P_a N(d_1) - P_e N(d_2) e^{-rt}$

Option price $= P_s N(d_1) - P_e N(d_2) e^{-rt}$

$\qquad\qquad = 50(0.5793) - 80 (0.2451) (0.7788)$

$\qquad\qquad = 28.97 - 15.27 = 13.\mathbf{7}$

Conclusion: The value of equity is ₦13.7m.

The equity in the firm still has substantial value because of the option characteristics of the equity. This explains why the equity of insolvent firms might still have value. The volatility of the asset base and the time until the debt has to be repaid means that there is a chance that the option will go into the money if the company continues to trade (though note that company law might forbid this in some cases).

6.4   BSOP model and debt – debt characteristics

Returning to the example used in section 6.2.

Example: BSOP model and debt

A firm has assets less current liabilities of ₦100m. This figure varies with a standard deviation of 0.4.

The face value of the outstanding debt is ₦80m. This debt is zero coupon and is to be paid in 5 years' time.

The risk free rate is 5%

This led to the following inputs and outputs from the BSOP model

BSOP model inputs			BSOP model outputs				
P_a =	₦100m	d_1	=	0.976	$N(d_1)$	=	0.8355
P_e =	₦80m	d_2	=	0.082	$N(d_2)$	=	0.5326
r =	5% (= 0.05)						
t =	5 years to expiry				c = ₦50.37m		
s =	0.40				e^{-rt} = 0.7788		

Required:

Calculate the value of the debt, the interest rate carried by that debt and the credit spread on that debt.

A

Answer

Value of the debt

The total market value of the firm = Value of equity + Value of debt

₦100m = ₦50.37m + Value of the debt Value

of debt = ₦100m − ₦50.37m = ₦49.63m

Interest rate on the debt

The fair value of the debt is linked to its face value through the interest rate.

Fair value $(1 + i)^n$ = face value (the amount paid on redemption)

$$\Rightarrow ₦49.63m \ (1 + i)^5 = ₦80m$$

$$\Rightarrow i = \sqrt[5]{80/49.63} - 1 = 10\%$$

Credit spread on the debt

The risk free interest rate is 5% this implies a credit spread of 5% (10% − 5%).

6.5 BSOP model and debt – default

An earlier chapter explained that credit risk reflects the expected loss from a loan. The expected loss is a function of the loss given default (LDG) and the probability of default (p(d)). This is a simple expected value calculation.

The loss given default is the amount that could be lost if a lender defaults. It is not necessarily the amount of the loan as the lender might hold some form of collateral or the borrower may be able to pay a percentage of the amount owed.

The BSOP model can be used to provide information in this area.

Probability of default

The value of $N(d_2)$ is the probability that a call option will be in the money at the exercise date.

Therefore the probability that it will not be in the money is: $1 - N(d_2)$

Q

Example: BSOP model and debt – default

BSOP model inputs			BSOP model outputs				
P_a	=	₦100m	d_1	=	0.976	$N(d_1)$	= 0.8355
P_e	=	₦80m	d_2	=	0.082	$N(d_2)$	= 0.5326
r	=	5% (= 0.05)					
t	=	5 years to expiry				c = ₦50.37m	
s	=	0.40				e^{-rt} = 0.7788	

Required:

Calculate the probability of default.

Answer

Probability of default = 1 − N(d2) = 1 − 0.5326 = 0.4674 or 46.74%

Expected loss

When a firm borrows cash the shareholders are given a put option on the firm's assets, written by the lenders with an exercise price equal to the face value of the debt. The ability to walk away at the date of redemption of the debt if the asset value is less than the face value of the debt has a value to the shareholders. This value is provided by the lender. It is the expected loss on the debt.

The value of the put option (expected loss from the lenders' view) can be calculated using put-call parity as explained in an earlier chapter.

The relationship is repeated here for your convenience.

Formula: Put-call parity

Value of put	+	Current market price of underlying item	=	Value of call	+	Present value of the exercise price.

Value of put	=	Value of call	+	Present value of the exercise price.	−	Current market price of underlying item

Note that the present value of the exercise price must be calculated using continuous discounting. The discount factor is found using e^{-rt}. This was covered in an earlier chapter.

Example: Expected loss

A firm has assets less current liabilities of ₦100m. This figure varies with a standard deviation of 0.4.

The face value of the outstanding debt is ₦80m. This debt is zero coupon and is to be paid in 5 years' time.

The risk free rate is 5%.

This led to the following inputs and outputs from the BSOP model.

BSOP model inputs			BSOP model outputs				
P_a =	₦100m		d_1 =	0.976	$N(d_1)$	=	0.8355
P_e =	₦80m		d_2 =	0.082	$N(d_2)$	=	0.5326
r =	5% (= 0.05)						
t =	5 years to expiry				c = ₦50.37m		
s =	0.40				e^{-rt} = 0.7788		

Required:

Calculate the value of the put option on the assets (the expected loss).

Answer

Value of put	=	Value of call	+	Present value of the exercise price	−	Current market price of underlying item
	=	₦50.37m	+	(₦80m ⓧ 0.7788)	−	₦100m
	=	₦50.37m	+	₦62.3m	−	₦100m
	=	**₦12.67m**				

Loss given default

This can be calculated from the previous numbers by rearranging the following expression for expected loss:
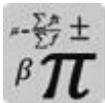
Formula: Loss given default

Expected loss = Loss given default ⓧ Probability of default

$$\text{Loss given default} = \frac{\text{Expected loss}}{\text{Probability of default}}$$

Example: Loss given default

Using data from the previous examples.

$$\text{Loss given default} = \frac{\text{Expected loss}}{\text{Probability of default}}$$

$$\text{Loss given default} = \frac{₦12.67m}{0.4674} = ₦27.12m$$

6.6 BSOP model and warrants

The BSOP is a method for valuing options on shares written by investors.

A warrant is a contract issued by a company which entitles the holder to subscribe to the company's shares at a pre-agreed price at some point in the future. They are a call option on the company's shares which the company will satisfy (if exercised) by issuing shares to the warrant holder.

Warrants are very similar to options so they can be valued using the BSOP. However, the valuation of options is complicated by the fact that they are dilutive on exercise. That is to say, they increase the number of shares in the company so that the firm's assets and profits will be spread over a greater number of shares. Sometimes the dilution is negligible and can be ignored. However, if the exercise of the warrant increases the number of the shares substantially that should be taken into account during the valuation.

The approach involves applying the BSOP to find the value of a call option of the firm as if it had no warrants outstanding and then adjusting this by a dilution factor.

Formula: BSOP dilution factor for valuation of warrants

$$= \frac{1}{1 + q} \times 100$$

Where:
q = number of warrants issued per share outstanding

Example: Valuation of warrants

A company's statement of financial position expressed in market values is as follows:

	₦m
Assets	200
Equity (1 million shares @ ₦170)	170
Debt	30
	200

The company wants to raise ₦50 million by issuing debt and warrants.

The debt is worth ₦40 million. Therefore the investors must pay ₦10 million for the warrants.

The statement of financial position (expressed in market values) would be as follows after the issue of these instruments:

		₦m
Assets		250
Equity		170
Warrants		10
	180	
Debt	70	
	250	

The warrants would entitle the holders to subscribe for 0.2 shares for each one in issue. This means that an additional 200,000 shares will come into issue if the warrant is exercised.

The amount paid for each warrant is therefore, ₦10 million/200,000 shares or ₦50 per warrant.

The market value of the shares as if there were no warrants in issue would be ₦180 (₦180 million/1 million shares.

The information required to value the warrants is as follows:

Current share price (P_a)	=	₦180
Exercise price (P_e)	=	₦165
Risk-free interest rate (r)	=	7% (0.07)
Time to expiry of the option (t)	=	5 years
Standard deviation of the returns of the share (s)	=	12% (0.12)
Number of warrants issued per outstanding share	=	0.2

What is the value of the warrants?

A 🔍

Answer: Valuation of warrants

The warrants are valued as follows:

Step 1. List the variables

P_a	=	180
P_e	=	165
r	=	7% (= 0.07)
t	=	4
s	=	0.12

Step 2. Calculate d_1

$$d_1 = \frac{\ln(P_a/P_e) + (r + 0.5s^2)t}{s\sqrt{t}}$$

$$d_1 = \frac{\ln(170/165) + [0.07 + (0.5 \times 0.12^2)]\,4}{0.12\sqrt{4}}$$

$$d_1 = \frac{\ln(1.0303) + [0.07 + 0.0072]\,4}{0.24}$$

$$d_1 = \frac{0.02985 + 0.3088}{0.24}$$

$$\mathbf{d_1} = \frac{0.33865}{0.24} = \mathbf{1.4110 \text{ (say 1.41)}}$$

Step 3. Calculate d_2

$d_2 = d_1 - s\sqrt{t}$

$d_2 = 1.41 - 0.12\sqrt{4}$

$d_2 = 1.41 - 0.24$

$\mathbf{d_2 = 1.17}$

Answer (continued): Valuation of warrants

Step 4 - Obtain values for N(d₁) and N(d₂)

N(d₁).

When $d_1 = 1.41$ the corresponding value in the normal distribution table is 0.4207.

The value of d_1 is positive, so add 0.50.

$N(d_1) = 0.4207 + 0.50 = 0.9207$.

N(d₂).

When $d_2 = 1.17$, the corresponding value in the normal distribution table is 0.3790.

The value of d_2 is positive, so add 0.50.

$N(d_2) = 0.3790 + 0.50 = 0.8790$.

Step 5 - Calculate the option price (for a call option)

$c = P_a N(d_1) - P_e N(d_2) e^{-rt}$

Tip – calculate the value of e^{-rt} first

$rt = (0.07)(4) = 0.28$.

$e^{-0.28} = 1/e^{0.28}$

$e^{0.28} = 1.3231$

Therefore $1/e^{0.28} = 0.7558$.

Option price $= P_s N(d_1) - P_e N(d_2) e^{-rt}$

$= 180(0.9207) - 165(0.8790)(0.7558)$

$= 165.73 - 109.62 = \mathbf{56.11}$

Step 6- Dilution adjustment

$= 56.11 \times 1/1 + q$

$= 56.11 \times 1/1.2$

$= 46.75$

Comment

The investors are being asked to pay ₦50 for warrants that are worth only ₦46.75. The company may need to re-price the offer to make the warrants more attractive to the investors.

7 DELTA HEDGING

Section overview

- Delta defined
- Constructing a delta hedge for a call options exposure
- Constructing a delta hedge for a put options exposure
- The Greeks

7.1 Delta defined

Buying call options or put options is a method of hedging financial risk. Options are a zero-sum game, and to the extent that an option holder is protected against risk, the option writer is exposed to risk. For banks and other institutions that write options, their own exposure to risk from writing options can be hedged with a delta hedge.

The delta of an option is defined as the change in the price of an option in proportion to the change in the value of the underlying item.
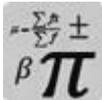
Formula: Delta

$$\text{Delta} = \frac{\text{Change in value of the option}}{\text{Change in market value of the underlying share}}$$

For example, in the case of an option on a company's shares, if the share price goes up by $1, the option price will go up if it is a call option or down if it is a put option.

However, the change in the price of the option will not exceed $1. The value of an option delta is therefore in the range – 1 to + 1.

❏ A **call option** that is **deeply in-the-money** has a delta close to + 1

❏ A **put option** that is **deeply in-the-money** has a delta close to – 1.

❏ An option that is deeply out-of-the-money has a delta close to 0.

❏ An **option that is at-the-money** has a delta close to + 0.5 (call option) or –
0.50 (put option).

Delta is always positive for calls and negative for puts.

Even though delta will be a number between 0.0 and 1.0 for a long call (and/or short put) and 0.0 and −1.0 for a long put (and/or short call), these numbers are commonly presented as a percentage of the total number of shares represented by the option contract(s). This is convenient because the option will (instantaneously) behave like the number of shares indicated by the delta.

For example, if an American call option on XYZ has a delta of 0.25 (25%), it will gain or lose value just like 25 of 100 shares of XYZ as the price changes for small price movements.

The value of an option's delta can be calculated. It is related the value of $N(-d_1)$ or $N(d_1)$ in the Black-Scholes option pricing model.

7.2 Constructing a delta hedge for a call options exposure

A bank that writes a large number of options has an option portfolio. It might want to create a hedge for its exposure to adverse price movements.

❑ An option portfolio is said to be delta neutral when its delta is 0.

❑ A bank that writes call options can create an option position that is delta neutral by purchasing a quantity of the underlying item. For example, a bank that has written call options on the shares of XYZ Company can hedge the position by holding some shares in XYZ.

❑ If the value of the underlying shares goes up, the value of the call options will also go up. The bank will incur a loss on its options position, because it has written options. However, it makes a gain on the rise in the value of the underlying shares.

❑ A delta neutral position will exist when the rise in the value of the options (= benefit to the option holders and loss for the option writer) is matched by an equal rise in the value of the shares held by the option writer (bank). This will leave the bank with neither a loss nor a gain.

The number of shares that a call option writer should hold to create a delta hedge
= [Quantity of the underlying item on which there are options] × [Option delta.]

For example if the delta value for call options on 1,000,000 shares of XYZ Company at an exercise price of \$15 is 0.45, a delta hedge will be created by holding 450,000 of the shares (1,000,000 × 0.45).

Calculating delta for call options

The value of delta for a position in call options is the value of $N(d_1)$ in the Black- Scholes model formulae:
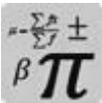
Formula: Amount of underlying to hold as a hedge (call options)

Amount of underlying to hold as a hedge	=	Amount of underlying item to be hedged	×	$N(d_1)$

Example:

A Nigerian bank is writing currency call options on €200 million in exchange for naira. The value of delta of the options is 0.5326, measured as $N(d_1)$.

In order for the bank to be certain that it will not make a loss, it could hedge its options position by holding a quantity of euros.

The quantity of euros that it would need to hold to create a hedge is:

€200 million × 0.5326 = €106.52 million.

In principle, the same formula can be used to calculate how many at-the-money call options it would be necessary to hold to eliminate exchange rate risk entirely.

> **Example:**
>
> A Nigerian company needs to buy €100 million in three months' time and wants to use currency call options to create a hedge that would eliminate the exchange rate risk entirely. At-the-money call options on Euros have a delta value of 0.5326. Each option is for €100,000.
>
> The number of Euros for which at-the-money call options should be purchased is calculated by re-arranging the previous formula:
>
> €100 million/ N(d1) = €100 million/0.5326 = €187.758 million.
>
> Since each option contract is for €100,000, this would mean buying 1,878 contracts.

Any increase in the value of the Euro would mean that the cost of buying the €100 million at the option exercise date would increase, but this 'loss' would be offset entirely by a gain on the call options position.

In practice however, creating a hedge with options that eliminates the risk entirely is very expensive, because of the cost of the options. In this example, if the company did decide to use options to create a hedge, the number of options that it would buy is likely to be €100 million/€100,000 per contract = 1,000 contracts.

## 7.3 Constructing a delta hedge for a put options exposure

A similar technique can be applied to calculate a hedge position for a writer of put options. The difference is that if a bank writes put options, it will incur a loss on the options position if the price of the underlying item falls.

To create a hedge, it therefore needs to be 'short' in the underlying item. It could do this by borrowing the underlying item in the case of shares, or selling the item forward if it is currency.

For example if the delta value for put options on 1,000,000 shares of XYZ Company at an exercise price of $15 is – 0.27, a delta hedge will be created by borrowing 270,000 of the shares (1,000,000 × 0.27), and the settlement date for returning the borrowed shares should be the same as the expiry date for the option..

Calculating delta for put options

The value of delta for a position in put options is the value of $N(-d_1)$ in the Black-Scholes model formulae:
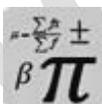
Formula: Amount of underlying to hold as a hedge (put options)			
Amount of underlying to hold as a hedge	=	Amount of underlying item to be hedged	× N(−d₁)

> **Example:**
>
> A Nigerian bank is writing currency put options on €50 million in exchange for naira. The value of delta of the options is 0.4674, measured as $N(-d_1)$.
>
> In order for the bank to be certain that it will not make a loss, it could hedge its options position by selling forward a quantity of Euros, for settlement on the same date as the expiry date for the options.
>
> The quantity of Euros that it would need to sell forward to create a hedge is €50 million × 0.4674 = €23.37 million.

In principle, the same formula can be used to calculate how many at-the-money put options it would be necessary to hold to eliminate exchange rate risk entirely.

> **Example:**
>
> A Nigerian company will receive €20 million in three months' time and wants to use currency put options to create a hedge that would eliminate the exchange rate risk entirely. At-the-money put options on Euros have a delta value of 0.4764 $(N(-d_1))$. Each option is for €100,000.
>
> Re-arranging the previous formula, the number of Euros for which at-the-money call options should be purchased can be calculated:
>
> €20 million/ $N(-d_1)$ = €20 million/0.4764 = €41,981,528.
>
> Since each option is for €100,000 this would mean having to buy 420 put option contracts.

As stated earlier, creating a hedge with options that eliminates the risk entirely is very expensive, because of the cost of the options. In this example, if the company did decide to use options to create a hedge, the number of options that it would buy is likely to be €20 million/€100,000 per contract = 200 contracts.

7.4 The Greeks

Organisations that deal in options calculate a variety of option ratios for establishing and monitoring their option positions. These ratios are called 'the Greeks', because they are all designated by a Greek letter (though strangely there is not Greek letter "vega")

Delta (Δ)

Delta has already been explained. It is the change in the price of an option (in money value) for a given change in the price of the underlying item.

The value of delta changes as the price of the underlying item changes. For example, if the market price of a share rises, the delta value of a call option on the shares will increase.

The delta value of an option may also be seen as a probability estimate that the option will expire in-the-money. For example, a deeply in-the-money option has a delta close to + 1 (call option) or – 1 (put option) and the probability estimate that it will expire in the money is therefore close to 100%.

A deeply out-of the-money option has a delta close to 0, and the probability that it will expire in-the-money is therefore close to 0%.

For an at-the-money option, the probability that it will expire in the money is about 50%.

Gamma (Γ)

The gamma for an option is the ratio of the change in the delta of an option for a given change in the value of the underlying item. For example, it is the change in delta of a share option for an increase or decrease of $0.01 in the share price.

The value of gamma for an option is very low as the certainty increases that the option will expire in-the-money or out-of-the-money.

The value of gamma increases with uncertainty as to whether the option will expire in-the-money or out of-the-money.

Vega (v)

Vega measures the ratio of the change in the option price for a 1% change in the volatility of the underlying item. If volatility in the underlying item increases, vega increases.

Vega is typically expressed as the amount of money, per underlying share the option's value will gain or lose as volatility rises or falls by 1%.

Vega can be an important Greek to monitor for an option trader, especially in volatile markets since some of the value of option strategies can be particularly sensitive to changes in volatility.

Rho (ρ)

Rho is a measure of the sensitivity of the option price to interest rate changes.

	Impact on calls	**Impact on puts**
Interest rate rises	Increase	Decrease
Interest rate falls	Decrease	Increase

Except under extreme circumstances, the value of an option is least sensitive to changes in the risk-free-interest rates. For this reason, rho is the least used of the first-order Greeks.

Theta (θ)

Theta is a measure of the sensitivity of the option price to the remaining time to expiry of the option.

The theta value indicates how much value a stock option's price will diminish per day with all other factors being constant. If a stock option has a theta value of - 0.012, it means that it will lose 1.2 cents a day.

The nearer the expiration date, the higher the theta and the farther away the expiration date, the lower the theta.

Summary

	Change in:	**Due to change in:**
Delta	Option price	Underlying asset value
Gamma	Delta	Underlying asset value
Vega	Option price	Volatility
Rho	Option price	Interest rate
Theta	Option price	Time to expiry

8   CHAPTER REVIEW

Chapter review

Before moving on to the next chapter check that you now know how to:

■ Use the binomial option pricing method to value options

■ Explain how the binomial option pricing method can be used to arrive at an option price

■ Explain how the Black Scholes option pricing model can be used to arrive at an option price

■ Use the Black Scholes option pricing model to value options

■ Explain put-call parity

■ Explain the nature of real options and provide examples

■ Use the Black Scholes option pricing model to value real options

■ Estimate the market value of a business using option based techniques

SOLUTIONS TO PRACTICE QUESTIONS

Solutions   **1**

Answer

Step 1- List the variables

P_a = 400

P_e = 440

r = 6% = 0.06)

t = six months to expiry, t = 0.50.

s = 0.30

Step 2- Calculate d_1

$$d_1 = \frac{\ln(400/440) + [0.06 + (0.5 \times 0.30^2)]\,0.5}{0.30\sqrt{0.5}}$$

ln (400/440) = ln 0.9091. Using a calculator, the natural logarithm of 0.95238 can be obtained. This is – 0.0953.

$$d_1 = \frac{-0.0953 + 0.0525}{0.30\sqrt{0.5}} = {}^{-0.0428}/_{0.2121} \textbf{ = – 0.202}$$

Step 3 - Calculate d_2

$$d_2 = d_1 - s\sqrt{t} = -0.202 - 0.30 \times \sqrt{0.5} \textbf{ = – 0.414}$$

Step 4- Obtain values for N(d1) and N(d2)

N(d_1).

When d_1 = – 0.202, the corresponding value in the normal distribution table is about 0.0801.

The value of d_1 is negative, so subtract 0.0801 from 0.50. N(d_1) =

0.5000 – 0.0801 = 0.4199

N(d_2).

When d_2 = – 0.414, the corresponding value in the normal distribution table is about 0.1613.

The value of d_2 is negative, so subtract 0.1613 from 0.50. N(d_2) =

0.5000 – 0.1613 = 0.3387.

Step 5 - Calculate the option price (for a call option)

The value of rt is (0.06)(0.5) = 0.030. $e^{0.03}$ =

1.03045.

Therefore $e^{-0.03}$ = 1/1.03045 = 0.9704.

Option price = $P_s\,N(d_1) - P_e\,N(d_2)\,e^{-rt}$

= 400(0.4199) – 440 (0.3387) (0.9704)

= 167.96 – 144.62 **= 23.34**

Solutions 2

Step 1- List the variables

P_a = ₦240m (this is the value of the underlying asset at the start of the project)

P_e = ₦400m

r = 5% = 0.05)

t = 4 years to expiry, t = 4.

s = 0.30

Step 2- Calculate d_1

$$s\sqrt{t} \qquad d_1 = \frac{\ln(P_a/P_e) + (r + 0.5s^2)t}{}$$

$$0.3\sqrt{4} \qquad d_1 = \frac{\ln(240/400) + [0.05 + (0.5 \times 0.30^2)]\,4}{}$$

$$0.6 \qquad d_1 = \frac{\ln(0.6) + [0.05 + 0.045]\,4}{}$$

$$0.6 \qquad d_1 = \frac{-0.5108 + 0.38}{}$$

$$d_1 = \frac{-0.1308}{0.6} \qquad \mathbf{= -0.218\ (say\ -0.22)}$$

Step 3 - Calculate d_2 d_2

= $d_1 - s\sqrt{t}$

$d_2 = 0.218 - 0.3 \quad \sqrt{4}$

$d_2 = 0.218 - 0.6$

$d_2 = -0.818$ (say 0.82)

Step 4- Obtain values for N(d_1) and N(d_2) N(d_1).

When $d_1 = -0.22$ the corresponding value in the normal distribution table is 0.0871. The value of d_1 is negative, so subtract 0.0871 from 0.5

N(d_1) = 0.5 – 0.0871 = 0.4129. **N(d_2).**

When $d_2 = -.82$, the corresponding value in the normal distribution table is 0.2939. The value of d_1 is negative, so subtract 0.2939 from 0.5

N(d_2) = 0.5 – 0.2939 = 0.2061

Solution (continued) **2**

Step 5 - Calculate the option price (for a call

option) $c = P_a N(d_1) - P_e N(d_2) e^{-rt}$

Tip – calculate the value of e^{-rt} first

$$rt = (0.05)(4) = 0.2.$$

$$e^{-0.2} = 1/e^{0.2}$$

$$e^{0.2} = 1.2214$$

Therefore $1/e^{0.035} = 0.8187$

Option price $=$ $P_s N(d_1) - P_e N(d_2) e^{-rt}$

$=$ $240(0.4129) - 400 (0.2061) (0.8187)$

$=$ $99.1 - 67.5 = \mathbf{31.6}$

Conclusion

The value of the option to enter a further project is ₦31.6m. This gives an overall project value of ₦10m + ₦31.6 = ₦41.6m

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CHAPTER

31

Emerging issues

Contents

INTRODUCTION

Aim

Strategic Financial Management supports management in making informed decisions. Candidates are expected to apply relevant knowledge, skills and exercise professional judgement in recommending appropriate options for financing a business, recognising and managing financial risks, dividend decisions and investments.

Detailed syllabus

The detailed syllabus includes the following:

A	Financial environment and role of financial manager and money market institutions	
	1	Financial environment and role of financial manager	
		i	Identify and assess the impact of emerging issues in strategic financial management.	

Exam context

This chapter gives an insight into recent and ongoing issues of international importance to financial management. More importantly perhaps take an interest in business news. Read articles in good quality newspapers and keep an eye out for relevant articles produced by ICAN, in particular by the examinations directorate.

By the end of this chapter, you should be able to:

■ Explain the roots of the financial crisis

■ Understand dark pool trading

■ Explain the nature of collective investment schemes in Nigeria

1 THE FINANCIAL CRISIS

Section overview

- Roots of the crisis
- Securitisations
- Securitisation through CDOs (Collateralised Debt Obligations)
- Impact

1.1 Roots of the crisis

Since the 1990s until recent years there was a wave of aggressive selling of home loans (mortgages), often to individuals who had no realistic prospect of ever repaying their debt. These loans are known as "subprime mortgages".

Lenders were prepared to do this because property prices had been rising steadily and provided good security for the loans in the event of default.

There are different views as to why lenders went into these markets:

❑ There is a view that many banks were forced to enter a high-risk section of the credit market which they would not have considered had they used normal commercial criteria. Successive US administrations have tried to improve the availability of credit for home loans across all levels of income, geographical locations, and social groups. Various government initiatives encouraged lenders to make loans available to individuals who would have previously been refused as a bad credit risk.

❑ Alternatively, there is a view that the market expansion allowed a valuable growth opportunity to the lenders. Which they were happy to exploit.

1.2 Securitisations

Banks hold many assets which give them access to future cash flows (e.g. mortgages, credit cards, loans etc.).

Banks often securitise such assets. This involves the transfer of the interest bearing assets to a 'special purpose vehicles' (SPVs). The SPV effectively purchases a bank's mortgage book for cash which is raised through the issue of bonds backed by the income stream flowing from the borrowers.

This results in the conversion of future cash receipts into cash today.

An example of asset securitization is a Mortgage Backed Security (MBS) which is a security that is backed by mortgage receivables. The principal and interest on the debt underlying the security are paid back to the various investors regularly. In Nigeria, Mortgage Backed Securities are being promoted by the Securities and Exchange Commission in view of their potential to address the huge housing deficit.

1.3 Securitisation through CDOs (Collateralised Debt Obligations)

Securitisation of sub-prime mortgages was affected through the issue of instruments known as 'collateralised debt obligations' or CDOs.

CDO securities are split into different risk classes, or tranches.

❑ Senior tranches are the lowest risk and carry the lowest return.

❑ Junior tranches carry higher coupon payments to compensate for additional default risk.

❑ The most junior tranche is known as the "equity" tranche

In simple terms, a CDO as a promise to pay cash flows to investors in a prescribed sequence, based on how much cash flow the CDO collects from the pool of bonds or other assets it owns. If cash collected by the CDO is insufficient to pay all of its investors, those in the lower layers (tranches) suffer losses first.

If the mortgages default then the equity tranche investors lose their principle first. When this is reduced to nothing the next level loses their investment and so on.

When the sub-prime mortgages were issued, high employment and rising property prices led to the expectation that the vast majority of borrowers would repay their interest and their debt on the due date. In other words it was expected that all tranches would be safe from default.

Under US Securities Exchange Commission rules, CDOs could only be traded between banks and other financial institutions. At the start of the credit crisis a trillion dollars of sub-prime debt was sitting on bank balance sheets in the form of what they believed to be very low risk securities.

Deterioration in the US economy led to rise in unemployment and increase in interest rates. This in turn resulted in defaults in the subprime mortgages. The scale of the default led to erosion of the junior tranches but then also the more senior tranches. This had an adverse effect on the cash flow position of the banks that had invested in the CDOs.

In addition to this the CDOs had to be reflected at fair value in the financial statements of banks. The increase in default led the fair value to fall. Banks are very highly geared with typically less than 10% their asset value covered by equity. Falling asset values pushed certain banks towards negative equity.

Investors holding CDOs tried to sell their securities. It was difficult to find buyers and this pushed the price of the securities into freefall exacerbating the problem.

Banks that had stayed free of the problem began to suspect the credit worthiness of other banks and, as a result, became reluctant to lend on the inter bank market. This led to an increase in LIBOR threatening the liquidity of banking operations.

1.4 Impact

The banking sector problems fed into the real economy. Banks tightened up their lending practices making credit harder to come by. As credit dries up, borrowing rates rise because of the scarcity of supply of willing lenders. This leads to potential home buyers being unable to raise mortgages and, as a result, a fall in property prices. The fall in property prices leads to less houses being built and a contraction of the building sector.

Recession in the real economy means that more people default on their home loans.

Consumer confidence begins to deteriorate and, as a result, previously strong economies began to slow down.

2 DARK POOL TRADING

Section overview

- Dark pools
- Regulatory response

2.1 Dark pools

An offer to sell a large block of shares for sale on an open exchange is advertised to every participant. The offer itself could affect the price of the security and this could cause the trader to lose out.

The term "dark pool" refers to a place where trading shares exists but is not displayed for all to see. Dark pool trades are for large blocks of shares between anonymous parties. The trade is only announced once the trade is completed. It is estimated that over 20% of share trades in the USA and UK are in dark pools.

Dark pool trades are at a price which is not known to the exchange. This means that the price set by the exchange for trades in the same securities is undermined reducing the efficiency of those exchanges. This could in turn harm investors on these exchanges.

2.2 Regulatory response

In the USA the Securities and Exchange Commission (SEC) has proposed measures calling for fuller disclosure of dark pool trades and by dark pool participants.

The European Commission is engaged in research to examine how dark pool trades affect securities pricing.

3 OTHER ISSUES

Section overview

- Introduction to Collective Investment Schemes
- Unit trusts
- Real Estate Investment Trusts (REITs)
- Exchange Traded Funds (ETF)

3.1 Introduction to Collective Investment Schemes

Collective Investment Schemes are very important in the Nigerian context in relation to investment in the capital market. They are a way of investing in a pool alongside other investors in order to share from the gain of being part of an investor group.

The Investment and Securities Act No. 29 of 2007 (which regulates the capital market in Nigeria) defines collective investment scheme as "any arrangement in which participants pool their resources for the purpose of sharing the profits or income arising from the management of their money or property solely from the effort of a third party.

Collective Investment Schemes include

- ❑ Unit trusts;
- ❑ Real Estate Investment Trust; and
- ❑ Exchange Traded Funds). CIS

include the following:

3.2 Unit trusts

A unit trust is a fund into which sums of money from individual investors and corporate entities are collected to form a pool for the purpose of investing in a portfolio of securities such as shares, bonds and money market instruments in the interest of the unit holders.

The fund is managed by professional fund managers at low cost while the fund holders enjoy the benefits of diversification. As at September 30 2012, there were forty eight registered unit trust schemes in Nigeria (www.sec.gov.ng).

3.3 Real Estate Investment Trusts (REITs)

The primary business of a REIT is to manage a group of income generating properties such as residential or commercial houses, shopping malls, business centers etc.

A REIT must distribute most of its profit as dividend and can be structured as a trust or a company listed on the stock exchange. Skye Shelter Fund Plc and Union Homes are two REITS listed on the Nigerian Stock Exchange.

3.4 Exchange Traded Funds (ETF)

These are funds consisting of a collection of securities that track a market, sector, or industrial index. They are hybrid products combining some of the features of stocks and mutual funds. They are traded on a stock exchange.

Each ETF has a net asset value which is determined by the total market capitalization of the securities or other products in the portfolio, plus dividends and interest but minus managerial and operational expenses divided by the number of shares issued by the fund'.

4 CHAPTER REVIEW

Chapter review

You should now know how to:

- Explain the roots of the financial crisis

- Understand dark pool trading

- Explain the nature of collective investment schemes in Nigeria

32

Technology tools for financial management

Contents

Technology tools for financial management

31.0 What is financial modeling?

Financial modeling involves combining key accounting, finance, and business metrics to build an abstract representation, or model, of a company's financial situation. This exercise helps a company visualise its current financial position and predict future financial performance. Financial modeling can be used in a number of situations. It can help inform investment decisions, securities pricing, and plans for corporate transactions, such as mergers, acquisitions, and divestitures.

The output of a financial model is used for decision making and performing financial analysis, whether inside or outside of the company. Inside a company, executives will use financial models to make decisions about:

 (a) Raising capital (debt and/or equity);
 (b) Making acquisitions (businesses and/or assets);
 (c) Growing the business organically (e.g., opening new stores, entering new markets, etc.);
 (d) Selling or divesting assets and business units;
 (e) Budgeting and forecasting (planning for the years ahead);
 (f) Capital allocation (priority of which projects to invest in);
 (g) Valuing a business;
 (h) Financial statement analysis/ratio analysis; and
 (i) Management accounting

31.1 Who builds financial models?
Financial models are created and used by many different types of financial professionals, which include but not limited to:
 (a) Accountants;
 (b) Corporate development analysts;
 (c) Investment bankers; and
 (d) Equity research analysts.

In the context of modern company, those involved in financial planning and analysis (FP&A) are most likely to be building and using financial models that steer the direction of the company.

31.2 Software applications to strategic financial management (SFM)
There are computer software in the market that support the strategic financial management in the area of financial modelling. financial modelling software refers to a programme or operating system designed in a way that portrays the relationship between finance and operation in order to study and examine the response of business in various favourable and unfavourable situations, evaluate the monetary implications of it well in advance and to arrive at conclusions for the best interest of the business in any given circumstances whether planned or unplanned.

31.2.1 Features of financial modelling software
The following are the features of financial modelling software:
 a. Exceptional calculation performance: The software makes complex calculations easier and straightforward, which can be quickly interpreted as per the requisite business needs. These calculations are mostly error-free and keep the assumptions of present economic conditions intact, thus assisting in better decision making;

 b. Next-generation business plan: The software provides firms and analysts with various economic, financial, and operational scenarios, thus giving an insight into future business standards and planning. This gives an upper hand advantage ahead of others in the market. The software is also developed with various inbuilt security and controls to maintain data secrecy;

c. Enterprise accessibility: This software is developed in such a way that it provides an easy access to the secured data and report anywhere in the world to the users as well as customers of the firm. It also helps to merge other operational models with financial models for better analysis;

d. Huge database: The software provides such a platform that helps the firm store any amount of data and prepare as many models as required by the firm without the fear of data being lost or stolen; and

e. Time efficient: This software interprets and analyses any form of data in less time as compared to manual workings. Thus, resulting in an added advantage as compared to time-consuming traditional ways of reporting.

31.2.2 Financial modelling software

Some of the financial modelling software that are available in the market are the following:

(a) Microsoft excel - The first and foremost tool that an analyst needs to have is Microsoft excel. Microsoft excel has so many functions within it that ease the job of any scale in the globe;

(b) Oracle BI – Developed by Oracle, provides end to end solutions for the financial supply chain;

(c) Business objects – Developed by SAP, helps to analyse business intelligence data;

(d) Hyperion – Developed by Oracle, helps in financial management;

(e) Operis – It is an advisory software that provides help and support for all business needs;

(f) IBM Cognos – Developed by IBM, which integrates business intelligence activities; and

(g) Quantrix – It is used by professionals to develop future planning, estimation, and budgeting.

The above list of financial modelling software is not exhaustive. Many IT companies worldwide are working day and night to develop software with the latest technologies to outperform rival organisations and meet diversified business needs.

31.2.3 Applications of financial modelling software

The applications of financial modelling software are used in various levels of the organisation falling under the categories of purchase, material, human resource, accounting, controlling, finance, reporting, etc. There are different types of models that financial planning and analysis (FP&As) can use, depending on the problems they are trying to solve. Below is a brief example of financial modelling areas:

(a) Three-statement financial model

The three-statement financial model integrates and forecasts a company's three financial statements—the income statement, the statement of financial position (balance sheet), and cash-flow statement—into the future. The three-statement model represents the real meat and potatoes when it comes to financial modeling. This model acts as a standard that gives a comprehensive overview of the company's financial history, current standing, and future performance.

(b) Merger and acquisition (M&A) model

The merger and acquisition (M&A) model calculates the impact of a merger or acquisition on the earnings per share (EPS) of the newly formed company. This value can then be compared to the company's current EPS. The M&A model is useful for helping a company decide whether a potential merger or acquisition will be beneficial to the company's bottom line.

(c) Forecasting models

Forecasting is one of the most important tasks that the financial planning and analysis (FP&A) department takes care of on a regular basis. It is typically used to predict future revenues, expenses, and capital costs. Financial models used for forecasting are often compared to the actual budget to review performance in retrospect.

31.2.4 DCF model

A financial analyst may turn to the discounted cash flow (DCF) model when they need a way of determining valuation. One of the key attributes of the DCF model is that it calculates current value while considering predictions for how much money an investment will make in the future.

The DCF model can be used to value an entire company, but the model can also be used to value:

    (a) Shares of a company;

    (b) A project or investment within a company;

    (c) A cost-saving initiative within a company; and

    (d) Anything that has an impact on cash flow.

31.2.5. Comparable company analysis (CCA) model

The comparable company analysis (CCA) model is another way for a business to calculate its value. It is a more basic valuation method than the DCF model. The CCA financial model assumes that similar companies will have similar valuation multiples. It uses metrics from other businesses with similar sizes and operations in the same industry. Listed below are some of the most commonly used valuation multiples:

    (a) EV/S – Enterprise value to sales;

    (b) P/E – Price to earnings;

    (c) P/B – Price to book; and

    (d) P/S – Price to sales.

31.2.6. Asset and liability management (ALM)

Asset and liability financial models are primarily used by financial institutions (banks and insurance companies) and pension funds (corporate or public) to manage their financial objectives. For example, pension funds must be able to pay pensioners during any economic conditions, including a crisis like 2008. This is achieved through thorough risk management strategies that are continually reviewed. Most pension funds conduct a comprehensive review every three to five years. During this process, they use financial analysis and modelling to adjust their asset and liability management strategies to reduce portfolio sensitivity to economic conditions, interest rate changes, and foreign exchange rates.

31.2.7. Capital budgeting model.

Every year, the FP&A department is tasked with helping to create the annual budget. Some people view this as being an extremely painful process due to all the fine tuning involved. However, proper annual financial planning model that make use of quarterly figures and forecasting can greatly expedite the process.

31.2.8. Initial public offering (IPO) model

This might not be a financial model that the FP&A department needs to be familiar with, but they should be aware of its existence. Typically, investment bankers on Wall Street and major exchanges have access to financial model templates that are built specifically for pricing IPOs.

31.2.9. Leverage buyout (LBO) model.

The leveraged buyout (LBO) model is used to analyse an acquisition that finances the cost mostly with debt. How much debt? Typically, a leveraged buyout is 90% debt and 10% equity. Due to this incredibly high debt-to-equity ratio, the bonds being issued are not investment grade, that is, junk bonds. Some people consider

LBOs to be an incredibly aggressive and risky move, but with great risk comes great reward.

31.2.10. Option pricing model

Most FP&A departments will not be looking at the option pricing model unless they are somehow involved with a company that specifically trades/holds derivatives. Option pricing models are typically used by market makers and securities traders looking to turn a profit or hedge risk. These financial models are used to assign a price (premium) for the options contract based on statistics and probability (that is, how likely the option will be in-the-money at expiration).

31.3 Forecasting tools

Forecasting is an important part of business strategy. Whether it is predicting sales, measuring market impact, or understanding if you need to grow your workforce, forecasting helps businesses assess where they are and predict where they might be going in many key areas. This is crucial when it comes to goal setting, budgeting, and campaign planning.

Essentially, forecasting allows a business to look at past trends plus their current position and predict a future. You can use business forecasting tools to help predict sales, budgets, and more. Having an accurate picture of your business's potential, using data and market trends can help you set and meet objectives. Here are some of the fundamental forecasting tools and techniques to help you plan and strategise effectively.

31.3.1 Business forecasting techniques

There are several business forecasting methods that might work for the business that will help understand past trends and potential demand. The right technique might depend on what industry is using it. Here are some of the general forecasting models often used by businesses:

(a)   Qualitative forecasting model

This method is appropriate where no hard data is available. Startups, for instance, cannot project against past data, because there is no past data for their business. They must use a subjective approach that looks at the industry, market research, and relies on opinions of industry experts;

(b)   Quantitative forecasting model

Quantitative methods forecast the future through looking at past data. This measurable method-based, analytical model is appropriate for several statistical forecasting needs, including short-term goals and planning; and

(c)   **Causal methods**

This kind of forecasting is used to try to understand and predict relationships between variables. If there has been a downturn in sales, is it because of the economy or bad customer service? Understanding the relationship between data sets can help to create a better plan going forward.

31.3.2   Forecasting application software

Strategic management of any goals requires accurate data to plan. To find, gather and analyse the most accurate data – and utilise it in your planning – you need the right tools. Below are some reliable tools to try when working on forecasting for a business:

(a) Demand Works

Demand Works offers forecasting software for businesses that run 100% in browsers, so you can run the software from servers, the cloud, or desktop. Their demand planning software is specifically for inventory management, capacity planning, and sales and operation planning;

(b) QuickBooks

QuickBooks is a go-to resource for anyone looking for accounting software. Because of their robust platform, you can generate trend reports and forecasting reports that will help you in planning financial and budgeting objective; and

(c)Tableau

Tableau has been touted as a great software solution for forecasting for business intelligence goals. It helps you get an accurate picture of several different areas of business and strategise around the data.

While it is not a crystal ball, forecasting methods can help to assess information for the business' future. Using the right budgeting and forecasting techniques is essential in creating accurate, reliable forecasts for the business. Decide on the goals, which will lead to the best forecast tools and techniques to help start planning and building strategies to accomplish those goals.

31.4 Technology tools for financial planning and management

Financial Planning is the process of estimating the capital required and determining its composition. It is the process of framing financial policies in relation to procurement, investment and administration of funds of an enterprise.

31.5 Objectives of financial planning

Financial planning has many objectives which include:

    a. Determining capital requirements - This will depend upon factors like cost of current and non-current assets, promotional expenses and long- range planning. Capital requirements have to be looked with both aspects: short- term and long- term requirements;

    b. Determining capital structure - The capital structure is the composition of capital, that is, the relative kind and proportion of capital required in the business. This includes decisions of debt- equity ratio- both short-term and long- term;

    c. Framing financial policies with regards to cash control, lending, borrowings, etc; and

    d. A finance manager ensures that the scarce financial resources are maximally utilised in the best possible manner at least cost in order to get maximum returns on investment.

Technology has significantly impacted professional financial planning. Independent advisers, registered representatives, and even accountants have come to rely on sophisticated financial software designed to help them not only to devise appropriate investment and retirement plans for clients but help them to engage clients better as well. Below is a list of applications that can be used for financial planning and management:

Financial Software	Highlighted Features
eMoney	Specialises in creating digital advisory software and platforms
Envestment Finance Logix	Strong emphasis on client participation

Money Tree	Abundance of support and training tools
MoneyGuidePro	Web-based practice management financial software
Redtail CRM	Engineered specifically to control client data, documents, and correspondence
NestEgg Estimat	The NetEgg Estimator, a Google app, is a comprehensive retirement tool that projects the client's finances into the future and breaks them down into income, taxes, assets and debt.
Black Diamond	Advent Software's Black Diamond is a cloud-based portfolio management platform. The features it offers independent financial advisors include information aggregation, customisable reporting, rebalancing and daily account reconciliation.
Equisoft/plan	An intuitive and effective financial planning solution providing comprehensive financial portraits

31. 6 Chapter review

At the end of this chapter, readers should be able to discuss:

(a) Relevant areas of SFM requiring IT support, such as financial models for business decisions, long-term strategic financial planning and forecasting).

(b) Specific application tools supporting SFM processes including:

   i. Financial modelling tools, such as excel and active data;

   ii. Forecasting tools especially in interest and currency rates management;

   iii. Financial planning and management tools, such as Gannt Chart; and

   iv. Reporting and presentation tools.

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