TAX REVENUE VOLATILITY AND ECONOMIC GROWTH IN NIGERIA

Omatozaye Ozavisa Oshemi[1] and Olatunde Julius Otusanya[2]

[1]*Research Student, Department of Accounting, University of Lagos, Lagos, Nigeria*
[2]Department of Accounting, University of Lagos, Lagos, Nigeria

Abstract

Revenue fluctuation puts government service provision at risk and creates difficulties when planning government expenditures which pose challenges to economic growth. With the uncertainty surrounding the length of the revenue decline, a rise in volatility could ultimately threaten sustainability. This study aimed to investigate the impact of tax revenue volatility on Nigeria's economic growth. The study employed an ex-post facto research design utilizing secondary data gathered from certified sources; including, National Bureau of Statistics, Central Bank of Nigeria Statistical Bulletin, and World Development Indicators covering a period from 1981 to 2020, amounting to forty (40) observations. With the use of E-views, Pearson correlation and stationarity tests were utilized for pre-estimation, while post-estimation testing used VECM for short run estimates and OLS for long run estimates between all variables. Findings revealed that tax revenue volatility comprising of oil and non-oil tax revenue sources moderated by inflation rate, interest rate, exchange rate and crude oil price had a positive and significant relationship in the short run ($R^2 = 0.81$, $\theta = 0.07$, t-test = 2.465, $\rho < 0.05$) but a positive and insignificant relationship in the long run ($\theta = 0.185$, t-test = 0.891, $\rho > 0.05$) on economic growth in Nigeria. The study concluded that macro-economic variables of inflation, effective exchange rate, interest rate, as well as crude oil prices contribute to the fluctuations in total tax revenue. A recommendation was made that government should review tax laws and policies in order to streamline and ensure optimal tax revenue generation to absorb potential shocks.

Keywords: Economic Growth, Gross Domestic Product, Nigeria, Tax Revenue, Volatility.
JEL Classification Code: 38

1. Introduction

Due to lower crude oil prices and containment measures to prevent COVID-19 from spreading, Nigeria's economy in 2020 plunged into a recession, reversing three years of economic growth, although economic sustainability measures included in the Economic Sustainability Programme (ESP) prevented a much more serious decline, the real GDP in 2020 fell by 3%. Further inflationary pressure was caused by the elimination of fuel subsidies and increased electricity tariffs. In 2021 and 2022, the economy is forecasted to grow by 1.5% and 2.9% respectively due to an expected recovery in crude oil production and prices. An increase in non-oil revenues may be achieved through the ESP and Finance Act of 2020's economic stimulus measures (African Development Bank, 2021). It therefore cannot be overemphasized how critical it is for the economy to diversify into non-oil tax revenue to spur economic growth (Sam, Omese, & Akor, 2020).

Cornia and Ray (2010) suggest that major tax reform proposals, including revenue enhancements, should be carefully anticipated and examined so that they can take into account

the potential long-term impact on growth and volatility of each country's tax revenue portfolio. Revenue generation for Nigeria's economic growth activities poses challenges and raises worries concerning contribution to economic growth derived from oil revenues and other sources (Akinola, Efuntade, & Efuntade, 2020). In addition, the COVID-19 pandemic and current global calls for environmental sustainability have led to a decline in global crude oil prices that will continue to fluctuate in the future. These challenges will put a dent in the country's over-dependence on oil taxes (Olayemi & Efuntade, 2020).

Traditionally, economists have been interested in what determines the growth rates of different countries as well as the levels of wealth they achieve. Economic growth and taxation can have a negative, positive, or neutral relationship, depending on the importance of tax revenue as an economic resource. It is widely believed that tax revenue significantly contributes to the development of a country (Takumah, 2014). Many factors can contribute to spikes in tax revenue, including tax rates, tax bases, economic conditions, and political factors; a volatile revenue base usually indicates fluctuations in personal income levels of taxpayers, as well as the disastrous business climate in Nigeria (Otusanya, Adeyeye, & Ovienbor, 2019; Adegbie, Salawu, &Ojutawo, 2020). Volatility in revenue can therefore be a significant concern for policymakers and fiscal administrators attempting to maintain a balanced budget (Kithure, Anthony, & Anthony, 2019). Volatility studies can assist policymakers in identifying budgetary risks and developing efficient savings strategies that help cushion lean years by maximizing tax growth in good years. Additionally, they can lower fiscal uncertainty by restricting spending on tax streams that are especially volatile (Murphy, Akshay, & Alexandria, 2018).

Economic growth in any nation is largely determined by how much revenue is generated and channeled towards its development. Government's inability to meet financial challenges caused by population growth and infrastructural decay resulting from dwindling oil prices and prevailing inflationary conditions in the country have forced Nigeria to undertake numerous tax policy reforms, using social engineering as a mechanism to stimulate general growth since 1904 till date (Sunday, Uniamikogbo, Erah, & Aggreh, 2020).

Government service provision is at risk when revenues fluctuate and can create difficulties for government planning since revenues frequently fall short of expenditures. Given the uncertainty over the length of the revenue decline, a rise in volatility may ultimately threaten sustainability if it is accommodated by borrowing (Porter, 2007). Volatility measures generally allow for understanding of fluctuations away from equilibrium, so they can provide insight into a country's economic progress (Staley, 2017).

Despite the apparent importance of tax revenue volatility, extant literature does not provide enough analysis of its impact on economic growth. A substantial body of literature has paid scholarly attention on tax revenue volatility and economic growth from a variety of competing perspectives (Abiodun, Oyeneye, & Dahn, 2014; Adegbie, Salawu, & Ojutawo, 2020). However,

broader accounts of the impact of tax revenue shocks on economic growth are relatively scarce. Therefore, this study aims to analyse the trend of government revenue in Nigeria over the last four (4) decades as well as to ascertain the impact of tax revenue volatility on the growth of the economy. The study covers the period for the years 1981-2020 making a time horizon of forty (40) years. This period was chosen due to the rise in revenue and spending experienced by the government during this time period.

This study seeks to determine if there is any association between Nigeria's economic growth and the volatility of tax revenues moderated by inflation, crude oil prices, real interest rates and exchange rates, in order to meet the above objectives. The following hypothesis was evaluated in order to provide an empirical answer to the research question:

H_o1: There is no positive and significant relationship between tax revenue volatility and economic growth.

Given the significance of the recent crash in oil prices on global output, inflation, the need to develop non-oil sectors, and the challenges the government is currently facing with stabilizing the economy, Nigeria makes a good case study for exploring the impact of tax revenue volatility on economic growth. This study contributes to accounting literature in two ways. First, it extends the empirical literature on tax revenue volatility (Abiodun, Oyeneye, & Dahn, 2014; Nwanna & Ayenajeh, 2016; Edewusi & Ajayi, 2019; Adegbie, Salawu, & Ojutawo, 2020) through the insights from developing country and expansion of the scope of the data used. Second, it augments the scant literature concerning the danger of tax revenue uncertainty in driving the growth of the economy in developing countries like Nigeria and how it could assist in resolving the gap between government expenditure and revenue sustainability that has become a yearly problem. The paper further argued that understanding the relationship between these two concepts is necessary if any policy prescription is to be offered to control and reduce the lingering budget deficit, the resultant public debt, and other related problems.

The study is further broken down into four segments. The second segment shows the conceptual, theoretical and empirical reviews of the extant literature relating to the study. The third segment outlines the research methods employed to test the hypothesis formulated for this study. The fourth segment concentrates on the data analysis, presentation of results and the discussion of findings. The last segment provides the summary, conclusions and recommendations.

2. Literature Review

Although the problem of tax revenue generation is universal, developing countries, such as Nigeria, are more plagued by it because of over dependence on oil revenue, unstable foreign exchange, global oil market, weak institutions and low tax compliance. This section discusses various concepts related to the study, identifies the theory adopted and reviewed empirical studies.

2.1 Conceptual Review

This section shows the review of related concepts.

2.1.1 Tax revenue volatility

Volatility measures how widely a market index returns fluctuate. A measure of volatility is often calculated as either the standard deviation or variance between market indices. Volatile revenues may lead to the inefficient provision of government services, pro-cyclical fiscal policies and, potentially, slower growth. If governments maintained stable spending during revenue booms and busts, volatility of revenues would be much less of an issue. The following underlying causes of revenue volatility have been identified through prior research: (1) taxes are becoming increasingly vulnerable to business cycle changes; (2) falling crude oil prices have also caused serious fluctuations for resource-dependent countries like Nigeria. Taxes based natural resource extraction, in general, are highly volatile; and (3) countries are more reliant on volatile revenue streams (Rueben & Megan, 2017). A state's tax portfolio (revenue sources it relies on); economic volatility; and other factors affecting its tax base will determine the level of tax revenue volatility (Seegert, 2018). The government's ability to generate revenue through taxation is one of the major instruments of economic, social, and fiscal policies (Ojong, Ogar & Arikpo, 2016). An effective administrative system and structures are necessary in order to create sufficient income to make public services and basic amenities more accessible to citizens. In order for businesses to thrive and compete globally, business owners require infrastructure amenities such as power, roads, water, telecommunications, high-quality health and education facilities, since these bring down the cost of operations and allow for expansion, resulting in wealth for the prosperity of all citizens and raising revenue per capital (Ezekwesili & Ezejiofor, 2022).

2.1.2 Taxation and economic growth

Growth in the economy can be impacted by tax policy through economic agents. Taxation has both positive and negative effect on growth. A higher tax burden decreases returns to investment and R&D (both in physical and human capital) (Abaa, Ekwe, & Ihendinihu, 2018). The underlying premise of taxation is to generate enough cash to improve people's well-being, with the specific goal of boosting economic growth and development (Edewusi & Ajayi, 2019). In theory and in simulations, adjustments in tax rates and the structure of the tax system may have an impact on economic activity, though not all tax changes will have the same effect, or even positive effects on long-run economic growth, especially when it comes to extreme policy changes like abolishing all personal exemptions and deductions and switching to a flat-rate tax. The long-term size of the economy will be more favorable if incentives are improved, subsidies are reduced, windfall gains and deficit financing are avoided. However, trade-offs between equity and efficiency may occur in some cases. (William & Andrew, 2014).

Proceedings of the 7th Annual International Academic Conference on Accounting and Finance
Disruptive Technology: Accounting Practices, Financial and Sustainability Reporting

2.2   Theoretical Review

An analysis of the literature on tax revenue and economic growth reveals that a variety of theoretical frameworks have been used to describe situations that causes volatility in revenue generation. Some common theories documented in economic literature that have provided theoretical framing includes, the expediency theory (Taiwo, Sakiru & Alebiosu, 2018) and social contract theory (Adegbie, Salawu, & Ojutawo, 2020). This study draws insights from the structuralism theory to describe in more detail the interrelationship between tax revenue and economic growth.

2.2.1   The structural theory

This theory was proposed by the well-known economists Myrdal (1968) and Straiten (1972). According to their hypothesis, there is a lack of a well-balanced integrated structure in which substitution possibilities between consumption and production are limited, and resource flows between different sectors of the economy are not always smooth and quick, causing inflation to be difficult to explain in terms of aggregate demand and supply. This hypothesis claims that macroeconomic fluctuations are to blame for structural shocks such as major price swings in food and oil (Supriya, 2020). Due to the widespread existence of bottlenecks and obstacles in the economy, the structuralist school advanced the claim that the economy was irreparably inflexible. Four types of bottlenecks were identified: (1) Agricultural bottlenecks that limit agricultural product supply, (2) resource constraints or government budget constraints, (3) Physical Infrastructural Bottlenecks, and (4) Foreign exchange bottleneck (Carvalho, 2018). The magnitude effect of structural shocks, however, is a point of contention among structuralism theorists. Supply shocks, according to one school of thought, are only transitory and have only short-term effects on the macro economy. Furthermore, they claim that, because policymakers' goal is to create favorable long-term economic conditions, they should not react to short-term pressures from volatile food and oil prices in order to avoid economic recession. They suggest that policymakers should instead concentrate on preventing "the second round impact," which will almost certainly last longer and potentially result in a recession (Ifeanyi & Ayenajeh, 2016).

2.3   Empirical review

Several alternative hypotheses have been put forward to establish the link between tax revenue and economic growth. This section presents the studies that focused on economic growth with respect to tax revenue volatility.

Adegbie, Salawu, and Ojutawo (2020) performed a research on tax revenue volatility and economic growth in Nigeria using quarterly report for the period 1981-2017. The method of analysis used was ordinary least square method. The findings indicate that tax revenue volatility controlled by inflation had a major impact on Nigeria's economic development. The researchers suggested that the government should adopt tax policies that encourage consistent tax revenue and ensure that tax funds are used wisely to construct infrastructure that leads to economic growth.

Abiodun, Oyeneye, and Dahn (2014) investigated the impact of tax revenue shocks on Nigeria's economic growth between 1961 and 2011. To test for the co integration relationship among the variables in the VAR model, the researchers used the Johansen co integration approach. The findings show that tax revenue shocks have a favorable impact on government spending and real GDP. The study concluded that every strategy that increases tax income would also increase government spending and real output.

Edewusi and Ajayi (2019) examined the relationship between tax revenue and economic growth in Nigeria. Multiple regression analysis and Co-Integration test were used to analyze the data from 1995 to 2015. The study's findings revealed that petroleum profit tax, corporate income tax, and value added tax all had a favorable influence on economic growth. The research concluded that the government should restructure its tax system to prevent practices that hinder the system's ability to generate the necessary revenue to spur economic growth.

Nwanna and Ayenajeh (2016) empirically assessed the impact of crude oil price volatility in Nigeria from 1980 to 2014. They analyzed the data using multiple linear regression. The results demonstrated a positive and substantial link between oil price and economic growth. To reduce dependency on crude oil and petroleum products, the researchers suggested that the government diversify its export revenue source.

3. Methodology

The study utilized an ex-post facto (correlation) research design in examining how the independent variable (tax revenue volatility) affects the dependent variable (economic growth). The study is empirical and analytical in nature in that it relies heavily on already computed data to confirm the nature, degree, and potential direction of the relationship between the variables. The data for this study was based on time series data from 1981 to 2020, a period of forty (40) years. The research's scope was determined by the apparent time gap in previous literature, which lacked broader study coverage, as well as the need to cover the years when Nigeria's economic potential became known to the world as a result of crude oil boom. The variables adopted are gross domestic product (GDP), tax revenue volatility (TRV), exchange rate, inflation rate, real interest rate, and crude oil prices. Data for gross domestic product, interest rate, exchange rate and inflation rate were adopted from World Bank Direction of Trade, while total tax revenue were sourced from Central Bank of Nigeria Statistical Bulletin and crude oil prices data were retrieved from the National Bureau of Statistics. The tax revenue volatility series are the independent variables. The other variables are real GDP, effective exchange rate, inflation, crude oil price and real interest rate.

3.1   Method of data analysis and model specification

The study used both descriptive and inferential statistics to determine the nature of correlation between the variables. Two models would also be used in estimation. The first model assessed the short run relationship using the vector error correction model (VECM) technique while the second model which is the ordinary least square model (OLS) was used in addition to

test for long run relationship. Finally, the post-estimation test was done to assess the reliability and consistency.

To estimate the impact of tax revenue volatility on economic growth the following model was developed:

$Y = F(X)^n$ ………………………………………………………………… ……..Eqn (1)

This denotes that Y= Dependent Variable, While X = Independent Variable.

The dependent variable (Y) is represented by GDP, which is a measure of economic growth, while the independent variable is represented by Tax Revenue Volatility (TRV). Therefore, $\Delta GDP = F(TRV)$,
The model in algebraic form is presented below as,

$$\Delta GDP_t = \delta + \theta TRV_t + \beta_{1t} INFR_t + \beta_{2t} EXR + \beta_{3t} INT + \beta_{4t} OP + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots..Eqn (2)$$

Where: GDP_t– Percentage change in Gross Domestic Product, TRV_t– Percentage change in Tax Revenue, $INFR_t$ – Inflation rate at period t, EXR_t – Exchange rate at period t, INT_t – Interest rate at period t, OP_t– Oil Price at period t δ –Stochastic variable (error term), ε_t –Constant term

4. Results and Discussion

This segment entails the presentation and analysis of data collected from various secondary sources. All data used was analyzed with E-views Statistics (version 10). The data analysis begins with analyzing the variable observed in this study with the aid of descriptive statistics (mean, standard deviation, skewness and kurtosis) and a trend analysis, followed by the stationarity test after which the vector error correction technique was adopted to capture the short term relationship and the ordinary least square was adopted in determining the presence or otherwise of long-term relationship amongst the variables of this study.

4.1 Descriptive statistics

Table 1 summarises the descriptive statistics of the sample. It provides the basic information about the variables and highlights potential relationship amongst the data set.

Table 1. Descriptive statistics

Statistic/Variables	TTRV	RIR (%)	RGDP_GR (%)	R_EEXCH_R (%)	INF_R (%)	COP (US$ Per Barrel)
Mean	25.49110	0.434224	3.440535	147.9393	18.99905	41.99175
Median	23.75616	4.326392	4.195924	100.5374	12.71577	28.62000
Maximum	66.84901	18.18000	15.32916	536.7891	72.83550	109.4500
Minimum	0.676733	-65.85715	-10.92409	49.73505	5.388008	12.28000
Std. Dev.	20.51849	14.44028	4.845217	117.1603	16.86844	29.25320
Skewness	0.421825	-2.680369	-0.444951	1.905728	1.823484	1.049845
Kurtosis	1.909245	12.58348	4.189927	5.840048	5.159020	2.913831
Jarque-Bera	3.089924	200.9676	3.587758	37.65511	29.93625	7.360201
Probability	0.213320	0.000000	0.166314	0.000000	0.000000	0.025220
Observations	40	40	40	40	40	40

Note: TTRV: Total Tax Revenue Volatility; RGDP_GR: Real GDP Growth Rate; R_EEXCH_R: Real Effective Exchange Rate; RIR: Real Interest Rate; INF_R: Inflation Rate; COP: Crude Oil Price Per Barrel.　　　　　　Source: Authors, 2022

Table 1 shows the mean values for total tax revenue volatility, real interest rate, real GDP growth rate, real effective exchange rate, inflation rate and crude oil price per barrel between 1981 to 2020 were estimated to be 25.49, 0.43%, 3.44%, ₦147 to a dollar, 19% and $41.99 per barrel respectively. All of the series are positively skewed except for real interest rate and gross domestic product growth which are negatively skewed. In terms of kurtosis, total tax revenue volatility and crude oil price per barrel are deemed *platykurtic* since they fall below the threshold value of 3. However, real interest rate, real exchange rate, non-oil tax revenue volatility, inflation rate and real GDP growth rate are described as *leptokurtic* since they exceed the threshold of 3. Furthermore, all variables from 1981 to 2020, with the exceptions of total tax revenue volatility and real GDP growth rate, did not follow a normal distribution because of the significance of the p-values revealed by the Jarque-Bera test. The standard deviation values reveal that of all variables observed in this study, and in descending order, the real effective exchange rate, crude oil price per barrel, total tax revenue volatility, inflation rate, real interest rate and the real GDP growth are most highly susceptible to change in Nigeria.

4.2   Trend analysis

The trend analysis presented below gives a graphical representation for the direction of movement between the independent variable (tax revenue volatility), dependent variable (economic growth) and the responsiveness of tax revenue with respect to economic growth. This is to show the trend and the nature of relationship which each variable exhibits with the dependent variable over time.
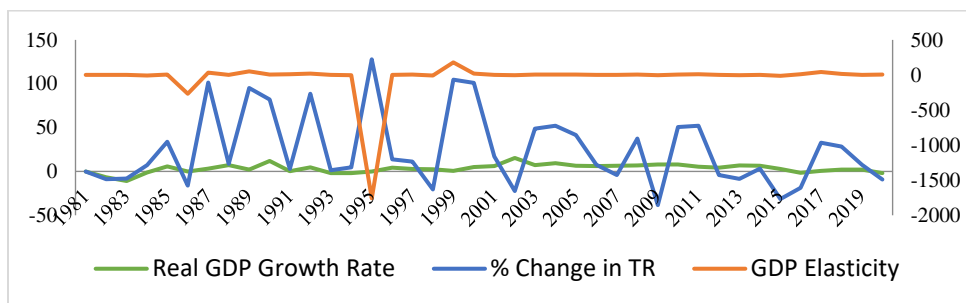

Fig 1. Graphical representation of %change in Tax revenue, GDP growth rate and GDP elasticity (1981 to 2020)

Figure 1, shows the graph depicting the trend on percentage change in tax revenue, real GDP growth rate and GDP elasticity (% change in tax revenue/GDP growth rate) over the period between 1981 and 2020. The line chart shows that movement in the flow of change in tax revenue was unsteady and regressive while the flow on economic growth rate shows that the trends have been stable but regressive over the period between 1981 and 2020 indicating volatility which will be as a result of many factors varying from corruption, poor institutional framework, mismanagement of funds, impact of the 2007/2008 global financial crisis on Nigerian crude oil price per barrel and the collapse in oil prices driven by a growing supply glut as a result of low demand between 2014 and 2016 dropping by over 42%, recessionary pressures between 2016 and 2020, and effect of Covid-19.

In addition, Figure 1 revealed that GDP elasticity fluctuates around one and show no increasing or decreasing trends except for the year 1995 that depicts -1759% elasticity, having 127.82%

Proceedings of the 7th Annual International Academic Conference on Accounting and Finance
Disruptive Technology: Accounting Practices, Financial and Sustainability Reporting

9

change in tax revenue and -0.073% change in growth rate which may be as a result of VAT implementation. Since elasticity of GDP is unitary it indicates that growth rate changes at the same rate as tax revenue. It is important to note that the measure of GDP elasticity does not take into consideration discretionary changes in tax policy which may give a different result.

4.3   Results of stationary test

The time series characteristics of the variables were examined using a stationary test across the study period. The series was tested for stationary using the Augmented Dickey Fuller (ADF) unit root tests, and the results are shown in Table 2.

Table 2. Summary of Unit Root Test Results

Variables	ADF Test Statistic at Level	Mckinnon Critical Value @ 5%	ADF Test Statistic at First Difference	Mckinnon Critical Value @ 5%	Order of Integration I(d)
TTRV	-5.928343	-2.941145-	-	-	I(0)
RGDP	-2.142654	-1.950117	-	-	I(0)
REEXCH_RT	-3.198128	-3.533083	-4.815906	-3.533601	I(1)
R_INT_RATE	-7.579490	-3.529758	-	-	I(0)
INF_RT	-4.068431	-3.533083	-	-	I(0)
COP (Per Barrel)	-1.911739	-3.529758	-5.120648	-3.533083	I(1)

Source: E-Views, 2022

The unit root test reveals that all series are stationary at initial differences I(1) and at level I(0). This mixed order of integration shows that the model estimation technique made use of Pesaran, Shin, and Smith's (2001) autoregressive distributed lag (ARDL) technique. However, the bounds test of co-integration must be performed first to determine whether or not there exists a long run relationship between all variables in the series.

4.4   Bounds test for cointegration

For small sample properties, the ARDL bounds testing method is more applicable and improves the outcome than multivariate cointegration methods (Haug, 2002). Using this method of cointegration, variables must be integrated in the same order. A long-run relationship cannot be established if variables are integrated in a different order. For these testing, an ideal lag length cannot be determined conclusively, since the choice of this factor is critical. Through the use of the bounds tests, the ARDL model addresses this issue by establishing relationships between variables over the long term, the ARDL representation of the macroeconomic relationship between the selected variables can be constructed as:

Table 3. ARDL bounds Co-integration test result

Models	F-Stat	Significance Levels (%)	Critical Values I(0)	Critical Values I(1)
			2.75	
			3.12	3.79
(1)		10		4.25
$\Delta GDPt = \delta + \theta TRVt + \beta_{1t}INFRt + \beta_{2t}EXR + \beta_{3t}INT$		5	3.49	4.67
$+ \beta_{4t}OP + \varepsilon t$	3.95947	2.5	3.93	5.23
	6	1		

Source: E-Views, 2022

The result of the bounds test (see Table 3.) showed that for the model established in this study, the value of F-statistic lies above the 95% upper and lower bound values of the Pesaran test statistic. This indicates an *inconclusive* result from the Bounds test. However, in line with Pesaran (2001), the order in which the dependent variable in the model is integrated determines whether a final decision is to be made based on the lower or upper bound values. Since *RGDP_GROWTH*, which is the dependent variable of this study in the model, is integrated at level I (0), the decision for co-integration testing will be based on the level order of the series.

As a result, the null hypothesis that there is no long-run relationship (co-integration) between the variables was rejected in this study. This guaranteed the conduct of the Error Correction (EC) needed for the estimation of long-run dynamics.

4.5   Test of hypothesis

To test the hypothesis formulated for this study, inferential statistics was applied to find out what type of relationship exists between the model's variables

Ho$_1$: There is no positive and significant relationship between tax revenue volatility and economic growth

Two models was used to evaluate the hypothesis above; a vector error correction model for short run testing and an ordinary least square approach for long run analysis.

The short run estimation

Table 4. Short run relationship between tax revenue volatility and economic growth

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.971138	0.885026	4.487029	0.0007
D(REAL_GDP_GROWTH_RATE(-1))	-0.285076	0.159525	-1.787031	0.0992
D(REAL_GDP_GROWTH_RATE(-2))	0.113341	0.160710	0.705251	0.4941
D(TRV)	0.070170	0.028471	2.464624	0.0298
D(TRV(-1))	-0.004703	0.033545	-0.140198	0.8908
D(TRV(-2))	-0.056636	0.031570	-1.793986	0.0980
D(INFLATION_RATE)	-0.062998	0.078138	-0.806250	0.4358
D(INFLATION_RATE(-1))	0.110631	0.055436	1.995654	0.0692
D(INFLATION_RATE(-2))	0.175804	0.050046	3.512871	0.0043
D(REAL_EFFECTIVE_EXCHANGE_RATE)	0.055358	0.013953	3.967543	0.0019
D(REAL_EFFECTIVE_EXCHANGE_RATE(-1))	-0.007793	0.011161	-0.698229	0.4983
D(REAL_EFFECTIVE_EXCHANGE_RATE(-2))	-0.009857	0.011616	-0.848558	0.4127
D(REAL_INTEREST_RATE)	0.063580	0.095771	0.663882	0.5193
D(REAL_INTEREST_RATE(-1))	0.101869	0.085360	1.193406	0.2558
D(REAL_INTEREST_RATE(-2))	0.121923	0.069075	1.765070	0.1030
D(COP)	0.072641	0.046737	1.554266	0.1461
D(COP(-1))	0.053720	0.047241	1.137139	0.2777
D(COP(-2))	0.028718	0.043824	0.655290	0.5246
CointEq(-1)*	-0.556138	0.102434	-5.429210	0.0002
R-squared	0.810562	Mean dependent var		-0.018851
Adjusted R-squared	0.609980	S.D. dependent var		4.513012
S.E. of regression	2.818447	Akaike info criterion		5.215499
Sum squared resid	135.0419	Schwarz criterion		6.051245
Log likelihood	-74.87898	Hannan-Quinn criter.		5.507197
F-statistic	4.041055	Durbin-Watson stat		2.271506
Prob(F-statistic)	0.002949			

The result shows that taken as a set, and in the short run, total tax revenue volatility and real effective exchange rate have a positive and significant relationship with economic growth; as captured by the growth rate of the real GDP (θ = 0.070170, t-test = 2.464624, ρ = 0.0298, $\beta2$ = 0.055358, t-test = 3.967543, ρ = 0.0019). The real interest rate and the crude oil price (per barrel) have a positive but insignificant relationship with economic growth ($\beta3$ = 0.063580, t-test = 0.663882, ρ= 0.5193, $\beta4$ = 0.072641, t-test= 1.554266, ρ = 0.1461). However, inflation rate has a negative and insignificant relationship with economic growth ($\beta1$ = -0.062998, t-test = -0.806250, ρ =0.4358). Furthermore, the CointEq(-1) calculated coefficient presented in Table is negative and statistically significant (CointEq(-1) = -0.556138, t-test = -5.429210, p= 0.0002). This suggests that variations from the equilibrium path of economic growth will be corrected by roughly 55.6% the following year. In other words, the adjustment process in Nigeria is pretty smooth. The presence of a long-run equilibrium link between economic growth and total tax revenue volatility in Nigeria is confirmed by the statistical significance of the CointEq(-1). The Adjusted R-square is 60.99%, implying that total tax revenue volatility, inflation rate, real effective exchange rate, real interest rate, and crude oil price (per barrel) explain about 61% of the changes/dynamics in economic growth, with the remaining 39% explained by other factors affecting changes in economic growth that was not captured in the model. Furthermore, the F-statistic of 4.041055 is statistically significant at the 5% level of significance (p = 0.002949), implying that total tax revenue volatility, inflation rate, real effective exchange rate, real interest rate, and crude oil price (per barrel) as a group perfectly explain changes in Nigeria's economic growth.

The long run estimates

Table 5. Long-Run Relationship between Tax Revenue Volatility and Economic Growth

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TRV	0.185167	0.207725	0.891403	0.3902
INFLATION_RATE	-0.447714	0.422131	-1.060604	0.3098
REAL_EFFECTIVE_EXCHANGE_RATE	0.035400	0.058294	0.607263	0.5550
REAL_INTEREST_RATE	-0.174557	0.830120	-0.210279	0.8370
COP	-0.063791	0.080941	-0.788118	0.4459

Source: E-Views, 2022

Table 5 shows the estimated long-run coefficients (elasticities) for the UECM model. In the long term, total tax revenue volatility and the real effective exchange rate appear to have a positive association with economic growth, but inflation, real interest rate, and crude oil price appear to have a negative relationship with economic growth. This means that improvements in total tax revenue volatility and the real effective exchange rate would result in increased economic growth in Nigeria, whereas increases in inflation, real interest rates, and crude oil prices will result in decreased economic growth. There is evidence of a long-run positive but insignificant relationship between total tax revenue volatility, economic growth and real effective exchange

rate (θ = 0.185167, t-test = 0.891403, ρ= 0.3902, β2 = 0.035400, t-test= 0.607263, ρ= 0.5550). In the long term, a 1% rise in total tax revenue volatility and real effective exchange will result in 0.185 percent and 0.035 percent improvements respectively in Nigeria's economic growth.

In addition, there is an indication of a long-run negative and insignificant relationship between Nigeria's inflation rate, real interest rate, crude oil price (per barrel), and economic growth (1 = -0.447714, t-test = -1.060604, = 0.3098, 3 = -0.174557, t-test= -0.210279, = 0.8370, 4 = -0.063791, t-test= -0.788118, = 0.4459). This means that a 1% increase in real interest rate, inflation, and crude oil price (per barrel) in Nigeria will result in 0.175%, 0.448%, and 0.064% lower economic growth in the long run, respectively. As a result, the null hypothesis of no significant link between total tax revenue volatility and Nigeria's economic growth was accepted. The study disproved the alternative hypothesis that there is a link between total tax revenue volatility and Nigeria's economic growth.

Diagnostic test

Table 6. Diagnostic tests

	Serial Correlation	Heteroskedasticity	Jarque-Bera (Normality)	Ramsey Retest (Linearity)
Statistic	1.448829	0.319813	9.366596	2.193114
Prob.	0.2923	0.9356	0.009248	0.1667

To assess if successive error terms are associated, the Breusch-Godfrey Serial Correlation LM Test was used. The F-statistical probability values for model 1 (0.2923) support the null hypothesis of no serial correlation in the residuals up to the stipulated lag order of 3 at the 5% significant level. Thus, this study concluded that in the calculated model for economic growth and total tax revenue volatility, the consecutive error factors were not associated.

This study also conducted a heteroskedasticity test, using *Breusch-Pagan Test Statistics* to establish the constancy of the covariance of the estimated models' error terms. The results suggest that the model established in this study were not statistically significant following from the obtained probability values of 0.9356 at 5% level of significance. As a result, the null hypothesis of homoskedasticity could not be ruled out. Thus, there is evidence that the model's covariance of error terms has a constant finite variance.

The Jarque-Bera method of testing was adopted in this study to determine if the models established were normal. The results of this test show that the null hypothesis of normality for the model should be accepted because the probability value (p=0.009248) was less than the 5% level of significance. For the model developed in this study, the linearity assumption of the ARDL test was assessed using the Ramsey Reset Test, with P-values of 16.67% larger than the 5% specified threshold of significance. As a result, the linearity null hypothesis cannot be rejected. This indicates that the model is appropriately defined and that the economic growth and overall tax revenue volatility in Nigeria are linearly related.

4.6 Discussion of findings

The purpose of this study was to investigate the impact of tax revenue volatility on Nigeria's economic growth between 1981 and 2020 using vector error correction approach to test for short run estimate and ordinary least square method for long run dynamics. The trend analysis revealed that change in tax revenue and real GDP growth rate has been regressive over the period, a further test in GDP elasticity showed that the correlation between GDP growth rate and tax revenue volatility is unitary which indicates that growth rate changes at the same rate as tax revenue. The results from hypothesis testing reveals the F-statistic of 4.041 is statistically significant at 5% level of significance ($p = 0.002949$) this means that total tax revenue volatility, real effective exchange rate, real interest rate, inflation rate and crude oil price (per barrel) taken as a set perfectly explain changes in Nigeria's economic growth; there is substantial evidence to reject the null hypothesis and conclude that tax revenue has a positive and significant relationship with economic growth in the short term but positive and negligible relationship in the long run, thus confirming previous research findings (Adegbie, Salawu, & Ojutawo, 2020; Abiodun, Oyeneye, & Dahn, 2014). However, there is a contradiction with these prior studies in terms of the relevance of the established relationship between total tax revenue volatility and economic growth; especially as long-run insignificant results were generated in this study. It should be noted that these prior studies had different time-scopes, which could have possibly contributed to the divergence in statistical significance. The implication that can be deduced from the findings is that increased tax revenue volatility will result in higher economic growth.

5. Summary and Conclusions

The purpose of this research was to determine the impact of tax revenue volatility on economic growth in Nigeria between 1981 and 2020. The study discovered that in the short-run, total tax revenue volatility has a substantial and positive relationship with economic growth in Nigeria but becomes insignificant in the long run. The study was premised on the structural theory which views tax revenue volatility as attributable to fluctuations in macro-economic factors such as government policies/laws, inflation rate, exchange rate and interest rate, to mention a few; which explains why this study controlled for the effects of these macroeconomic variables on economic growth. This study advocates its concern for the Nigerian government to look into enhancing its revenue generation capabilities from non-oil revenue sources, specifically in the area of taxation. This position was deemed justifiable by the study in the light of the drastic fall in global oil prices as exacerbated by the Covid-19 pandemic. This study believes that volatility of tax revenue might not be a terrible phenomenon as long as governments could maintain stable spending during revenue booms and busts.

On the bases of the findings of this study, it concluded that in the short run, tax revenue has a significantly positive relationship with economic growth. However, in the long run, the significance of these two variables on economic growth is negligible (although positive). Inferring from the results of the econometric analyses conducted, coupled with the theoretical reviews made, the macro-economic variables of inflation, effective exchange rate, interest rate as

well as crude oil prices also contribute to the fluctuations in total tax revenue. Consequently, public investment and consumption expenditure is affected in the short run, which ultimately reflects on economic growth potentials of Nigeria.

This study recommends that the government of Nigeria at all levels should review the tax laws and policies in order to streamline and ensure optimal tax revenue generation; such that even in periods when total tax revenue falls below expectations or the benchmark, the excesses from previous periods are able to absorb the shock and ultimately reduce the potential negative effects to Nigeria's economic growth. Also, policies that strengthen non-oil tax revenue flow should be formulated and implemented to control the volatility in crude oil price.

A host of prior studies seem to focus on the more volatile oil revenue in relation to economic growth. Consequently, this study calls for a comparative enquiry into the relationship between tax revenue volatility and economic growth in various regions of Nigeria especially in regions with high internally generated revenue flow such as Lagos and Rivers State. This potential move is believed to shed more light into the divergence as to the statistical significance or otherwise of the relationship between tax revenue volatility and economic growth in Nigeria.

References

Abaa, E. O., Ekwe, M., & Ihendinihu, J. U. (2018). Impact of tax revenues on economic growth of Nigeria. *Accounting and finance research association*, 159-170.

Abiodun, D. M., Oyeneye, T., & Dahn, H. F. (2014). Tax revenue shocks and economic growth in Nigeria, 1961-2011. *International journal of economics, finance and Management*, *3*(2), 59-70.

Adegbie, F. F., Salawu, R. O., & Ojutawo, I. R. (2020). Tax revenue volatility and economic growth in Nigeria. *European journal of accounting, auditing and finance research*, *8*(4), 65-88.

African Development Bank. (2021). Nigeria economic outlook, African development bank group. Https://www.afdb.org/en/countries-west-africa-nigeria/nigeria-economic-outlook

Akinola, A. O., Efuntade, A. O., & Efuntade, O. O. (2020). Tax revenue and its effect on government expenditure in Nigeria. *The international journal of business and Management, 8*(9), 279-286. https://doi.org/10.24940/theijbm/2020/v8/i9/BM2009-077

Cornia, G. C., & Ray, N. (2010). State tax revenue growth and volatility. *Federal Reserve Bank of st. Louis regional economic Development*, *6*(1), 23-58.

Edewusi, D. G., & Ajayi, I. E. (2019). The nexus between tax revenue and economic growth in Nigeria. *International journal of applied economics, finance and Accounting*, *4*(2), 45-55.

Ezekwesili, T. P., Ezejiofor, R. A. (2022). Tax revenue and economic growth: a study of Nigerian economy. *International Journal of Research in Education and Sustainable Development, 2*(3), 10-24.

Haug, A. A. (2002). Temporal aggregation and the power of cointegration tests: A Monte Carlo study. *Oxford Bulletin of Economics and Statistics 64*: 399–412.

Ifeanyi, O. N., & Ayenajeh, M. E. (2016). Impact of crude oil price volatility on economic growth in Nigeria (1980 -2014). *Iosr journal of business and Management*, 18(6), 10-19.

Kithure, M. E., Anthony, W., & Anthony, W. (2019). Modelling and forecasting volatility of value added tax revenue in Kenya. *Science journal of applied mathematics and statistics*, 1-7.

Murphy, M., Akshay, I., & Alexandria, Z. (2018). Tax revenue volatility varies across states, revenue streams. *Pew trust journal*, 1-2.

Nwanna, I. O., & Ayenajeh, M. E. (2016). Impact of crude oil price volatility on economic growth in Nigeria (1980 -2014). *Journal of business and Management*, *18*(6), 10-19.

Olayemi, I. F., & Efuntade, A. O. (2020). Comprehensive analysis of the effect of oil and non oil revenues on economic growth in nigeria. *Kiu interdisciplinary journal ofhumanities and social sciences*, 161-186.

Otusanya, O. J., Adeyeye, G. B., & Ovienbor, L. (2019). Informal sector Taxpayers perception of influence of government accountability on voluntary tax compliance and the moderating role of fiscal exchange. *International journal of accounting and finance, 8*(2), 2-21.

Porter, N. (2007). Revenue volatility and fiscal risks: an application of valu-e-at-risk techniques to Hong Kong's fiscal policy. *Emerging markets finance & trade*, 43(6), 6-24.

Rueben, K., & Megan, R. (2017). Revenue volatility: how states manage uncertainty. *Urbaninstitute* , 2.

Sam, N. O., Omese, I., & Akor, O. P. (2020). Non-oil revenue and economic development of nigeria. *International journal of innovative development and policy Studies*, 8, 91-99.

Seegert, N. (2018). Tax revenue volatility. *Journal of urban Economics*, 48.

Staley, T. (2017). The impact of fiscal limits on state revenue volatility. *American review of public Administration*, *47*(4), 443-454.

Sunday, A. A., Uniamikogbo, E., Erah, O. D., & Aggreh, M. (2020). Non-oil revenue and economic growth in Nigeria. *Journal of finance and Accounting*, 95-106.

Supriya, G. (2020). The structural theory of inflation. Article library. Https://www.yourarticlelibrary.com/macro-economics/inflation-macro-economics/the-structural-theory-of-inflation-explained/37980

Takumah, W. (2014). Cointegration and causality between tax revenue and economic growth in Ghana. *International research journal of marketing and Economics*, 1(6), 30-44.

William, G. G., & Andrew, S. A. (2014). Effects of income tax changes on economic growth. *Brookings Economics Studies*, 1-15.

15