TAX REVENUE AND ECONOMIC GROWTH: AN IN-DEPTH ANALYSIS OF NIGERIA'S FISCAL ACTIVITIES

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Abstract: *This study investigates the impact of a regime switch on the relationship between tax revenue and economic growth in Nigeria using time series data from 1981 to 2021. Employing statistical tests, including the CUSUM of Squares test and the Chow test, the study identifies a structural break in 1999 coinciding with the transition from military to civilian rule. In order to address this break, a dummy variable is introduced into the model, and its stability is assessed. Notably, stability is achieved only when the dummy variable is interacted with each regressor. Recognising the non-stationarity of the time series data, the study employs a breakpoint unit root test, revealing that all variables become stationary at order one. Contingent upon the co-integration among variables, the Fully Modified Least Squares (FMOLS) technique is applied. The result indicates a significant positive effect of tax revenue on economic growth. Additionally, the impacts of exchange rate, inflation rate, and interest rate on economic growth revealed mixed results. The diagnostic tests affirm the robustness of the model, with no evidence of autocorrelation in the residuals. Overall, the study contributes to the understanding of the dynamics between tax revenue and economic growth in Nigeria, emphasising the importance of accounting for structural breaks in time series modelling.*

Keywords: Economic growth, Tax revenue, Fiscal activities, Regime switch, Chow breakpoint test

Introduction

In order for an economy to effectively fulfil its primary and subsidiary functions, it requires sufficient funding. Over time, especially in developing countries such as Nigeria, government responsibilities have increased due to a growing population and the need for infrastructural development. Historically, the Nigerian government heavily relied on oil revenue to execute its functions and economic goals, neglecting the potential of taxation as a primary revenue source (Uzonwanne, 2020). Meanwhile, Adefolake and Omodero (2022) define tax as a mandatory, non-repayable remittance made to the government for products and services. Taxation, viewed as the art of charging citizens with taxes, is considered a civic duty, with taxes being mandatory payments by every citizen.

Taxes serve various purposes, including limiting the production of specific goods and services, protecting local businesses, reducing income disparity, regulating business, and controlling inflation (Edewusi & Ajayi, 2019). Despite its importance, the Nigerian government has predominantly depended on oil revenue, leading to the establishment of the First Inland Revenue Service (FIRS) and subsequent tax policies aimed at diversifying revenue sources away from oil, given its volatility. A well-structured tax framework serves as a crucial means of mobilizing a country's resources efficiently, fostering economic growth and development (Akintoye & Tashie, 2013 as cited in Obaretin et al., 2017). However, statistics from the Central Bank of Nigeria (CBN) reveals that the Nigerian government's tax revenue has not exceeded its expenditure, hindering capital formation for economic growth, as illustrated in Table 1 for the years 2000 to 2020.

Table 1: Trends of Tax and Oil revenues as percentages of Real GDP

	Period				
Item	2000-2004	2005-2009	2010-2014	2015-2019	2020
OR/RGDP	6.464	11.233	11.92	6.243	6.759
TR/RGDP	1.586	2.562	4.263	5.199	6.528

Recognising the significance of tax in generating revenue for government use and influencing consumption patterns for economic growth, nations strive to maximize tax revenues (Asaolu et al., 2018). Effective tax administration contributes to increased revenue, enabling the government to provide amenities and execute capital projects. Despite the growing responsibilities of the Nigerian government in meeting the needs of its expanding population and infrastructure development, the overreliance on oil revenue has impeded the effective execution of its functions and economic goals. While taxation should serve as a primary revenue source, the neglect of this avenue has resulted in fiscal challenges, exacerbated by the volatility of oil prices (Uzonwanne, 2020). Existing literature highlights the pivotal role of taxation in mobilizing resources for economic growth and development (Akintoye & Tashie, 2013 as cited in Obaretin et al., 2017). However, the Nigerian government's tax revenue has consistently fallen short of expenditure, hindering capital formation for sustainable economic growth, as evident from the Central Bank of Nigeria (CBN) statistics spanning 2000 to 2020.

Moreover, the effectiveness of tax administration is compromised by fraudulent activities and incompetence within tax authorities, posing significant threats to revenue collection (Asaolu et al., 2018). Despite the democratic transition, tax revenue has not played a central role in contributing to economic growth, with regression analyses indicating continuity in taxation practices across military and civilian regimes. Empirical research gaps persist in understanding the effects of taxation, particularly in the context of fraudulent practices by both taxpayers and collectors. Additionally, there is a dearth of studies exploring the perception among Nigerians that tax payment is an avenue for the government to exploit their labour. Addressing these gaps is crucial to formulating effective policies that leverage taxation for sustainable economic growth in Nigeria. This paper explores the relationship between tax revenue and economic growth, particularly in the context of Nigeria's evolving fiscal dynamics.

Conceptual Review

Tax Revenue, a crucial facet of government income, is derived from compulsory levies on legal activities and incomes within a country (Lin & Jia, 2019). Taxation, a powerful tool, can propel economic growth and development (Oyebanji et al., 2017). Nigeria, historically reliant on oil revenue, faces challenges due to the reduction in oil-based income, leading to an increased focus on taxation. Financing a nation's infrastructure hinges on an effective tax system, involving assessment, collection, and remittance for accountability by designated agencies (Herbert et al., 2018). However, issues such as overcharging and multiple taxation have surfaced, prompting the need for a comprehensive analysis of tax and oil revenue trends as percentages of Nigeria's real GDP.

Economic Growth, synonymous with Gross National Product (GNP) growth, signifies the expansion of an economy's output in goods and services (Ironkwe & Agu, 2019). It is characterised by sustained annual increases in real national income over an extended period, contributing to

improved living standards. Gross Domestic Product (GDP), a key measure of economic strength, reflects the total monetary value of goods and services produced within a country.

Theoretical Review

This deals with the established theoretical foundation crucial to delve deeper into studies that have shaped the discourse on taxation and economic growth. Adam Smith's enduring influence, as articulated in "The Wealth of Nations" (1776), provides the cornerstone for understanding taxation principles. Smith's criteria for 'good taxes' – proportionality, ability to pay, convenience, and cost-effectiveness – have reverberated through economic thought (Smith 2002).

In modern public-finance literature, Pigou's ability theory and Lindahl's benefit theory present influential perspectives on taxation. Pigou's emphasis on taxpayers contributing based on their capacity to pay aligns with the broader concept of progressive taxation (Pigou, 1920). Also, addressing the extent of state activity, allocation of expenditure, and tax burden distribution, Bandyopadhyay and Esteban (2007) provide a nuanced approach to understanding individuals' contributions to public goods. Bowen's model, as an operational advancement, underscores the opportunity cost of producing social goods under conditions of increasing costs, contributing depth to the discussion on economic implications of taxation policies (Bowen, 1943). The socio-political theory advocated by Wagner introduces a holistic perspective, urging consideration of economic problems within broader societal and political solutions (Wagner, 1883, as cited in Magazzino et al. (2015)).

The faculty theory, highlighted by Anyanfo (1996) and as cited in Ebimobowei and Ebiringa (2012), adds a distributive justice dimension, asserting that individuals should be taxed based on their ability to pay. This perspective aligns with the ongoing discourse on fairness and equity in tax distribution (Anyanfo, 1996). Examining the benefits and limitations of the benefit theory, as discussed by Bhartia (2009), the theory sheds light on the practical challenges associated with correlating tax payments directly with observed benefits. The application of the theory becomes constrained in scenarios where beneficiaries cannot be easily observed, as is often the case with public services (Bhartia, 2009).

The ability-to-pay approach, discussed in various economic literature, introduces the concept of sacrifice in taxation. Scholars such as Musgrave (1959) contribute to the ongoing discourse on measuring sacrifice, emphasising equal sacrifice, equal proportional sacrifice, and equal marginal sacrifice as methods to ensure fairness (Musgrave, 1959). Incorporating the Harrod-Domar theory of economic growth, the seminal work by Harrod (1939) and Domar (1946) emphasises the centrality of investment in the economic growth process. Their model underlines the dual role of investment in creating income and augmenting the productive capacity of the economy (Harrod, 1939; Domar, 1946). The Keynesian theory of taxation, as highlighted in this study, draws from Keynes's seminal work, "The General Theory of Employment, Interest, and Money" (1936). Keynesian insights underscore the role of reasonable tax rates in ensuring government revenue sufficiency to meet its obligations, preventing socio-economic crises (Keynes, 1936, as cited in Tily (2005)).

Empirical Review

Numerous empirical studies have delved into the relationship between tax revenue and economic growth in Nigeria, shedding light on the multifaceted impact of taxes on the nation's economic landscape. This review delves into the interplay between tax revenue and economic growth in Nigeria. Challenges such as over-reliance on oil revenue, low tax revenue-to-GDP ratio, and

structural issues in the tax system underscore the need for targeted reforms. The Finance Act of 2020 coupled with the ongoing efforts to enhance tax compliance and streamline the tax system aim to create a conducive environment for sustained economic growth in Nigeria. Thus, Adefolake and Omodero (2022) explored this connection by evaluating the influence of hydrocarbon tax, corporation income tax, and Value Added Tax (VAT) on Nigeria's economic growth using time series data. The findings of the study indicated that petroleum profit tax and VAT had positive and significant effects on Gross Domestic Product (GDP), while corporation income tax exhibited a negative and significant effect.

Similarly, Obaretin et al. (2017) investigated taxation as a tool for income redistribution in Nigeria. The study revealed that taxation had not effectively fulfilled its role in income redistribution. Abiola et al. (2021) conducted a causal-effect study on tax revenue, capital formation, and economic growth, revealing the significant positive impact of tax revenue on GDP. The study proposed widening the tax net and implementing expansionary measures to enhance tax revenue and boost GDP. Also, Edori (2022) analysed the impact of tax revenue, specifically corporate income tax, VAT, and petroleum profit tax, on Nigeria's economic growth. The study revealed a positive but insignificant relationship between the variables, attributing the insignificance to poor tax revenue management. The recommendation emphasised the efficient and effective utilization of tax revenue for infrastructure development.

Additionally, Onoja and Ibrahim (2020) focused on the analysis of tax revenue's impact on Nigeria's economic growth. The study found a positive but not significant relationship between petroleum profit tax (oil tax revenue) and economic growth, while VAT and companies income tax (non-oil tax revenue) had significant relationships. The study recommended minimizing corruption in tax administration, transparently accounting for tax revenue, and supporting entrepreneurial activities. Asaolu et al. (2018) examined the relationship among various taxes – VAT, Petroleum Profit Tax (PPT), Corporate Income Tax (CIT), and CED – and economic growth. VAT and CED showed significant positive relationships, while CIT exhibited significant negative relationship with economic growth. The study emphasised the irreplaceable role of taxation in nation-building and recommended reorganizing tax administration to reduce tax evasion. Similarly, Alao et al. (2023) explored the link between tax revenues and economic growth in Nigeria from 2000 to 2020. The findings of the study emphasised the importance of taxation to nation-building and its role as a powerful tool for promoting economic progress.

Obaje and Ogirima (2019) analysed the effects of taxation on economic growth, revealing a positive relationship between RGDP and CIT, PPT, and VAT. The study recommended attention to the informal sector by creating VAT offices at the local level. In the same vein, Amah (2021) examined the effect of the taxation system on the Nigerian economy from 1999 to 2017. The study revealed a significant positive relationship between GDP and PPT as well as CIT. the study recommended the provision of an enabling environment for companies to generate more revenue in addition to reduction in the VAT rate to encourage consumption. Garga and Akanegbu (2022) analysed the impact of direct tax on Nigeria's economic growth, finding a positive impact of CIT on economic growth. The study concluded that both CIT and PPT had positive impacts on the economic growth of Nigeria. This empirical literature provides a robust framework for exploring the multifaceted dimensions of taxation in shaping economic policies.

Methodology

Model Specification

The initial model of this study in the course of examining the effect of tax revenue on economic growth is as specified in Equation (1).

$$RGDP_t = F\left(TAXREV_t, EXR_t, INFR_t, INTR_t\right) \quad (1)$$

Where $RGDP_t$ is real gross domestic product at time t, $TAXREV_t$ is tax revenue at time t, EXR_t is exchange rate at time t, $INFR_t$ is inflation rate at time t, and $INTR_t$ is interest rate at time t. Taking the logarithmic form of Equation (1) and expressing it in explicit form, it yields Equation (2).

$$LNRGDP_t = \alpha_0 + \alpha_1 LNTAXREV_t + \alpha_2 LNEXR_t + \alpha_3 LNINFR_t + \alpha_4 LNINTR_t + \ell_t \quad (2)$$

Where α_i $(i = 0, 1, 2, \dots, n)$ are the estimated parameters of the model and e_t is the stochastic error term at time t. Based on the instability of the diagnostic test as suggested by the *CUSUM* of squares test, this study introduces a dummy variable (*DUM*) into the model. Thus, Equation (2) becomes Equation (3).

$$LNRGDP_t = \alpha_0 + \alpha_1 LNTAXREV_t + \alpha_2 LNEXR_t + \alpha_3 LNINFR_t + \alpha_4 LNINTR_t + \alpha_5 DUM_t + \ell_t \quad (3)$$

Since the model does not yet satisfy the stability condition, the dummy variable is interacted with each of the regressors as the model is re-specified as Equation (4).

$$LNRGDP_t = \alpha_0 + \alpha_1 LNTAXREV_t + \alpha_2 LNEXR_t + \alpha_3 LNINFR_t + \alpha_4 LNINTR_t + \alpha_5 DUM_t + \alpha_6 LNTAXREV_t * DUM_t + \alpha_7 LNEXR_t * DUM_t + \alpha_8 LNINFR_t * DUM_t + \alpha_9 LNINTR_t * DUM_t + \ell_t \quad (4)$$

Denoting $LNTAXREV_t * DUM_t$ by $TADU_t$, $LNEXR_t * DUM_t$ by $EXDU_t$, $LNINFR_t * DUM_t$ by $INFDU_t$, and $LNINTR_t * DUM_t$ by $INTDU_t$, Equation (4) becomes Equation (5).

$$LNRGDP_t = \alpha_0 + \alpha_1 LNTAXREV_t + \alpha_2 LNEXR_t + \alpha_3 LNINFR_t + \alpha_4 LNINTR_t + \alpha_5 DUM_t + \alpha_6 TADU_t + \alpha_7 EXDU_t + \alpha_8 INFDU_t + \alpha_9 INTDU_t + \ell_t \quad (5)$$

Subsequently, this study adopts the Fully Modified Ordinary Least Squares (FMOLS) proposed by Phillips and Hansen (1990) which has been popularised by several other studies including Pedroni (1996), Wagner and Hong (2016), and Wagner et al. (2020). The FMOLS is an estimator which utilises a semi-parametric correction to eliminate the problems caused by the long-run correlation between the co-integrating equation of stochastic regressors (Phillips & Hansen, 1990). The approach is used to provide optimal estimates of co-integrating regressions. The method modified least squares to account for serial correlation effects as well as the existence of a co-integrating relationship. The FMOLS estimator is as stated in Equation (6).

$$\hat{\theta} = \begin{pmatrix} \beta \\ \hat{\gamma} \end{pmatrix} = \left(\sum_{t=2}^{T} Z_t Z_t'\right)^{-1} \left(\sum_{t=2}^{T} Z_t y_t^{+} - T\begin{pmatrix} X_{12}^{t\,\prime} \\ 0 \end{pmatrix}\right) \quad (6)$$

Where $Z_t = \left(X_t', D_t'\right)'$ and thus represents a row vector of all the regressors in the estimated model while D_t represents the deterministic regressors.

Estimation Techniques

Estimating the impact of a regime switch on the relationship between tax revenue and economic growth in Nigeria involves several steps. The study employs various statistical techniques to address structural breaks, non-stationarity, and assess the robustness of the model. The study utilises statistical tests such as the CUSUM of Squares test and the Chow test to identify the structural break in 1999 which coincides with the transition from military to civilian rule. The study introduces a dummy variable into the model to account for the structural break identified, and subsequently, assesses the stability of the model by interacting the dummy variable with each regressor. Recognising the non-stationarity of the time series data, a breakpoint unit root test is employed to confirm the stationarity of all variables at order one. Based on the existence of co-integration among the variables, FMOLS technique is used to estimate the effect of tax revenue on economic growth, accounting for the introduced dummy variable

Description and Measurement of Variables

The variable descriptions and measurements provide a foundational understanding of each economic indicator and their role in assessing the economic landscape of Nigeria.

Real Gross Domestic Product (RGDP): This refers to the total value of all goods and services produced within a country's borders, adjusted for inflation. It serves as a key indicator of a nation's economic performance. Its measurement involves aggregating the value of goods and services across various sectors, factoring in changes in prices to obtain a constant, inflation-adjusted figure.

Tax Revenue (TAXREV): This refers to the total income collected by a government through various taxation mechanisms, including income taxes, corporate taxes, and consumption taxes. It plays a crucial role in funding public services, infrastructure, and government expenditures. Its measurement includes the total amount collected from different types of taxes, such as income tax, value-added tax (VAT), corporate tax, and other levies.

Exchange Rate (EXR): This is the value of one currency in terms of another and reflects the relative strength of different currencies. It is a critical factor in international trade, investment, and monetary policy, influencing the cost of imports and exports. It is measured as the amount of Nigerian Naira (NGN) required to purchase one unit of the US Dollar (USD).

Inflation Rate (INFR): This measures the percentage change in the general price level of goods and services over a specific period. It indicates the rate at which the purchasing power of a currency is eroded, affecting consumers' cost of living and investment decisions. It is measured by comparing the Consumer Price Index (CPI) at two points in time.

Interest Rate (INTR): This represents the cost of borrowing money or the return on investment. Central banks use interest rates as a tool to regulate economic activity, controlling inflation and influencing spending and investment decisions. The measurement involves assessing the cost of borrowing or the return on investment in relation to the principal amount involved.

Scope and Source of Data

This study collects annual time series data on tax revenue, economic growth, exchange rate, inflation rate, and interest rate in Nigeria from 1981 to 2021. This period allows for a comprehensive analysis of long-term trends. The study sources data for all the variables from the Central Bank of Nigeria (CBN) statistical bulletins (2022). The CBN is often a reliable and authoritative source for economic data in the country.

Results and Discussion

Stability Diagnostics Test

Based on the possibility that the real-world event (such as regime switch) has the tendency to affect the trend of time series data, this study subjects the estimated model to stability test by performing the CUSUM of Squares test and the result is reported in Figure 1. From the result, the parameters of the estimated model are not constant over time and thus the sum of squares residuals would not have been minimised. The CUSUM of Squares plot deviates from the 5% significant level boundary in 1999 which coincides with the period of regime switch from military rule to civilian rule in Nigeria. This suggests the possible presence of structural break in the data generating process.

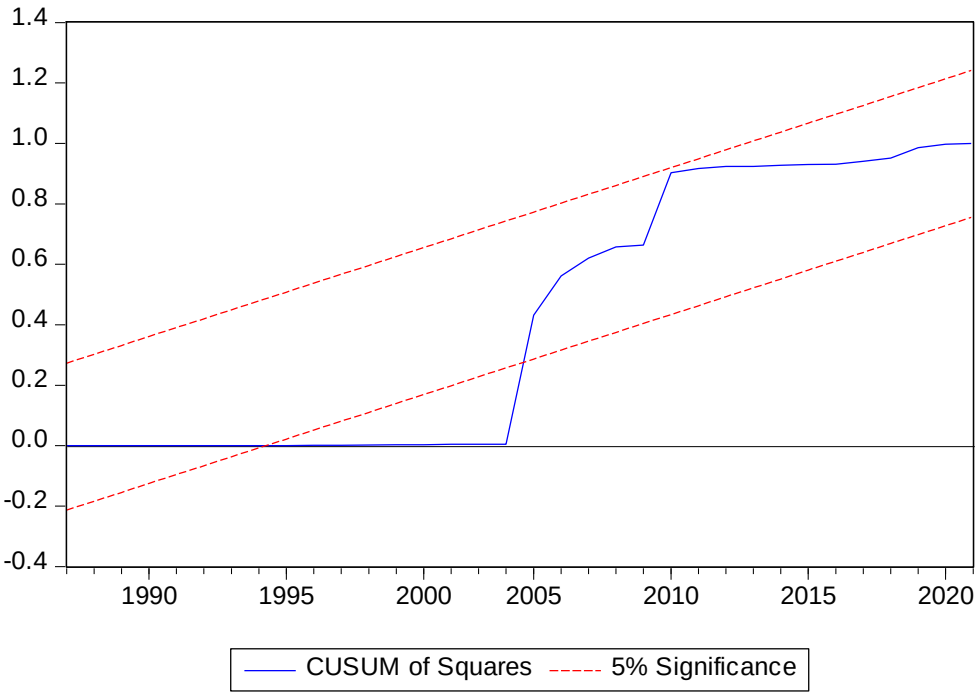

Figure 1: CUSUM of Squares Result

In an attempt to ascertain whether breakpoint actually exists in the estimated model in 1999, this study uses the Chow test and the result is contained in Table 2. The Chow test result confirms the existence of breakpoint in the time series as the *F*-statistic is statistically significant at 1% level of significance $(F = 5.23, \rho < 0.01)$. Hence, the null hypothesis of no breakpoint in the data generating process is rejected and the study concludes that there is break in 1999 when regime switch from military to civilian rule took place.

Table 2: Chow Breakpoint Test: 1999
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables

F-statistic	5.230	Prob. F(5,29)	0.0015
Log likelihood ratio	25.067	Prob. Chi-Square(5)	0.0001
Wald Statistic	26.149	Prob. Chi-Square(5)	0.0001

Introduction of Dummy Variable into the Estimated Model

The literature has established that a clear way-out in estimating a model that contains structural break is by introducing a dummy variable into the estimated model. In this study, the dummy variable (DUM) is created which takes zero (0) for years without the break (1981 – 1998) and one (1) from the breakpoint year (1999 – 2022). Subsequently, the result of the re-estimated model is captured in Table 3. However, when the re-estimated model is subjected to stability test by carrying out the CUSUM of Squares test, the result is as reported in Figure 2, the CUSUM of Squares plot still deviates from the 5% significant level boundary. This suggests that the estimated result in Table 3 is not stable.

Table 3: Dependent Variable: LNRGDP
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTAXREV	0.236	0.033	7.156	0.0000
LNEXR	0.071	0.014	5.259	0.0000
LNINFR	-0.011	0.014	-0.800	0.4293
LNINTR	0.033	0.037	0.895	0.3772
DUM	0.017	0.042	0.413	0.6825
C	8.462	0.224	37.703	0.0000
R-squared	0.973			
Adjusted R-squared	0.969			

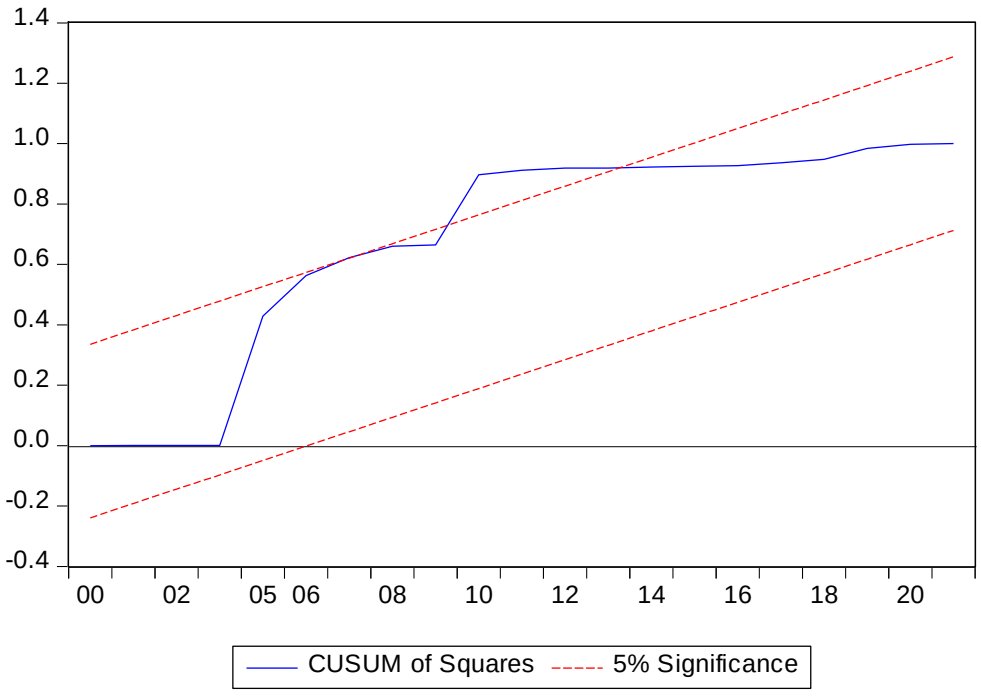

Figure 2: CUSUM of Squares Result for Model with Dummy Variable

Interaction of the Dummy Variable with all Regressors of the Estimated Model

Since mere inclusion of the dummy variable into the estimated model does not ensure the stability of the model, it is required that the dummy variable be interacted with each of the regressors in the estimated model. Hence, the estimated model of this study includes all the regressors, the dummy variable, and the interaction of the dummy variable with each of the regressors. The result is reported in Table 4 and its CUSUM of Squares result is in Figure 3. The plot of the CUSUM of Squares graph stays within the 5% significant level boundary, indicating that the model has become stable.

Table 4: Estimated Model with the Interaction of Dummy Variable

Dependent Variable: LNRGDP
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTAXREV	0.974	0.180	5.410	0.0000
LNEXR	-0.001	0.022	-0.037	0.9709
LNINFR	0.0002	0.013	0.016	0.9872
LNINTR	0.014	0.049	0.282	0.7799
DUM	3.860	0.972	3.970	0.0004
TADU	-0.808	0.184	-4.390	0.0001
EXDU	0.140	0.041	3.382	0.0021
INFDU	0.015	0.030	0.479	0.6353
INTDU	0.001	0.061	0.012	0.9901
C	4.693	0.951	4.934	0.0000
R-squared	0.986			
Adjusted R-squared	0.981			

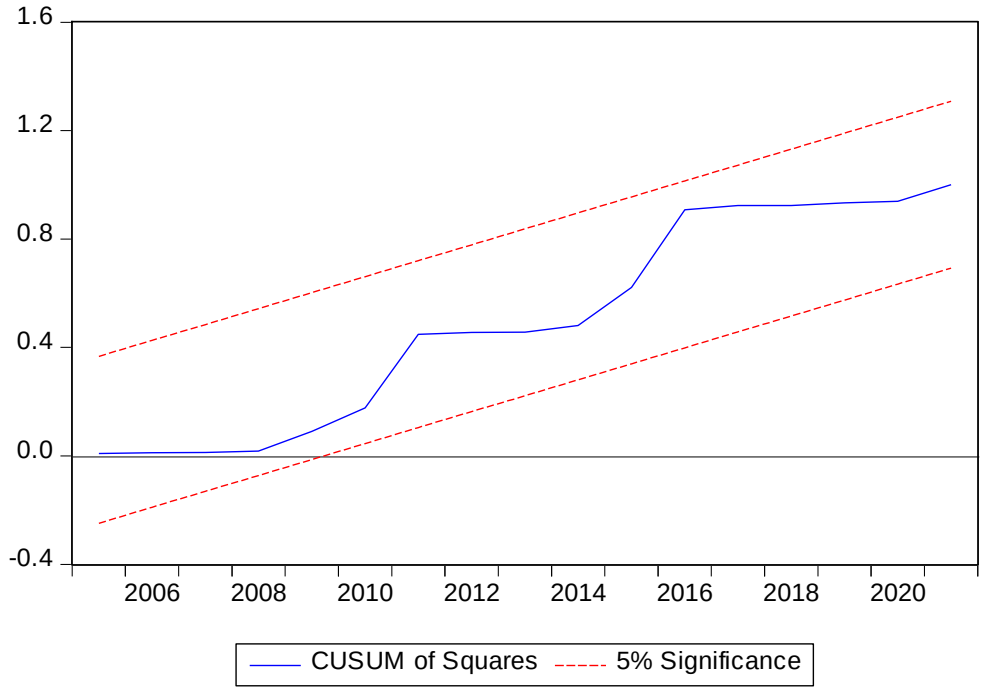

Figure 3: CUSUM of Squares Result for the Estimated Model with Interaction of Dummy Variable

Breakpoint Unit Root Test

Since most time series data are not usually stationary at level, it becomes imperative to always subject time series data to stationarity test before estimating any model. Meanwhile, the data series used contain breakpoints which suggests that the use of the standard unit test (Augmented Dickey-Fuller or Phillips-Perron) may not yield appropriate result. Therefore, this study resorts to the use of breakpoint unit root test instead of the standard unit root test. The result of the breakpoint unit root test is not reported but it is available on request. The breakpoint unit root result suggests that all the variables are not stationary at level but they become stationary after first difference and thus, stationary at order one, that is, I(1). As such, the use of the Fully Modified Least Squares (FMOLS) technique requires the existence of co-integration among the variables of the estimated model.

Co-integration Test Result

Having discovered that the time-series data consist of variables that are I(1), this study tests for the existence of co-integration, or otherwise, among the variables. In order to capture the extent of co-integration among the variables, the multivariate co-integration methodology proposed by Johansen and Juselius (1990) is utilised (Abere, 2023). The approach gives room for determining whether there is at least one linear combination of the variables that is I(0). The trace test and the Max-Eigen test from the co-integrating result reported in Table 5 reveal that the null hypothesis of no co-integration (that is, r = 0) among the variables should be rejected, as both of them indicate 1 co-integrating equation at the 5% significant level. This implies that there is co-integration between economic growth (which is proxied by RGDP) and the respective explanatory variables in the model at the 5% significant level. The existence of co-integration implies that there is long-run relationship among the variables in the model. Hence, the linear combination of two or more of the variables exhibits a long-run relationship.

Table 5: Co-integrating Results

Trace Test				Max-Eigen Test			
Null	Alternative	Statistic	5% Critical Value	Null	Alternative	Statistic	5% Critical Value
$r = 0$	$r = 1$	86.547	69.819	$r = 0$	$r = 1$	46.329	33.877
$r \leq 1$	$r = 2$	40.217	47.856	$r \leq 1$	$r = 2$	16.058	27.584
$r \leq 2$	$r = 3$	24.16	29.797	$r \leq 2$	$r = 3$	12.775	21.132
$r \leq 3$	$r = 4$	11.384	15.495	$r \leq 3$	$r = 4$	6.675	14.265
$r \leq 4$	$r = 5$	4.709	3.841	$r \leq 4$	$r = 5$	4.709	3.841
Trace test indicates 1 co-integrating equation at the 5% level of significance				Max-Eigen test indicates 1 co-integrating equation at the 5% level of significance			

r is the number of co-integrating vectors

Estimated Results of the Fully Modified Least Squares (FMOLS)

In order to critically examine the effect of tax revenue on economic growth in Nigeria, this study does not only utilise Ordinary Least Squares (OLS) with the interaction of the dummy variable to account for structural breaks, but also utilises the Fully Modified Least Squares (FMOLS) as a complementary technique. Thus, the FMOLS result in Table 6 corroborates the OLS result in Table 4. The results reveal that, at 5% level of significance, tax revenue (LNTAXREV) has significant positive effect on economic growth (which is proxied by real GDP) in both the OLS result in Table 3 $(\beta = 0.97, t = 5.40, \rho < 0.01)$ and the FMOLS result in Table 5 $(\beta = 0.23, t = 6.86, \rho < 0.01)$. The result conforms with a-priori expectation as expansion in the tax revenue in an economy is expected to boost the income of the country and subsequent increase in real GDP.

The result is as well consistent in terms of both sign and significance with the findings of some extant studies such as Obaje and Ogirima (2019), Abiola et al. (2021), Adefolake and Omodero (2022), Garga and Akanegbu (2022) which found significant positive relationship between tax revenue and economic growth in Nigeria. The result is, however, contrary in terms of significance with some studies in the literature which found insignificant relationship between tax revenue and economic growth (Onoja & Ibrahim, 2020; Edori, 2022).

Furthermore, while the OLS result in Table 4 shows that exchange (LNEXR) rate does not have significant effect on economic growth $(\beta = -0.001, t = -0.04, \rho > 0.05)$, the FMOLS result in Table 6 portrays that that exchange rate has significant positive effect on economic growth in Nigeria $(\beta = 0.07, t = 7.18, \rho < 0.01)$. Meanwhile, both inflation rate (LNINFR) and interest rate (INTR) are revealed not to have significant effect on economic growth during the sample period.

Also, from the result in Table 6, the adjusted multiple coefficients statistic portrays that about 97% of the variations in real GDP are jointly accounted for by the variations in the explanatory variables in the model $(\hat{R}^2 = 0.969)$. The diagnostic test result in Table 7 is satisfactory as the non-significance of the probability values of the Correlogram Squared Residual statistic strongly suggests no evidence of autocorrelation in the model's residuals.

Table 6: Estimated Model with FMOLS

Dependent Variable: LNRGDP
Method: Fully Modified Least Squares (FMOLS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTAXREV	0.233	0.034	6.862	0.0000
LNEXR	0.075	0.010	7.176	0.0000
LNINFR	-0.013	0.013	-1.041	0.3053
LNINTR	0.023	0.036	0.643	0.5246
C	8.514	0.230	37.074	0.0000
R-squared	0.972			
Adjusted R-squared	0.969			

Table 7: Correlogram Squared Residual

Sample: 1981 2021
Included observations: 39

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |** |	. |** |	1	0.221	0.221	2.0544	0.152
.*| . |	.*| . |	2	-0.135	-0.193	2.8383	0.242
. | . |	. | . |	3	-0.011	0.074	2.8433	0.416
. |*. |	. |*. |	4	0.154	0.123	3.9316	0.415
.*| . |	.*| . |	5	-0.104	-0.189	4.4389	0.488
.*| . |	.*| . |	6	-0.184	-0.071	6.0865	0.414
. | . |	. |*. |	7	0.054	0.096	6.2325	0.513
.*| . |	**| . |	8	-0.08	-0.217	6.5638	0.584
.*| . |	. | . |	9	-0.141	-0.005	7.6304	0.572
.*| . |	.*| . |	10	-0.124	-0.096	8.4757	0.582

Conclusion

In this study, the stability of the estimated model was rigorously examined, considering the potential impact of real-world events, such as a regime switch in 1999, on the time series data. The CUSUM of Squares test and Chow test provided robust evidence of a structural break in the data generating process, specifically coinciding with the regime switch from military to civilian rule in Nigeria. In an attempt to account for this break, a dummy variable was introduced into the model, but the dummy variable alone did not ensure model stability. Only when the dummy variable was interacted with each regressor did the model achieve stability. Recognising the non-stationarity of time series data, breakpoint unit root tests were employed, and the results revealed that all the variables were non-stationary at the level but became stationary after the first difference (I(1)). Subsequently, co-integration tests confirmed the existence of a long-run relationship among the variables of the estimated model. The results of the interaction of the dummy variable and FMOLS consistently indicated a significant positive effect of tax revenue on economic growth at a 5% level of significance. This aligns with expectations, as an expansion in tax revenue is anticipated to boost national income and subsequently increase real GDP.

Recommendations

Policymakers should recognise the crucial role of tax revenue in fostering economic growth, and hence, make efforts to formulate and implement tax policies that encourage revenue generation without hindering economic activities. Also, given the sensitivity of the model to structural breaks, researchers and policymakers should remain vigilant for significant events that may impact the stability of the economic system. Researchers should make necessary updates and adaptations to the estimated model to reflect changes in the economic environment. The disparity in the findings regarding the impact of the exchange rate on economic growth warrants further investigation. Future research could explore the intricate dynamics between exchange rates and economic growth in Nigeria to provide more nuanced insights. Although the study found no significant effects of inflation and interest rates on economic growth during the sample period, continuous monitoring of these variables is essential. Economic conditions may evolve, and their impact on growth dynamics could change over time. By implementing these recommendations and staying attuned to the evolving economic landscape, policymakers and researchers can contribute to a more accurate understanding of the relationship between tax revenue and economic growth in Nigeria.

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