



Interest Rates and Real Economic Growth in Nigeria: Empirical Investigation from Autoregressive Distributed Lag Model

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To cite this article:

Olufemi Ademola, Samson Alalade, Peter Ogbebor, Olalekan Aworinde. (2023). Interest Rates and Real Economic Growth in Nigeria: Empirical Investigation from Autoregressive Distributed Lag Model. *International Journal of Economics, Finance and Management Sciences*, 11(6), 300-310. <https://doi.org/10.11648/j.ijefm.20231106.12>

Received: November 1, 2023; Accepted: November 17, 2023; Published: November 24, 2023

Abstract: Researchers continue to debate the effect of interest rates on economic growth. While some argue that the high interest hurt the economy and high borrowing cost discourages capital investments, others argue that the moderating effect of high interest rate on inflation leads to a positive real growth in the economy. In the bid to test the effect of interest rate on the economic growth, this study examined the nexus between interest rate and real gross domestic product (GDP) growth in Nigeria. To act as counterbalances, the study also introduced money supply and institutional quality as proxies for interest rate. The research is based on ex-post facto research design using a time series data of 68 quarters from 2006Q1 to 2022Q4). The Autoregressive Distributed Lag (ARDL) model was utilized to assess the effect of interest rate on real GDP growth in Nigeria. The study found that interest rate has long-run significant cointegrating relationship with real GDP growth rate (Adj R² = 0.44; F-stat (4, 63) = 18.55 p < 0.05). The study concluded that interest rate is a significant factor influencing real GDP growth in Nigeria and that maintaining a stable lending rate is one of the basic requirements for developing countries to attain high level of economic growth. The study thus recommends that as a short-term economic tool, the policymakers may use interest rates to stimulate real growth in GDP in addition to the implementation of appropriate fiscal reforms to stimulate economic activities and support growth.

Keywords: Interest Rate, Economic Growth, Money Supply, Institutional Quality, Real GDP Growth

1. Introduction

The interest rate, commonly referred to as the "price of money," has been emphasized as a policy instrument for the past 50 years by traditional economics and central bank publications. The importance of interest rates and interest policy in macroeconomics has been acknowledged in a large body of literature. However, many economists contend that an unsustainable bias toward destructive growth in economies may be caused by a debt and interest-based system [1, 2]. Soddy, F. [1] specifically noted that interest accruing debts push the economy toward the limits established by limited resources and the laws of physics. Such a warning frequently serve as inspiration for the argument for a fundamental

revision of the monetary system, one that substitutes "full reserve banking" [3], also referred to as a "green" banking reform, for interest-based and debt-based money supply [4]. Researchers like Horowitz [5], who upholds the emphasis on "prices," Loehr [6], who advocates negative rates based on Gesell [7]), and Jackson and Victor [8], are however not persuaded along that line. Therefore, according to Aspinall *et al.*, [9], more empirical research on these and related issues is required to better understand the connections between finance and sustainable economic growth.

While researchers fail to agree over the issue of revision to monetary system, all the major economic schools of thought, including classical, e.g., [10], neo-classical, e.g., [11], Keynesian, e.g., [12-14], monetarist, e.g., [15, 16], and new

classical, e.g., [17], routinely make assertion to the importance of interest rates on economic growth. There is, however, the effect is different in the different economic climates.

Economic growth refers to an increase in the quantity of goods and services that is produced by a country within a given period [18]. It is a fundamental indicator of a country's macroeconomic performance and as well as its wealth [19]. The Gross Domestic Product (GDP) is an effective index that measures the economic development of a country and reflects the value of people's income. The growth rate in GDP is among the most common measures of a country's economic growth. It is a vital macroeconomic variable that measures the growth in the real output produced in an economy for a given period. Globally, governments' economic policies are targeted at attaining sustainable growth in output and income in the near future. Slesnick [20] regards increase in the level of production as a driver of economic well-being, and that GDP is a popular measure of the welfare of the aggregate economy. Real Gross Domestic Product (RGDP) is commonly used in economic literature as a measure of economic growth given that it caters for the adjustment of inflation/deflation that causes price level of goods and services to fluctuate [21].

In Nigeria, the policy makers have embarked upon several macroeconomic policy initiatives in the bid to drive economic growth and development as well as improve the living standard of the citizens. Basically, the government policies are targeted at improving macroeconomic performance and specifically designed to improve the wellbeing of the state and the citizens [22]. The envisaged wellbeing of the state and citizens would be achievable through full employment, improved productivity, and favourable balance of payment, amongst others, which are triggered by sound institutional arrangements. However, while these institutional arrangements are strong in developed countries, they may not be so in developing countries such as Nigeria.

The Nigerian economic growth has been stunted arguably due to social vices such as institutional corruption which hinders public office holders from diligently delivering on the requirements of the economy [23]. These situations hinders the performance of businesses in Nigeria since a stable macroeconomic environment plays an essential role for business, which is very significant for a country's overall competitiveness [24]. Economic researchers have therefore arguments that the macroeconomic outcomes in developing economies are mostly a result of manipulation of macroeconomic policies [25].

Following the recent structural and cyclical changes in the global economy, leading to monetary tightening across countries, this study systematically explores the empirical relationship between the level of nominal interest rates and economic growth in Nigeria.

2. Review of the Literature

2.1. Theoretical Review

The theoretical underpinning of this study is the Keynesian

Theory of Interest Rate. The Keynesian theory of interest rate was contained in Keynes celebrated masterpiece, "The General Theory of Employment, Interest and Money" first published in 1936. The publication of this book brought a paradigm shift in economic theory, making Keynesianism to be widely embraced by nation states as the bedrock of macroeconomic policy with interest rate as the cardinal of the Keynesian analysis [26].

According to Keynes [12], interest rate determines the level of investment, employment, and output in the economy. In this respect, the growth of the economy is closely linked to interest rate as it is used by the monetary authority to influence allocation of resources and production activities [27]. Keynes viewed interest rate as the reward for parting with liquid cash for a specific period and noted the factor that determines interest rate is the willingness to have money in cash form or be ready to part with it which he called, the liquidity preference. Keynes saw liquidity preference as a determining factor of the amount of money that is held by the masses when the prevailing interest rate is known. He thus identified three motives of liquidity preference, transaction, precautionary and speculative motives. According to Keynes, while transaction and precautionary motives were largely influenced by income, speculative motive depends on interest rate. Hence argued that the supply of money and the demand for money determine interest rate. Essentially, the monetary interest rate theory proposed by Keynes finds relevance in the marginal efficiency of capital to impact economic activities [28].

However, Keynes' Theory of Interest Rate was criticised as an indeterminate one since it assumes a given level of income. The theory suggests that demand for money (DM) and supply of money (SM) determine the rate of interest. However, without knowing the level of income, it is difficult to determine the demand for money. Therefore, the rate of interest is indeterminable until the level of income is known, and the level of income cannot be determined until the rate of interest is known. Keynes's theory was also criticised for rejecting real factors as the determinants of interest rate determination and for giving a choice between holding risky bonds and riskless cash that an individual holds either bond or cash and never both. In the real world, it is the uncertainty or risk that induces an individual to hold both.

The theory is relevant to this study as an increase in money supply decreases interest rate which creates a positive impact on marginal efficiency of capital and whose multiplier effects are increase in economic activities such as: expansion in investments, increase in aggregate demand for goods and services, increase in employment, income and overall economic growth. On the other hand, the reverse will be the case if there is an increase in interest rate.

2.2. Empirical Review

A number of studies have examined the impact of interest rate on economic growth in developing countries. Ewubare and Ushang [29] examined the relationship between exchange rate and economic growth in Nigeria between 1981 and 2020. Using the ARDL approach the bounds cointegration test

showed that long-run relationship exists between GDP growth and the underlying explanatory variables. The findings showed that there is evidence of a significant positive effect of interest rate on GDP growth. This finding explains the reality in Nigeria, where businesses and households tend to borrow even as interest rate increases but tend to cut corners by reducing the quality of their products and services or pass-on the increased costs of borrowing to consumers by increasing prices. Kang-Soek and Richard [30] found evidence that interest rates are not negatively correlated with economic growth and do not cause growth. Instead, they found evidence that the relationship may be the opposite in both dimensions. This adds to the recent doubts about the prevailing conduct of monetary policy and common theoretical models. Specifically, the study noted that lowering interest rates may be counter-productive when trying to stimulate the economy.

Daniel *et al.*, [31] investigated the effect of interest rate spread on Ghanaian economic growth using annual time series data from 1975 to 2018. The study used the Engel-Granger two-step procedure which uses the OLS technique to establish both the long-run and short-run relationships between interest rate spread and economic growth. The study found that interest rate spread is a statistically important determinant of economic growth in Ghana but has a negative impact in the long run. In addition, the result shows that labour force, capital stock, and exports affect economic growth in Ghana positively both in the long-run and short-run.

Njie and Badije [32] examined the effects of interest rate on economic growth in The Gambia over the period of 1993 to 2017. The study utilised the Vector Error Correction Model (VECM) to check the relationships between gross domestic product and real interest rate, both in the short-run and long-run. Post estimation tests, including Lagrange Multiplier test for residual autocorrelation were also conducted for autocorrelation, as well as Jarque Bera to test for stability and to check whether residuals are normally distributed. The empirical evidence indicates that there is no short-run association between the growth of the Gambian economy and interest rate but that there is a long run connection that runs from real interest rate and real exchange rate to GDP.

Martinianus and Teresia [33] analyzed the effect of prime interest rate as a monetary policy instrument to stimulate economic growth in Namibia using a Vector Autoregressive Model (VAR) for the period of 1980 to 2019. The result shows that Namibia's prime interest rate has no significant effect on economic growth. This finding remains robust and consistent when impulse response function and variance decomposition are employed. The impulse response function indicates a shock on the prime interest rate exhibits an inverse relationship. However, this effect is insignificant in both short and long-run scenarios. The variance decomposition indicates that the prime interest rate has a strongly exogenous impact; implying it has a weak influence on GDP growth.

Ibrahim and Enofe [34] investigated the relationship between monetary policy instruments and economic growth in Nigeria using annual time series data from 1986 to 2018. The empirical results showed that only interest rate had a positive

(0.42) and significant (10%) impact on economic growth in Nigeria in the short run. They recommended that the monetary authority should develop and implement an expansionary monetary policy capable of creating rapid growth of money supply which would lead to a decrease in interest rate which in turn would lead to increase in aggregate investment. These would lead to an increase in economic growth, if properly implemented.

Olaniyan *et al.*, [35] examined the impact of interest rate and economic growth as determinant of the firm's investment decision in Nigeria between the period of 1989 and 2019. The study disaggregated interest rate and economic growth into external borrowing, exchange rate, inflation rate, and gross domestic product in line with the predicated theories reviewed. The findings from the result point to a unique long-term relationship between interest rates, external borrowing, exchange rate, and economic growth.

Hatmanu *et al.*, [36] examines the influence of the monetary policy interest rate, the real exchange rate and the business climate in the Euro area on the economic growth in Romania. For this purpose, they applied a pre-test for structural breaks to identify the existence of structural breaks, followed by the traditional unit root tests and the unit root tests with structural breaks to verify the stationarity of the variables. The results of the Bound cointegration test led to the autoregressive distributed lag (ARDL) short-run model that measures the short-run impact of the interest rate, exchange rate and the business climate in the Euro area on the economic growth of Romania. Findings show that in the short run, the economic growth is negatively influenced by the interest rate, and positively by the exchange rate.

Sujianto *et al.*, [37] measured the effects of real interest rate (RIR), gross domestic savings (GDS), and net exports (EN) shocks on Indonesia's economic growth (EGR) from 1986 to 2017. The findings of the study indicated that economic growth responded positively to real interest rate shocks, which implies that when the real interest rate experiences a shock (increase), the economy will be inclined to growth. While economic growth responded negatively to gross domestic savings and net export shocks.

Aderemi *et al.*, [38] examined the relationship between monetary policy and performances of macroeconomic variables in Nigeria. Data were collected from the Central Bank of Nigeria Statistical Bulletin. Bounds Test ECM and ARDL model was utilized to address the objective of this study. Consequently, the study found that monetary policy and real GDP have an insignificant negative relationship with each other in the short run meanwhile, the relationship becomes positive in the long run. The study recommended that as a matter of urgency, the Nigerian monetary authority should embark on contractionary monetary policy.

3. Materials and Methods

3.1. Research Design

The study utilized the ex-post facto research design for

investigating the effect of interest rate on real GDP in Nigeria from 2006Q1 to 2022Q4. The adoption of this research design is based on the established theoretical relationships between the interest rate and real growth in GDP, its use in previous studies and the availability of usable data for this study. This research design has been used in prior studies [39-41].

3.2. Statement of Hypotheses

The objective of this study is to analyse the effect of interest rates on Nigeria's real growth in gross domestic product. Therefore, the testable hypotheses are:

H₀₁: Interest rates have no significant effect on the real gross domestic product growth in Nigeria.

H_{a1}: Interest rates have significant effect on the real gross domestic product growth in Nigeria.

3.3. Sources and Definition of Data

The study used quarterly data for seventeen years between January 2006 and December 2022 which span through 68 quarterly observations. The data were obtained through secondary sources such as the annual reports of the Central Bank of Nigeria (CBN), the National Bureau of Statistics (NBS) and the World Development Indicator (WDI). This period will take cognizance of pre and post global recession and the data will be ideal in answering the research questions and to empirically test the formulated research hypothesis to achieve the objective of the study. The selected variables for the study include Real GDP growth (RGDPG), Prime Lending Rate (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ).

3.4. Method of Data Analysis

This study examined the effect of interest rates on real GDP in Nigeria using time series data analyzed through descriptive and inferential statistics. The descriptive analysis was done through statistical measures such as mean, minimum, maximum and standard deviation. Pearson's Product Moment Correlation and Variance Inflation Factor (VIF) were employed to examine the degree of association and to

determine whether there is multicollinearity problem among the explanatory variables.

Prior to the estimation of the regression analysis, the unit root tests were conducted to examine the time series properties of the variables. The unit root tests of Augmented Dickey Fuller and Phillip and Perron unit root tests were conducted. The linear autoregressive distributed lag model (ARDL) was used to estimate the time series regression. This econometric technique has the following justifications: first, the ARDL approach can be used with variables of different orders of cointegration [42]. This occurs when variables have a mixed order of I(0) and I, for example (1). Secondly, the ARDL technique can be used with small or finite sample sizes [43]. Third, the short-run and long-run parameters are calculated simultaneously. Fourth, the method can consider structural breaks in time series data.

3.5. Model Specification

The model to determine the effect of interest rates on economic growth was based on the Keynesian Theory of Interest Rate which states that economic growth is closely linked to interest rate as it is used by the monetary authority to influence allocation of resources and production activities. This study thus employed and modified models based on the works of [44, 45] to create the functional relationship specified in equation (1) below.

$$\text{RGDPG} = f(\text{MPR}, \text{LR}, \text{MS}, \text{INSTQ}) \quad (1)$$

Where RGDPG is the real GDP growth, LR is lending rate, MPR is monetary policy, MS is the money supply, and INSTQ is the institutional quality. The estimable form of equation (1) is specified in equation (2).

$$\text{RGDPG}_t = \beta_0 + \beta_1 \text{MPR}_t + \beta_2 \text{LR}_t + \beta_3 \text{MS}_t + \beta_4 \text{INSTQ}_t + \mu_t \quad (2)$$

β_0 is the constant term and μ_t is the disturbance term. The parameters $\beta_i (i = 1, 2, \dots, 4)$ are the coefficient of the respective variables.

The linear ARDL model for economic growth is shown below:

$$\Delta \text{RGDPG}_t = \alpha_0 + \sum_{i=0}^{n_1} \alpha_1 \Delta \text{RGDPG}_{t-i} + \sum_{i=0}^{n_2} \alpha_2 \Delta \text{LR}_{t-i} + \sum_{i=0}^{n_3} \alpha_3 \Delta \text{MPR}_{t-i} + \sum_{i=0}^{n_4} \alpha_4 \Delta \text{MS}_{t-i} + \sum_{i=0}^{n_5} \alpha_5 \Delta \text{INSTQ}_{t-i} + \beta_1 \text{LR}_{t-1} + \beta_2 \text{MPR}_{t-1} + \beta_3 \text{MS}_{t-1} + \beta_4 \text{INSTQ}_{t-1} + u_t \quad (3)$$

3.6. Apriori Expectation

The Keynesian Theory of Interest Rate states that increase in money supply decreases interest rate creates a positive impact on marginal efficiency of capital and lead to economic growth. Therefore, the study expected that an increase in lending and monetary policy rates would lead to a decline in economic growth while increase in money supply growth and strong institutional quality would result in an increase in economic growth.

4. Results

4.1. Descriptive Statistics, Correlation and Stationarity Test

This section discusses the analysis of the data using descriptive statistics, Pearson correlation analysis and stationarity tests the results obtained from the analysis and their interpretations.

4.2. Descriptive Statistics

The study utilized Nigerian quarterly data for the period of 2006Q1 to 2022Q4. The descriptive presented in Table 1 are the mean, maximum, minimum, standard deviations, and the

numbers of observations for each of the dependent and independent variables, and each of these variables were discussed in turn.

Table 1. Descriptive Statistics of Interest Rates and Macroeconomic Performance.

Variables	Mean	Maximum	Minimum	Std. Dev.	Obs
RGDPG	3.891	10.660	-6.100	3.169	68
PLR	16.027	19.420	11.200	2.010	68
MPR	11.504	16.170	6.000	2.484	68
MSG	4.031	27.691	-7.269	5.289	68
INSTQ	0.011	0.427	-0.402	0.248	68

Source: Researcher's Computation 2023

Notes: Table 1 shows the mean, maximum, minimum and standard deviation of the variables. The dependent variable is Real Gross Domestic Product Growth (RGDPG). The regressors are Prime Lending Rates (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ). The sample period is from 2006Q1-2022Q4 representing 68 quarterly observations. The estimation process was facilitated using EVIEWS 12.

RDGP growth has a standard deviation of 3.17 and a mean value of 3.89. The fact that the 3.169 standard deviation deviates significantly from the 3.89 mean suggests that real GDP growth in Nigeria was less variable over the study period. It was evident from the lowest value of -6.10 and highest value of 10.66 that Nigeria's real GDP growth rates vary. The standard deviation of the prime lending rate is 2.01, while its mean value is 16.03. Given the low standard deviation of 2.01, it can be concluded that there was less volatility in the prime lending interest rate between 2006Q1 and 2022Q4. Nigeria has varying prime lending interest rates, as evidenced by the minimum value of 11.2 and maximum value of 19.42. The monetary policy rate is 11.50 on average, with a 2.48 standard deviation. The comparatively low standard deviation of 2.48 suggests that there was less volatility in the monetary policy rate between 2006Q1 and 2022Q4. It was evident from the lowest value of 6.00 and highest value of 16.17 that Nigeria's monetary policy rate varies. The growth of the money supply has a mean of 4.03 and a standard deviation of 5.29. The relatively large standard deviation of 5.29 suggests that there

will be significant fluctuations in the money supply increase between Q1 of 2006 and Q4 of 2022. The range of values observed in Nigeria's money supply growth is demonstrated by the minimum value of -7.27 and the largest value of 27.69. The mean value of institutional quality is 0.011, with a standard deviation of 0.248. The comparatively low standard deviation of 0.248 suggests the existence of weak institutions in Nigeria from 2006Q1 to 2022Q4. The range of values, from -0.402 at the minimum to 0.427 at the maximum, suggests that Nigeria's institutional quality varies.

4.3. Pearson Correlation Analysis

This section discusses the degree of association between the interest rates variables and Real Gross Domestic Product Growth (RGDPG). Emphasis is on the degree of association between Prime Lending Rates (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ) with Real Gross Domestic Product Growth (RGDPG) for the period 2006Q1-2022Q4 in Nigeria.

Table 2. Correlation Matrix for Interest Rates and Real GDP Growth in Nigeria.

Variables	RGDPG	PLR	MPR	MSG	INSTQ	VIF
RGDPG	1.000					N/A
PLR	0.253	1.000				1.108
MPR	-0.611	-0.236	1.000			2.517
MSG	0.132	-0.089	-0.110	1.000		1.040
INSTQ	-0.694	-0.058	0.752	-0.170	1.000	2.415

Source: Researcher's Computation 2023

Notes: Table 2 shows the Pearson pairwise correlation matrix. The dependent variable is Real Gross Domestic Product Growth (RGDPG). The regressors are Prime Lending Rates (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ). The sample period is from 2006Q1-2022Q4 representing 68 quarterly observations. The estimation process was facilitated using EVIEWS 12. The correlations are below the major diagonal and the last row titled VIF is the test for multicollinearity.

4.4. Interpretation of the Correlation Analysis

The results of the correlation analysis in Table 2 show that a positive association exists between money supply and prime lending interest rates and real GDP growth; hence, increases in these variables will raise real GDP growth. On the other hand, there is a negative correlation between the real GDP growth in

Nigeria and monetary policy rates and institutional quality. This means that an increase in any of these variables will result in a decrease in the country's real GDP growth. Furthermore, a multicollinearity test was performed, and each explanatory variable's variance inflation factor (VIF) was less than 10. For the prime lending interest rates, monetary policy rates, money supply growth, and institutional quality, the VIFs were 1.108, 2.517, 1.040, and 2.415 respectively. As a result,

there was no correlation between the four regressors that were employed in the estimated model.

4.5. Result of the Stationarity Test

In order to examine the time series properties of the variables over the study period, stationarity test using the Augmented Dickey Fuller (ADF) and the Phillip-Perron unit root tests were conducted and the result is presented in Table 3.

Table 3. Result of the Unit Root Test.

Variables	ADF	PP	Remarks
RGDPG	-2.799	-2.386	
ΔRGDPG	-9.428***	-9.728***	I(1)
PLR	-2.001	-2.318	
ΔPLR	-6.871***	-6.861***	I(1)

Variables	ADF	PP	Remarks
MPR	-2.261	-2.443	
ΔMPR	-4.694***	-4.766***	I(0)
MSG	-5.847***	-8.547***	
ΔMSG	-10.634***	-37.186***	I(1)
INSTQ	-2.241	-2.139	
ΔINSTQ	-3.721***	-3.567***	I(1)

Source: Researcher's Computation 2023

Notes: Table 3 presents the unit root test. The dependent variable is Real Gross Domestic Product Growth (RGDPG). The regressors are Prime Lending Rates (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ). The sample period is from 2006Q1-2022Q4 representing 68 quarterly observations. The estimation process was facilitated using EVIEWS 12. The critical value at 5% for intercept and trend is -3.50 and for intercept alone is -2.93. ** and *** indicates significant at 5 and 1 percent respectively.

Table 4. Interest Rates and Real GDP Growth.

Dependent Variable: RGDPG				
Variable	Coefficient	S. E	t-stat	Prob
<i>Panel A: Long Run Estimates</i>				
C	-3.639	3.526	-1.032	0.307
PLR	0.405	0.135	3.006	0.004
MPR	0.074	0.170	0.436	0.665
MSG	-0.009	0.114	-0.075	0.941
INSTQ	-10.289	1.780	-5.781	0.000
<i>Panel B: Short -Run Estimates</i>				
D(RGDPG(-1))	0.313	0.130	2.400	0.020
D(PLR)	0.298	0.120	2.490	0.016
D(MPR)	0.232	0.104	2.225	0.031
D(MSG)	0.043	0.038	1.122	0.267
D(MSG(-1))	-0.008	0.043	-0.197	0.844
D(MSG(-2))	-0.101	0.032	-3.118	0.003
D(INSTQ)	-2.579	6.261	-0.412	0.682
D(INSTQ(-1))	9.569	7.632	1.254	0.216
D(INSTQ(-2))	16.194	6.862	2.360	0.023
ECT(-1)	-0.886	0.147	-6.044	0.000
<i>Panel C: Diagnostic Tests</i>				
Bound Test	Statistic	Prob.		
Adjusted R-square	5.504	0.000		
F-Statistic	0.443			
Serial Correlation	18.548	0.000		
Heteroscedasticity	0.546	0.583		
Linearity Test	0.559	0.898		
Normality	1.815	0.161		
	1.720	0.423		
	CUSUM	CUSUMSQ		
Stability Test	Stable	Stable		

Source: Researcher's Computation 2023

Notes: Table 4 reports the long-run estimates, short run estimates and the diagnostic tests for the relationship between interest rates and real GDP Growth. The dependent variable Real GDP Growth (RGDPG) and the regressors are Prime Lending Rates (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ).

4.6. Interpretation of Stationarity Test

From the unit root test in Table 3, the stationarity tests were carried out on the data using ADF and PP. There is evidence that Real Gross Domestic Product Growth (RGDPG), was stationary in first differences. This was because the unit root statistic for the ADF and the PP unit root tests were more negative than the critical values at the 5 percent level. In addition, there is evidence that all the regressors; Prime Lending Rates (PLR), Money Supply Growth (MSG), and Institutional Quality (INSTQ) were also first difference

stationary, except the Monetary Policy Rate (MPR), which is stationary at level at the 5 percent level of significance. It should be noted that because of the different order of integration of the variables, the Autoregressive Distributed Lag (ARDL) model approach to cointegration of Pesaran and Pesaran (2001), which allows for the combination of levels and first difference stationary variables were used. Another rationale for using the ARDL approach to cointegration was that the short run and the long-run dynamics of the specified model were estimated concurrently.

4.7. Hypothesis Testing

Research Objective: Determine the extent to which Interest Rates impacts Real Growth of Nigeria's Gross Domestic Product.

Research Question: To what extent does Interest Rates affect Real Growth of Gross Domestic Product in Nigeria?

Research Null Hypothesis: Interest rates has no significant effect on the real gross domestic product growth in Nigeria.

4.8. Interpretation of the Regression Analysis

4.8.1. Bound Test

In order to determine whether a long-term connection is possible, the bound test statistics of 5.504 are shown to be statistically significant at the 5 percent level. This is because, at one percent, the 5.504 statistics exceed the critical levels of 4.26, 3.5, and 3.13. This suggests that there may be a chance for a long-term cointegrating link between the variables. The analysis then calculates the long-run and the short-run elasticity based on the potential for a long-run link between interest rates and real GDP growth. Table 4 presents the empirical findings for the model analyzing the short- and long-term relationships between interest rates and real GDP growth.

4.8.2. The Long-Run Dynamics

Panel A of Table 4 contains the estimated long-run coefficients (elasticities) for the ARDL model. There is evidence that the prime lending interest rate and real GDP growth are positively correlated over the long term. This suggests that Nigeria's real GDP growth will accelerate in response to increases in prime lending rates. Consequently, a one percent rise in prime lending rates will result in a 0.405 percent rise in real GDP growth. The findings also showed a strong correlation between Nigeria's real GDP growth and prime lending rates ($PLR = 0.405$, $t\text{-test} = 3.006$, $p < 0.05$). This suggests that variations in prime lending interest rates have a big impact on changes in Nigeria's real GDP growth.

The findings also demonstrate a favorable correlation between real GDP growth and the monetary policy rate. This suggests that real GDP growth will increase in response to increases in monetary policy rates. Hence, a one percent rise in real GDP growth will result in a 0.074 percent increase in GDP growth overall. The findings showed that there is no discernible correlation between Nigeria's real GDP growth and the monetary policy rate ($MPR = 0.074$, $t\text{-test} = 0.436$, $p > 0.05$). This suggests that variations in Nigeria's real GDP growth are not significantly influenced by changes in the monetary policy rate.

Moreover, data suggests that the expansion of the money supply and the growth of the real GDP are negatively correlated. This suggests that a rise in the money supply will result in a fall in the real GDP growth rate. As a result, the real GDP growth will drop by 0.009 percent for every 1% rise in the money supply. The findings showed that there is no discernible correlation between Nigeria's real GDP growth and the money supply ($MSG = -0.009$, $t\text{-test} = -0.075$, $p >$

0.05). This suggests that fluctuations in the money supply are not a major factor affecting Nigeria's real GDP growth.

Furthermore, there is proof that real GDP growth and institutional quality are negatively correlated. It is implied by this that real GDP growth will slow down as institutional quality rises. Therefore, real GDP growth will decline by 10.289 percent for every 1% increase in institutional quality. The findings showed a substantial correlation between Nigeria's real GDP growth and institutional quality ($INSTQ = -10.289$, $t\text{-test} = -5.781$, $p < 0.05$). This suggests that variations in Nigeria's real GDP growth are significantly influenced by institutional quality.

4.8.3. Short-Run Dynamics

The purpose of this subsection is two-fold. The first step is to determine whether the short run model reflects the long run's changes and statistical significance. The second step involves utilizing the error correction term to assess the extent of equilibrium restoration. The error correction term ECT_{t-1} measures the short-run adjustment process, which demonstrates how rapidly variables recover from a shock and reach equilibrium. The coefficient of ECT_{t-1} needs to be statistically significant and have a negative sign in order to be stable.

The outcome demonstrates that there is a positive and substantial correlation between prime lending rates and real GDP growth in the short term. This outcome is consistent with the long-term beneficial connection that was seen. This suggests that there are both short- and long-term effects of prime lending rates on Nigeria's real GDP growth. Furthermore, data suggests that the monetary policy rate and real GDP growth have a positive and significant association over the short term. The findings also showed that, whereas institutional quality has a negative but significant link with real GDP growth, the money supply has a short-term negative substantial impact on real GDP growth. The cointegrating term is found to have the correct sign and to be substantial as predicted by the short-run dynamics results, suggesting that any deviation from the steady-state in Nigeria can be readily adjusted for. As a result, the ECT_{t-1} calculated coefficient in Panel B of Table 4 is statistically significant and negative ($ECT = -0.886$, $t\text{-test} = -6.044$, $p < 0.05$). This suggests that throughout the course of the next quarter, deviations from the real GDP growth equilibrium path are rectified by almost 89%. Put otherwise, Nigeria has a comparatively high adjustment process. The existence of a long-run equilibrium link between interest rates and real GDP growths in Nigeria is further supported by the statistical significance of the ECT_{t-1} .

With an Adjusted R-square of 0.443, it can be inferred that prime lending rates, monetary policy rates, money supply growth, and institutional quality account for approximately 44% of changes in real GDP growth. The remaining 56% of the variation in real GDP growth is attributable to other factors that were not included in the model. The F-test, which verifies the null hypothesis that all of the model's coefficients are zero, provides an indication of the model's overall fit. The F-test in this instance is significant at the 5% level, suggesting that the

model fits the data well overall. On the other hand, the F-test statistic of 18.548 with a probability value of 0.000 suggests that variations in the real GDP growth of Nigeria are jointly influenced by major factors such as institutional quality, money supply growth, monetary policy rates, and prime lending rates. As a result, the alternative hypothesis—which holds that interest rates have a considerable impact on real GDP growth in Nigeria—was accepted and the null hypothesis—which holds that interest rates have no such effect—was rejected.

4.8.4. Post-Estimation Test

In order to ensure the reliability and validity of the parameter estimates and the capacity to make meaningful inferences from the data, five different kinds of diagnostic tests were carried out. The F-statistic of 0.546 and a probability value of 58% are greater than the 5 percent level, indicating that the successive error terms are not serially linked, according to the data, which do not reject the null hypothesis that there is no serial correlation in the residuals. According to the study's findings, there was no correlation between the subsequent error factors in the estimated model for interest rates and real GDP growth in Nigeria. Furthermore,

the results of the heteroscedasticity test indicate that, at the 5 percent significance level, the F-statistic of 0.559 with a probability value of 89.8 percent is not statistically significant. This suggests that there is evidence supporting the homoscedasticity of the error terms' variance and that the null hypothesis of homoscedasticity could not be rejected. Furthermore, there is no statistical significance in the linearity test conducted using the Ramsey RESET. This has a probability value of 16 percent, which is more than the 5 percent level, and an F-statistic of 1.815. The findings thus show that there is a linear relationship between interest rates and real GDP growth in Nigeria and that the estimated model is accurately defined. The null hypothesis of normalcy was not rejected since the Jarque-Bera statistic for the normalcy test yielded an F-statistic of 1.720 with a probability statistic of 42.3 percent, which is higher than the 5 percent criterion of significance. Additionally, Figures 1 and 2 and the CUSUM and CUSUMSQ shown in Panel C demonstrate that the estimated model is stable. This is because the plot of the CUSUM and CUSUMSQ statistic is represented by two straight lines and remains within a 5% significant level.

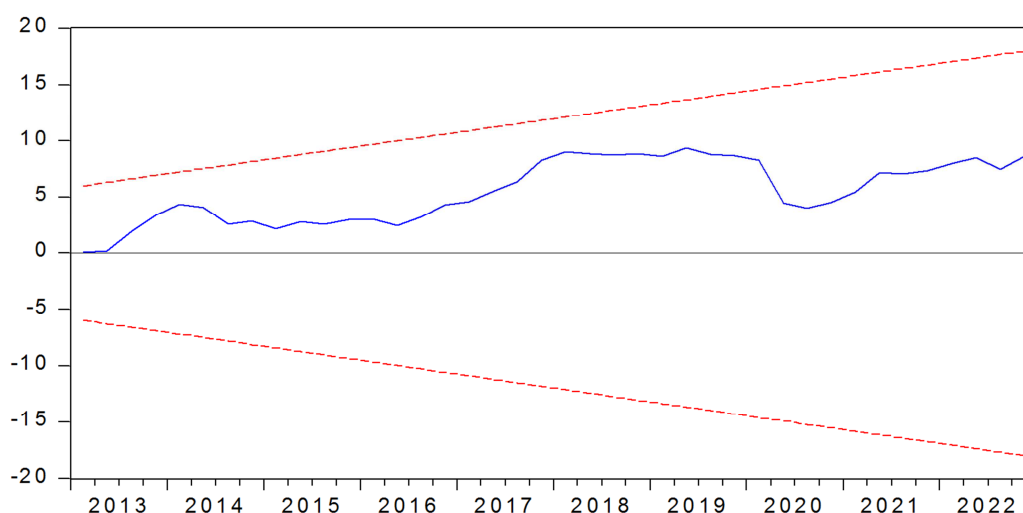


Figure 1. Stability Test – Plots of Cumulative Sum of Residual.

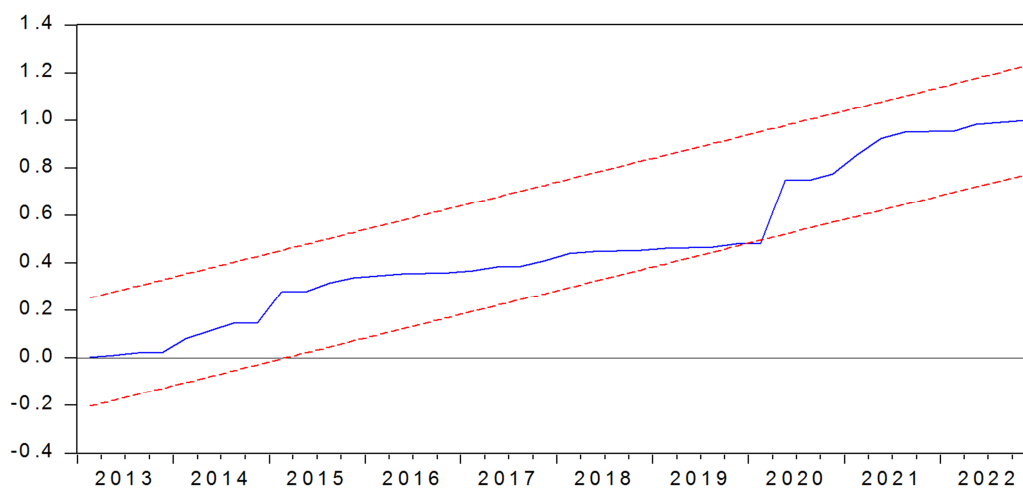


Figure 2. Stability Test – Plots of Cumulative Sum of Square Residual.

5. Discussion

The Autoregressive Distributed Lag (ARDL) model was used to accomplish the study's goal, and the results show that interest rates and real GDP growth have a long-term cointegrating relationship. The following findings were revealed by the long-run and short-run elasticities in the presence of a long-run cointegrating relation: in the long run, there is evidence that the real GDP growth in Nigeria is positively correlated with the prime lending interest rate and the monetary policy rate, but negatively correlated with the growth of the money supply and institutional quality. Furthermore, there is evidence of a long-term significant relationship between real GDP growth in Nigeria and institutional quality as well as prime lending rates; in contrast, there is no evidence of a long-term significant relationship between real GDP growth in Nigeria and the growth of the money supply and the monetary policy rate.

The study's findings are consistent with those of previous research, such as that conducted by Ewubare and Ushang [28], who looked at the connection between Nigeria's economic growth and exchange rate between 1981 and 2020 and found a proof that there is a noteworthy positive relationship between interest rates and GDP growth and Kang-Soek and Richard [29] whose findings suggests that interest rates do not drive growth or have a negative correlation with economic expansion, a finding that reinforces the current skepticism over the prevalent monetary policy practices and widely accepted theoretical frameworks and support that argument that attempting to stimulate the economy through decreasing interest rates may backfire. The results of the study also conforms with Daniel *et al.*, [30], who used annual time series data from 1975 to 2018 to examine the impact of interest rate spread on economic growth and found that although interest rate spread has a short-term negative effect, it is a statistically significant predictor of economic growth.

6. Conclusions

The study examined the effect of interest rates on real GDP growth and the empirical analysis and findings resulting from the analyses revealed mixed results. In the long run, there is evidence that prime lending interest rate and monetary policy rate have positive relationship with real GDP growth, while money supply growth and institutional quality has negative relationship with real GDP growth in Nigeria. In addition, there is evidence of a long-run significant relationship between prime lending rate and institutional quality on the one hand, and real GDP growth in Nigeria on the other hand, while monetary policy rate and money supply growth has no long-run significant relationship with real GDP growth in Nigeria.

The result shows that in the short-run, prime lending rate, monetary policy rate, and institutional quality have positive relationship with real GDP growth in Nigeria, while money supply growth has a negative relationship with real GDP

growth. Also, there is evidence that monetary policy rate, prime lending rates, money supply growth, and institutional quality have significant short-run impact with the real GDP growth in Nigeria. The results of the hypothesis testing support the rejection of the null hypotheses that there is no significant effect of interest rates on real GDP growth in Nigeria and the acceptance of the alternative hypothesis that interest rates have a significant effect on real GDP growth in Nigeria.

Contrary to expectation, the study found that interest rates exert positive impacts on economic growth in Nigeria. It was expected that high interest rates would deter investments, reduce economic activities leading to low economic growth. The study, however, showed that the effect of interest rates on inflation was strong enough to lead to positive real growth in economic growth. Findings showed the opposite with regards to money supply growth. It is also noteworthy that the combined effects of interest rates, money supply growth and institutional quality account for only 44.3% of real growth in GDP.

The study thus recommends that as a short-term economic tool, the CBN may use interest rates to stimulate real growth in GDP. However, since it only account for about 44.3% of real growth in GDP; there is the need to collaborate with the fiscal authority and other relevant departments and agencies to remove all impediments to economic growth. These include the implementation of appropriate fiscal reforms to stimulate economic activities and support growth.

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Conflicts of Interest

The authors declare no conflicts of interest.

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