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Interest Rate and Growth Nexus in Nigeria: The ARDL – Bound Test Approach

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ABSTRACT: *This study examined the effect interest rate on economic growth in Nigeria. Augmented Dickey – Fuller (ADF), Bound Test and Autoregressive Distributed Lag (ARDL) were employed to examine the effect of impact of interest rate on economic growth in Nigeria. The unit root test showed gross domestic product was 1(0) while interest rate, investment and gross capital formation were 1(1). The result of the Bound Test indicated long run relationship among the macroeconomic variables employed in the study. The result of the ARDL indicated that interest rate had negative effect on economic growth both in short run and long run. However, in the long run investment and gross capital formation were established to have positive effect on economic growth with gross capital formation being insignificant.* It was concluded that interest rate has a macroeconomic tool is not effective in stimulating economic growth in Nigeria. It was recommended that the level of interest rate should be adequately controlled for the purpose of stimulating economic growth without inflationary pressure. Finally, robust macroeconomic policies aimed at ensuring economic stability should be formulated in order to increase capital formation and attract investment in order to promote economic growth.

Key Words: Economic Growth, Gross Capital Formation, Gross Domestic Product, Interest Rate and Investment

I. Introduction

Interest rate serves as one of the major macroeconomic variables that determine the level of stability and growth of an economy. Interest rate serves as a tool that facilitate the allocation of scarce financial resources by financial intermediaries for productive and development purpose.

Interest rate is the rate that is charge on lending which represents cost of investment. According to James, Richard and Victor (2013) interest rate is regarded as the return that is received on investment or rate charged on lending. Interest rates play significant role in transmitting monetary policy thrust to economic activities through its influence on major macroeconomic variables (Jelilov, 2016). Reduction in interest rate spurs up liquidity by lowering consumption costs thereby simulating aggregate demand which accelerated investment and growth (Ismail and Roux, 2004). Developing countries are faced with the task of efficiently allocating scarce financial resources among competing investments opportunities (Etale & Ayunku, 2016).

The significant effect of interest rate on investment which determines the level of economic growth has been of great concern in developing countries. James, *et al.,* (2013) noted that financial sector serves as the main driver of growth given the role it plays in the intermediation of funds among economic agents and the prevailing interest rate spread between deposit rate and lending rate determines effectiveness of banks in promoting investment and growth. Interest rate determination has undergone different regime in Nigeria. Before the deregulation, interest rate was determined and fixed by the Central Bank of Nigeria (CBN) and the country moved towards market based financial system in 1986

through the adoption of Structural Adjusted Programme in which interest rate is determined by the forces of demand and supply for funds in the financial system in order to increase the depth and breadth of the Nigerian financial system and moved the economy towards the path of growth (Etale & Ayunku, 2016). Obamuyi and Olorunfemi (2011) asserted that the main aim of this reform is to eliminate financial repression and ensure allocative and productive efficiency in the economy. In 1993, interest rate was very high and volatile which resulted in the fixing MPR at 13.5% (CBN, 1994). However, market based determinants of interest rate has been affected with volatility which posed challenges to the success of the reform in Nigeria (CBN 2006).

The Nigerian economy has continued to be retarded by several challenges which influenced economic activities negatively. The demoralizing consequences of the global economic recession and financial meltdown have not only affected economic performance but also financial system performance (Obansa, et al., 2010; Jelilov, 2016). One of the major problems retarding the growth of the Nigerian economy is high interest rate and the inability of the policy makers to fix rate that will engender growth. High interest rate will lead unemployment crisis, discourage investment thus retarding growth and development (James, *et al.,* 2013). Etale and Ayunku (2016) asserted that high interest rate depress investments, reduce output, increase unemployment rate and impede growth through high cost of borrowing. Despite formulation of different reforms to cushion the effect on interest rate volatility on the Nigerian economy, the growth rate of the country still remains sluggish.

Researches on the effect of interest rate on economic growth in Nigeria showed an inclusive result on the relationships between interest rate and economic growth which resulted in the need to further undertakes a further study in the subject area. Thus, this study focused on the effect of interest rate on economic growth in Nigeria.
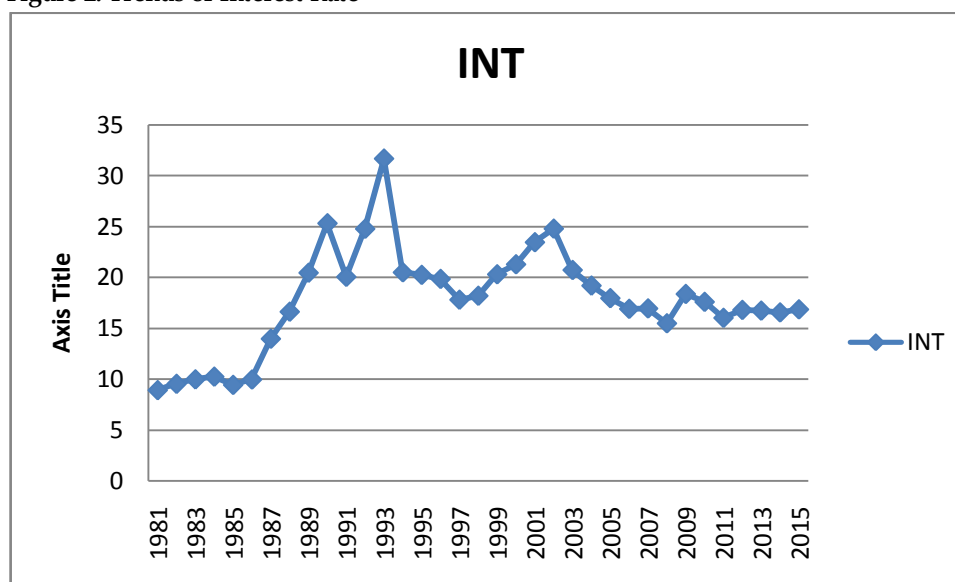
II.   Literature Review

Figure 1: Trends of GDP
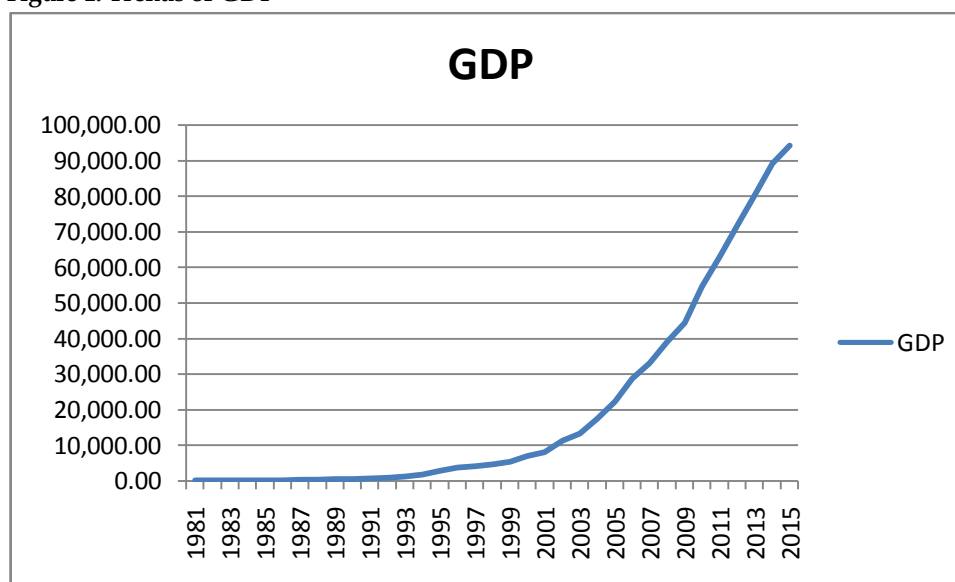
Sources: CBN Bulletin, 2016

Figure 1 showed the trends analysis of gross domestic product in Nigeria. It was revealed that gross domestic was at its lowest ebb between 1981 and 1993. However, from 1993 there was sharp rise in gross domestic product to 2015.

Figure 2: Trends of Interest Rate

The figure above presents, the trends of interest rate. It was indicated that interest rate has remained unstable in Nigeria. Interest rate was low from 1981 to 1985 before shooting up between 1985 and 1989. Interest rate falls significantly in 1991 before rising again in 1993 and was low between 1995 and 1997. Interest rate started rising again from 1991 and get to the highest level in 2001 before dropping in 2009 and had remained low to 2015 but without reaching lowest point.

Obainuyi and Olorunfemi (2011) examined the implications of the financial reforms and interest rate behaviour on the economic growth in Nigeria from 1970 to 2010 by employing co-integration statistics and error correction model and it was found that that financial reforms and interest rates have significant impact on the Nigerian economic growth

Anaripour (2011) investigated the relationship between interest rate and economic growth using time series panel data collected from 22 countries for the period 2004 – 2010 which was analyzed using and it was indicated that there was a negative relationship between interest rate and economic growth. The result of Udoka and Roland (2012) and Imoisi *et al.* (2012) indicated inverse relationship between interest rate and economic growth through the adoption of OLS to examine the effect of interest rate on economic growth in Nigeria. Saymeh and Orabi (2013) investigated the effect of interest rate, inflation rate and GDP on real economic growth in Jordan. The employed ADF unit root test, Johansen co-integration test and regression statistics to analyse data and it was indicated interest rate had positive effect on economic growth. Adeniran, Yusuf and Adeyemi (2014) examined the impact of exchange rate on economic growth in Nigeria by adopting secondary time series data for the period 1986 and 2013 which was analyzed using regression analysis and it was found that that interest rate had insignificant and negative impact on economic growth. By adopting OLS to analyzed data set from 1986 to 2010, Ifeanyi and Chukwu (2014) examined the impact of interest rate deregulation on economic growth in Nigeria and it was found that low interest rate stimulates and increase growth in real domestic product. Mushtaq and Siddiqui (2016) examined the effect of interest rate on economic performance of Islamic and non Islamic nation by adopting data from non-Islamic and 17 Islamic countries from 2005 to 2013 which was analyzed using random effect and system generalized method of moments (GMM) and it was found that domestic credit of banks had negative and significant effect on investment of non-Islamic countries, while in Islamic countries, remittances show a positive significant impact on investment.

Recently, Etale and Ayunku (2016) employed Error Correction Model (ECM) to examine the relationship between interest rate and economic growth in Nigeria by using secondary time series data from 1985 to 2014 and it was revealed that interest rate negatively and insignificantly   related to economic growth. However, Jelilov (2016) found that interest rate had positive impact on growth by examining the effect of interest rate on economic growth in Nigeria from 1990 to 2013 which was analyzed using Ordinary Least Square techniques. This finding was corroborated by the result of Ajudua and Okonkwo (2015) who revealed that interest rate promote growth in Nigeria while examining the determinants of interest rate in Nigeria by using error correction mechanism (ECM) to analyzed data obtained from the Central Bank of Nigeria statistical bulletin and were analyzed.

However, the finding of Jelilov (2016) was contradict by the empirical result of Nkemakolam (2017) and Babalola, Danladi, Akomolafe and Ajiboye (2015) who establish negative relationship between interest rate and economic growth through the adoption of Ordinary Least Square to examine the effect interest rate on economic growth. However, Maiga (2017) examined the impact of interest rate of economic growth in Nigeria from 1990 to 2013 and found that the interest rate had positive effect on growth.

From the review of empirical work of scholars, it could be seen that the nexus of the relationship between interest rate and economic growth has generated controversial and inclusive results. The Findings of Udoka and Roland (2012); Imoisi *et al* (2012) Adeniran, Yusuf and Adeyemi (2014); Babalola *et al.,* (2015); Etale and Ayunku (2016); Nkemakolam (2017) revealed that there exist an indirect relationship between interest rate and economic growth. However, the empirical finings of Obamuyi and Olorunfemi (2013); Ifeanyi and Chukwu (2014); Ajudua and Okonkwo (2015); Jelilov (2016); Maiga (2017) indicated positive relationship between interest rate and economic growth. This inclusive results have generated the need for further empirical and more econometrics approach to examine the relationship between interest rate and economic growth. Thus, this study examined the short run and long run effect of interest rate on economic growth in Nigeria by adopting Auto-regressive Distributed Lag and Bound Test Approach.

III.   Methods

In this study, expo facto research design was adopted to investigate the effect of interest rate on economic growth in Nigeria because the data were mainly historical and non manipulative in nature. Data for the study spanned through 1981 to 2016 and obtained from Central Bank of Nigeria Statistical Bulletin (2016) and World Development Indicator (2016).

Model Specification

In order to capture the impact of interest rate deregulation on economic growth in Nigeria a multiple regression model of James et al., (2013) was adopted with a little modification. The model for this work as:

GDP = f(INT, GCF, INV)   (1)

GDP = $B_0 + B_1$INT + B_2GCF + B_3INV + u   (2)

GDP = Gross Domestic Product

INT = Interest Rate

GCF = Gross Capital Formation

INV = Investment

B_0 = Constant Term

$B_1 – B_3$ = Parameters of the variables to be estimated

u = Unexplained Error Term

The autoregressive distributed lag (ARDL) is suitable are either I(1) or the mixture of I(1) and I(0). The ARDL model avoids endogeneity problems when compared with other form of co-integrating toques and also estimates the long run and short run parameters simultaneously.

$$GDP_t = \beta_0 + \sum_{i=0}^{n} \beta 1i \triangle GDP_{t-i} + \sum_{i=0}^{n} \beta 2i \triangle INT_{t-i} + \sum_{i=0}^{n} \beta 3i \triangle GCF_{t-i} + \sum_{i=0}^{n} \beta 4i \triangle INV_{t-i}$$
$$+ \alpha_1 GDP_{t-1} + \beta_2 INT_{t-2} + \beta_3 GCF_{t-3} + \beta_4 INV_{t-4} + e_t \qquad (3)$$

Where Δ denotes the first difference operator, β_0 is the drift component, and e_t is the white noise residuals. The expression ($\beta 1 – \beta 4$) represents the short-run dynamics of the model. The remaining expression with the ($\alpha_1 – \alpha_4$) represents the long- run relationship of the model.

Method of Data Analysis

The preliminary test of analysis in this study commenced with Augmented Dickey Fuller (ADF) unit root test in order to test order of integration of the variables and to overcome the problems of spurious regression often associated with non-stationary time series data. The study employed Bound Test to establish the long run relationship among the variable. However, Auto-regressive Distributed Lag was adopted to examine the long run and short run relationship among the variables employed. This method enables the estimation of both short run and long run coefficients when variables are either 1(1) or the combination of 1(1) and 1(0). Also, the variables take care of the problem of endogeneity in the regression mole (Pesaran, Shin & Smith, 2001).

Some of the diagnostic techniques include Lagrange serial correlation test, Jarque Bera normality test, Breusch-Pagan heteroscedasticity test and Ramsey Reset Test.

IV. Interpretation of Results

Correlation Matrix

Table 1: Correlation Matrix

	GDP	INT	GCF	INV
GDP	1.000000			
INT	-0.145193	1.000000		
GCF	0.628856	-0.021613	1.000000	
INV	0.656234	-0.069682	0.285319	1.000000

Source: Researchers' Computation, 2018

Table   1 above revealed that there is absence of multicollinearity among the variables since the correlation value are less than 70%. The result revealed that interest rate had negative correlation with gross domestic with a value of -0.145193. Also, it was revealed that Investment and Gross Capital Formation had positive correlation with gross domestic product with correlation value of 0.628856 and 0.656234 for GCF and INV respectively.

Test of Stationarity

Table 2: Summary of Unit Root Result

VARIABLES	TEST STATISTIC	5% CRITICAL VALUE	Prob.	LEVEL	S/NS
GDP	/3.245753/	/2.963972/	0.0270	1(0)	S
INT	/5.047070/	/2.957110/	0.0003	1(1)	S
INV	/4.580447/	/2.957110/	0.0009	1(1)	S
GCF	/4.364721/	/2.954021/	0.0016	1(1)	S

Sources: Researcher's Computation, 2018

The table above revealed the summary of unit root test for the macroeconomic variables using Augmented Dickey Fuller test. It was indicated that Gross Domestic Product was stationary at level 1(0) while Interest Rate, Investment and Gross Capital Formation were free from unit root problem first difference at 1(1). However, since the macroeconomic variables employed are mixture of I(0) and I(1) orders of integration thus the study employed the Autoregressive Distributed Lag of short run and long run equilibrium.

Long Run Relationship

Table 3: Bound Test

Test Statistic	Value	K
F-statistic	5.789195	3
Significance	**I0 Bound**	**I1 Bound**
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Sources: Researchers' Computation, 2018

The result from Bound Test revealed that that the F-statistics value is 5.789195 which is greater than the lower bound critical value of 3.23. Thus, the null hypothesis of no long association-ship is rejected for the model implying Interest Rate, Investment and Gross Capital Formation are good determinants of gross domestic product in the long run.

Autoregressive Distributed Lag Result

Table: 4 Short Run Co-integrating Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INT)	-0.002084	0.003441	-0.605613	0.5510
DLOG(INV)	0.166496	0.047985	3.469739	0.0022
DLOG(INV(-1))	-0.169324	0.072296	-2.342092	0.0286
DLOG(GCF)	0.113831	0.081091	1.403743	0.1744
DLOG(GCF(-1))	-0.205877	0.183444	-1.122283	0.2738

CointEq(-1)	-0.027190	0.009314	-2.919152	0.0079

Sources: Researchers' Computation, 2018

Table 4 revealed the short run result of regression model. The result of the short run co-integration result revealed that there is speed of adjustment among the macroeconomic variables with a negative and significant value of -0.027190. This implies that gross domestic product will adjust back to its equilibrium state at 2.7% in the short run.

Also, in the short run it was revealed that interest rate, first period lag of investment and gross capital formation had negative and insignificant effect on gross domestic product with first period lag of investment being significant while investment and gross capital formation had positive significant impact on gross domestic product.

Table 5: Long Run Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INT)	-0.464378	0.179966	-2.580365	0.0171
DLOG(INV)	12.961527	5.087086	2.547928	0.0183
DLOG(GCF)	15.778825	11.449878	1.378078	0.1820
C	9.511724	2.256061	4.216077	0.0004

Sources: Researcher's Computation, 2018

The result of the long run relationship revealed that Interest Rate had negative and significant effect on gross domestic product in Nigeria with a coefficient of -0.464378, implying that an increase in Interest Rate will lead to fall in Gross Domestic Product which is in conformity with the theoretical expectation. However, it was revealed that Investment had significant and positive effect on Gross Domestic Product with a coefficient value of 12.961527 which means that an increase in Investment will lead rise in Gross Domestic Product and is line with the theoretical expectation. Finally, the long run ARDL model revealed that there is a significant and direct relationship between Gross Capital Formation and Gross Domestic Product With a coefficient value of 15.778825 which implies that a unit increase in Gross Capital Formation will increase gross domestic product.

Table 6: Diagnostics Results

Diagnostics test	Observed value	P-value (Chi-square)
Normality Test	1.462079	0.4813
Breusch-Godfrey LM test for autocorrelation	4.617411	0.0994
Heteroskedasticity Test: Breusch-Pagan-Godfrey	5.585248	0.7806
Ramsey RESET Test	4.074120	0.0565

Source: Researcher's Computation, 2018

The table above shows the diagnostics test for the regression result. The Jarque-Bera normality test revealed that the residuals of the model is normally distributed with a probalaity value of 0.4813. Also, Breusch-Godfrey Lagranger Multiplier test (LM) revealed the absence of serial correlation with a p-value of 0.0994. The result of Breusch-pegan test indicated that the model result was homosecedatic with a probability value of 0.7806 which is statistically insignificant at 5% critical value thus leading to the acceptance of null hypotheses that the residual is. Finally, the result revealed that Ramsey Reset Test indicated no misspecification in the regression model.

Table 7: Causality Test

Null Hypothesis:		Obs	F-Statistic	Prob.	Result
INT does not Granger Cause GDP		32	0.06311	0.9390	No Causality
GDP does not Granger Cause INT	32		0.50346	0.6100	No Causality
GCF does not Granger Cause GDP		32	5.74060	0.0084	Causality Exist
GDP does not Granger Cause GCF	32		11.6860	0.0002	Causality Exist
INV does not Granger Cause GDP		32	0.81081	0.4550	No Causality
GDP does not Granger Cause INV	32		6.99088	0.0036	Causality Exist

Source: Researcher's Computation, 2018

The result of the causality test indicated that there independent relationship between interest rate and gross domestic product which implies that there is no causality between interest rate and gross domestic product. Also, it was indicated that there is a bi-directional relationship gross capital formation and gross domestic product which implies

that there is causal relationship between gross capital formation and gross domestic while unidirectional relationship was established between investment and gross domestic product.

V. Conclusion

Interest rate serves as one of the major macroeconomic tools used stimulating economic growth. The connection of the association-ship between investment and economic growth is determined by interest rate. Stable interest rate allocates resources effectively to engender investment and growth in the economy. Depending on the policy thrust of the government, authority can either increase its interest rate to stimulate economic growth or reduce it to contrast the economy. From the findings of the research it was established that interest rate and investment had significant influence on the economic growth of Nigeria. However, gross capital formation was found to have insignificant effect on economic growth. It was concluded that interest rate has a macroeconomic tool is not effective in stimulating economic growth in Nigeria. It was recommended that the level of interest rate should be adequately controlled for the purpose of stimulating economic growth without inflationary pressure. Interest rate should be reduced to single digit so as to encourage investment through borrowing which will eventually stimulate economic growth and development. Finally, robust macroeconomic policies aimed at ensuring economic stability should be formulated in order to increase capital formation and attract investment in order to promote economic growth.

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