Regulated Interest Rate, Deregulated Interest Rate and Economic Growth in Nigeria: A Dissaggregated Analysis

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ABSTRACT

This study investigates the effect of interest rate on economic growth in Nigeria using annual data spanning the period of 1970–2016. Specifically, the study analyzes the effect of regulated and deregulated interest rates on economic growth in Nigeria. The study employs Ordinary Least Square (OLS) techniques to achieve the objectives. The regression models employed for analysis are specified and categorized to capture: the regulated interest rate regime $(1970 - 1986)$; the deregulated interest rate regime $(1987 - 2016)$ and the full period of study $(1970 - 2016)$. The study reveals that: there is a negative and significant relationship between regulated interest rate and economic growth in Nigeria; there is a negative and significant relationship between deregulated interest rate and economic growth in Nigeria; there is a negative and significant relationship between interest rate and economic growth in Nigeria. The policy implications are easily discernible: high interest rate is detrimental to economic growth in Nigeria; interest rate can be used as a policy variable by the monetary authorities to control the flow of credit and also influence economic growth in Nigeria. Therefore, irrespective of the kind of regime, the management of the interest rate in Nigeria calls for high level discretion on the part of monetary authorities if macroeconomic goals are to be achieved. Thus, the study recommends that: interest rate should be closely monitored, stabilized and effectively managed. Monetary authorities should endeavour to maintain the interest rate at a single digit and at minimal levels to encourage investment and foster output growth.

Highlights of this paper

- This study investigates the effect of interest rate on economic growth in Nigeria using annual data spanning the period of 1970–2016.
- The study employs Ordinary Least Square (OLS) techniques to achieve the objectives.
- The study reveals that: there is a negative and significant relationship between regulated interest rate and economic growth in Nigeria; there is a negative and significant relationship between deregulated interest rate and economic growth in Nigeria; there is a negative and significant relationship between interest rate and economic growth in Nigeria.

1. INTRODUCTION

Interest rates play a crucial role in the efficient allocation of resources in the growth and development process of countries in the global economy. Nigeria's interest rates adjustment overtime tend to have a spill-over effect on the economic growth of the country. Right from 1986 when the Structural Adjustment Programme (SAP) was adopted, interest rate and other price variables experienced lots of fluctuations, which was presumably caused by the deregulation of these variables to be determined by the market forces as it was one of the conditions of SAP given by the International Monetary Fund (IMF) (Fatoumata, 2017). This adjustment was evident in the sudden swings in interest rate from 10.5% in 1986 to 17.5% in 1987; it further increased to 26.8% in 1989.

As the interest rate started fluctuating attaining double digits, the growth rate of the real gross domestic product recorded a sharp decline. This shows that interest rate is one of the major factors that influence output performance in Nigeria. Thus, one can invariably say that the policy makers' choice of keeping the interest rate at a double digit and in some cases unusually high levels is extremely detrimental to the growth of the Nigerian economy. In some cases, the argument is that just as interest rate reduction is used as an expansionary monetary policy, in order to curtail the level of inflation, the interest rate ought to be increased. This to a certain extent may not be applicable to developing countries such as Nigeria. Swings in interest rate create serious market uncertainties which are very detrimental to direct investment in the local economy.
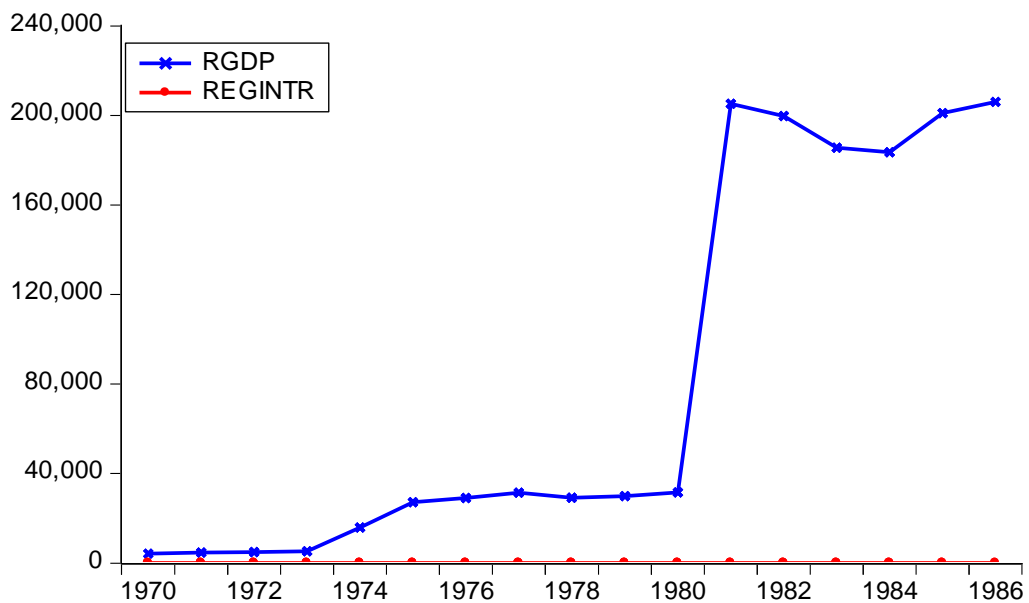

Figure-1. Trends in regulated interest rate and economic growth in Nigeria from 1970-1986.

Interest rate management in Nigeria has experienced two principal eras: the regulated regime and the deregulated regime. Figure 1 presents the trend in regulated interest rate and economic growth in Nigeria. As

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shown in the figure above, the interest rate was fairly stable while output fluctuated actively throughout the period of 1970 to 1986.
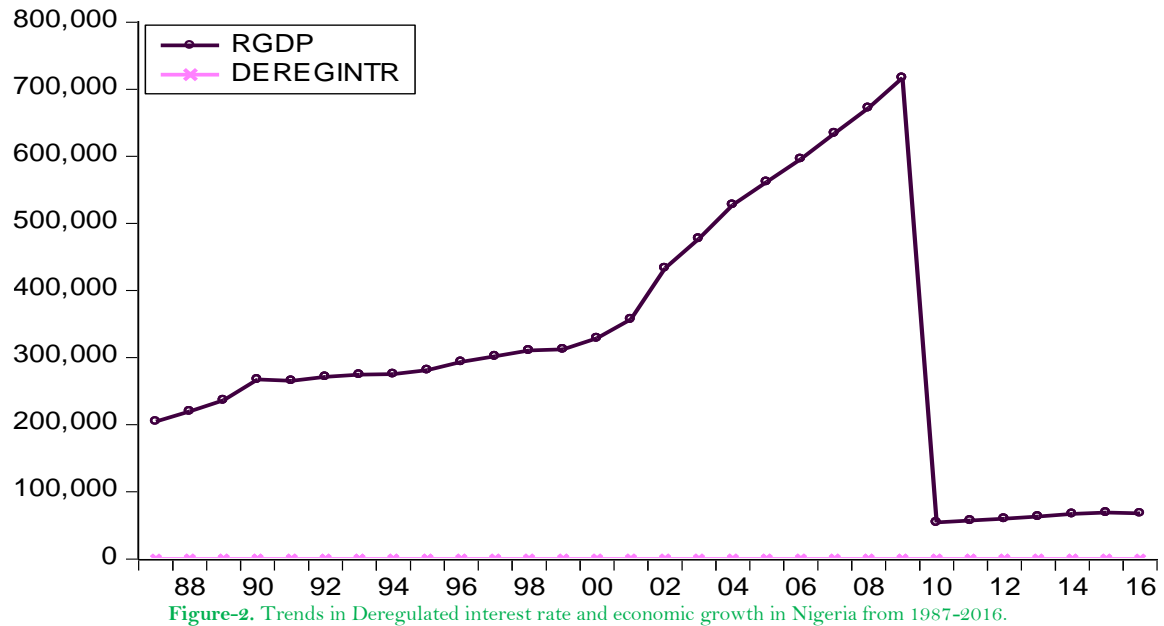

Figure-2. Trends in Deregulated interest rate and economic growth in Nigeria from 1987-2016.

Figure 2 presents the trends in interest rate and economic growth in the deregulated regime of interest rate in Nigeria from 1987 to 2016. In 1986, interest rate deregulation was one of the prominent features of the Structural Adjustment Programme (SAP). The trends in interest rate in Figure 2 express some measure of upward and downward swings. This may be highly due to the fact that the rate was determined by the market forces.
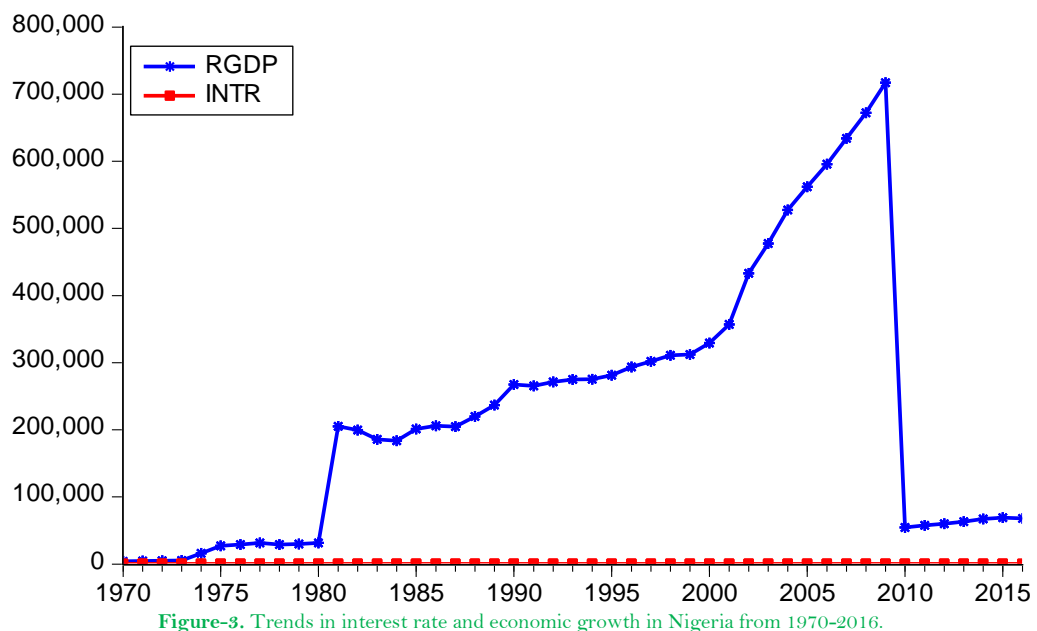
Figure-3. Trends in interest rate and economic growth in Nigeria from 1970-2016.

Figure 3 presents the trends in interest rate and economic growth in Nigeria form $1970 - 2016$. From 1970 to 1986, the interest rate was fixed after which it was deregulated. Whereas economic theory postulates a negative relationship between interest rate and economic growth, the graphical presentations in Figures 1, 2 and 3 do not really reveal the inverse relationship in the case of Nigeria. In a regulated and deregulated regime, what really is the

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relationship between interest rate and economic growth in Nigeria? What is the effect of regulated and deregulated interest rates on economic growth in Nigeria? These are the crucial questions which this study seeks to answer. Therefore, the major objective of this study is to investigate the effect of interest rate on economic growth in Nigeria. Specifically, this study seeks to examine the effect of regulated and deregulated interest rates on economic growth in Nigeria.

This study is very relevant to the monetary authorities as it will provide information that will guide them the process of interest rate regulation and management. It will also proffer information on how economic growth responds to the uncontrollable and unanticipated swings in the interest rate in Nigeria and how the economy could be managed in the face of the changes in interest rate. Furthermore, this study will also serve as a reference material for students and researchers who are interested in this area of study. This study will also help to enlighten the businessmen, speculators and potential investors (domestic and foreign)in order to guide their investment decisions. The paper is organized in five sections. Section 1 is the Introduction while section 2 contains the Literature Review. Section 3 presents the Methodology of Research employed in this study. The Empirical Results and Findings are presented in section 4. Finally, section 5 of this study presents the Summary, Conclusion and Recommendations.

2. LITERATURE REVIEW

2.1. Theoretical Framework

There are several theories on the subject of interest rate and economic growth. However, the theory that is relevant in developing countries like Nigeria is IS-LM theory. The IS–LM model, or Hicks–Hansen model, is a macroeconomic tool that shows the relationship between interest rates and assets market (also known as real output in goods and services market plus money market). The intersection of the "investment–saving" (IS) and "liquidity preference–money supply" (LM) curves models "general equilibrium" where supposed simultaneous equilibrium occurs in both interest and assets markets. Yet two equivalent interpretations are possible: first, the IS–LM model explains changes in national income when price level is fixed short-run; second, the IS–LM model shows why an aggregate demand curve can shift. Hence, this tool is sometimes used not only to analyze economic fluctuations but also to suggest potential levels for appropriate stabilization policies.

The IS curve is defined by the equation $Y = C(Y-T) + I(r) + G + NX(Y)$ (1a)

Where Y represents income, C(Y-T) represents consumer spending as an increasing function of disposable income (income, Y, minus taxes, T(Y), which themselves depend positively on income), I(r) represents investment as a decreasing function of the real interest rate, G represents government spending, and NX(Y) represents net exports (exports minus imports) as a decreasing function of income (decreasing because imports are an increasing function of income). In this model, the level of C (consumption), G (government spending), EX (exports), IM (imports), and R_t (real interest rate) are considered to be exogenous, meaning that they are taken as a given, because they are determined by factors outside of this model.

Mathematically, the LM curve is defined by the equation $M/P = L(Y,i)$ (1b)

Where the supply of money is represented as the real amount M/P (as opposed to the nominal amount M), with P representing the price level, and L being the real demand for money, which is some function of the interest rate i and the level Y of real income. The LM curve shows the combinations of interest rates and levels of real income for which money supply equals money demand—that is, for which the money market is in equilibrium.

2.2. Empirical Literature Review

Several studies have examined the relationship between interest rate and economic growth. Some studies have revealed a positive relationship between both variables. For instance, see Inyiama (2013); Saymeh and Orabi (2013); Okoye and Eze (2015); Akpan (2004) Some studies reveal a negative relationship between interest rate and economic growth. For instance, see Anaripour (2011); Giovanni and Shambaugh (2008); Udoka and Roland (2012); Acha and Acha (2011); Ifeanyi and Chukwu (2014); Nwoko and Ihemeje (2016); Owolabi and Adegbite (2014); Torlagh (2013); Mutinda (2014); and Anaripour (2011). Some studies reveal a long run relationship between both variables. For instance, see Obamuyi (2009); Etale and Ayunku (2016); Hansen and Seshari (2013); Okoro (2013); Saymeh and Orabi (2013); Other studies that revealed that interest rate impacts on growth include: Obaniuyi and Obrunfemi (2011); Owolabi and Adegbite (2014); and Nyong (2007).

3. RESEARCH METHODOLOGY

3.1. Nature and Sources of Data

Data used in this study are entirely secondary in nature. They are time series data spanning the period 1970 - 2016 (47) years. For the purpose of analysis, the data on interest rate and economic growth have been disaggregated into the regulated regime (1970 - 1986) and the regulated regime (1987 − 2016). They are obtained from official sources such as: Central Bank of Nigeria (2016) and National Bureau of Statistics (2016).

3.2. Model Specification

The model of this study is broken into three equations in order to suit the structure of this study. The equations will be specified based on the regulated interest rate regime (1970 − 1986); the deregulated interest rate regime (1987 − 2016) and the full period of study (1970 − 2016). The model of this study is thus specified in its fundamental form:

$$RGDP_{Ft} = F\ (INTR_{Ft},\ EXR_{Ft},\ INF_{Ft},\ POP_{Ft},\ TGEFt,\ INV_{Ft}) \qquad (2)$$
$$\quad\quad\quad (-) \quad\ (+) \quad (+/-) \quad (+) \quad (+) \quad (+)$$

$$RGDP_{Rt} = F\ (INTR_{Rt},\ EXR_{Rt},\ INF_{Rt},\ POP_{Rt},\ TGE_{Rt},\ INV_{Rt}) \qquad (3)$$
$$\quad\quad\quad (-) \quad\ (+) \quad (+/-) \quad (+) \quad (+) \quad (+)$$

$$RGDP_{Dt} = F\ (INTR_{Dt},\ EXR_{Dt},\ INF_{Dt},\ POP_{Dt},\ TGE_{Dt},\ INV_{Dt}) \qquad (4)$$
$$\quad\quad\quad (-) \quad\ (+) \quad (+/-) \quad (+) \quad (+) \quad (+)$$

Where,

RGDP = Real gross Domestic product (%).

INTR= Interest rate [proxied by Prime lending rate (%)].

EXR = Exchange rate (%).

INF = Inflation (%).

POP = Population growth rate (%).

TGE = Total Government expenditure (%).

INV = investment proxied by gross fixed Capital formation.

Ft = full period.

Rt = Regulated period.

Dt = Deregulated period.

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3.2.1. Apriori Expectations

The signs in the parenthesis represent the apriori expectations of the behaviour of the relationship between the dependent and the independent variables as measured by the value of their coefficients.

3.3. Analytical Techniques

The analytical techniques used in this study are employed based on the specific objectives of the study.

3.3.1. Objective 1

To examine the effect of regulated and deregulated interest rate on economic growth in Nigeria, the Ordinary Least Square technique was employed.

3.3.1a. The Ordinary Least Square (OLS)

The Ordinary Least Square (OLS) is a method for estimating the unknown parameters in a linear regression model with the goal of minimizing sum of the squares of the differences between the observed responses in the given dataset and those predicted by a linear function of a set of explanatory variables. The result estimator can be expressed by a simple formula especially in a case of a single regressor on the right hand side. The OLS estimators are consistent when the regressors are exogenous and optimal in the class of linear unbiased estimators when the errors are homoscedastic and serially uncorrelated. OLS was employed in this study because the variables in the study are not volatile and does not have high level of fluctuations. Their trends being linear fit the basic Best Linear Unbiased Estimator (BLUE) criteria of OLS.

The study experimented with the different functional forms of a model, viz: Linear, Exponential, Semi-Log and Double Log functional forms. Through the comparism of the different results, the functional form that is consistent with apriori and statistical expectation in R square, Akaike Information Criterion, and Schwarz information criterion will be selected as the lead function of the study. To choose the lead functional form, the result of the post-estimation diagnostics will also be used as a yardstick. The model of this study is stated thus in their different functional forms:

Linear Functional Form:

$$RGDP_{Ft} = \beta_0 + \beta_1 INTR_{Ft}, + \beta_2 EXR_{Ft} + \beta_3 INF_{Ft} + \beta_4 POP_{Ft} + \beta_2 TGE_{Ft} + \beta_2 INV_{Ft} \tag{5}$$

$$RGDP_{Rt} = \beta_0 + \beta_1 INTR_{Rt}, + \beta_2 EXR_{Rt} + \beta_3 INF_{Rt} + \beta_4 POP_{Rt} + \beta_2 TGE_{Rt} + \beta_2 INV_{Rt} \tag{6}$$

$$RGDP_{Dt} = \beta_0 + \beta_1 INTR_{Dt}, + \beta_2 EXR_{Dt} + \beta_3 INF_{Dt} + \beta_4 POP_{Dt} + \beta_2 TGE_{Dt} + \beta_2 INV_{Dt} \tag{7}$$

Double Log Functional Form:

$$LRGDP_{Ft} = \beta_0 + \beta_1 LINTR_{Ft}, + \beta_2 LEXR_{Ft} + \beta_3 LINF_{Ft} + \beta_4 LPOP_{Ft} + \beta_2 LTGE_{Ft} + \beta_2 LINV_{Ft} \tag{8}$$

$$LRGDP_{Rt} = \beta_0 + \beta_1 LINTR_{Rt}, + \beta_2 LEXR_{Rt} + \beta_3 LINF_{Rt} + \beta_4 LPOP_{Rt} + \beta_2 LTGE_{Rt} + \beta_2 LINV_{Rt} \tag{9}$$

$$LRGDP_{Dt} = \beta_0 + \beta_1 LINTR_{Dt}, + \beta_2 LEXR_{Dt} + \beta_3 LINF_{Dt} + \beta_4 LPOP_{Dt} + \beta_2 LTGE_{Dt} + \beta_2 LINV_{Dt} \tag{10}$$

Semi Log Functional Form:

$$RGDP_{Ft} = \beta_0 + \beta_1 LINTR_{Ft}, + \beta_2 LEXR_{Ft} + \beta_3 LINF_{Ft} + \beta_4 LPOP_{Ft} + \beta_2 LTGE_{Ft} + \beta_2 LINV_{Ft} \tag{11}$$

$$RGDP_{Rt} = \beta_0 + \beta_1 LINTR_{Rt}, + \beta_2 LEXR_{Rt} + \beta_3 LINF_{Rt} + \beta_4 LPOP_{Rt} + \beta_2 LTGE_{Rt} + \beta_2 LINV_{Rt} \tag{12}$$

$$RGDP_{Dt} = \beta_0 + \beta_1 LINTR_{Dt}, + \beta_2 LEXR_{Dt} + \beta_3 LINF_{Dt} + \beta_4 LPOP_{Dt} + \beta_2 LTGE_{Dt} + \beta_2 LINV_{Dt} \tag{13}$$

Exponential Functional Form:

$$LRGDP_{Ft} = \beta_0 + \beta_1 INTR_{Ft}, + \beta_2 EXR_{Ft} + \beta_3 INF_{Ft} + \beta_4 POP_{Ft} + \beta_2 TGE_{Ft} + \beta_2 INV_{Ft} \qquad (14)$$

$$LRGDP_{Rt} = \beta_0 + \beta_1 INTR_{Rt}, + \beta_2 EXR_{Rt} + \beta_3 INF_{Rt} + \beta_4 POP_{Rt} + \beta_2 TGE_{Rt} + \beta_2 INV_{Rt} \qquad (15)$$

$$LRGDP_{Dt} = \beta_0 + \beta_1 INTR_{Dt}, + \beta_2 EXR_{Dt} + \beta_3 INF_{Dt} + \beta_4 POP_{Dt} + \beta_2 TGE_{Dt} + \beta_2 INV_{Dt} \qquad (16)$$

Where,

RGDP = Real gross Domestic product.

INTR= Interest rate (proxied by Prime lending rate).

EXR = Exchange rate (Official Monthly Average).

INF = Inflation.

POP = Population growth rate.

TGE = Total Government expenditure.

INV = Investment (proxied by gross fixed Capital formation).

Ft = full period.

Rt = Regulated period.

Dt = Deregulated period.

L = Natural Log.

3.4. Diagnostic Tests

3.4.1. Unit Root Tests

This is the pre cointegration test. It is used to determine the order of integration of a variable that is how many times it has to be differentiated or not to become stationary. It is a check for the presence of a unit root in the variable, that whether the variable is stationary or not. The null hypothesis is that there is no unit root. This test is carried using the Augmented Dickey Fuller (ADF) technique of estimation .The rule is that if the ADF test statistic is greater than the 5 percent critical value we accept the null hypothesis , that is the variable is stationary , but if the ADF test statistic is less than the 5 percent critical value , the the variable is non-stationary, we reject the null hypothesis and go ahead to differentiate once. . If the variable does not become stationary at first difference we differentiate twice. However, it is expected that the variable becomes stationary at first deterrence.

3.4.2. Lagrange Multiplier Test (LM)

This is associated with the relationship between a given set of variables and itself at a given time interval Lagrange Multiplier test is often or usually found in repeating form when the level of variables affect its future level. The main advantage of the LM test is that it does   not require an estimate.

3.4.3. Auto Regressive Conditional Heteroscesdasticity Test (ARCH)

This test is employed to characterize and model observed time series in econometrics. It is put to use when the error terms will have a characteristic size of the variance. This model assume the variance of the current error term or innovation to be a function of the actual sizes of the previous time period error term; where the variance is related to the square of the previous innovation (Gujarati & Porter, 2009).

3.4.4. Normality Test

This is used to examine whether the error terms correspond to the different observations or regression models are normally distributed to meet or fulfilled the OLS assumption. This test is seen as being important due to the

fact that the test of significance is based on the assumption that the error term is normally distributed, meanwhile this may not be so because the mean of the error term can be approximated to zero.

3.4.5. Ramsey Regression Equation Specification Error Test (RESET)

This involves the selection of an appropriate functional form for the model and then determining the variables which will be included in the model .An estimation will be considered biased and inconsistent when the model is wrongly specified .The test is general specification test for the linear regression model. It help to test for nonlinear relationship between the variables.

4. PRESENTATION OF EMPIRICAL RESULTS AND DISCUSSIONS

This section analyses and discusses the empirical results of this study.

4.1. Unit Root Tests

We begin this analysis by examining the time properties of the data. This is done in order to avoid spurious regression. The orders of integration of the variables are examined using the Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) test statistics. The results of these tests are presented in presented in Table 1 and Table 2.

The result of the unit root test based on the Augmented Dickey Fuller in Table 1 shows that real GDP, exchange rate, investment, interest rate, and total government expenditure were stationary at first difference. However, inflation, and population were stationary at level. The result of the unit root test based on the Phillip Perron in Table 2, shows that real GDP, exchange rate, investment, population and interest rate were stationary at first difference. However, inflation, and money supply were stationary at level.

Table-1. Result of unit root test based on augmented dickey fuller (ADF).

Variable	ʊ ADF	1% critical value (***)	5% critical value (**)	Prob	Order of integration
RGDP	-6.743579***	-4.18	-3.51	0.0000	I~(1)
INTR	-10.58409***	-4.18	-3.51	0.0000	I~(1)
INF	-3.987122**	-4.18	-3.51	0.0160	I~(0)
EXR	-5.667754**	-4.18	-3.51	0.0001	I~(1)
INV	-8.208525***	-4.18	-3.51	0.0000	I~(1)
POP	-4.303405***	-4.18	-3.51	0.0075	I~(0)
TGE	-7.725846	-4.18	-3.51	0.0000	I~(1)

Table-2. Result of unit root test based on Phillips-Perron (PP).

Variable	PP adjusted stat	1% critical value (**)	5% critical value (*)	Prob.	Order of integration
RGDP	-6.887243***	-4.18	-3.51	0.0000	I~(1)
INTR	-10.82561***	-4.18	-3.51	0.0000	I~(1)
INF	-3.926244**	-4.18	-3.51	0.0187	I~(0)
EXR	-5.666831***	-4.18	-3.51	0.0001	I~(1)
INV	-9.757477***	-4.18	-3.51	0.0000	I~(1)
POP	-8.647016***	-4.18	-3.51	0.0000	I~(1)
TGE	-7.683811***	-4.18	-3.51	0.0000	I~(1)

4.2. Ordinary Least Square Estimation Results

To achieve the first specific objective of this study, the Ordinary least square estimation technique was adopted. Four different functional forms were experimented during this process. They are, linear, double log, semi log and exponential functional forms. Through the comparism of the different results, it will aid the determination of which functional form is consistent with apriori and statistical expectation. The study examined the R^2, Akaike

Information Criterion, and Schwarz information criterion to arrive at the appropriate choice of model. The lead functional form in this analysis is the functional form that has a very strong R2, significant coefficients and also has the least AIC and SIC values together with an acceptable Durbin Watson statistics (Gujarati, 2003).

Table-3. OLS result of the relationship between RGDP, regulated interest rate and other exogenous variables (1970 − 1986).

Variables	Linear functional form	Double log functional form	Semi log functional form	Exponential functional form
C	-286754.0(0.3791)	1.200741(0.0040)***	-431456.2(0.0066)***	0.767567(0.3603)
INTR	11558.78(0.2922)	–0.0385(0.0054)***	-748.0365(0.8273)	-0.007320(0.7901)
EXR	-43551.9(0.3318)	0.11652(0.0299)**	-32269.88(0.3183)	0.302088(0.0204)**
INF	1058.824(0.2768)	0.05267(0.0457)**	-43981.55(0.0140)**	-0.000737(0.7616)
INV	6721.008(0.1239)	0.14346(0.0562)*	-5883.520(0.6807)	0.015970(0.1514)
TGE	14216.57(0.0092)***	0.11324(0.0073)***	71662.32(0.0000)***	-0.007698(0.5128)
POP	110937.4(0.4495)	0.299684(0.0058)***	-46419.52(0.6695)	-0.263652(0.4833)
R²	0.772965	0.908791	0.988283	0.585526
F- test	10.079[0.001]	54.152[0.001]	140.57 [0.000]	2.354[0.111]
DW	2.30	1.93	1.05	1.47
AIC	24.42	-0.967353	21.92682	-1.322512
SIC	24.76	-1.62426	22.26991	0.979424
Diagnostic Test				
Test	Linear Function FF	Double Log FF	Semi-log FF	Exponential FF
Arch test	2.168410(0.1630)	18.40986(0.0007)***	0.842813(0.4545)	0.307174(0.5882)
LM test	0.506405(0.6208)	6.897929(0.0448)**	8.057285(0.0121)**	1.54501(0.3922)
Normality test	1.988900(0.369927)	5.222058(0.0211)**	0.182083(0.912980)	1.221567(0.542925)
Reset test	0.475127(0.6460)	2.790597(0.0070)***	1.486572(0.1713)	0.246318(0.8110)

Table 3 presents the OLS result of the relationship between deregulated interest rate and economic growth in Nigeria. The result of the OLS based on the double log functional form shows that regulated interest rate together with other explanatory variables have 91% significant relationship with economic growth in Nigeria. The result further revealed that under the regulated interest rate regime, when interest rate increases by 1%, RGDP decreases by 4%; when exchange rate increases by 1%, real GDP increases by 11.6%; when inflation increases by 1%, RGDP increases by 5%; when investment increases by 1%, economic growth increases by 14%; when total government expenditure increases by 1%, real GDP increases by 11%; and when population increases by 1%, real GDP increases by 30%. The result of the diagnostic test shows that the double log functional form satisfies all the test requirements. This implies that it is free from Heteroscedasticity and it is normally specified.

Table 4 presents the OLS result of the relationship between deregulated interest rate and economic growth in Nigeria. Still based on the established standard of choice of functional forms, the double log functional form was considered as the lead functional form in this analysis. The result shows that deregulated interest rate and other exogenous variables have 95% significant relationship with economic growth in Nigeria. The result further shows that under the deregulated interest rate regime, 1% increase in interest rate leads to 23% decrease in RGDP; 1% increase in exchange rate leads to 15.7% increase in the value of real GDP; 1% increase in inflation leads to 15.6% decrease in real GDP; 1% increase in investment leads to 80% increase in RGDP; 1% increase in total government expenditure leads to 16% increase in the value of real GDP; and 1% increase in population leads to 2.7% increase in RGDP. The result of the diagnostic test shows that the double log functional form satisfies all the test requirements. This implies that it is free from Heteroscedasticity and it is normally specified.

Table-4. OLS result of the relationship between RGDP, deregulated interest rate and other exogenous variables (1987 − 2016).

Variables	Linear functional form	Double log functional form	Semi log functional form	Exponential function form
C	293937.6(0.0009)***	−5.80469(0.0035)***	−2370025.0(0.0000)***	2.698521(0.0025)**
INTR	497.4038(0.8582)	−0.23305(0.0093)***	173.9265(0.9734)	−0.088754(0.0605)*
EXR	1269.022(0.0001)***	0.156744(0.0312)**	−2689.021(0.9365)	0.019321(0.0000)***
INF	−689.8296(0.1848)	−0.156005(0.0165)**	16089.41(0.0000)***	−0.102072(0.0041)**
INV	0.234501(0.0000)***	0.803265(0.0000)***	2538.312(0.7116)	0.515507(0.0058)***
TGE	−91.1103(0.0000)***	0.164975(0.1224)	204390.9(0.0000)***	0.343115(0.0086)***
POP	−4757.88(0.8202)	0.027229(0.0035)***	12909.16(0.5951)	0.173204(0.0253)**
R²	0.603323	0.954471	0.984608	0.889303
F- test	83.38[0.000]	80.36[0.000]	245.22 [0.000]	30.8[0.000]
DW	1.31	1.88	1.003	1.64
AIC	24.51	0.653563	23.45729	1.542014
SIC	24.83	0.980509	23.56188	1.868960
Diagnostic Test				
Test	Linear Function FF	Double Log FF	Semi-log FF	Exponential FF
Arch test	1.911211(0.1559)	5.026231(0.0027)***	1.128138(0.3584)	5.389310(0.0280)**
LM test	1.882864(0.1650)	8.592076(0.0019)***	3.371723(0.0388)**	12.01232(0.0003)***
Normality test	0.720379(0.697544)	12.62074(0.0094)***	5.755118(0.056272)*	10.11996(0.006346)***
Reset test	5.571714(0.0060)***	4.286743(0.0172)**	26.21940(0.0000)***	6.007281(0.0000)***

Table-5. OLS result of the relationship between RGDP, interest rate and other exogenous variables (1970 − 2016) full period.

Variables	Linear functional form	Double log functional form	Semi log functional form	Exponential functional form
C	25406.50(0.7491)	0.405757(0.0049)***	−1113692.0(0.0000)***	0.175142(0.7799)
INTR	12698.26(0.0000)***	−0.35570(0.0066)***	−17480.46(0.0523)*	0.110908(0.0000)***
EXR	1447.041(0.0006)***	0.093307(0.0000)***	86278.48(0.0291)**	0.022359(0.0000)***
INF	−174.1861(0.7845)	0.098673(0.0005)***	40191.89(0.0000)***	0.002592(0.6064)
INV	0.242620(0.0000)***	0.536484(0.0000)***	−53621.99(0.0000)***	2.230007(0.1347)
TGE	−79.67306(0.0000)***	0.302233(0.0000)***	102321.5(0.0000)***	4.340005(0.7039)
POP	12245.27(0.6566)	0.121103(0.7010)	−22096.06(0.6778)	−0.191351(0.3803)
R²	0.900237	0.970486	0.913583	0.939728
F- test	60.16[0.000]	219.21[0.000]	70.48 [0.000]	103.9[0.000]
DW	1.21	1.65	0.91	0.78
AIC	25.19020	0.976141	25.04659	1.690123
SIC	25.46576	1.251695	25.32214	1.960123
Diagnostic Test				
Test	Linear function FF	Double Log FF	Semi-log FF	Exponential FF
Arch test	0.512934(0.6757)	9.629000(0.0001)***	7.276237(0.0005)***	2.218375(0.1009)
LM test	3.768331(0.0321)**	12.40492(0.0000)***	7.953691(0.0013)***	8.784779(0.0002)***
Normality test	1.949166(0.377350)	7.596665(0.022408)**	3.641239(0.161925)	0.687383(0.709148)
Reset test	3.221468(0.0026)***	22.55200(0.0000)***	8.671602(0.0000)***	7.008349(0.0000)***

Table 5 presents the OLS result of the relationship between both regulated and deregulated interest rate and economic growth in Nigeria. Still based on the established standard of choice of functional forms, the double log functional form was considered as the lead functional form in this analysis. The result shows that interest rate and other exogenous variables have 97% significant relationship with economic growth in Nigeria. The result further shows that under the deregulated interest rate regime, 1% increase in interest rate leads to 36% decrease in RGDP; 1% increase in exchange rate leads to 9.3% increase in the value of real GDP; 1% increase in inflation leads to 9.9% increase in real GDP; 1% increase in investment leads to 53% increase in RGDP; 1% increase in total government expenditure leads to 30% increase in the value of real GDP; and 1% increase in population leads to 12% increase in RGDP. The result of the diagnostic test shows that the double log functional form satisfies all the test requirements. This implies that it is free from Heteroscedasticity and it is normally specified.

4.3. Findings and Discussion

4.3.1a. Findings and Discussion of the Relationship between Regulated Interest Rate and Economic Growth in Nigeria (OLS) –1970-1986

Based on the result of the Ordinary Least Square (OLS) estimation, the findings of this study show that there is a negative and significant relationship between regulated interest rate and economic growth in Nigeria. The findings further showed that regulated interest rate has a negative effect on real GDP in Nigeria; this means that when interest rate under the regulated regime was increased by the monetary authorities, it caused the level of economic growth to decrease. Also, it has been revealed that under the same regime, exchange rate has a positive relationship with economic growth in Nigeria. Therefore, this finding supports that currency devaluation has the potential to improve the level of economic growth in the country. The findings further show that inflation has a positive effect on economic growth in Nigeria, inflation occurs as a result of an expansionary policy which is always aimed at improving economic growth in the country. Investment has been revealed to have a positive effect on real GDP in Nigeria. This is in line with economic theory as investment is always a catalyst to economic growth. Government expenditure has also been revealed to have a positive effect on economic growth in Nigeria. Therefore, to foster economic growth, expansionary fiscal policy through increase in government expenditure is fundamental. During the regulated regime, population has a positive relationship with economic growth in Nigeria. Thus, maintaining an active and skilled workforce is a very vital factor of economic growth in Nigeria.

4.3.1b. Findings and Discussion of the Relationship between Deregulated Interest Rate and Economic Growth in Nigeria (OLS)-1987-2016

Based on the result of the ordinary least square estimation, the findings of this study show that there is a negative and significant relationship between deregulated interest rate and economic growth in Nigeria. The findings further showed that deregulated interest rate has a negative effect on real GDP in Nigeria; this means that when interest rate under the deregulated regime increases it caused the level of economic growth to decrease. It is important to note that in the deregulated regime, interest rate has more effect on economic growth than in the regulated regime. Also, it has been revealed that under the deregulated regime, exchange rate has a positive relationship with economic growth in Nigeria. This may be due to the fact that when exports become cheaper it contributes substantially to economic growth. The findings further show that inflation has a positive effect on economic growth in Nigeria, inflation occurs as a result of an expansionary fiscal or monetary policy which is always aimed at improving economic growth in the country therefore; having some level of inflation in the country could be a tradeoff to decrease in economic output. Under the deregulated interest rate regime, investment has been revealed to have a more positive effect on real GDP in Nigeria than in the regulated regime. This is in line with economic theory as investment is always an effective catalyst to economic growth in Nigeria. Government expenditure has also been revealed to have a positive effect on economic growth in Nigeria. Therefore, to foster economic growth, expansionary fiscal policy through increase in government expenditure is fundamental. During the deregulated regime, population has a positive relationship with economic growth in Nigeria. Thus, population can be seen as an asset that fosters economic growth in Nigeria.

4.3.1c. Findings and Discussion of the Relationship between Interest Rate and Economic Growth in Nigeria (OLS)-1970-2016

Based on the result of the ordinary least square estimation, the findings of this study show that there is a negative and significant relationship between interest rate and economic growth in Nigeria. The findings further

showed that interest rate has a negative effect on real GDP in Nigeria; this means that generally, when interest rate increases it causes the level of economic growth to decrease. It is important to note that in the full period of this study, interest rate and every other variable had a more intensified effect on economic growth in Nigeria.

4.4. Policy Implications of Findings

The findings of this study showed that there is a negative and significant relationship between regulated interest rate and economic growth in Nigeria. The findings also showed that there is a negative and significant relationship between deregulated interest rate and economic growth in Nigeria. In other words, regulated and deregulated interest rates have negative effects on real GDP in Nigeria. This means that when interest rate (whether under the regulated or deregulated regime) was increased by the monetary authorities, it caused the rate of economic growth to decrease. From this finding, the policy implications are easily discernible: high interest rate is detrimental to economic growth in Nigeria; interest rate can be used as a policy variable by the monetary authorities to control the flow of credit and also influence economic growth in Nigeria; the interest rate needs to be maintained at a single digit and at very minimal levels to encourage investment and foster output growth; interest rate must be closely monitored, stabilized and effectively managed by government and the monetary authorities given its significant relationship with output growth in Nigeria

The combination of the regulated and deregulated regimes in this study was used to measure the combined effect of interest rate on economic growth in Nigeria. The findings showed that there is a negative and significant relationship between interest rate and economic growth in Nigeria. It is pertinent to note that in the deregulated regime, interest rate has more effect on economic growth than in the regulated regime. Therefore, even though the interest rate is deregulated, it is equally important for the policy makers to intervene in the market activities through demand or supply of credit and other financial assets in order to maintain a stable interest rate. Therefore, irrespective of the kind of regime, the management of the interest rate in Nigeria calls for high level discretion on the part of the monetary authorizes if the macroeconomic goals are to be achieved.

5. SUMMARY, POLICY RECOMMENDATIONS AND CONCLUSION

This study examined the relationship between interest rate and economic growth in Nigeria using annual data spanning the period of 1970–2016. Specifically, the study analyzed the effect of regulated and deregulated interest rates on economic growth in Nigeria. The study employed Ordinary Least Square (OLS) estimation to achieve the objectives. The OLS results revealed that: regulated, deregulated and full period interest rates have negative and statistically significant relationship with economic growth in Nigeria. The study recommends amongst others that: interest rate should be closely monitored, stabilized and effectively managed. The monetary authorities should endeavour to maintain the interest rate at a single digit and at minimal levels to encourage investment and foster output growth.

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