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The Relationship between Interest Rate and Economic Growth in Nigeria: An Error Correction Model (ECM) Approach

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Abstract: This study examined the relationship between interest rate and economic growth in Nigeria, using secondary time series panel data for the period 1985 – 2014. Data was collected from various issues of the Central Bank of Nigeria Statistical Bulletin and the National Bureau of Statistics. The study employed Augmented Dicker-Fuller (ADF) unit root tests as well as Johansen co-integration test followed by Error Correlation Model (ECM) approach. The ADF unit root test results indicated that the variables are all stationary at first difference. The variables were integrated of order one (1) which implies that the null hypothesis of non-stationary for all the variables of interest is rejected. The Johansen co-integration test result revealed the existence of two co-integrating relationship between the variables at 5% level of significance. The study proceeded to perform the ECM approach and found that interest rate is inversely related to economic growth, but the relationship is statistically insignificant. The recommended that monetary authorities should adopt appropriate policies that would promote and stimulate economic growth in Nigeria.

Keywords: Interest rate; Deregulation; Investment; Savings; Gross domestic product; Economic growth.

1. Introduction

The most important tasks of any economy is to allocate its capital resources across different possible investment outlays, and that in deciding upon the best investment opportunity, one needs to evaluate the costs and benefits associated with that investment (Samuelson and D., 2010).

In Nigeria, prior to the deregulation of the banking sector or industry in 1986, interest rates were administratively determined by the Central Bank of Nigeria (CBN), and there were ceilings on both deposits and lending rates. During this period most developing countries like Nigeria intervened substantially in the financial sector by setting interest rates and directing the allocation of credit in the economy, so as to accelerate the most desired development. This development was counter-productive as the repressed financial sector could no longer mobilize loanable funds for investment. Therefore, financial sector reforms were introduced to correct the problem caused by financial repression, and such reforms include interest rate liberation and the removal of ceiling and other controls on credit allocation (Obainuyi and Olorunfemi, 2011). Interest rate essentially refers to the price paid for borrowing money from a lender. From the corporate finance point of view interest rate is the rate of return associated with investing money or the cost of capital for borrowing money.

Obainuyi and Olorunfemi (2011) Observed that the financial reforms which commenced in July 1986 relied on market forces and the main objective was the elimination of financial repression in order to improve the incentive structure and ensure productive efficiency in the economy. It has been asserted that high interest rates discourage investments and hence forestall economic growth and that high interest rate increase the cost of borrowing which could ultimately led to reduction of output and spur up unemployment rate in a country, such as Nigeria, while low interest rate is likely to stimulate production and real economic development.

The review of past empirical literature on this field showed a lack of consensus among the findings of scholars, indicating the existence of a research gap. This study attempted to bridge that gap and contribute to existing literature. Thus, the main objective of this study was to examine the relationship between interest rate and economic growth in Nigeria. The study introduced inflation rate and exchange rate as control variables for a more robust analysis of data and testing of hypotheses.

The rest of the paper is structured as follows: section two provided the review of empirical literature, while section three presents the research methodology and sources of data. Section four presented the empirical results and discussion, while section five highlighted the conclusion and recommendations offered based on our findings.

2. Review of Empirical Literature

The issue of interest rate and economic growth has been well documented in the body of empirical literature. This section presents the review of previous empirical literature to provide a background for examining the relationship between interest rate and economic growth in Nigeria using time series data from 1985 to 2014.

Hansen and Seshari (2013) examined the relationship between interest rates and productivity growth (proxy for economic growth) in the United States of America, using correlation estimation techniques. Their study revealed moderate correlation between interest rate and economic growth. More, specifically the found that in the long-run low interest rate will lead to high productivity growth, while high interest rates would lead to low productivity.

Anaripour (2011) investigated the relationship between interest rate and economic growth in Iran, using time series panel data collected from 22 countries for the period 2004 – 2010. The study employed regression estimation technique based the computer software package E-Views. The results of the study showed that there was a negative relationship between interest rate and economic growth in Iran.

Saymeh and Orabi (2013) investigated the effect of interest rate, inflation rate and GDP on real economic growth in Jordan, using time series data for the period 2000 – 2010. The employed ADF unit root test, Johansen co-integration test and regression statistics to analyse data. The results indicated, among others, that interest rate had positive effect on economic growth in Jordan for the period covered by the study.

Giovanni and Shambaugh (2008) studied the relationship between interest rate and real output growth in major industrial and other countries. The results of the showed that high foreign interest rates have a contraction effect on the annual real gross domestic product growth rate in the domestic economy and that the effect was more centred on countries with fixed exchange rates.

Also, Obainuyi and Olorunfemi (2011) examined the implications of the financial reforms and interest rate behaviour on the economic growth in Nigeria. The study involved statistical time series panel data collected for the period 1970 – 2010. They employed co-integration statistics and error correction model to analyse their study data. The results of the study indicated that financial reforms and interest rates have sufficient impact on economic growth in Nigeria. They concluded that interest rate behaviour has important economic implication for economic growth and development in Nigeria.

In a related study, Udoka and Roland (2012) investigated the effect of interest rate fluctuation on economic growth of Nigeria for the period 1970 – 2010, using the ordinary least square multiple regression analytical technique. Their analysis spanned two time periods; before and after the interest rate deregulation regimes. Their *ex-post facto* research design used secondary time series panel data collected from the Central Bank of Nigeria (CBN) statistical Bulletin. The findings revealed that interest rate had an inverse relationship with economic growth in Nigeria.

Imoisi *et al.* (2012) examines the impact of interest and exchange rates on economic growth in Nigeria for the period 1975 – 2008, using OLS technique in the analysis of data. The study collected secondary time series data from the Statistical Bulletin of the Central Bank of Nigeria. The results revealed that interest rate and exchange rate exerted a negative impact on economic growth in Nigerian during the period under review. They concluded that increase in interest rate retards investment and economic growth, while the lag of exchange rate shows the expected positive sign, implying that depreciation in exchange rate retarded economic growth for the period under review.

Obanuyi (2009) investigated the relationship between interest rate and economic growth in Nigeria, using secondary time series data for the period 1970 – 2006. He employed co-integration technique and error correction model to capture both the long-run and short-run linear causality relationship between the study variables, and the analysis of data. The result showed that real lending rates have significant effect on economic growth and there also exist a unique long-run relationship between interest rate and economic growth.

Acha and Acha (2011) examined the implications of interest rate for savings and investments in Nigeria. The study employed Pearson's correlation and regression techniques to analyse secondary time series data obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin. The results of the study indicated interest rate is a poor determinant of savings and investments in Nigeria. They found out that bank loans are not used for productive purposes and suggested that bank loans should be channelled to the productive investment, if interest rate is to play its catalytic role in the economy.

Adeniran *et al.* (2014) examined the impact of exchange rate on economic growth in Nigeria, using secondary time series data for the period 1986 to 2013. They used correlation and regression analysis techniques to regress exchange rate, interest rate and inflation rate (the independent variables) against GDP (proxy for economic growth). The study found, among others, that interest rate had an insignificant negative impact on economic growth.

Also, Ifeanyi and Chukwu (2014) examined the impact of interest rate deregulation on economic growth in Nigeria, using secondary data collected from Central Bank of Nigeria Statistical Bulletin for the period 1986 to 2010. The study employed OLS technique based on the E-View statistical package to analyse data, and found that low interest rate stimulates and increase growth in real domestic product.

Similarly, Mutinda (2014) conducted a study on the effect of lending interest rate on economic growth in Kenya. Though interest rate was used as the main explanatory variable, the study also introduced budget deficit, inflation rate, exchange rate and gross investment as control variables. The involved secondary time series data for the period 2003 – 2012, collected from the Kenyan National Bureau of Statistics and the Central Bank of Kenya. They employed regression estimation techniques to analyse data, and the results showed that interest rate was negatively related to economic growth in Kenya during the period covered by the study.

3. Methodology

This study examined the effect of interest rate on economic growth in Nigeria. In order to bring about robustness in the analysis of data and testing the hypotheses, the study introduced inflation rate and exchange rate as control variables. Therefore, the study investigated the relationship between interest rate (INT), inflation rate, (INF), exchange rate (EXC) and gross domestic product (GDP) in Nigeria, using secondary time series data for the period 1985 – 2014. Gross domestic product was used as proxy for economic growth. Thus, the study employed a causal comparative research design which deals with already existing data where the researchers lack the power to manipulate the data.

3.1. Sources of Data

This study used annual data for the period covering 1985 to 2014, obtained from the Statistical Bulletin of the Central Bank of Nigeria (CBN) and the National Bureau of Statistics (NBS). The availability of the relevant required data relating to the study variables informed the choice of the study period. Besides, this source of data is considered reliable and dependable.

3.2. Data Analysis Technique

The study made use of the Augmented Dickey-Fuller unit root test, descriptive statistics, Johansen co-integration test, Error Correction Model (ECM) to analyze data collected for the period 1985 – 2014. The aim was to provide a robust data analysis and hypotheses testing.

3.3. Model Specification

To facilitate the analysis of data, a regression model of the following order was developed to capture the causality relationship between INT, INF, EXC and GDP (INF and EXC used as control variables):

$$GDP = f (INT, INF, EXC)$$

The above regression model was explicitly translated into a regression equation as stated below:

$$GDP = \alpha + \beta_1 INT + \beta_2 INF + \beta_3 EXC + e \quad \text{equation 1}$$

Where;

GDP = Gross domestic product (proxy for economic growth), the dependent variable

INT = Interest rate, one of the independent variables

INF = Inflation rate, the second independent variable

EXC = Exchange rate, the third independent variable

α = is the constant term

$\beta_1, \beta_2, \beta_3$ = are the coefficients of the independent variables, and each, as expected $\neq 0$

e = is the error term of the equation

Equation 1 above can further be expressed in terms of logarithm as follows:

$$\text{Log}INT = \alpha + \beta_1 \text{Log}GDP + \beta_2 \text{Log}INF + \beta_3 \text{Log}EXC + e \quad \text{equation 2}$$

4. Empirical Results and Discussion

The study commenced with the analysis of testing the variables of interest using Augmented Dickey Fuller (ADF) Unit root test so as to ascertain whether the variables are non-stationary or stationary at level or first differencing, this is to avoid estimating spurious regression. The result of ADF unit root test is presented in [table 1](#) below.

Table-1. Augmented Dickey Fuller (ADF) Unit Root Test

Series	ADF Test statistics	5% Critical values	10% Critical values	Order of integration	Remarks
Log(INT)	-5.211269	-1.954414	-1.609329	(1)	Stationary at first dif.
Log(INF)	-5.412240	-1.955020	-1.609070	(1)	- do -
Log(GDP)	-2.695778	-1.954414	-1.609329	(1)	- do -
Log(EXC)	-4.648845	-1.954414	-1.609329	(1)	- do -

Source: E-View Output

From [table 1](#) above, the Augmented Dickey Fuller (ADF), unit root test indicated that all the variables were stationary at first differences having found to be non-stationary at their levels.

Table-2. Descriptive Statistics Result

	Log(INT)	Log(INF)	Log(GDP)	Log(EXC)
Mean	2.916597	2,730669	8.416925	3.912232
Median	2.932021	2.515180	8.631385	4.584358
Maximum	3.454738	4.286754	11.29094	5.049856
Minimum	2.295560	1.690096	4.902307	0.703098
Std. Dev.	0.244988	0.739340	1.875090	1.350387
Skewness	-0.446988	0.737400	-0.258018	-1.049529
Kurtosis	3.609822	2.434519	2.036546	2.620723
Jarque-Bera	1.366255	2.910606	1.393627	5.308212
Probability	0.505035	0.233330	0.498170	0.070362
Sum	81.66472	76.45873	235.6739	109.5425
Sum sq. Dev.	1.620513	14.75886	49.93102	49.23574
Observations	28	28	28	28

Source: E-View Output

From table 2 above, the Descriptive Statistic result indicated interest rate (INT) as log average 2.92 and ranges from 2.30 to 3.45 with standard deviation of 0.24. While skewness, kurtosis, jarque-Bera values stood at -0.45, 3.61 and 1.37 respectively. The log of inflation rate, log (INF) mean value stood at 2.73 and it ranges from 1.69 and 4.29 respectively. Its median value was 2.51 while the standard deviation, skewness and kurtosis all stood at 0.74, 0.74 and 2.43 respectively.

On the other hand, the log of GDP and Exchange rate mean values at 8.42 and 3.92 and it ranges from 4.90 to 11.29 and 0.79 and 5.05 respectively. GDP and EXC had standard deviation, skewness and kurtosis values of 1.88, -2.26, 2.04 and 1.35, -1.05 and 2.62 respectively.

Johansen Co-integration Test Results

The Johansen co-integration test result is presented in table 3.

Table-3. Johansen co-integration test result with series: Log(INT), Log(INF), Log(GDP) and Log(EXC).

No of CE(s)	Eigen Value	Trace statistics	0.05 Critical value	Prob **
None *	0.842032	93.09485	47.85613	0.0000
At most 1*	0.724982	45.11538	29.79707	0.0004
At most 2	0.346818	11.55150	15.49471	0.1797
At most 3	0.018222	0.478133	3.841466	0.4893

Trace test indicates 2 co-integrating equation(s) at the 0.05 level.

*Denotes rejection of the hypothesis at the 0.05 level

** Mackinon-Haug-Michelis (1999) p-values

Source: E-View Output

The Johansen co-integration trace test result indicated unique co-integrating equations at the 0.05% significance level between the variables, such as Log(INT), Log(INF), Log(GDP) and Log(EXC). These results suggest that there exist a unique long-run relationship between the variables. Thus, we proceeded to estimate the Error Correction Model (ECM) so as to reconcile the short-run dynamics with long-run disequilibrium of the variables. The Error Correction Model results are presented in table 4 below.

Table-4. Error Correction Model (ECM) Test Result.

Dependent Variables: DLog(INT)

Variables	Coefficient	Std. error	t-statistics	Prob
C	0.015502	0.044748	0.346432	0.7323
DLog(INF)	0.039828	0.045073	0.861456	0.3983
DLog(GDP)	-0.148034	0.184629	-0.81788	0.4313
DLog(EXC)	0.162860	0.130339	1.249509	0.2246
ECM(-1)	-0.028217	0.008052	-3.504100	0.0020

R-Squared 0.45

Adj. R-Squared 0.35

F-Statistic 4.45

Prob (F-statistic) 0.01

Durbin-Watson stat 1.50

Source: E-View Output

The Error Correction Model (ECM) test result presented above as expected showed the correction sign as it was negative and was statistically significant. Though the coefficient of the ECM value was -0.03, which is quite low. This means that the speed of adjustment from the short-run to the long-run equilibrium is 0.03% annually. The R² value of 0.45 means that 45% of the total variation in (INT) is well accounted for by the other explanatory variables,

this suggest that our model is adequate and is a good fit. Furthermore, the Durbin-Watson Statistic value of 1.50 implies that there was no indication of serial correlation among the variables.

The results of the short-run dynamics has a positive influence while (GDP) has a negative influence on interest rate in Nigeria, and statistically insignificant. This means if interest rate is increased gross domestic product will go down, and if interest rate is reduced gross domestic product will increase. Thus interest rate has an inverse relationship with economic growth in Nigeria. This finding is consistent with that of (Udoka and Roland, 2012) who investigated the effect on economic growth of Nigeria for the period 1970 – 2010 using OLS multiple regression, and found that there exist an inverse relationship between interest and economic growth in Nigeria. The finding of this study also agrees with the study findings of (Imoisi *et al.*, 2012), (Anaripour, 2011) and (Hansen and Seshari, 2013).

5. Conclusion and Recommendations

The study examined the relationship between interest rate and economic growth in Nigeria using secondary time series data for the period 1985 – 2014. The study introduced two control variables, such as inflation rate and exchange rate, in order to achieve robustness in the analysis of data and the testing of hypotheses. The study therefore investigated the relationship between interest rate, inflation rate, exchange rate and gross domestic product (used as proxy for economic growth) in Nigeria. Data for the study was collected from National Bureau of Statistic (NBS) and various Statistical Bulletins of the Central Bank of Nigeria (CBN).

The study commenced with the analysis of testing the variables of interest using Augmented Dickey Fuller (ADF) unit root test and the result indicates that the variables were non-stationary at level but was stationary at first differences. The Johansen co-integration test revealed the existence of long-run relationship between the variables. While the empirical result of the Error Correction Model (ECM) test showed that inflation and exchange rate exert positive influence on interest rate, while on the other hand interest rate exerted a negative influence on gross domestic product in Nigeria. Thus interest rate was found to have a statistically significant inverse effect on economic growth in Nigeria.

Based on the findings, the study made the following recommendations:

- Monetary authorities should adopt appropriate macroeconomic policies that would promote and stimulate economic growth in Nigeria.
- That the interest rate as it stands has some policy implication for economic growth in Nigeria, this is so because an increase in interest rate tends to reduce or retards investment and economic growth, while a reduction in interest rate would promote and stimulate economic growth in Nigeria.

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