Influence of Exchange Rate Movements on Economic Growth in Nigeria

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Abstract
Nigeria's dwindling external reserves and exchange rate fluctuations have been major sources of concern to major stakeholders in recent times. Adopting a longitudinal research design, this study examines the influence of exchange rate movements on economic growth in Nigeria, using annual time series data from 1981 – 2014 obtained from the Central Bank of Nigeria Statistical Bulletins. Economic growth is the dependent variable proxied by Real Gross Domestic Product (RGDP) while the explanatory variables are nominal exchange rate, inflation rate as well as growth in money supply. The unit root test indicates that all variables are I(1) while Johansen cointegration test reveals a long run relationship between economic growth and the explanatory variables. The Error Correction Model indicates a negative short run causality running from nominal exchange rate to RGDP, and from growth in money supply to RGDP in Nigeria. The error correction term indicates that departure from long run equilibrium gets corrected at the rate 93.55 percent. The paper also reveals that long run Granger causality runs from growth in money supply to RGDP, and from growth in money supply to inflation rate. Also, long run Granger causality runs from exchange rate to inflation. All results are tested at 5% level of significance. The paper, therefore, recommends that Government should design export-oriented policies that would accelerate accretion to foreign reserves in order to reverse or, at least, minimize exchange rate depreciation. Finally, the Central Bank of Nigeria should ensure sound exchange rate, and inflation rate management with a view to promoting economic growth in Nigeria.
Keywords: Exchange Rate, Economic Growth, Cointegration, Granger Causality, Error Correction Model.

1.0 Introduction

Nigeria's dwindling external reserves and exchange rate fluctuations have been major sources of concern to major stakeholders in recent times and this has captivated the interest of governments, researchers, and policymakers on the exchange rate debate. The fundamental role played by exchange rate in economic growth of developing nations, including Nigeria, cannot be over-emphasized. However, Nigeria's mono-cultural economy which relies largely on oil exports is predisposed to financial shocks mainly driven by vicissitudes in oil prices.

Exchange rate can simply be defined as the price of one country's currency expressed in terms of another currency (Jhingan, 2005). It determines the relative prices of domestic and foreign goods, as well as the strength of external sector participation in the international trade. Exchange rate regime and interest rate remain important issues of discourse in international finance as well as in developing nations, with more economies embracing trade liberalization as a requisite for economic growth (Obansa, Okoroafor, Aluko & Millicent, 2013). Successive governments in Nigeria have switched between "dirty" float (deregulated) to fixed-but-adjustable exchange rate (regulated) regimes. Under dirty float regime, the value of foreign exchange is determined by the forces of demand and supply of major currencies but with sporadic central bank interventions in foreign exchange market. Active intervention results in changes in international reserves while indirect intervention, through changes in interest rates, liquidity and other financial instruments, does not result in changes in reserves (Edwards & Savastano**,** 2000). However, under the fixed-but-adjustable exchange rate regime, the nominal exchange rate is fixed but the Central Bank is not obliged to maintain the parity indefinitely. No tight constraints are imposed on the monetary and fiscal authorities, who can follow, if they so decide, policies that are consistent with preserving the parity. Under this regime, adjustments of the parity (devaluations) are a powerful policy instrument (Edwards & Savastano, 2000).

Over the years, the exchange rate of the Naira has been largely influenced by the volume of net exports, volume of foreign reserves, exchange rate regime adopted as well as external shocks, among others. The Naira exchange rate was relatively stable between 1973 and 1979 during the oil boom era and when agricultural products accounted for more than 70% of the nation's Gross Domestic Products [GDP] (Ewa, 2011). At the advent of the Structural Adjustment Programme (SAP) in 1986, the country moved from fixed-but-adjustable exchange rate (peg) system to "dirty" float regime. The latter is otherwise referred to as the managed float whereby monetary authorities intervene periodically in the foreign exchange market in order to attain some strategic objectives (Mordi, 2006). The contradiction in exchange rate policies exacerbated uncertainty as well as the unstable value of the Naira (Gbosi, 2005). For instance, the Naira has undergone persistent annual depreciation from 1980 to 2014, in spite of Central Bank of Nigeria's determined efforts to stabilize its value. Yet, a number of macroeconomists have emphasized that sustainable economic growth of a country with inappropriately managed exchange rates is very much in doubt (Rodrik, 2008) as maintaining both internal and external balance of a country requires the control of its exchange rate (Jhingan, 2005).

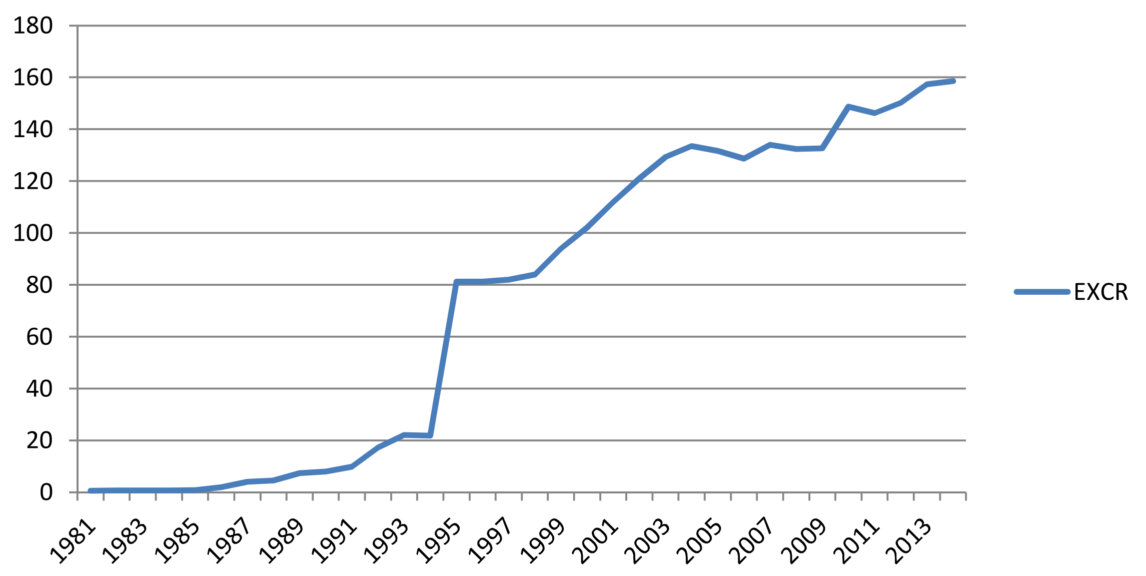
Table 1: N/US $ Nominal Exchange Rate (1981 -2014)

Year	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**
Exchange Rate	0.62	0.67	0.72	0.77	0.89	2.02	4.02	4.54	7.39	8.04
Year	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Exchange Rate	9.91	17.3	22.05	21.89	81.2	81.2	82	84	93.95	102.1
Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Exchange Rate	111.9	121	129.3	133.5	131.66	128.65	134.05	132.37	132.6	148.68
Year	**2011**	**2012**	**2013**	**2014**						
Exchange Rate	146.2	150.2	157.31	158.55						

Sources: CBN Statistical Bulletin (Various editions)

Table 1 and figure 1 show that the Naira has persistently depreciated against the US Dollar from 1981 to 2014. For instance, N0.62 which exchanged for 1US$ in 1981, depreciated by 1,196.8% to N8.04/US$ in 1990. Also by year 2000, nominal exchange rate had plummeted to N102.10/US$, representing about 1,169.9% depreciation within a decade. The depreciation of the Naira continued till 2014, with the exchange rate standing at N158.55/US$. Against this background, this study intends to investigate the influence of exchange rate on economic growth in Nigeria over a period of 34 years (1981 – 2014).

Figure 1: Exchange Rate Movements in Nigeria (1981-2014)



Against the backdrop of the import-dependent nature of the Nigerian economy, the consistent depreciation of the Naira over the years throws up the following research questions: what is the influence of exchange rate movements on economic growth in Nigeria? Findings from this study would add significant value to the extant body of knowledge on exchange rate-economic growth nexus in Nigeria, and provide a clearer trajectory for major stakeholders such as government and policymakers in their bids to ensure sustainable economic growth in Nigeria.

The rest of this paper is organized as follows: section two deals with review of relevant empirical literature while section three discusses the methodology of the study. Section four presents the results and discusses findings from the study. Finally, section five concludes the paper and proffers recommendations.

2.0 Review of Empirical Literature

The relationship between exchange rate movements and economic growth has attracted wide spread attention in the past decades and there have been a large number of studies in this area which articulated theoretical and empirical ways in which exchange rate influences economic growth.

Shunning overvaluation of the currency is one of the strong recommendations emanating from studies on exchange rate - economic growth nexus around the world and it is one that appears to be strongly supported by cross-country empirical evidence (Razin & Collins, 1997; Johnson, Ostry, & Subramanian, 2007).

The direct relationship between real exchange rate undervaluation and economic growth has been established in some studies. For instance, Hausmann, Pritchett, and Rodrik (2005) identified 83 episodes of sustained growth acceleration in developed and developing countries between 1960 and 2000 and observed that these were preceded by real exchange rate depreciations. Using a Purchasing Power Parity-based index of real exchange rate undervaluation in a fixed-effects model for a panel of 184 countries between 1960 and 2004, Rodrik (2008) explicitly tested for asymmetries between developing and developed countries. He defined developing countries as those with a GDP per capita less than $6,000 and established that positive relationship between real exchange rate undervaluation and economic growth is stronger and more significant for developing countries than for developed countries.

In another study, Berg, Ostry, and Zettelmeyer (2008) examined the factors that make growth episodes sustainable in both developing and developed countries. They established that the overvaluation of real exchange rate adversely affected the duration of growth. In a cross-country study carried out by Polterovich and Popov (2002), foreign exchange reserve accumulation was established to be positively associated with GDP per capita growth and the level of real exchange rate.

Levy-Yeyati and Sturzenegger (2009), using data for developing countries, built two indexes of foreign exchange intervention and found that they are positively correlated (in independent regression analyses) with GDP growth and the level of Real exchange rate. The results of these two studies are interpreted by the authors as evidence that foreign exchange reserve accumulation by central banks in developing countries is carried to maintain undervalued real exchange rates and thus to stimulate growth (Rapetti, Skott & Razmi, 2011).

A number of studies have also been carried on the nexus between exchange rate and economic growth in Nigeria. For instance, Adeniran, Yusuf and Adeyemi (2014) examined the impact of exchange rate on economic growth from 1986-2013 and observed that exchange rate fluctuations have positive impact on economic growth in Nigeria. Furthermore, their results showed that interest rate and inflation rate have negative impact on the economic growth.

Fapetu and Oloyede (2014) investigated the effect of foreign exchange management on economic growth in Nigeria. The outcome of the study revealed that there is long run relationship among economic growth, exchange rate, volume of exports, inflation, volume of imports as well as foreign direct investment. Ayodele (2014) empirically investigated the impact of exchange rate on the Nigeria economy, using Ordinary Least Squares (OLS) method of multiple regression analysis. As evidenced from the result of the analyses, exchange rate depreciation has a negative impact on economic growth because as the rate increases, economic growth is negatively affected. He therefore suggests that Nigerian government should ensure a friendly economic climate and improve local production of goods and services in order to reduce the pressure on the demand for foreign currency.

Adelowokan, Adesoye and Balogun (2015) examined the effect of exchange rate volatility on investment and growth in Nigeria between 1986 and 2014. The study applied vector error correction approach, cointegration and Augmented Dickey Fuller (ADF) statistics for stationarity test to capture the interactions between exchange rate, investment, interest rate, inflation and growth within the period. Their findings show that long run relationship exists among exchange rate, investment, interest rate, inflation and growth. However, the study revealed that exchange rate instability has a negative effect on investment and growth while exchange rate instability has a positive relationship with inflation and interest rate in Nigeria. They recommend the development of sound exchange rate management system in the country to facilitate economic growth.

Akinlo and Lawal (2015) examined the impact of exchange rate on industrial production in Nigeria for the period 1986-2010. The findings were arrived at using Vector Error Correction Model (VECM) which confirmed long run relationship between industrial production index, exchange rate, money supply and inflation rate whilst, exchange rate depreciation has no noticeable impact on industrial production in the short-run even though has positive impact in the long run.

Ali, Ajibola, Omotosho and Adeleke (2015) explored the impact of Naira real exchange rate misalignment on Nigeria’s economic growth with reference to quarterly data spanning the period 2000-2014. They derived the estimates of Real Exchange Rate Misalignment (RERMIS) by calculating deviations of the actual real exchange rate from a sustainable equilibrium path that was calculated using the Behavioural Equilibrium Exchange Rate (BEER) approach of Edwards (1989). An empirical support for a negative impact of RERMIS on economic growth was established from the study. This made them to vouch for continued use of market-based exchange rate arrangements in order to ensure that the Naira real exchange rate trails its path of sustainable stability.

The nexus between exchange rate variation and economic growth in Nigeria was the subject of the work of Amassoma and Odeniyi (2016) with main focus on purchasing power of average Nigerians and level of international transactions. The study which used econometric techniques including, Multiple Regression Analysis, Augmented Dickey Fuller (ADF) test, Johansen Co-integration test and the Error Correction Model (ECM) supported the findings of Adelowokan, Adesoye and Balogun (2015) on the same topic. The study revealed that there exists a positive though insignificant impact of exchange rate fluctuations on economic growth in Nigeria both in the long run and short run.

The review of empirical literature shows that results obtained from a number of studies have produced mixed conclusions that are less consensual. Thus, this paper examines the influence of exchange rate movements on economic growth in Nigeria.

3.0 Data and Methodology

3.1 Data

This study makes use of annual data spanning 1981 to 2014 on the following macroeconomic variables: real gross domestic product (RGDP), nominal exchange rate (EXCR), growth in money supply (MS) and inflation (INF). Data on the variables were obtained from the Central Bank of Nigeria Statistical Bulletin (2015). This period was chosen due to availability of data on all the selected variables while the number of observations was considered large enough to produce reliable results. RGDP was used as a proxy to measure the overall economic activity in Nigeria while EXCR captures movements in nominal exchange rate. MS and INF were used as proxies for monetary policy while serving as control variables. The data were processed using EViews 8 software.

3.2 Estimation Procedure

The monetary approach defines exchange rate as a function of relative shift in money stock, inflation rate and domestic output, between a country and a trading partner economy (Frankel, 1978). Since this study focuses on the influence of exchange rate on economic growth, the paper follows a simple linear specification of the multivariate time series using an enhanced Khan-Knight (1991) model by adding exchange rate as an open economy indicator. In order to investigate the effect of exchange rate movements on economic growth, we specify a growth model with three covariates. In other words, we model economic growth as a function of three independent variables, including nominal exchange rate as follows:

RGDP= *f* (INF, EXCR, MS)

The economic growth equation is explicitly specified as follows:

$$LNRGDP_t = ß_0 + ß_1 LNEXCR_t + ß_2 LNMS_t + ß_3 lNF_t + \varepsilon_{t1} \qquad \text{--- equation (1)}$$

Where $LNRGDP_t$ is the natural log of economic growth proxied by Real Gross Domestic Product (output) at period t; $LNEXCR_t$ is the natural log of exchange rate at period t; $LNMS_t$ is the natural log of growth in money supply at period t; lNF_t is the inflation rate proxied by Consumer Price Index at period t. The parameters to be estimated are $ß_0$ (constant) and βi (i=1…3), which are the slope parameters; ε_t is the error term at period t that is assumed to be identically and independently distributed with zero mean and constant variance (σ^2).

The paper employed the Ordinary Least Square (OLS) method to estimate the equation. The OLS method has been used in a wide range of economic relationship with satisfactory results. The method was employed because it has a sound statistical technique appropriate for empirical problems, and it has become so standard that its estimates are presented as a point of reference even when result from other estimation techniques are used. More so, the reliability of this method lies in its desirable properties which are efficiency, consistency and being unbiased. This implies that its error term has minimum and equal variance while the conditional mean value is zero and normally distributed (Gujarati, 2004).

3.3 Unit Root Test

When building and testing economic models, it is conventionally assumed that the underlying variables are stationary, but this is not always true. Hence, before estimating our model in equation (1), we checked for the time series properties of the data. This became necessary because time series econometricians observed that regression results emanating from most macro-economic variables are likely to be "spurious" if the time series properties of such series are not examined. Hence, the time series properties of the data were examined using Augmented Dickey Fuller (ADF) test at 5% level of significance. The ADF test conducted on each of the variables is based on the null hypothesis of non stationarity. The non-rejection of the null hypothesis implies the need for appropriate differencing to induce stationarity. In carrying out the ADF unit root test, each variable is regressed on a constant, a linear deterministic trend, a lagged dependent variable and q lags of its first difference. The specification of ADF test is given as follows:

$$X_t = \alpha + \beta_\tau + \rho X_{t-1} + \sum_{i=1}^{q} \delta_i \Delta X_{t-1} + \mu_t \qquad \text{-----equation (2)}$$

Where X_t is the level of the variable under consideration, t denotes time trend and μ_t is error term assumed to be normally and randomly distributed with zero mean and constant variance. The ADF test for unit root tests the null hypothesis H_O: $\rho = 0$ against the one-sided alternative

H_1: $\rho< 0$ in equation (2**)**. The optimal lag length was chosen on the basis of sequential modified LR test statistic (at 5% level).

3.4 Co-integration Test

To test for presence of cointegration among the variables, a procedure developed by Johansen (1988), and Johansen and Juselius (1990) was used. The objective of cointegration test is to determine whether a group of non-stationary series is cointegrated or not. According to Komolafe (1996), two or more different series may not themselves be stationary but some linear combinations of them may indeed be stationary with the generalization to more than two series.

Technically speaking, two variables will be cointegrated if they have long term relationship between them. The technique of cointegration is borne out of the need to integrate short run dynamics with long run equilibrium. Thus, the existence of cointegration means that long run relationship exists among non-stationary variables. In this study, the Johansen test of cointegration was used to examine the existence of long run relationship between RGDP and the explanatory variables in the model if all of them were integrated of the same order. The specification of the Johansen-Juselius cointegration test is given as follows:

$$\Delta X_t = \sum_{i=1}^{\rho=1} \gamma_j \Delta X_{t-1} + \eta \Delta X_{t-1} + \mu_t \quad \text{----equation (3)}$$

Where:

X_t = 2 x1 vector;

$\eta = \alpha\beta$ where:

β = vector cointegrating parameters;

α = vector of error correction coefficients which is the speed of convergence to the long run steady state.

Hypothesis tested under cointegration were as follows:
H_O: There exists no cointegration between RGDP and the explanatory variables.
H_1: There exists a long run relationship (cointegration) between RGDP and the explanatory variables.

3.5 Error Correction Model (ECM)

The error correction term indicates the speed of adjustment which restores equilibrium in a dynamic model. The ECM coefficient shows how quickly variables return to equilibrium and it should have a statistically significant coefficient which must be less than 1, and with a negative sign. Error correction technique corrects for disequilibrium between short run and long run behavior of the dependent variable. Since disequilibrium may exist in the short run, there is need to tie the value of the dependent variable to its long run value. The error term from the initial cointegrating regression is usually referred to as the "disequilibrium error". According to Granger representation theorem, if two variables *Y* and *X* are cointegrated, then the relationship between the two can be expressed as ECM. The ECM is hereby specified as follows:

$$\Delta LNRGDP_t = \quad + \quad \Delta LNEXCR_{t-i} + \quad \Delta LNMS_{t-i} + \quad \Delta INF_{t-i} + \quad \mu_t \quad \varepsilon_{t3} \text{ ------ equation (3)}$$

Where;

Δ = Difference parameter

β_t = parameters to be estimated

i = the optimal lag length.

μ_{t-1} = One period lagged value of the error from the cointegrating regression

ε_t = Error term assumed to be normally and randomly distributed with zero mean and constant variance.

3.6 Granger Causality Test

Granger causality is used to examine the causality between two variables. Causality is concerned with the direction of influence between two variables. The rationale for this test is that it enables one to know whether the independent variable can actually cause the variations in the dependent variable or vice versa. Causality test is important because two variables may correlate without one causing changes in or influencing the other. In this study, causality test was conducted to explore the transmission mechanism between nominal exchange rate (EXCR) and Real GDP (RGDP) on one hand, and between RGDP and its relevant explanatory variables. For instance, causality test between RGDP and EXCR involves estimating the following pair of regressions:

$$LNRGDP_t = \sum_{i=1}^{n} \alpha_i \, LNEXCR_{t-i} + \sum_{i=1}^{n} \beta_j \, LNRGDP_{t-j} + \mu_{1t} \quad \text{......... Equation} \quad (4)$$

$$LNEXCR_t = \sum_{i=1}^{n} \gamma_i \, LNRGDP_{t-i} + \sum_{i=1}^{n} \delta_j \, LNEXCR_{t-j} + \mu_{2t} \quad \text{......... Equation} \quad (5)$$

Where;
α_i, β_j, γ_i and δ_j = parameters to be estimated
i = the optimal lag length.
μ = Error term assumed to be normally and randomly distributed with zero mean and constant variance.

4.0 Empirical Results

4.1 Tests for Unit Root

The results of the ADF unit root tests conducted on the included variables are presented in Table 1. All the variables are integrated of order one, which implies that they are I(1) and differencing them once would make them stationary. Thus, the I (1) variables entered into the error correction model in their differenced form.

Table 1: Results of Augmented Dickey-Fuller Unit Root Test

Variable	Level ADF Test Statistic	First Difference ADF Test Statistic	Decision
LNRGDP	0.298652	-5.619375	I(1)
LNEXCR	-2.383278	-5.005189	I(1)
LNMS	-1.035481	-9.820547	I(1)
INF	-2.584483	-5.461924	I(1)

MacKinnon (1996) Critical Value at Level at 5% level of significance = -2.954021
MacKinnon (1996) Critical Value at First Difference at 5% level of significance = -2.957110
Source: Computed by the Authors

4.2 Cointegration Test

The implication of the results of the unit root tests which indicates that all the variables become stationary at first difference is that the model is amenable to Johansen Cointegration test and same was conducted accordingly. The result of the cointegration test is presented in Table 2. The Max- Eigen Value and Trace Tests reject the following null hypotheses of no cointegration: at most one cointegration, and at most three cointegration equations in the model respectively. However, it accepts the hypothesis of "at most two cointegrating equations" at 5% level of significance. This is because the Max-Eigen Value and Trace statistics are greater than their respective critical values at 5% level of significance while their associated probabilities are < 0.05 when number of cointegrating equations are hypothesized as none, at most one, and at most three and only > 0.05 when number of cointegrating equations are hypothesized as "at most two". The results indicate that long run relationship exists between RGDP and the explanatory variables, which suggests that an error correction model can be estimated.

Table 2: Results of Cointegration Test
Date: 09/04/16 Time: 22:05
Sample (adjusted): 1985 2014
Included observations: 30 after adjustments
Trend assumption: Linear deterministic trend
Series: LNRGDP INF LNMS LNEXCR
Lags interval (in first differences): 1 to 3

	Max-Eigen Value Test			Unrestricted Cointegration Rank Test (Trace)		
Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.**	Trace Statistic	0.05 Critical Value	Prob.**
None *	40.87424	27.58434	0.0006	77.32977	47.85613	0.0000
At most 1 *	22.33311	21.13162	0.0337	36.45552	29.79707	0.0074
At most 2	9.366008	14.26460	0.2569	14.12242	15.49471	0.0796
At most 3 *	4.756408	3.841466	0.0292	4.756408	3.841466	0.0292

Trace and Max-Eigen Value Tests indicate 2 cointegrating equations at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values
Source: Computed by Authors

4.3. Error Correction Model and Short run Causality Test

Table 3 presents the result of the error correction model. From the result, ECT(-1) is well specified and correctly signed. The coefficient of the ECT(-1) is -0.9355 and is statistically significant at 5% level. It also means that about 93.55 percent departure from long run equilibrium is corrected in the short run. It also indicates that about 93.55 percent of the disequilibrium in the previous year is corrected in the current year. The implication is that it takes approximately 13 months to fully restore a departure from long run equilibrium. That is, the speed of adjustment is high. The negative sign in the ECT(-1) confirms the existence of cointegrating (long run) relationship between RGDP and the explanatory variables in the model while the statistically significant coefficient of the error correction term means disequilibrium in the long run.

The Coefficient of Determination (R^2) is 0.73. This indicates that about 73 percent of the total variations in RGDP are explained by the variations in the explanatory variables used in the model. This implies that the model is a good fit. The Adjusted R^2 shows the actual variations in RGDP captured by the explanatory variables introduced in the model after taking into consideration effect of additional explanatory variables on R^2. It can be observed from the result that the Adjusted R^2 still explains about 57 percent of the total variations in RGDP. The F-statistic is a test of significance of the joint variations in the independent variables used in a model. The F-statistic is significant at 1% critical value (prob: 0.0028). With this, we reject the null hypothesis that all explanatory variables introduced in the model are not jointly significant in explaining the variations in RGDP.

Table 3: Error Correction Model

Dependent Variable:D(LNRGDP)			
Variable	**Coefficient**	**T-Statistic**	**Prob.**
C	0.767444	4.554728	0.0003*
D(INF(-1))	0.035048	3.144558	0.0059*
D(INF(-2))	-0.006734	-0.661524	0.5171
D(INF(-3))	0.009798	1.085515	0.2928
D(LNMS(-1))	-0.172499	-1.291554	0.2138
D(LNMS(-2))	-0.929167	-5.312041	0.0001*
D(LNMS(-3))	-0.400717	-2.776802	0.0129*
D(LNEXCR(-1))	-1.031664	-2.505861	0.0227*
D(LNEXCR(-2))	0.082804	0.167137	0.8692
D(LNEXCR(-3))	-0.23263	-0.501065	0.6228
ECT(-1)	-0.935499	-2.405297	0.0278*
R-squared 0.730633		**Durbin-Watson stat**	1.945305
Adjusted R-squared 0.572182		**F-statistic**	4.611093
S.E. of regression 0.526234		**Prob(F-statistic)**	0.002872

*Significant at 5% level.

Source: Computed by the Authors

Table 3 also shows that inflation at lag 1 has a significant positive influence on real output thereby granger-causing same at 5% level while the coefficients of the variable are not statistically significant at lags 2 and 3. With the coefficient of inflation at lag 1 estimated at 0.03504 implies that a one percent increase in inflation rate in the previous year leads to 0.035% increase in real output in the current year. It could be inferred from this finding that inflation rate has been properly managed by the Central Bank of Nigeria. Growth in money supply at lags 2 and 3 exhibit significant negative influence on, and therefore, negatively granger-causes real output in the current year. While a one percent growth in money supply at lag 2 leads to a decrease in real output in the current year by about 0.93%, growth in money supply at lag 3 tends to reduce current output by 0.40%. Also, only nominal exchange rate at lag 1 has a significant negative influence on and therefore negatively granger-causes current real output. One percent fall in the value of the Naira (exchange rate) at lag 1 induces a 1.03% reduction in real output in the current year. This indicates that the short run relationship between the nominal exchange rate and real output is fairly elastic. The sign of the coefficient is in line with *a priori* expectations and findings from similar studies that used different modeling approaches, such as Ali, Ajibola, Omotosho and Adeleke (2015), and Ayodele (2015), among others.

4.4 Long Run Granger Causality Test

Table 5 presents the results of the long run pairwise Granger causality test. The results reveal a long run unidirectional causality running from growth in money supply to real output while a one-way causality also runs from growth in money supply to inflation and from nominal exchange rate to inflation. The implication is that in the long run, increase in money supply drives economic growth but it stokes inflation while exchange rate depreciation also fuels inflation. However, no long run causality was established between inflation and real output or between exchange rate and real output. It was also established that inflation rate does not "granger-cause" growth in money supply neither does causality flow from inflation to nominal exchange rate. In the same vein, there is no long run causality flow (either way) between growth in money supply and exchange rate.

Table 5: Long Run Granger Causality Test

Pairwise Granger Causality Tests			
Date: 09/05/16 Time: 23:47			
Sample: 1981 2014			
Lags: 3			
Null Hypothesis:	Obs	F-Statistic	Prob.
INF does not Granger Cause LNRGDP	31	0.09740	0.9607
LNRGDP does not Granger Cause INF		0.17677	0.9111
LNMS does not Granger Cause LNRGDP	31	4.88665	0.0086
LNRGDP does not Granger Cause LNMS		0.24602	0.8633
LNEXCR does not Granger Cause LNRGDP	31	0.24800	0.8619
LNRGDP does not Granger Cause LNEXCR		0.04685	0.9862
LNMS does not Granger Cause INF	31	3.10567	0.0454
INF does not Granger Cause LNMS		0.30131	0.8241
LNEXCR does not Granger Cause INF	31	3.33343	0.0363
INF does not Granger Cause LNEXCR		0.96386	0.4259
LNEXCR does not Granger Cause LNMS	31	1.85537	0.1642
LNMS does not Granger Cause LNEXCR		0.23259	0.8728

Source: Computed by the Authors

4.5 Evaluation of the Error Correction Model

As can be observed from table 6, the ECM passed all diagnostic tests against serial correlation (Breusch-Godfrey test), heteroscedasticity (Breusch-Pagan-Godfrey test) and normality of errors (Jacque Bera test).

Table 6: Diagnostic Tests for the Error Correction Model

Test	Statistic	Probability
Breusch-Godfrey Serial Correlation LM	Obs *R Squared: 1.369424	0.7127
Breusch-Pagan-Godfrey Heteroscedasticity	Obs*R-squared : 18.15157	0.0525
Jacque Bera Normality of Errors	Jacque Bera 1.247911	0.535821

Source: Computed by Authors

The stability of the long run coefficients is tested by the short run dynamics. The cumulative sum of recursive residuals (CUSUM) was applied to the estimated error correction model to assess the parameter stability (Pesaran & Pesaran, 1997). The results indicate the absence of any instability in the coefficients because the plot of the CUSUM statistic fell inside the critical bounds of the 5% significance level of parameter stability (Appendix 1).

5.0 Conclusion and Recommendations

In spite of the increasing exchange rate-economic growth literature, empirical research works that examined the impact of nominal exchange rate on economic growth in Nigeria are limited with most of them failing to carry out necessary diagnostic tests on the models employed, such as tests for serial correlation, heteroscedasticity, stability and normality of errors, thereby giving no assurance that the models are adequate for inference.

Using annual time series data, we examined the short and long-run causal relationships between nominal exchange rate and real output in Nigeria from 1981 – 2014. While testing for the time series properties of the data, we observed that all the variables were stationary at first difference and therefore amenable to Johansen-Juselius (1990) cointegration test. We also found empirical support for cointegrating relationship between real GDP and its selected determinants, which are nominal exchange rate, growth in money supply and inflation rate. The coefficient of the error correction term (ECT) at 0.935499 implies a high speed of convergence of output to its long run equilibrium as about 93.55 percent of the disequilibrium in the nominal exchange rate is corrected within a year. The error correction term was significant and negative, implying that the ECM is stable. The ECM also showed that nominal exchange rate in the previous year negatively granger-causes real output in the current year. It also revealed that previous year's inflation rate positively granger-causes current year output. Also growth in money supply in the previous year and two preceding years negatively reduce current year output. In other words, while increase in previous year's inflation rate would impact positively on output in the short run, increase in money supply in two and three preceding years and previous year's depreciation in nominal exchange rate impact negatively on output in line with a priori expectation. This is probably because Nigeria is an import-dependent economy; hence, depreciation in nominal exchange rate reduces the purchasing power of firms and individuals to import raw materials and other goods.

The long run causality results reveal a unidirectional causality running from growth in money supply to real output while a one-way causality also runs from growth in money supply to inflation and from nominal exchange rate to inflation. The implication is that in the long run, increase in money supply drives economic growth but it stokes inflation while exchange rate depreciation also fuels inflation.

Overall, the findings of this study reinforce the outcomes of some previous works that exchange rate movements significantly retard economic growth in Nigeria such as Ali, Ajibola, Omotosho and Adeleke (2015), and Ayodele (2015). Therefore, Government must strengthen export-oriented policies and ensure export diversification in order facilitate sustainable accretion to foreign exchange reserves with a view to reversing, or at least, minimizing the instability of the Naira. Finally, the empirical analysis also found support for a significant negative influence of growth in money supply on economic growth, suggesting the need to ensure strict monitoring of money supply to be in consonance with level of economic activities in the country while the Central Bank of Nigeria should ensure sound exchange rate and inflation rate management with a view to promoting economic growth in Nigeria.

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Appendix 1: Model Stability