

An Empirical Analysis of the Relationship between Exchange Rate Movements and Economic Growth in Nigeria

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Abstract

This paper analyses the relationship between exchange rate movements and economic growth in Nigeria using annual data spanning 1970-2011. Specifically, it sought to: examine the relationship between exchange rate and economic growth; and also to determine the nature and the direction of causality between exchange rate and economic growth in Nigeria. Employing the Ordinary Least Square (OLS) technique and the Granger Causality Test, the study revealed the existence of a positive and insignificant relationship between exchange rate and economic growth in Nigeria. The results also indicate that there is no causality between exchange rate and economic growth in Nigeria. In view of the fact that exchange rate stability is absolutely imperative for macroeconomic stability, the study recommends amongst others that government should adopt appropriate monetary and fiscal policies that will not only ensure a realistic and stable exchange rate but will also serve to foster economic growth in Nigeria.

Keywords: Exchange Rate, Economic Growth, Ordinary Least Square, Causality.

1.0 Introduction

Exchange rate stability is pivotal to the achievement of macroeconomic stability and the economic performance of any country in the global economy. Thus, exchange rate policy plays a significant role in determining an appropriate exchange rate and ensuring its stability. A country's foreign exchange policy is derived from the perceived overall economic objective to be achieved and the expected direction of growth (CBN, 2003). Since independence in 1960, Nigeria has employed diverse exchange rate policies in an attempt to attain a realistic exchange rate that would ensure efficient allocation of foreign exchange and allow for non-inflationary growth of the economy. Specifically, in a bid to achieve macroeconomic stability, Nigeria's monetary authorities have adopted various exchange rate arrangements over the years. It shifted from a fixed regime in the 1960s to a pegged arrangement between the 1970s and the mid-1980s, and finally to the various types of floating regime since 1986 (Eze and Okpala, 2014; Dada and Oyeranti, 2012), following the adoption of the Structural Adjustment Programme (SAP).

Exchange rate refers to the rate at which one currency is exchanged for another (Jhingan, 2005). It is the price of a country's currency expressed in terms of another country's currency. On the other hand, economic growth is the increase in the total market value of the goods and services produced by an economy over time. It is conventionally measured as the percentage rate of increase in real gross domestic product or real GDP (Argyrous, 2004). Economic growth is defined and measured as either: an increase in real gross domestic product (GDP) accruing over some time period, or an increase in real GDP per capita occurring over some time period (McConnell and Brue, 2005). With either definition, economic growth is calculated as a percentage rate of growth per quarter (3- Month period) or per year. The second definition takes into consideration the size of the population. Real GDP per capita (or per capita output) is found by dividing real GDP by the size of the population (McConnell and Brue, 2005).

There is a general consensus in the literature that exchange rate fluctuations influence domestic output performance. For instance, Obansa (2012), Fapetu (2013) and Danmola (2013) found that exchange rate fluctuations influence economic growth in Nigeria. Exchange rate fluctuations influence domestic prices through their effects on aggregate supply and demand. A currency's depreciation results in higher import prices while a currency's appreciation results in lower import prices. The potentially higher cost of imported inputs associated with an exchange rate depreciation increases marginal costs and leads to higher prices of domestically produced goods (Kandil, 2004). Also, import-competing firms might increase their prices in response to foreign competitor price increases to improve profit margins.

Available data on the Nigerian economy (CBN, 2010) reveals that real exchange rate was relatively stable during the fixed regime but it fluctuated throughout the floating regime. On the other hand, growth rate of real gross domestic product (GDP) has been quite epileptic throughout the period 1970-2011. Figure 1.1 graphically presents the trend of exchange rate and growth rate of GDP in Nigeria during the period 1970-2011. Between 1970 and 1985 the graph shows a direct positive relationship between economic growth and exchange rate the rate of growth of GDP increases and decreases with the exchange rate. This was in the period of fixed exchange rate in Nigeria. However, with the introduction of Structural Adjustment programme (SAP) by the Federal Government, the country moved from a pegged regime to a flexible exchange rate regime where exchange rate was allowed to be determined by market forces of demand and supply and from this period the exchange rate started rising above the growth rate of GDP.

Despite all the policies adopted by government to achieve stability in exchange rate especially in the last two decades. The

naira continued to depreciate against the American dollar. The economic growth of Nigeria started on a good note in the 1970's as the period coincided with the end of civil war which necessitated the need for massive reconstruction activities. Growth rate of GDP was negative in 1986, 1987, 1991, and 1995 while exchange rate kept on rising. Apart from these four years. Nigeria has never experienced negative growth since flexible exchange rate was adopted in Nigeria There was a drastic increase in exchange rate from 1999 to 2000 as naira was depreciated from ₦21.89 in 1999 to ₦85.98 in 2000 while the growth rate moved from 0.5% to 5.3%.

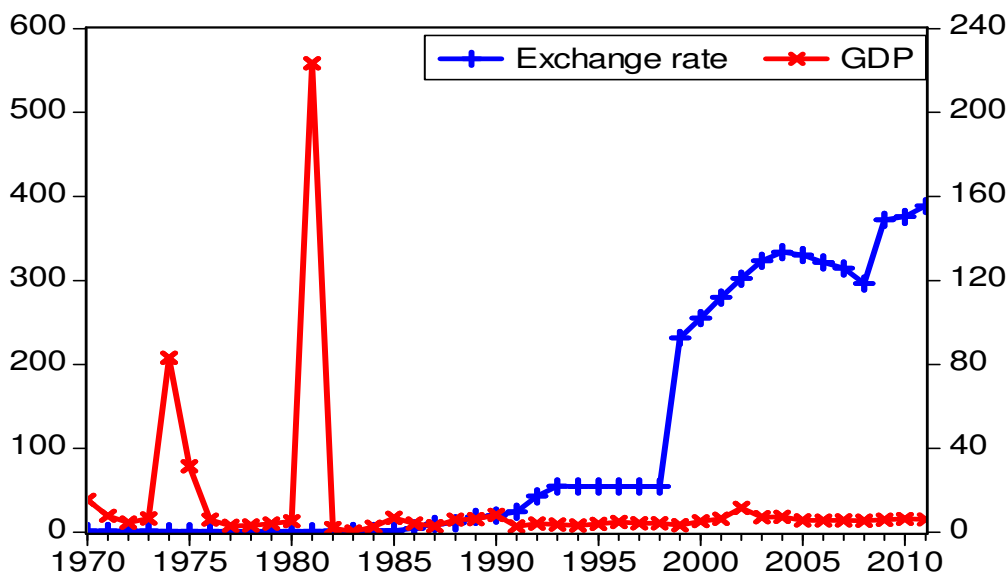


Fig 1.1: Trend of Exchange rate and growth rate of real GDP
 Source: Central Bank of Nigeria(2011)

In early 2009, naira was depreciating to ₦170 against the American dollar, and the depreciation was attributed by some to the decline in the nation's foreign exchange reserves while others argued that the activities of some market operators (speculators) and banks are responsible for recent decline in the value of the naira. It has also been argued that the quest for higher profits in the face of the global economic meltdown is forcing some banks to engage in round-tripping: a situation in which banks buy foreign exchange from the Central Bank of Nigeria (CBN) and sell to parallel market operators at price other than the official prices which led to exchange rate fluctuation and misalignment. Obadan (2006) in his own view argued that some of the factors that led to the depreciation of the exchange rate include: weak production base, import-dependent, fragile export base and weak non-oil export earnings.

A close scrutiny of the figure 1.1 shows that, GDP was increasing and decreasing with the exchange rate during the period of fixed exchange rate between 1970 and 1985. However, following the adoption of Structural Adjustment Programme (SAP) in 1986 the country moved from a pegged regime to a flexible exchange rate where exchange rate is allowed to be determined by the forces of demand and supply. From this period the exchange rate of naira began to rise although the rate of growth seems to maintain a positive state, but the rate at which exchange rate rises is far above the rate of growth. Thus, what really is the relationship between exchange rate and economic growth in Nigeria? Does exchange rate movements in Nigeria have any important implications for the growth of gross domestic product? What really is the relationship between both variables in Nigeria? Is there any causality between both variables? These are the underlying questions which this study seeks to address.

Thus, the major objective of this paper is to investigate the relationship between exchange rate and economic growth in Nigeria using annual data spanning the period of 1970 to 2011. Specifically, the paper seeks to: examine the relationship between exchange rate and economic growth in Nigeria; and determine the nature and direction of causality between exchange rate and economic growth in Nigeria. This study is significant as the findings would serve as a useful and reliable resource for exchange rate policy formulation by government and relevant agencies. This study would also serve as a good guide to the private sector in realizing the effect of exchange rate on economic growth. It will also be of great help to students and researchers in related fields as it would widen and improve their knowledge on the subject matter.

This paper is organized into five sections beginning with the introduction in section 1, section 2 presents brief theoretical and empirical discourses while section 3 explains the methodology of research. The data and estimated results are discussed in section 4. Section 5 embodies the policy recommendations and conclusion.

2. Literature Review

2.1 Theoretical literature review

Exchange rate is the price of one country's currency expressed in terms of another country's currency. There are two concepts of exchange rate: the nominal exchange rate and the real exchange rate. The nominal exchange rate is the rate at which the monies of different countries can be exchanged for one another. The real exchange rate is the rate at which the goods and services produced in different countries can be exchanged for one another (Delong, 2002). Similarly, there are two broad categories of exchange rate policies: the fixed exchange rate and the flexible exchange rate. In a fixed exchange rate system, foreign central banks stand ready to buy and sell their currencies at a fixed price in terms of dollars. In a flexible exchange rate system, by contrast, the Central Banks allow the exchange rate to adjust to equate the supply and demand for foreign currency (Dornbusch, Fischer and Startz, 1998).

Exchange rate language can be very confusing. In particular, the terms "depreciation", "appreciation", "devaluation" and "revaluation" recur in any discussion of international trade and finance (Dornbusch, et al, 1998). A devaluation takes place when the price of foreign currencies under a fixed rate regime is increased by official action. A devaluation thus means that foreigners pay less for the devalued currency and that residents of the devaluing country pay more for foreign currencies. The opposite of devaluation is a revaluation.

On the other hand, a change in the price of foreign exchange under flexible exchange rates is referred to as currency depreciation or appreciation. A currency depreciates when under floating rates it becomes less expensive in terms of foreign currencies. By contrast, a currency appreciates when it becomes more expensive in terms of foreign money (Dornbusch, et al, 1998). When the domestic currency is appreciated, its value in terms of other currencies is high. Foreign-produced goods are relatively cheap for domestic buyers, but domestic-made goods are relatively expensive for foreigners. In these circumstances, imports are likely to be high; exports are likely to be low. When the domestic currency is depreciated, the opposite is the case. Domestically-made goods are cheap for foreign buyers, thus, exports are likely to be high. But domestic consumers' and investors' power to purchase foreign-made goods is limited. Thus, imports are likely to be low (Delong, 2002).

There are various theories of economic growth. Some of these theories include: the classical theory, Keynesian theory, Harrod-Domar growth theory, Solow's growth model, Rostow's stages of Growth, Neoclassical theory, Endogenous growth theory, to mention but a few. However, for the purpose of this paper, the relevant theory is the Rostow's stages of growth. Rostow's model is part of the liberal school of economics that lays emphasis on the efficiency of modern concepts of free trade which is known to be the avenue through which exchange rate of a nation influences the level of growth of an economy.

Rostow identified five stages of growth through which all economies must pass through: the traditional stage (where economic decisions are based on obligations, culture and traditions and trade is predominantly regional and local and largely done barter.); the pre-conditions for take-off (where a shift from agrarian to an industrial or manufacturing society begins slowly); the take-off stage (where the economy begins to experience a rapid and self-sustaining growth); the drive to maturity (where there is improvement in production techniques, increase in the growth of new industries accompanied by increase in export); stage of high mass consumption (where the economy is deemed to have matured and all industries are in full operation producing enough goods and services).

2.2 Empirical literature review

Several studies have empirically investigated the relationship between exchange rate and economic growth in most countries of the world. For instance, Ferrando (2011) examined the relationship between exchange rate appreciation and economic growth in China using the annual data between 1987 and 2008. Using the Generalized Method of Moment (GMM) technique, the study revealed that exchange rate has a negative effect on economic growth in China. Similarly, Brown (2012) studied the impact of real exchange rate volatility on economic growth in Kenya using the annual data for the period of 1993 to 2009. Using Vector Auto-regression (VAR) technique, the result revealed that exchange rate has a negative impact on economic growth in Kenya.

Mewadi (2013) investigated the impact of real exchange rate on economic growth in South Africa using the annual data for the period 1994 to 2010 Using Ordinary least Square technique, the result showed that exchange rate has a negative long run impact on economic growth in South Africa. Musyoki (2010) examined the impact of real exchange rate misalignment on economic growth in Kenya using annual data between 1993 and 2009. Using generalized method of moment (GMM) technique, the result revealed a negative relationship between the two variables. Toulaboe (2007) examined the relationship between real exchange rate misalignment and economic growth in Brazil using the annual data for the period of 1980 to 2005. Using Ordinary Least Square (OLS) technique, the result revealed a negative relationship between exchange rate and economic growth in Brazil.

Tarawalie (2010) investigated the relationship between the real exchange rate behavior and economic growth in Sierra Leone using the annual data for the period of 1990 to 2009. Using Ordinary Least square, the study revealed that real exchange rate is positively related with economic growth in Sierra Leone. Ullah (2013) analyzed the link between exchange rate and economic growth in Pakistan using annual data for the period of 1970 to 2007. Using Three-Stage least square technique, the result revealed that the exchange rate has a positive association with economic growth in Pakistan. Joans (2012) investigated the relationship between exchange rate depreciation and economic growth in South Africa using the

annual data for the period of 1990 to 2010. Using ordinary least square technique, the result revealed that South African GDP response positively to depreciation of the rand.

Attah (2013), investigated the econometric analysis of the relationship between GDP growth rate and the exchange rate in Ghana. using the annual data for the period of 1980 to 2013. Using Ordinary least Square technique, the result revealed a positive relationship between exchange rate and economic growth in Ghana. Huang (2004) examined the effect of exchange rate movement on economic growth in Togo, using the annual data for the period of 1970 to 2000 Using Ordinary Least Square, the result revealed a negative relationship between exchange rate and economic growth in a short run while a positive relationship exists in the long run. Pius (2006) investigated the relationship between exchange rate and economic growth in Ghana using the annual data for the period of 1980 to 2005. Using ordinary least Square technique, the result revealed that there is a positive relationship between exchange rate and economic growth in Ghana.

Kennedy (2010) studied the relationship between exchange rate and economic growth in Kenya using the annual data for the period of 1970 to 2009. Using ordinary Least Square (OLS), the result showed a positive relationship between the two variables in Kenya. Sibanda (2012) studied the impact of real exchange rate and economic growth in South Africa using the annual data for the period of 1994 to 2010. Using ordinary least Square (OLS). The result revealed that exchange rate has a positive impact on economic growth in South Africa. Alhayky (2011) examined the relationship between effective real exchange rate volatility and economic growth in Togo using annual data for the period of 1980 to 2004. Using fully modified Ordinary Least Square technique, the result revealed that real exchange rate volatility negatively affected economic growth.

Adeniran (2012) studied the impact of exchange rate fluctuation on the Nigerian economic growth using annual data for the period of 1980 to 2010. Using ordinary least square (OLS) technique, the study revealed that exchange rate has positive impact on economic growth in Nigeria. Dada (2012) examined the effect of exchange rate volatility on economic growth in Nigeria using the annual data for the period of 1970 to 2009. Using Vector Auto-regression (VAR) technique, the study revealed that economic growth is negatively related to exchange rate in the long run while in the short run, a positive relationship exist between the two variables in Nigeria.

Oyeranti (2010) investigated the relationship between exchange rate and macroeconomic aggregate in Nigeria using annual data of the period 1970 to 2009. Using a Vector Auto-regression technique, the study revealed that there is no strong direct relationship between exchange rate and economic growth, rather Nigeria's economic growth has been directly affected by fiscal and monetary policies. Asher (2012) examined the impact exchange rate fluctuation on the Nigerian economic growth using annual data for the period of 1980 to 2010. Using Ordinary Least Square (OLS) technique, the study revealed that exchange rate has a positive effect on the GDP.

Aloku (2009) analyzed the effect of interest rate, exchange rate on the Nigerian economic growth using the annual data between 1975 and 2008. Using Ordinary Least Square technique, the result revealed that interest rate and exchange rate exerted negative impact on economic growth in Nigeria. Obansa (2012) investigated the relationship between exchange rate, interest rate and economic growth in Nigeria using annual data for the period of 1970 to 2010. Using Vector Auto-regression (VRR) technique, the study revealed that exchange rate has a significant impact on economic growth in Nigeria.

Fapetu (2013) investigated the relationship between foreign exchange and the Nigerian economic growth using the annual data for the period of 1960 to 2012. Using Ordinary Least Square (OLS) technique, the result revealed that exchange rate explained and accounted for about 99% variation in economic growth. Akpan (2009) studied the relationship between exchange rate and economic growth in an emerging petroleum based economy using the annual data for the period of 1970 to 2007. Using Ordinary Least Square (OLS) technique, the result revealed that there is a positive relationship between exchange rate and economic growth in Nigeria.

Pius (2012) investigated the relationship between exchange rate volatility and economic growth in Nigeria, using the annual data for the period of 1960 to 2010. Using Ordinary Least Square (OLS) technique, the result showed that there is a positive relationship between the two variables in Nigeria. Shehu (2012) examined the relationship between exchange rate volatility, trade flows and economic growth in Nigeria using the annual data for period of 1970 to 2009. Using a Vector Auto-regression (VAR) technique, the result revealed that exchange rate volatility has positive effects on the economic growth in Nigeria. Danmola (2013) examined the impact of exchange rate volatility on the macroeconomic variables in Nigeria using the annual data between 1986 and 2010 Using Ordinary Least Square technique, the result revealed that exchange rate volatility has a positive influence on the economic growth in Nigeria.

Line and Atan (2012) investigated the effects of exchange rate movement on economic growth in Nigeria using the annual data between 1986 and 2010. Using generalized Method of moments (GMM) technique, the result revealed that there is no strong direct relationship between the two variables in Nigeria. Sunday (2011) studied the effects of exchange rate movement on economic growth in Nigeria using the annual data for the period of 1986 to 2010. Using Ordinary Least Square (OLS) technique, the result revealed that exchange rate is positively related with economic growth in Nigeria.

Dickson (2012) analyzed the effect of exchange rate volatility on economic growth in Nigeria using the annual data for the period of 1970 to 2009. Using generalized method of moment, the result revealed that in the short run economic growth is positively responsive to exchange rate while in the long run, a negative relationship exist between the two variables. James (2010) studied the effect of exchange rate on economic growth in Nigeria using the annual data for the period of 1980 to 2010. Using Ordinary Least Square (OLS), the result showed that exchange rate has a positive influence on economic growth

in Nigeria.

3. Methodology

3.1 Model Specification

This study employs the Ordinary Least Square(OLS) regression technique to analyse the relationship between exchange rate and Economic growth in Nigeria. The study specifies an output model wherein Gross Domestic Product (GDP) is expressed as a function of exchange rate, interest rate, inflation rate and total government expenditure. The model is presented thus:

$$PGDP = F(EXR, INR, IFR, TGE) \dots \dots \dots (1)$$

(-) (-) (+) (+)

PGDP_t = Growth rate of real Gross Domestic Product(GDP)(%)

ER = Real Exchange rate(%)

INT = Interest rate (prime lending rate)(%)

INF = Inflation rate(%)

TGE_t = Growth rate of Total Government Expenditure(%)

A Priori Expectations

The figures in parentheses represent a priori expectations about the signs of the coefficients.

The study also employs the Granger causality test to determine the nature and direction of causality between exchange rate and GDP in Nigeria. The Granger causality test is used to detect the nature and direction of influence or causality between two variables. In this study the Granger causality test was carried out based on the following equations:

$$\text{LnPGDP}_t = \sum_{i=1}^n r_i \text{LnER}_{t-i} + \sum_{j=1}^n r_j \text{LnPGDP}_{t-j} + U_{1t} \dots \dots \dots (2)$$

$$\text{LnER}_t = \sum_{i=1}^n \theta_i \text{LnER}_{t-i} + \sum_{j=1}^n P_j \text{LnPGDP}_{t-j} + U_{2t} \dots \dots \dots (3)$$

3.2 Data

The series employed are annual observations of real GDP, Exchange rate, Interest rate, Inflation rate and Total government expenditure for the period 1970 to 2011. They were sourced from various issues of the Central Bank of Nigeria Statistical Bulletin.

3.3 Diagnostic Tests

The statistical properties of the estimated output model as expressed in equation (1) were also examined. This is to ensure that the model is well specified. Thus, apart from the unit root test of stationarity of the variables employed, other diagnostic tests carried out include: the test of the goodness of fit R², the test of the overall significance of the multiple regression (F-Test), Durbin-Watson test of serial correlation, Normality test, heteroscedasticity test and Ramsey Reset test.

4. Analysis And Discussion of Results

4.1 Unit Root Tests

Tables 4.1a and 4.1b present the results of the Augmented Dickey Fuller (ADF) and Phillip Peron (PP) Unit root tests for the order of integration of the variables under investigation. The essence of the test is to determine whether the series: Growth rate of real Gross Domestic Product (PGDP_t); Real Exchange Rate (ER); Interest Rate (IR); Inflation rate (INF); and Growth rate of Total government expenditure(TGE_t) are Stationary (i.e have unit roots) and their order of integration. Thus, the essence of the test is the null hypothesis of nonstationarity. To reject this, the ADF and PP statistics must be more positive or negative than the critical values and significant.

Table 4.1a Result of Unit Root Test Based on Augmented Dickey-Fuller.

| Variable | ADF | 1% critical value | 5% critical value | 10% critical value | Order of integration |
|-------------------|---------|-------------------|-------------------|--------------------|----------------------|
| PGDP _t | -6.0388 | -4.1985 | -3.5236 | -3.1929 | I(0) |
| ER | -5.7482 | -4.2050 | -3.5266 | -3.1946 | I(1) |
| INT | -9.9971 | -4.2050 | -3.5266 | -3.1946 | I(1) |
| INF | -6.4146 | -4.2146 | -3.5297 | -3.1946 | I(1) |
| TGE _t | -4.4683 | -4.1985 | -3.5236 | -3.1929 | I(0) |

Source: Computed Result (E-Views 7.0)

Table 4.1b Result of Unit Root Test based on Phillip-Perron

| Variable | ADF | 1% critical value | 5% critical value | 10% critical value | Order of integration |
|-------------------|----------|-------------------|-------------------|--------------------|----------------------|
| PGDP _t | -6.0412 | -4.1985 | -3.5236 | -3.1929 | 1(0) |
| ER | -5.7482 | -4.2050 | -3.5266 | -3.1946 | 1(1) |
| INT | -40.2149 | -4.2050 | -3.5266 | -3.1946 | 1(1) |
| INF | -11.5610 | -4.2050 | -3.5266 | -3.1946 | 1(1) |
| TGE _t | -4.3833 | -4.1985 | -3.5236 | -3.1929 | 1(0) |

Source: Computed Results (E-Views 7.0)

After comparing the test statistic value against the Mackinnon critical value at 5% level of significance, it was noticed that two of the variables in the two tests employed (that is, ADF and PP) were stationary at levels while three are stationary at first difference. The results of both the ADF and PP test show that PGDP_t and TGE_t are stationary at levels (i.e. integrated of order zero I(0) while ER, INT and INF are stationary at first difference. (i.e. integrated of order I(1)). Thus, we conclude that two of the variables are I(0) while three are I(1) variables.

4.2 Ordinary Least Square Result

Table 4.2 below presents the regression results for the estimated equation. We experimented with four different functional forms: Double log, Exponential, Linear and Semi-log functional forms. The aim here is to complete the four models and then choose the one which is relatively robust and consistent in terms of a priori, econometric and statistical criteria.

Table 4.2: OLS Results of Macroeconomic variables Influencing Output
 Dependent variable = PGDP_t

| Variables | Double log functional form | Exponential functional form (lead model) | Linear functional form | Semi-log functional form |
|------------------|----------------------------|--|------------------------|--------------------------|
| C | 5.4831(0.000) | 3.7509(0.000) | 27.4641(0.0000) | 46.9891(0.0000) |
| ER | 0.1227(0.6975) | 0.0094(0.1675) | 0.1137(0.1821) | 1.1101(0.7696) |
| INT | -0.4978(0.2884) | -0.0147(0.4993) | -0.2203(0.4209) | -6.5974(0.2227) |
| INF | -0.0888(0.4777) | -0.0088(0.1100) | -0.1035(0.1341) | -1.2376(0.4101) |
| TGE _t | -0.9371(0.0023) *** | -0.069(0.0001)*** | -0.6595(0.0020) | -9.6891(0.0076) |

| | | | | |
|--------------------|------------|-------------|-------------|----------|
| R ² | 0.2866 | 0.4034 | 0.3172 | 0.2499 |
| Adj R ² | 0.2073 | 0.3371 | 0.2414 | 0.1665 |
| F-Test | 3.6154 | 6.0862 | 4.1824 | 2.9985 |
| Prob. | (0.0141)** | (0.0007)*** | (0.0069)*** | (0.0310) |
| D-W | 2.0321 | 2.0055 | 1.9644 | 20072 |
| AIC | 1.8408 | 1.6619 | 3.7174 | 6.8115 |
| SIC | 2.0498 | 1.8709 | 6.9263 | 7.0204 |

| Diagnostic test | | | | |
|-----------------|-----------------|------------------|----------------|-----------------|
| ARCH test | 0.0007(0.9780) | 0.4117(0.5249) | 0.0067(0.9351) | 0.0141(0.9658) |
| LM Test | 0.4171(0.6623) | 0.77131(0.4703) | 0.0161(0.9840) | 0.0193(0.9808) |
| RESEST Test | 7.7574(0.0017) | 111.0818(0.0021) | 0.5536(0.4618) | 0.3731(0.5453) |
| Normality test | 51.5194(0.0000) | 21.9479(0.0000) | 73.8171(0.000) | 54.4494(0.0000) |

Source: Computed Result (E-Views 7.0 version)

Notes:

- 1) Variables are as defined in Equation 1 in Section 3.1; **C** = Intercept; **R²** = coefficient of determination; **DW** = Durbin Waston statistic; **AIC** = Akaike Information criterion; **SC** = Schwarz information criterion; **ARCH** = Autoregressive conditional Heteroscedasticity; **LM Test**= Lagrange Multiplier Test; **RESET Test** = Regression specification Error
- 2) Asterisks *, ** and *** denotes 10%, 5% and 1% significant levels respectively
- 3) Values in parenthesis are the P – values.

The lead model which forms the basis of our analysis is the Exponential function This is given by the some of the relevant statistical and econometric criteria, for instance, the coefficient of multiple determination R^2 for the exponential model is highest, indicating that the explanatory power of the independent variable is robust in the exponential form than in other forms specified. Secondary, and of significant interest is the Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC). In econometric literature (Gujarati, 2003) these two criteria are powerful in selecting a functional form. Thus, this is often done by choosing the functional form with the least AIC and SIC value. It is evident in the regression results for the four models that AIC and SIC statistic for the exponential model have the least values compared to that of other functional forms. Hence, based on the above mentioned criteria the exponential function is chosen as the lead model, which will be utilized for the interpretation.

Furthermore, the coefficient of determination R^2 is 0.4034 implying that approximately 40 percent variation in GDP is collectively explained by explanatory variables in the model. The F-Statistic reveals that the overall relationship in the model is significant, as is evident in the statistically significant value of the F-test statistic. The Durbin-Watson Statistics shows the absence of serial correlation in the residuals of the estimated model.

The regression results presented above offers some interesting outcome. First, the coefficient of exchange rate assumes a positive out non-statistically significant value. This implies that 1 percentage point rise in exchange rate (depreciation of Naira) related to other currencies such as dollar will result in a 0,0094 percentage increase GDP. The result fails to conform to the apriori expectation. However, a similar result has also been obtained by previous studies such as Oyeran (2010) and James (2012).

As expected, the coefficient of interest rate takes a negative relationship between interest rate and economic growth. Specifically, it shows that each percentage point rise (decrease) in interest rate will result in approximately 0.0147 percent reduction (increase) in economic growth. However, the result here is in tine with theorizing of macroeconomics. This result conforms to the a priori expectation as stated in the model. Similarly, the coefficient of inflation also assumes a negative sign. This is however surprising given the stated theoretical expectation. It implies that a unit rise in inflation will reduce growth by 0.0088 percent. This result fails to conform to the a priori expectation.

Finally, the coefficient of government total expenditure shows a negative relationship between government expenditure and economic growth. This implies that an increase (decrease) in government expenditure will cause a reduction (increase) in GDP growth rate by 0.0679. However, the negative value of the coefficient of this variable fails to conform to the a priori expectation as well as the theorizing of the Keynesian economics.

A brief review of some of the diagnostic tests will suffice at this point. First, the Autoregressive Conditional Heteroscedasticity (ARCH) value reveals that there is no heteroscedasticity. Put more technically, it shows that the variance of the residual term is homoscedastic. It is evident in p-value of the chi-square which is (0.5249) indicating that chi-square value is not significant at the 5% level of significance. Similarly, the Breuch-Godfrey serial correlation Langrange Multiplier (LM) Test reveals that there is no serial correlation in the variables. The result further reaffirms that of the Durbin-Watson Statistic earlier stated. However, the Regression Specification Error Test (RESET) result shows some possible mis-specification of the model. As shown in the table, since the F- Statistic is significant at the 5% level, we fail to reject the null hypothesis that the model is mis-specified. Lastly, the Normality test results, using the Jacque-Berra (J-B) approach, shows that the residuals are not normally distributed. As shown in the value of the J-B, the P-value is (0.000) showing that it is significant at 1% level. Hence, we reject the null hypothesis that residuals are normally distributed.

4.3 Granger Causality Results

Table 4.3 Pairwise Granger Causality Test Results

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|-----|-------------|-------------|
| ER does not Granger Cause PGDP _t | 40 | 3.99969 | 10.0273 |
| PGDP _t does not Granger Cause ER | | 0.3801 | 0.6866 |

From the Granger results, we accept the null hypothesis that exchange rate(ER) does not Granger cause PGDP_t. This is because computed F- statistic value is not significant. Similarly, we accept the null hypothesis that PGDP_t does not granger cause exchange rate(ER). Thus, there is no causality between PGDP_t and ER.

5. Policy Recommendations and Conclusion

This study empirically investigated the relationship between exchange rate and economic growth in Nigeria using annual data spanning the period of 1970 to 2011. Specifically, it sought to: examine the relationship between exchange rate and economic growth in Nigeria; and also to determine the nature and the direction of causality between exchange rate and economic growth in Nigeria. Employing the Ordinary Least Square (OLS) technique and the Granger Causality Test, the study revealed the existence of a positive and insignificant relationship between exchange rate and economic growth in Nigeria. This implies that when exchange rate increases(depreciates), output growth rate also increases. On the other hand, it also implies that when exchange rate decreases(appreciates), output growth rate also decreases. The results also indicate that there is no causality between exchange rate and economic growth in Nigeria.

From the findings of this study, there exists a positive relationship between exchange rate and economic growth in Nigeria. Policy option requires that government should adopt a favorable exchange rate policy that will allow for a realistic and stable exchange rate to enhance output performance. The depreciation of the nation's currency is likely to increase the cost of imported raw materials as well as the cost of imported finished goods. Thus, producers would prefer domestically sourced inputs. Similarly, locally made products would become more preferable to consumers as they will be cheaper than their foreign substitutes. Thus, exchange rate depreciation has a way of encouraging local production and boosting national output. Based on this, occasional devaluation of the naira by the government and the monetary authorities should be allowed as it is capable of enhancing output performance and boosting the Nigerian economy. On the other hand, exchange rate appreciation has the tendency of making imported raw materials and imported finished goods cheaper thus impeding local production and reducing national output.

In conclusion, given that exchange rate movements have serious implications for economic growth in Nigeria, it is absolutely imperative that government formulate and implement an appropriate mix of fiscal and monetary policies that will not only ensure a realistic and stable exchange rate but will also guarantee a rate that encourages local production and boosts national output. It is pertinent to note that exchange rate stability is necessary for macroeconomic stability which is a basic requirement for fostering a sustainable growth and development of the Nigerian economy.

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