

## Relationship between Exchange Rate and Gross Domestic Product in Nigeria ARDL Approach

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### Abstract

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This paper empirically investigates the relationship between exchange rate and the Gross Domestic Product (GDP) in Nigeria from 1981 to 2017. The annual data was obtained from CBN statistical bulletin. Using the Auto-Regressive Distributed Lag (ARDL) co-integration procedure. The result indicates that GDP in Nigeria is not responsive to official exchange rate movement. A long run relationship was found to exist between GDP and official exchange rate, but not statistically significant. The Error Correction Mechanism (ECM) estimate was rightly signed but was found to have a short-run disequilibrium adjustment of less than 2% for correcting any deviation from long-run equilibrium. The models are found not to have serial correlation and also found to be stable meaning that the result is appropriate for policy consideration. It is therefore suggested that policy makers should not totally rely on exchange rate manipulation as an instrument to boost the economy, but should consider other economic variables to strengthen the GDP.

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**Keywords:** Auto-regressive distributed lag, Error Correction model, Official Exchange rate, Gross Domestic Product.

### 1.0 Introduction

It is an established fact that no any country worldwide lives in an absolute economic independence. The economies of the world are interrelated in one way or the other be it in terms of import, export, Forex, foreign direct investment and many more. In most economic relations that exist between countries. Foreign exchange plays an important role. The price (value) of foreign currency in terms of local currency is actually very important in understanding the growth of all the countries. Strong evidence abound on strong alignment between exchange rate and growth of per capita output in developing nations (Babatolu, 2015).

In developing countries exchange rate policies are often sensitive and controversial, mainly because of the kind of structural transformation required, such as reducing imports or expanding non-oil exports, which invariably imply a depreciation of the nominal exchange rate. Such domestic adjustments, due to their short-run impact on prices and demand, are perceived as damaging to the economy. Ironically, the distortions inherent in an overvalued exchange rate regime are hardly a subject of debate in developing economies that are dependent on imports for production and consumption (Akpan, 2010).

The debate rather focuses on the degree of fluctuations in the exchange rate in the face of internal and external shocks. There appears a consensus view on the fact that devaluation or depreciation could boost domestic production through stimulating the net export component. This is evident through the increase in international competitiveness of domestic industries leading to the diversion of spending from foreign goods whose prices become high, to domestic goods. As illustrated by Ogunleye (2008), the success of currency depreciation in promoting trade balance largely depends on switching demand in proper direction and amount as well as on the capacity of the home economy to meet the additional demand by supplying more goods. On the whole, exchange rate fluctuations are likely, in turn, to determine economic performance. It is therefore necessary to evaluate the effects of exchange rate fluctuations on the GDP growth.

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Most emerging economies adopted the main two exchange rate regimes with the purpose of gaining domestic and international balance. Nations economic strength is measured as the sum of exchange rate and budget indices. Exchange rate is the value of foreign currency in relation to local currency, while budget is a prepared and approved financial statement (Bala and Asemota, 2013). Therefore, country's foreign exchange and budget can aid in slowing or accelerating the walking growth progress and development. Jinghan (1997) opined that factors that stimulates demand and supply in Forex market are equally responsible for change in exchange rate.

In Nigeria, the exchange rate policy has undergone substantial transformation from the immediate post-independence period when the country maintained a fixed parity with the British pound, through the oil boom of the 1970s, to the floating of the currency in 1986, following the near collapse of the economy between 1982 and 1985 period. In each of these epochs, the economic and political considerations underpinning the exchange rate policy had important repercussions for the structural evolution of the economy, inflation, the balance of payments and real income.

### **1.1 Historical background**

History has shown that a number of flexible exchange rate system have been introduced and the dynamic effect on economic growth and development has not been identical across the world economy. In the same vein, explanations as to which macroeconomic variable(s) is significantly affected by the exchange rate volatility in a particular economy have also received considerable attention in order to provide policy guide to economic managers of different countries (Bala and Asemota, 2013). Changes in the economy and structural shifts in production are the key factors that brought about the evolution of foreign exchange market in the Nigerian economy. Private sectors and commercial banks earned and held foreign exchange by acting as local agents during which agricultural export was the main source of foreign exchange receipt (Babatolu, 2015).

A comprehensive exchange rate came in bear in Nigeria around 1982, despite that the foreign exchange was deficient in yielding an adequate means of foreign exchange alleviation in line with requirement of internal balance. These resultant shortfalls brought about the introduction of what is called as Second Tier Foreign Exchange Market (SFEM) in 1986; through which market forces dictates exchange rate and budget allocation. In 1989, the scope of the exchange rate bureau was broadened. Yet another reform was introduced in 1994 due to volatility in the exchange market, which include official pegging of the Naira exchange rate, centralization in the Central Bank of Nigeria (CBN), restriction on Bureau De Change, the reaffirmation of the illegality of parallel market, discontinuation and bills of payment. The introduction of an Autonomous Foreign Exchange Market (AFEM) brought about the liberalization of the foreign exchange market in 1995 by the CBN. In October 1999, the foreign exchange witnessed yet another liberalization with the introduction of Inter-Bank Foreign Exchange Market (IFEM) (CBN, 2014), (Akpan and Atan, 2010).

Following the failures of the variants of the flexible exchange rate mechanism (the AFEM introduced in 1995 and the IFEM in 1999) to ensure exchange rate stability, the Dutch Auction System (DAS) was re-introduced on July 22, 2002. The DAS was to serve the triple purposes of reducing the parallel market premium, conserve the dwindling external reserves and achieve a realistic exchange rate for the naira. The DAS helped to stabilize the naira exchange rate, reduce the widening premium, conserve external reserves, and minimize speculative tendencies of authorized dealers. The foreign exchange market has been relatively stabilized since 2003 (NDIC, 2015).

In order to further liberalize the market, narrow the arbitrage premium between the official interbank and bureau de change segments of the markets and achieve convergence, the CBN introduces the Wholesale Dutch Auction System (WDAS) on February 20, 2006 replacing the Retail Dutch Auction System RDAS. This was meant to consolidate the gains of the retail Dutch Auction System as well as deepen the foreign exchange market in order to evolve a realistic exchange rate of the naira. Under this arrangement, the authorized dealers were permitted to deal in foreign exchange on their own accounts for onward sale to their customers. These exchange rate regimes have had some implication for economic performance (NDIC, 2016).

After the crash in crude oil market which led to economic downturn in Nigeria which affected the exchange rate stability, it was observed that the RDAS and WDAS were no longer sustainable because the foreign reserve was depleted. A new flexible foreign exchange policy was introduced in June 2016 (CBN, 2016).

In line with the Central Bank of Nigeria's (CBN's) mandate to foster depth, stability and liquidity in the Nigerian Foreign Exchange (FX) market, CBN has adopted the flexible exchange rate system and established the Foreign Exchange Primary Dealers (FXPDs) system whereby interested Authorized Dealers are accorded access to transact FX products directly with the CBN. This is to allow the forces of demand and supply to determine the value of the naira. The main objectives for the establishment of Primary Dealership in FX products are:

- i. To achieve exchange rate management policy objectives
- ii. To improve the effectiveness of CBN FX market intervention activities
- iii. To enhance market liquidity

The CBN hereby emphasizes that the nature of its relationship with the FXPDs is primarily a counterparty relationship and delisted some items from accessing foreign exchange window, therefore, importers of such items shall source for their foreign currency without any recourse to the Nigerian foreign exchange market. Delisted items include Rice, Cement, meat, vegetables, galvanized steel sheet etc. This policy pushed the demand for forex to move upward at geometric rate and the CBN has to intervene again in the market by providing liquidity to some customers for reasons such as, Personal Travel Allowance PTA, Business Travel Allowance BTA, Medical bills, School fees etc. this helped in gaining stability in the market with (N360-N364/ 1\$) (CBN, 2016).

Exchange rate volatility and sustainable development have become a crucial policy issue since the global economic managers started to adopt the floating exchange rate system in the 1970s. As such, attention of research in finance and economic literature on exchange rate volatility has grown tremendously.

According to Bala and Asemota (2013), exchange rate and its volatility are key factors that influence economic activities in Nigeria. The volatility, swings or fluctuations over a period of time in the Naira exchange rate against major international currencies has witnessed excessive volatility of the Naira exchange against major international currencies. Dickson (2012) also explains that economic growth is responsive to exchange rate volatility in both the short and long run, in the Nigerian context. In another study by Musyoki et al (2012), their result shows that real exchange rate in Kenya was very volatile and exhibit appreciating trend in the foreign currency, implying that international competitiveness is hampered and reflected a negative impact on economic growth of Kenya.

Previous empirical researches were conducted on the determinants of exchange rate and its impact on GDP, these include Jones (2012), Linjoum (2007) Akpan et.al (2010); Babatolu (2015), among others. However, these earlier works were conducted before the emergence of the flexible exchange rate regime and with more emphasis on the determinants of foreign exchange. Therefore, this study will bridge the gap to bring an update to the existing researches with special interest on the impact of the exchange rate on economic growth in Nigeria. It will also contribute to the existing literature by investigating and modeling an approach to exchange rate management and its structural variant by highlighting if current exchange rate policies would impact on the GDP.

The rest of the paper is presented in four sections. Section 2, reviews related literature. The empirical model is presented in section 3. Data analysis and estimation are presented in section 4, while section 5 highlighted the summary, conclusion and recommendation.

## 2.0 Literature Review

### 2.1 Theoretical review

Although economic theory suggests that the type of exchange rate arrangement may matter for growth, it does not clearly ascertain what type of arrangement would be more likely to promote growth. It not noticeably articulate how the exchange-rate regime and particularly the exchange-rate peg affects economic growth. Instead, arguments typically focus on its impact on investment and international trade (primarily exports). However, according to Babatolu (2015), Levy-Yeyati and Sturzenegger comprehensively treat how exchange-rate regime impacts on growth which shows no impact in the short-run. The theoretical literature on the subject is quite thin and usually derived from studies that are *indirectly* linked to growth, such as export growth or currency crises.

The linkage between regime and economic growth exists, but the sign of the influence is blurred. Advocates of exchange-rate ageing (hereafter ERT) strategy usually highlight that by the reduced policy uncertainty and lowered interest-rates variability, this strategy promotes an environment which is conducive to growth. On the contrary, an exchange-rate target does not provide an adjustment mechanism in times of shocks, thus stimulating protectionist behavior, distorted price signals and therefore misallocation of resources in the economy (Ogunleye, 2008).

In the same line, for instance, Okhiria and Saliu (2008) argue that before the Asian crisis of 1997/98 the exchange-rate stability against the US dollar contributed to low inflation and the sound fiscal position. The resulting stable expectations then promoted investment and boosted long-term growth, which has become known as the East Asian miracle.

## 2.2 Empirical literature

There is a vast body of empirical literature on the volatility of exchange rate, its determinants, impact on output and prices. In some of the existing studies, exchange rate has impact on GDP. Others did not consider exchange as a significant variable that impact on GDP.

The study by Jones (2012) conducted to investigate how the movement in exchange rate affect the real GDP, prices and interest rate in South Africa from 2000-2010, using VARX model for the estimation, impulse response functions and forecast error variance decomposition. Major findings of this research are real GDP responds positively to depreciation of Rand, prices and interest rates have been increasing also following a depreciation of the Rand. Therefore, there is an established impact of the exchange rate of Rand and economic growth in South Africa.

Akpan and Atan (2010) investigates the effect of exchange rate movement on real output growth in Nigeria. It uses quarterly data for the period 1986-2010. The paper examines the possible direct and indirect relationship between exchange rates and GDP growth. Simultaneous equation and Generalised method of moment technique model were used to derive the relationship. The research indicates that no evidence of a strong direct relationship between exchange rate and output growth. Rather, Nigeria's economic growth has been directly affected by monetary variables. The research conclude that improvements in exchange rate management are necessary but not adequate to revive the Nigerian economy. A board program of economic reform is required to complement the exchange rate policy adopted.

Bailluet al (2003) conducted a research on the influence exchange rate regime on Economic growth in Ghana. The research uses Ordinary Least Square regression and time series quarterly data from 1990 – 2000 for the analysis. Findings of the research argued that regime's influence on growth could be direct, through the regime's effect on shock adjustments, or indirect, through investment, international trade and financial sector development. The first effect is channeled through regime's effect on growth by "dampening or amplifying the impact and adjustment to economic shocks", thus allowing a flexible rate option to enable fast and easy accommodation and absorption of the economic shocks. Consequently, "when the adjustment to shocks is smoother, one would expect the growth to be higher, given that the economy is, on average, operating closer to capacity". Whereas, the indirect implications arises from the relationship between the uncertainties imposed by the exchange-rate regime and trade and investment.

Schnabi (2007) used both the generalized least square fixed effect model and the dynamic panel estimation model to investigate the impact of exchange rate stability on economic growth for a sample of 41 mostly small open economies at the European Monetary Union (EMU) periphery from 1999 to 2005. The result identified international trade, international capital flows and macroeconomic stability as an important transmission channels from exchange rate stability to increased economic growth and further argued that fixed exchange rates provides a more stable framework for the adjustment of asset and labour markets of countries in the economic catch-up process, thereby accelerating growth. The panel estimation reveal a robust negative relationship between exchange rate volatility and economic growth for countries in the economic catch-up process with open capital accounts.

Adeku (2003) studied the effect of the exchange rate volatility on Gross Domestic Product GDP in Nigeria, using the Exponential Generalised Autoregressive Conditional Heteroscedasticity (EGARCH) technique to establish the relationship between exchange rate volatility and GDP growth rate in Senegal using time series data from 1990-2000. The study indicated that there is negative relationship between exchange rate volatility and GDP, that is, depreciation in the value of local currency leads to growth in GDP in the long run.

Mahmood, Ehsanullah, and Ahamed (2011), studied the exchange rate volatility and macroeconomic variables in Pakistan from 1999-2010 employing the GARCH model and Ordinary Least Square (OLS). The result indicated that exchange rate volatility affects macroeconomic variables in Pakistan; exchange rate volatility positively affect GDP, growth rate and trade openness while it negatively affect the FDI.

Musyoki et.al (2012) in a similar study employed the (GARCH) and computation of the unconditional standard deviation of the changes to measure volatility and Generalized Method Moments (GMM) to assess the impact of the real exchange rate volatility on economic growth in Kenya, the study revealed that real exchange rate was very volatile and that Kenya's real exchange rate generally exhibit an appreciating and volatility trend, implying that Kenya's international competitiveness deteriorates. Therefore, real exchange rate volatility in Kenya reflected a negative impact on economic growth of Kenya.

Udoh et al (2012) model the short-run and long-run impact of some macroeconomic fundamentals on the exchange rate volatility in Nigeria using a monthly data from 2007-2010. The empirical results revealed that the coefficients of total import, industrial capacity utilization rate, lending rate of commercial banks, foreign private investment and liberalization policy period are significant in the long-run while the coefficient of external reserves, inflation rate, interest rate, foreign private investment, total import and industrial capacity utilization rate were significant in the short-run.

Danmola (2013) analyzed the impact of exchange rate volatility on macroeconomic variables with quarterly data from 1990-2010, using the Correlation Matrix, Ordinary Least Square (OLS) and Granger Causality test, the result indicates that exchange rate volatility has a positive impact on the inflationary rate in Nigeria. Babatolu, (2015) employed the ARCH and GARCH methodology to measure the volatility of exchange rate and its effect on the GDP of Nigeria, using the Seemingly Unrelated Regression method (SUR) in estimating the coefficient of the two system equation. The ARCH and GARCH results indicated that the exchange rate is volatile, while SUR results shows that exchange rate has negative but statistically not significant effect on the GDP. Kalu and Ogunjo (2015) examined the causal relationship between exchange rate and Gross Domestic Product using the pairwise Granger causality and also estimate the Error Correction Term (ECT) in a Vector Auto-Regression (VAR) model environment. The result shows that there exists a unidirectional causality running from exchange rate GDP and that the exchange rate deregulation has negatively influenced the GDP in Nigeria.

### 3.0 Methodology

The research used the econometric method of Auto-Regressive distributive Lag (ARDL) model to adopt the work of Kalu and Ogunjo (2015). Data was sourced and obtained mainly from the 2016 statistical bulletin of Central Bank of Nigeria (CBN). The sample covers a period from 1981-2016.

#### 3.1 Model specification

The model used in this research work is specified as follows;

The functional form is:

$$GDP = f(EXR)$$

Where:

GDP is Gross Domestic Product at 1990 constant basic principle in Billion Naira.

EXR is the official exchange rate of the Nigerian naira against the United State (U.S) dollar.

The econometric form of the Auto-Regressive Distributive Lag (ARDL) is:

$$\Delta GDP = \alpha_0 + \alpha_1 \Delta GDP_{t-i} + \alpha_2 \Delta EXR_{t-i} + \alpha_3 GDP_{-1} + \alpha_4 EXR_{-1} + u_t$$

Where:

$\Delta GDP_{t-i}$  is the first differenced GDP at the appropriate lag as given by the Akaike and Schwatz lag selection criterion.

$\Delta EXR_{t-i}$  is the first differenced EXR at the appropriate lag as given by the Akaike and Schwatz lag selection criteria.

$\alpha_3$  and  $\alpha_4$  are the estimates for the long run relationship in the model.

The Error Correction Mechanism (ECM) model is:

$$\Delta GDP = \alpha_0 + \alpha_1 \Delta GDP_{t-i} + \alpha_2 \Delta EXR_{t-i} + \alpha_4 ECT_{-1} + u_t$$

Where:

ECT is the error correction term which measures the speed of adjustment from short run disequilibrium back to the long run equilibrium. The variable is the residuals derived from the Ordinary Least Square (OLS) regression of the Data at level.

**3.2 Method of Data Analysis**

In this study, the research employ quantitative tools of data analysis which are; the Augmented Dickey-Fuller (ADF) unit root test for stationarity, followed by estimating the Co-integration regression to determine if the variable have a long-term or equilibrium relationship using the Auto-Regressive Distributive Lag (ARDL) method. The Error Correction Mechanism (ECM) is then used to determine the short run disequilibrium adjustment and the Wald test is used to test for the short run relationship. The ECM model will be tested for adequacy by the residuals diagnostic test of normality, ARCH test, heteroscedasticity test, serial correlation test and finally, model is tested for its stability.

**4.0 Data Analysis and Findings**

**4.1 Unit root test**

**Table 1:**Augmented Dickey-Fuller test statistics

| Variables                       | ADF       | 1%        | 5%        | 10%       | P-Value |
|---------------------------------|-----------|-----------|-----------|-----------|---------|
| GDP                             | 9.525660  | -3.653730 | -2.957110 | -2.617434 | 1.000   |
| 1 <sup>st</sup> Differenced GDP | -1.176250 | -3.670170 | -2.963972 | -2.621007 | 0.6713  |
| EXR                             | -0.134898 | -3.653730 | -2.957110 | -2.617434 | 0.937   |
| 1 <sup>st</sup> Differenced EXR | -5.298357 | -3.661661 | -2.960411 | -2.619160 | 0.0001* |

\*significant at 5%

Source: Author’s computation using Eviews 9, 2018.

The stationarity test was conducted on the variable’s data use for this research and using the Augmented Dickey-Fuller methodology and the result is provided in table 1. The result shows that GDP is not stationary both at levels and first differenced while EXR is stationary at first differenced but not at levels. This is one of the pre-conditions of using the Auto-Regressive Distributive Lag (ARDL) regression methodology.

**4.2 Lag selection**

To determine the lag length appropriate for the model. Two (2) criterions were selected, the Akaike and the Schwarz criterion for determining the appropriate lag length for the model. Starting from lag 2 to lag 6 and pick the values for the Akaike and Schwarz as shown in the table below:

**Table 2:** Lag Length

| Lag Length | Akaike Value | Schwarz Value |
|------------|--------------|---------------|
| 2          | 7.64*        | 7.96*         |
| 3          | 7.76         | 8.18          |
| 4          | 7.66         | 8.18          |
| 5          | 7.79         | 8.41          |
| 6          | 7.68         | 8.41          |

Source: Author’s computation using Eviews 9, 2018.

From table 2, it is indicated that the selected lag length is two (2),because lag 2 has the smallest values for both the Akaike and Schwarz criterion. Therefore, it will be used for the ARDL regression.

### 4.3 ARDL Regression and Co-integration Test

We used the Auto-Regressive Distributive Lag (ARDL) to determine the long-run association between Gross Domestic Product (GDP) and the official exchange rate of Naira to Dollar (EXR) in Nigeria.

#### 4.3.1 Bound Test for Cointegration Analysis

Bound Test for Cointegration among the variables captured in the model is required after Unit root test and Lag selection have been carried out. The Bound Test result shows that there exists a Cointegration among the variables as the F-Statistics value of 4.0205 percent is greater than the critical value of upper bound of 3.9369 at 5% level of significance. This reveals that the null hypothesis which states that there is no Cointegration among the variables is hereby rejected.

**Table 4.2 Bound Test result**

| <b>Asymptotic Critical Value for Rejecting Null Hypothesis</b> |        |        |
|--|--------|--------|
| Critical Value   | At 5%  | At 10% |
| Lower Bound  | 2.6872 | 2.1607 |
| Upper Bound  | 3.9369 | 3.2744 |

F-Statistics 4.0205\*\*. Significant at 5%

Source: Author's computation

From Table 4.2, it can be said that there is a strong Cointegration among the captured variables. This is owing to the fact that at 5% level of significance, the F-statistics of 4.0205 is greater than the upper bound critical value of 3.9369.

**Table 3: ARDL regression result**

**Table 7: Dependent Variable: D (GDP)**

| Variable            | Coefficient    | Prob. |
|---------------------|----------------|-------|
| C                   | -6.788560.4388 |       |
| D(GDP(-1))          | 0.1755540.3940 |       |
| D(GDP(-2))          | -0.149830.4729 |       |
| D(EXR(-1))          | -0.029580.8464 |       |
| D(EXR(-2))          | -0.124510.4098 |       |
| GDP(-1)             | 0.0495410.1482 |       |
| EXR(-1)             | 0.1304000.1228 |       |
| R-squared           | 0.789064       |       |
| Adjusted R-squ      | 0.734037       |       |
| S.E of regression   | 9.965169       |       |
| Sum squared resi    | 2284.005       |       |
| Log likelihood      | -107.556       |       |
| F-Statistics        | 14.33962       |       |
| Prob (F-statistics) | 0.000001       |       |
| Mean depvar         | 23.99000       |       |
| S.D dependenvar     | 19.32298       |       |
| Akaike info crite   | 7.637032       |       |
| Schwarz criterion   | 7.963978       |       |
| Hannan-Q crite      | 7.741625       |       |
| Durbin-Watson st    | 2.153906       |       |

**Source:** E-Views run by the Author, 2018.

Table 3 is the ARDL regression result consisting of two lag of GDP and EXR where the GDP (-1) and EXR (-1) are the long-run parameters of the model. Wald test coefficient diagnostics is used to test the GDP (-1) and EXR (-1) jointly to determine if there is long run association ship between them.

**Table 4: Wald Test:**  
Equation Untitled

| Test Statistics | Value    | df      | Probability |
|-----------------|----------|---------|-------------|
| F-statistic     | 6.173618 | (2, 23) | 0.0071      |
| Chi-square      | 12.34724 | 2       | 0.0021      |

Source: E-Views output run by the Author, 2018.

Table 4 shows that the F-statistics Wald test value result is 6.173618 and we compare this value against the Pesaran critical value table. The value for the lower bound is 4.934 and the upper bound value is 5.764 in the Pesaran F-statistics table. Since the Wald test F-statistics is greater than the lower and upper bound values and under the hypothesis of no co-integration, we reject the hypothesis and conclude that there is long run association ship between GDP and EXR.

#### 4.4 Model Diagnostic Checking

A diagnostic check is appropriate in order to establish whether the modal can be accepted for policy formulation or not. The serial correlation test and the stability test are conducted to establish the model robustness.

**Table 5: Breusch-Godfrey Serial Correlation LM Test:**

|               |          |                    |        |
|---------------|----------|--------------------|--------|
| F-statistic   | 2.910089 | Prob. F(2, 23)     | 0.0071 |
| Obs*R-squared | 6.510223 | Pro. Chi-Square(2) | 0.0021 |

Source: E-Views output run by the Author, 2018.

Table 5 is the Breusch-Godfrey serial correlation test result. Under the hypothesis of no serial correlation, the result shows that we should reject the hypothesis, meaning that there is serial correlation in the residual of the model with the P-value of the observed R<sup>2</sup> being less than 5%. The serial correlation was corrected by removing the 1<sup>st</sup> differenced lag of the dependent variable in the ARDL model.

**Table 6: Breusch-Godfrey Serial Correlation LM Test:**

|               |          |                    |        |
|---------------|----------|--------------------|--------|
| F-statistic   | 2.265230 | Prob. F(2, 22)     | 0.1275 |
| Obs*R-squared | 5.122933 | Pro. Chi-Square(2) | 0.0772 |

Source: E-Views output computer by the Author, 2018

Also, after removing the 1<sup>st</sup> differenced lag variable of gross domestic product in the model, the Breusch-Godfrey serial correlation test from table 6 now indicates the absence of serial correlation in the model with the P-Value of the observed R<sup>2</sup> being more than 5%. Therefore, after the modification of the ARDL model, the model is now satisfactory by being stable, without serial correlation and now appropriate for prediction and forecasting.

#### 4.4 ECM and short-run Causality

The Error Correction Mechanism (ECM) is used to determine the short run disequilibrium adjustment of the model using the modified ARDL model that is stable and not serially correlated.



**Table 7: Dependent Variable: D (GDP)**

| Variable            | Coefficient     | Prob. |
|---------------------|-----------------|-------|
| C                   | 7.9795370.0581  |       |
| D(GDP(-2))          | 0.7641330.0000  |       |
| D(EXR(-1))          | 0.1110740.5889  |       |
| D(EXR(-2))          | 0.0978350.6291  |       |
| ECM(-1)             | -0.0118300.7558 |       |
| R-squared           | 0544462         |       |
| Adjusted R-squ      | 0.471576        |       |
| S.E of regression   | 14.04641        |       |
| Sum squared resi    | 4932.541        |       |
| Log likelihood      | -119.1043       |       |
| F-Statistics        | 7.470041        |       |
| Prob (F-statistics) | 0.000173        |       |
| Mean depvar         | 23.99000        |       |
| S.D dependenvar     | 19.32298        |       |
| Akaike info crite   | 8.273623        |       |
| Schwarz criterion   | 8.507156        |       |
| Hannan-Q crite      | 8.348332        |       |
| Durbin-Watson st    | 1.575500        |       |

**Source:** E-Views output computer by the Author, 2018.

Table 7 shows the ECM estimate of the model taking the residual of the Ordinary Least Square estimates of the regression at levels. The ECM estimate is correctly signed negatively meaning that gross domestic product and official exchange rate move together in the long run but not statistically significant because the P-Value is more than 5%. The ECM estimate simply means that short run dis equilibrium between official exchange rate and the gross domestic product of Nigerian is adjusted at a speed of 1.18% and not statistically significant. To measure the short run associationship or causality from exchange rate to gross domestic product, the Wald test is conducted under the hypothesis of no short run relationship. The result is shown in table 8 with the P-Value being more than 5% means that we cannot reject the hypothesis. This result indicates that there is no short run causality running from official exchange rate to the gross domestic product in Nigeria.

**Table 8:** Wald Test:  
Equation: Untitled

| Test Statistic | Value    | df      | Probability |
|----------------|----------|---------|-------------|
| F-statistic    | 0.238559 | (2, 25) | 0.7895      |
| Obs*R-squared  | 0.477118 | (2)     | 0.7878      |

**Source:** E-Views output computer by the Author, 2017.

Finally, this means that the long run associationship between gross domestic product and the official exchange rate is not significant and there is no short run causality running from official exchange rate to gross domestic product in Nigeria.

#### 4.5 Discussion of findings

The result of the analysis indicated a long run relationship between GDP and official exchange rate, however, the relationship is not statistically significant. The implication of this is that an official exchange rate pronouncement is insignificant to impact on the Gross Domestic Product which is supported by the findings of Akpan and Atan (2011); and Babatolu (2015). In the same vein, the movement of the official exchange rate of naira to dollar does not have any meaningful impact on the GDP of Nigeria in both the long-run and the short-run. This contradict the findings of Jones (2012), Schnabi (2007), Mahmood, Ehsanullah, and Ahamed (2011); and Adeku (2003) which indicates a long-run impact and statistically significant relationship between the exchange rate and GDP growth.

Lack of confidence and the perceived risk, inconsistency in the policies and non-impact of the official exchange rate movement on the real economic growth is a major problem facing the economic policy makers and is making Nigeria to become non-attractive for investment purposes and there will not be any meaningful GDP growth that will be felt by ordinary Nigerians.

### 5.0 Summary, Conclusion and Recommendations

This study reveals that gross domestic product and official exchange rate of naira to dollar in Nigeria have long-run relationship but not statistically significant. That is, the official exchange rate and the gross domestic product move together in the long-run but the movement is not significant.

In conclusion, despite the perceived economic gains expected from currency depreciation, the shortcomings observed has made it impossible for the Nigerian GDP to benefit from official exchange rate activities due to unrealistic tendency of the official exchange rate, low level of confidence in governance coupled with high risk and high running cost of production due to infrastructural decay among other factors.

Thus, the paper indicates that there could be long-run relationship between exchange rate and GDP in Nigeria but the government, policy makers, regulatory authorities and the participant must jointly and rigorously pursue growth in GDP via other macroeconomic means such as provision of social amenities such as stable power supply, enabling environment with adequate and upgraded infrastructure, discourage the dollarization of the economy, etc.

As a result of the findings in this paper, the recommendations provided are;

- the government is advised to provide social amenities such as stable power supply, enabling environment with adequate and upgraded infrastructure that will encourage savings and investments in Nigeria;
- Nigerians should be educated as to the benefit of consuming locally made products than foreign made and its attendant impact on the value of the naira.
- Policy makers should be consistent on their policies on foreign exchange to avoid speculation in the foreign exchange market, political influence and premium seekers taking advantage.
- Accurate forecast of volatility in the exchange rate market should be conducted by regulators for estimating risk and the measures to be taken should not be overemphasized, it will indicate the possible directions that regulators will take in the future knowing that a shifts in volatility affect investors' willingness to hold risky assets and their prices. Sudden changes in the level of financial market volatility, when accurately forecasted, should be of concern to policymakers and I will help impact significantly on the GDP.

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