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THE DYNAMICS OF NIGERIA EXCHANGE RATE AND ITS IMPLICATIONS ON DOMESTIC OUTPUT GROWTH: AN AUTOREGRESSIVE DISTRIBUTED LAG APPROACH

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Abstract

The study uses Pesaran et al. (2011) Autoregressive Distributed Lag (ARDL) model to test for the long run co-integration relationship among the variables. It examined the relationship that exists among exchange rate, net capital inflows, inflation, growth rate of official foreign exchange reserves and other variables of interest. It investigates the nature of long-run relationship among the economic growth, exchange rate and other variables of considered using Bounds testing of co-integration approach and autoregressive distributed lag (ARDL) models. The stability test and the residual diagnostic test were conducted to make sure that the assumptions of the classical linear regression model were fulfilled. The tests results showed no incident of instability in the variables used, as the residual variance remained generally stable within a 5 percent critical band. The ARDL Bounds Test showed existence of co integration relationship among the variables with F-statistics of 7.544 greater than I(0) and I(1) bound of 2.06 and 3.24 at 5 percent significant level, respectively. The result also shows that the nominal exchange rate was relatively stable between 2010 and third quarter of 2014 when it trended upwards as a result of devaluation. It stabilised however in the first quarter of 2015 till June 2016 when it spiralled again as a result of the adoption of the current exchange rate regime. The study however recommended that a more forward-looking strategy in the medium to long-term has to be designed to propel long-term domestic growth and reduce over-dependence on imports.

Introduction

Movements in Nigeria's exchange rate affects activities in the real sector of the economy, as severe fluctuations may create uncertainty for market participants. Large swings (negative) in the exchange rate may lead to reversal of capital inflows by portfolio investors from economy due to uncertainty of business environment and this may exert pressures on the economy. This study seeks to enable investors (direct and portfolio) and analysts become familiar with the volatility in exchange rate in Nigeria. Since the commencement of the flexible foreign exchange management by the Bank in July 2016, antagonist of the policy had argued that it had exerted a contractionary effect on output due to spiral in exchange rate. It must be stressed that the swig in a country's exchange rate, either through a gradual downward floating of the exchange rate or through an immediate outright devaluation of the currency, is normally expected to, among other favorable effects; promote the country's domestic output. Such growth would usually be achieved through an increase in the country's exports – which would now be cheaper abroad – and the secondary and tertiary multiplier effects of increases in investment, income, capital utilization, the

Vol. 2, No. 06; 2018

ISSN: 2456-7760

employment of other factors of production, and spending in both the exporting and non-exporting sectors of the economy. Exchange rate plays an increasingly significant role in the economy as it influences the flow of goods and services, capital and resource allocation, domestic price level, trade, profits as well as investment decisions. It has been argued that floating exchange rate introduced volatility in the exchange rate. When exchange rates are volatile, movement in relative prices become unpredictable thus affecting productivity, unemployment and other macroeconomic variables.

The exchange rate of a country's currency has a great role to play in determining the macroeconomic stability of a nation. Nigerian foreign exchange market has evolved as a fairly developed market involving timely interventions by the Central Bank of Nigeria (CBN), with the mandate of maintaining the value of the domestic currency. It is also true as oil revenue, to a country like Nigeria, is a critical success factor to the country's growth ad development. This is because changes in its price are said to affect economic growth, development and welfare in countries around the world (Rentschler 2013). Oil price slide has serious implications to the fortunes of a country particularly oil dependent nations like Nigeria. Nigeria is Africa's largest producer of crude oil and is one of the world's leading oil producers and exporters. Given that Nigeria relies mainly on oil revenue, the fall in oil prices has affected all aspects of the economy. A decline in revenue that accrues to a nation has a great consequence on exchange rate and its concomitant impact on growth. It was argued in economic literatures that a country exchange rate determines the competitiveness of a country. The work of Takaendesa (2006) examines the behavior of the real exchange rate (REER) in South Africa. It was discovered that finding the exchange rate determines the allocation of production and spending in the domestic economy between foreign and domestic goods. In last one decade, evidence from the huge body of literature on the subject matter suggests its impact on output growth remains unclear. There is no clear consensus among policy analysts about the exact nature of the relationship between the two macroeconomic variables. While some researchers theorize that the exchange rate has no effect on real macroeconomic aggregates (Baxter and Stockman, 1989), others like Mundell (1995), Moreno (2000 and 2001) have shown that higher economic growth results from a pegged or managed float. Other dimensions to the debate revolve around the choice of the exchange rate regime; the fix versus the flex debate, and the impact that a devaluation or an appreciation will have on economic output.

In Nigeria, the exchange rate of the naira receives considerable attention among policymakers and market analysts because access to global financial markets by developing countries depends on a stable exchange rate, Calvo and Reinhart (2002) examine exchange rate regimes in developing countries and find that higher exchange rate pass-through (ERPT) in developing economies than developed ones, as well as the promotion of international trade due to a reduction in risks and transaction costs.

In Nigeria, different exchange rate regimes have been adopted over the years with the main objective of attaining macroeconomic stability. Since the inception of the Structural Adjustment Programme (SAP) in the country has adopted different variants of the flexible exchange rate system depending on prevailing economic conditions. In June 2016, the Central Bank of Nigeria

Vol. 2, No. 06; 2018

ISSN: 2456-7760

(CBN) in another policy shift floated the naira following chronic shortages of foreign currency as oil revenue dwindled. The crisis which was precipitated by a plunge in global crude oil prices was further worsened by a reduction in domestic crude oil production as militants in the Niger Delta sabotaged major oil installations. According to figures published by the Organisation of Petroleum Exporting Countries (OPEC), Nigeria's crude oil production dropped by about 24% between January 2015 and June 2016, while crude oil prices had declined by about 56.02% since January 2014 till the period when the policy was adopted.

Prior to the float, there had been concerns that this policy will lead to economic hardship for majority of the citizens as Nigeria is a net importer of many staple food items such as wheat, rice, fish, as well as important raw materials for the manufacturing sector. Devaluation, it was argued, would lead to a hike in the price of these goods and weaken the purchasing power of most Nigerians. The inflationary pressure that this policy will generate and its impact on economic growth were the most significant issues at the heart of these debates.

Several studies have been conducted to establish the relationship of output growth and foreign exchange market (Englama et al, 2010; Basher et al, 2011; Abubakar and Umar, 2012; Salisu and Mobolaji, 2013). However, it must stress that economic theory presupposes that the depreciation of a country's currency, either through a gradual downward floating of the exchange rate or through an immediate outright devaluation of the currency has expansionary effect on domestic output. Such growth would usually be achieved through more competitive exports and the secondary and tertiary multiplier effects of increases in investment, income, capital utilization, the employment of other factors of production, and spending in both the exporting and non-exporting sectors of the economy. In light of the foregoing, this study examined the impact of the floating exchange rate policy of the CBN on output growth and its impact on inflation, export, and interest rates.

The paper is organized as follows. Section 2 presents a review of the literature. In section 3, the research methodology is discussed while the results of models are presented in section 4. In section 5, the empirical results and discussions of the presented. Section 6 gives the concluding remarks and proposed relevant recommendations.

Literature Review

The nexus between exchange rate and output has been the focus of several studies. The results, however, have been divergent. Mireille (2007) reported that exchange rate overvaluation slowed economic recovery in Nigeria and Benin Republic and suggested that devaluation, and the accompanying higher price of imported goods is required to foster growth in the economy. Akpan and Atan (2012) on the other hand used simultaneous equation models and the Generalized Method of Moments (GMM) techniques to show the lack of a strong direct relationship between changes in exchange rate and output growth. The study further reported that the depreciation of exchange rate leads to inflationary pressure in the economy. This is corroborated by Batini (2012) and Mordi (2012) in different studies carried out in Nigeria. Their findings revealed that exchange rate has an effect on prices. Odusola and Akinlo (2001) also

Vol. 2, No. 06; 2018

ISSN: 2456-7760

employed a structural vector autoregressive (VAR) model to determine the relationship among exchange rate, inflation and output in Nigeria. Findings from the study indicate that the impact of the parallel exchange rate on output is contractionary in the short term. Also, while Dami (2011) and Gala (2012) agree that exchange rate devaluation stimulates growth in developing economies, Kamin and Roger (2000) point out that devaluation leads to a reduction in output. This result also receives support from Eichengreen and Leblang (2011) which provided evidence of a strong negative relationship between volatile exchange rate movements and economic growth for 12 countries. The argument by Dada and Oyeranti (2012) that devaluation could boost output indirectly through net export falls short of the inconclusiveness of evidence from empirical literature. This point is highlighted sharply by Aghion *et. al.* (2011) that the overall effect of exchange rate on output was ambiguous and may be dependent on the economy's characteristics and initial conditions

The choice to adopt a fixed or flexible exchange rate represents yet another aspect to the subject matter. Eduardo and Federico (2011) is one of the many studies which investigated the impact of the exchange rate regime on economic growth. The study revealed that different flexible exchange rate policies lead to higher levels of depreciation but with equally higher levels of domestic output. Similarly, Bailliu*et. al.* (2014) revealed that pegged, intermediate or flexible exchange rate regimes that are characterized by an anchor positively influence economic growth. This finding underscores the importance of a monetary policy anchor over the type of exchange rate regime adopted by a country. Edwards and Levi Yeyati (2013) also found that countries with fixed exchange rates grow less rapidly as those with more flexible exchange rate regimes.

Using a vector Error Correction Model Aliyu *et. al*. (2011) examined the exchange rate pass-through in Nigeria from 1990 to 2010 estimation for the estimation process. Aliyu *et. al*. (2011) finds that Exchange rate pass-through in Nigeria was low and declined along the price chain, which is in disagreement with conventional findings of exchange rate pass-through is being higher in developing countries than developed countries.

Examines exchange rate fluctuations in developing countries using a rational expectations model. Exchange rate fluctuations were found to influence prices through their effects on aggregate supply and demand. Kandil, (2014) also finds that currency depreciation will result high costs of imports if the country is a price taker whereas low cost of imports result to appreciation of a domestic currency.

Chang and Velasco (2013) adopts a different approach and noted that optimal monetary policy under specific analytical frameworks is more important in evaluating an exchange rate policy rather than focusing on the type of exchange rate regime in practice. The study noted that credibility and exchange rates, insulation and floatation, financial fragility and exchange rate policy, exchange rates and the strategy for monetary policy are key issues in determining whether to float or not to float an exchange rate.

Vol. 2, No. 06; 2018

ISSN: 2456-7760

Omisakin*et. al* (2010) examines the behavior of trade inflows in selected Economic Community of West Africa (ECOWAS) countries finding income, exchange rate and prices to be significant in explaining the inflows into the countries. However, the study finds that in contrast to the Orcutt hypothesis, exports flows was found to respond quicker to relative prices than it does to exchange rate in these countries while contrarily, imports flow respond to exchange rate quicker than import prices.

Table 1 below presents the summarized literature on the relationship between the selected key variables and economic growth in Nigeria.

Table 1: Summarized literature

Author(s)	**Country**	**Sample Period**	**Estimation Technique**	**Findings**
Nkoro and Uko (2016)	Not specific	General	ARDL cointegration framework	Long run relationship exists
Anthony *et al.* (2012)	Nigeria	1975-2008	OLS technique	A long run relationship
Shittu *et al.*(2012)	Nigeria	1960 - 2009	ARDL cointegration framework	Compares favorably with the theory that the ARDL is equivalent to the short-run dynamics of the ECM
Akinlo (2004)	Nigeria	1970-2001	ECM	Not significant
Dada and Oyeranti (2012)	Nigeria	1970-2009	Simultaneous equations model	No strong relationship
OkiliePashal I. Peter	Nigeria	1986-2015	OLS	Exchange rate positive effect on growth
Aminu and Anono (2012)	Nigeria	1970-2010	Granger causality test	GDP causes inflation
Ayanwale (2007)	Nigeria	1970-2002	2SLS	Not significant

Vol. 2, No. 06; 2018

ISSN: 2456-7760

Dritsakis(2012)	Hungary	1995-2010	ARDL cointegration framework	A stable, long-run relationship exists between demand for money and its determinants
Egwakhide (2012).	Nigeria	1980-2009	VECM	Lag effect
Abur*et al.* (2013)	Nigeria	1990-2011	Co-integration	Positive impact amongst variables
Okereke and Nzotta(2009).	Nigeria	1986-2007	2SLS (2stage least squares)	No impact on variables
Bello and Adeniyi (2010)	Nigeria	1970-2006	ARDL	No long run relationship
Obansa*et al.* (2013)	Nigeria	1970-2010	VAR technique	Positive relationship
Onwioduokitand Bassey(2011)	Nigeria	1970-2006	OLS	Negative & insignificant on macroeconomic variables.
Omoke (2010)	Nigeria	1970-2005	Granger causality test	No co-integrating relationship
Chete (2006)	Nigeria		Interest Rate	Long run relationship
Oriakhi and Iyoha (2013)	Nigeria	1970-2010	VAR	Positive impact
Obamuyi (2009)	Nigeria	1970-2006	ECM	Significant effect
Adekunle and Aderemi (2012)	Nigeria	1980-2012	Negative relationship	Gross Capital Formation
Odularu (2007)	Nigeria	1970-2005	OLS	No significant relationship
Olomola and Adejumo (2006)	Nigeria	1970-2003	Regression analysis	No significant effect

Vol. 2, No. 06; 2018

ISSN: 2456-7760

Okoro (2013).	Nigeria	1980-2011	OLS	Long run Positive impact
Shehu and Youtang (2012)	Nigeria	1970-2009		Significant effects
Seetanah*et al.* (2012)	Selected African countries	1990-2009	Panel Vector Autoregressive model (PVAR)	Positive effect
Abu and Abdullahi (2010)	Nigeria	1970-2008	A disaggregated analysis	Mixed results
Oriakhiand Ighodaro(2010)	Nigeria	1960-2007	Cointegration and granger causality tests	Negative impact on macroeconomic variables
Paschal Ojimadu,Chibueze Aniebo and CallistusOgu	Nigeria	1980 - 2014	ECM technique	Positive but no significant impact of bank credit on capital formation.
Adebiyi (2006)	Nigeria	1980-2006	VAR	Positive effect
Ismail *et al.* (2010)	Nigeria	1970-2008	VECM	Significant impact
Ugwuegbe and Uruakpa (2013)	Nigeria	1980 - 2013	OLS technique	Positive and significant impact
Ejiogu*et al.* (2013)	Nigeria	1981-2011	OLS technique	No causality
Isola and Alani(2012)	Nigeria	1981 – 2012	Growth accounting	Significant relationship on macroeconomic variables
Anaduaka and Eigbiremolen (2014)	Nigeria	1999-2012	Augmented Solow	Positive impact on macroeconomic variables

Vol. 2, No. 06; 2018

ISSN: 2456-7760

Developments in Foreign Exchange Market in Nigeria

The principal goal of exchange rate management is to defend the value of the domestic currency against foreign currencies and maintain a suitable level of foreign reserves. While the regulator (monetary authority) is concerned with the mandate of ensuring macroeconomic stability, the operators in the economy are interested in foreign currency availability for their economic activities. The demand for foreign currencies in any economy, therefore, becomes an important source of concern for both the regulators and the players in the economy considering the important role of international trade and commerce in the modern economies. One veritable reason for the demand for foreign exchange is the demand for goods, especially goods that are either not produced in the domestic economy or are in short supply within the domestic economy. Other reasons range from speculative purposes, payments for purchase of assets, tourism and unilateral transfers.

The Central bank is responsible for the management of the foreign exchange market in most economies, following from one of its principal mandates to ensure monetary and price stability. This is particularly important as foreign exchange rate is one key price in the external sector that determined the relative effectiveness through international trade and capital flows. In Nigeria, foreign exchange management has undergone various reforms, with the Central Bank of Nigeria (CBN) being responsible for the management and distribution of foreign exchange. From the beginning, the CBN has been vested with the mandate of safe keeping and disbursement of the foreign exchange resources to maintain the value of the domestic currency and support international trade activities. Between 1958, at the inception of Central Banking of Nigeria and before the introduction of the Structural Adjustment Programme (SAP) in 1986, the CBN on behalf of the government was responsible for the regulation, determination and control of the flow of foreign currency for consumption, investment and importation. During this period, the CBN was in control and "simply allocated foreign exchange resources to individuals and corporate bodies for the main purpose of funding imports and other invisible trade items" (Uma, 1998). This administrative measure was replaced with a market determined system with the introduction of SAP in 1986, as the naira exchange rate is now determined on the basis of demand and supply in the foreign exchange market. The market determined system adopted in the management of the foreign exchange since 1986 has further undergone series of modifications and fine-tuning.

The foreign exchange market consists of three major segments until 2015. This include the official market (comprises of Wholesale Dutch Auction System (w DAS)/Retail Dutch Auction System (r DAS)), the Inter-Bank Foreign Exchange Market (IFEM), and the Bureau De Change (BDC). The exchange rate can be stabilized through both monetary and fiscal policies. During the period of excess liquidity, monetary authorities sell securities in order to strengthen the local currency and push up the interest rate. Fiscal expansion causes an appreciation of the currency that forces the government to purchase foreign assets. This will increase money supply preventing the currency appreciation.

Vol. 2, No. 06; 2018

ISSN: 2456-7760

There are two types of flexible exchange rate regimes - managed float and free float. The rDAS was introduced in 2002 to replace the IFEM. Transactions in this system were based on demand for forex by end users; the authorized dealers only bided for forex based on the number of actual requests from end users. In addition, the r DAS required specific and strict documentation from authorized dealers to establish the legitimacy of each transaction.

In 2006, the w DAS was introduced to consolidate the gains of the r DAS and further liberalize the foreign exchange market. The system required that the CBN receives bids from authorized dealers on behalf of end users of forex like corporate organizations and importers, for purchase of foreign currencies during an auction and such bids did not necessarily have to match the total request of the end users. In essence, the authorized dealers may bid for an amount of forex that exceeds the confirmed requests of its end users, if such bids were successful, the dealers could then sell to end users.

By January 2009, w DAS was replaced with the r DAS as a result of increased speculative activities in the forex market. Also, the decline in the price of oil in the international market during that period, negatively affected the nation's accretion to foreign reserves. In order to effectively manage the exchange rate, the CBN became an active player in the market. The official and interbank segments co-existed since 1999 until 2015 when the official window was closed just to tackle malpractices such as round-tripping and speculation. Under w DAS, the exchange rate achieved some level of stability and appreciated from N130.29/US$ in January 2006 to N117.89/US$ in November 2008.

Nigeria embarked on Flexible Exchange Rate system with effect from July, 2016; this is a foreign exchange regime, which allows the market forces or demand and supply to determine the exchange rate of the domestic currency. Under flexible exchange rate regime, the value of the currency is greatly determined by market forces. Thus, capital flows and trade play a significant role in determining the currency's value. When the flexible was introduced the exchange rate depreciated significantly to N305/US$ in July 2016. Further, with effect from April 21, 2017, the CBN established the Investors' & Exporters' FX Window (I&E FX Window) which serves as the trading segment for Investors, Exporters and End-users that allows for FX trades to be made at exchange rates determined based on prevailing market circumstances, thus ensuring efficient and effective price discovery in the Nigerian FX market. The exchange rate of transactions in the window which is currently at N350/US1.00 is as agreed between authorized Dealers and counterparties (willing buyers and sellers in the market.

Methodology

Sources of Data

The study uses quarterly time series from 2000:Q1 to 2018:Q2. Data was obtained from the databases of Central Bank of Nigeria (CBN) statistical and the National Bureau of Statistics statistical. This period captures incidences of falling oil prices and exchange rate depreciation. It also represents a period for which consistent and relevant economic variables are available.

Vol. 2, No. 06; 2018

ISSN: 2456-7760

Approach to Co integration Testing

Empirically, it has been proved that when one co integrating vector exists, Johansen and Juselius (1990) co integration procedure is not useful. It is therefore imperative to use Pesaran and Shin (1995) and Pesaran *et al* (1996b) proposed ARDL approach to co integration or bound procedure for a long-run relationship, irrespective of whether the variables of consideration are I(0), I(1) or a combination of both. Thus, the application of ARDL approach to co integration will give reliable and efficient estimates. Autoregressive Distributed Lag (ARDL) approach to co integration also helps in identifying the co integrating vector(s). If one co integrating vector is identified, the ARDL function of the integrating vector is parameterized into ECM. The parameterized outcome gives short-run dynamics (i.e. traditional ARDL) and long run relationship of the variables of a single model. Because the ARDL is a dynamic single model equation and of the same form with the ECM, the re-parameterization is feasible.

Requirements for ARDL application

ARDL technique is applicable to variables that are I (0) or I (1) or a combination of both. The technique helps to avoid the pretesting problems associated with standard co integration analysis that requires the classification of the variables into I (0) and I (1). This implies that the bound co integration testing procedure does not require the pre-testing of the variables included in the model for unit roots and is robust when there is a single long run relationship between the underlying variables.

- If the F-statistics known as the Wald test establishes that there is a single long run relationship and the sample data size is small or finite, the ARDL error correction representation becomes more efficient.
- If the F-statistics (Wald test) establishes that there are multiple long-run relations, ARDL approach cannot be applied. Therefore, the alternative technique like Johansen and Juselius (1990) can be used. Thus, if the various single equation of the underlying individual variable as dependent variable shows a feedback effect(that is, multiple long run relationships) between the variables, then a multivariate procedure need to be used.
- If the trace statistics or Maximal eigenvalue or the F-statistics show that there is a single long-run relationship, ARDL approach can be used rather than applying Johansen and Juseliustechnique.

Bounds Test

This study focuses on investigating the nature of long-run relationship among the variables of interest using Bounds testing of co-integration approach and autoregressive distributed lag (ARDL) models. The autoregressive distributed lag is a technique that allows us to simultaneously estimate the short-run and long-run coefficients of our model. In order to examine the long-run and short-run relationships between real GDP and other variables considered, the parametized version of ARDL model (Pesaran*et al.*, 2001) with lag four is estimated and verified in this study. The Bounds tests that was made popular by Pesaran*et al* (1999), computes a Wald statistic in order to examine the significance of the lagged values of variables in an unrestricted error correction regression (Pesaran et al, 1999).The justification for

Vol. 2, No. 06; 2018

ISSN: 2456-7760

the selected method of analysis in this study is that unlike the single equation method of Engle and Granger (1987), this method allows for the testing of hypothesis about the co integrating relationship. Again, the Bounds method does not place strict limitations on the level of integrating of the variables in the model.

The ARDL $(p,q_1,q_2,\cdots,q_k)$ model specification is given as follows:

$$\Phi(L,p)y_t = \sum_{i=1}^{k}\beta_i\,(L,q)x_{it} + \theta w_t + u_t\Phi_p L_p + u_t \qquad (1)$$

$$\Phi(L,p) = 1 - \Phi_1 L - \Phi_2 L^2 - \Phi_3 L^3 - \cdots - \Phi_p L^p$$

$$\beta(L,p) = 1 - \beta_1 L - \beta_2 L^2 - \beta_3 L^3 - \cdots - \beta_q L^q$$

For i=1, 2, 3…….k, $u_t \sim$ *iid* $(0;\delta^2)$.

L is a lag operator with $L^0 y_t = X_0$; $L^1 y_t = y_{t-1}$, and the wtis a *s x1* vector of deterministic variables such as the intercept term, time trends, seasonal dummies, or exogenous variables with the fixed lags, where *P=0,1,2…,m, q=0,1,2….,m, i=1,2….,k:* namely a total of *(m+1)k+1* different ARDL models. The maximum lag order, m, is selected by the user and the sample period, *t = m+1, m+2.*

The Bounds testing equation is:

$$\begin{aligned}\Delta LRGDPG_t = {} & \alpha_0 + \sum_{i=1}^{n}\alpha_{1i}\Delta LRGDPG_{t-i} + \sum_{i=0}^{n}\alpha_{2i}\Delta INF_{t-i} + \sum_{i=0}^{n}\alpha_{3i}\Delta TOP_{t-i} + \sum_{i=0}^{n}\alpha_{4i}\Delta M2_{t-i} + \sum_{i=0}^{n}\alpha_{5i}\Delta MPR_{t-i} \\ & + \sum_{i=0}^{n}\alpha_{6i}\Delta NCI_{t-i} + \sum_{i=0}^{n}\alpha_{7i}\Delta NER_{t-i} \\ & + \sum_{i=0}^{n}\alpha_{8i}\Delta ERG_{t-i} + \sum_{i=0}^{n}\alpha_{9i}\Delta BDC_{t-i} + \sum_{i=0}^{n}\alpha_{10}\Delta EXR_{t-i} + \theta_1 LRGDPG_{t-1} + \theta_2 INF_{t-1} \\ & + \theta_3 TOP_{t-1} + \theta_4 M2_{t-1} + \theta_5 MPR_{t-1} + \theta_6 NCI_{t-1} + \theta_7 NER_{t-1} + \theta_8 ERG_{t-1} + \theta_9 BDC_{t-1} \\ & + \theta_{10} EXR_{t-1} + \varepsilon_t \quad (1)\end{aligned}$$

where α_0 is the intercept and ε_t random error term respectively, while Δ is the difference operator for the lagged values of the variables in the model. The endogenous and the exogenous variables are as defined in Table 2. The short-run relationships are measured by $\alpha_{1i},\ldots,\alpha_{10i}$ while long-run relationships are measured by θ_i,s; i=1, 2, 3, 4, 5,…, 10

The following null and alternative hypotheses are used to conduct Bounds testing for co integration:

$H_0: \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = \theta_7 = \theta_8 = \theta_9 = \theta_{10} = 0$

$H_A: \theta_1 \neq 0, \theta_2 \neq 0, \theta_3 \neq 0, \theta_4 \neq 0, \theta_5 \neq 0, \theta_6 \neq 0, \theta_7 \neq 0, \theta_8 \neq 0, \theta_9 \neq 0 = \theta_{10} \neq 0$

Vol. 2, No. 06; 2018

ISSN: 2456-7760

The null hypothesis shows the absence of a long-run relationship as against the alternative hypothesis, H_A. The test computes an F-statistic in order to examine the significance of the lagged values of variables in an unrestricted error correction regression (see, Pesaran, Shin and Smith, 1999).Also, the test computes two asymptotic (the lower bound and the upper bound) critical values. The lower bound critical value is based on the assumption that all the causal variables are integration of order zero, while the upper bound critical value assumes that all there gressors are integration of order one. The decision rule follows the normal convention of comparing the F-calculated with the F-statistics. However, if the calculated statistic falls between the lower bound and the upper bound, the test becomes inconclusive; then we will require more information about the level of integration of each of the variables before reliable and consistent inferences can be drawn (Pesaran, Shin and Smith, 1999).

Secondly, the long-run and short-run models obtained from equation 2 can be written as equations 3 and 4, respectively:

$$RGDPG_t = \theta_1 LRGDPG_{t-1} + \theta_2 INF_{t-1} + \theta_3 TOP_{t-1} + \theta_4 M2_{t-1} + \theta_5 MPR_{t-1} + \theta_6 NCI_{t-1} + \theta_7 NER_{t-1} + \theta_8 ERG_{t-1} + \theta_8 BDC_{t-1} + \theta_{10} EXR_{t-1} + \varepsilon_t \quad (2)$$

And

$$\Delta LRGDP = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LRGDPG_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta INF_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta TOP_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta M2_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta MPR_{t-i} + \sum_{i=0}^{n} \alpha_{6i} \Delta NCI_{t-i} + \sum_{i=0}^{n} \alpha_{7i} \Delta NER_{t-i} + \sum_{i=0}^{n} \alpha_{8i} \Delta ERG_{t-i} + \sum_{i=0}^{n} \alpha_{9i} \Delta BDC_{t-i} \sum_{i=0}^{n} \alpha_{10i} \Delta EXR_{t-i} + \tau ECM_{t-1} \quad (4)$$

The error correction term, ECM_{t-1} captures the short-run dynamics while other parameters are as defined in equation 1.The Bounds method cannot be applied to test long-run association if any of the variables have an order of integration greater than one. Therefore, need to use the standard unit root test to determine the order of integration of the variables. We shall equally employ the Breusch-Godfrey serial correlation LM test for the diagnostic test of serial correlation on the residuals obtained from the model, and the ARCH test for heteroscedasticity, Jarque-Bera test for normality of the residual term, are conducted on the model estimated.

Table 2. Data description

Variable	Source	Description
RGDPG	CBN	Real per capita GDP growth (%)
INF	CBN	Inflation (%)
TOP	CBN	Trade openness (Total trade, exports plus imports, at current

Vol. 2, No. 06; 2018

ISSN: 2456-7760

		prices, as % of GDP).
M2	CBN	Money supply that includes all elements of M1 as well as "near money."
MPR	CBN	Monetary policy rate (%)
NCI	CBN	Net Capital Inflows (Total financial liabilities minus total financial assets, excluding foreign exchange reserves, as % of GDP)
NER	CBN	Nominal Exchange Rate(₦/US$)
ERG	CBN	Growth rate of official foreign exchange reserves in USD (%)
BDC	CBN	Bureau de change rate
EXR	CBN	Real Exchange Rate (₦/US$)

Need for testable relationships

In none of the appraisals or assessments available to date, has the depreciation of the naira been directly linked, through a functional relationship, to the results attributed to it. Generally, there have been no attempts 'to isolate the effect of exchange rate changes from those arising from other policies, especially monetary, fiscal and sect oral policies (Pesaran*et al.* (2011).

It seems desirable, therefore, to attempt to establish whether or not any significant relationships exist between the variations in the naira exchange rate and some policy-target variables in the domestic economy.

Only a simple linear relationship will be attempted here, as a first approximation to any true relationship which may, in reality, exist. The existence or non-existence of any significant relationship between variations in the nominal exchange rate and growth rates of any real output category will, therefore, depend mainly on the applicable regression coefficient, based on ordinary least squares estimates. Similarly, a simple time-trend variable will be utilized to bring out the influence of any time-trend effect which may be implicit in the data. To enable decision makers develop good adequate understanding and interlink ages of macroeconomic time series; the application of economic models and testing are relevant in explaining the dynamics of economic growth. This study therefore estimate linear dynamic model based on Pesaran*et al.* (2001) multivariate autoregressive distributed lag (ARDL) approach.

Equation (3) will be estimated using both the naira-valued output and the US dollar-valued output time series data, respectively, for the period 2000Q1-2018Q2 for real gross domestic product growth.

Vol. 2, No. 06; 2018

ISSN: 2456-7760

Table 3: Descriptive Statistics of Selected Variables 2000Q1 -2018Q2

	BDC	ERG	EXR	INF	M2	MPR	NCI	NER	PLR	RGDPG	TOP
Mean	180.2153	16.44326	163.6904	12.20196	9916881.	24.11518	13.56088	158.6396	18.31298	3.598657	34.06939
Median	152.6605	9.558430	151.4630	12.04290	9121931.	23.67721	12.69747	147.3198	17.23201	4.116674	34.76754
Maximum	472.4880	127.0423	262.9592	24.31930	24814005	31.95000	31.36986	305.9474	26.26333	11.89901	55.97633
Minimum	105.5400	-30.18358	107.1537	-1.417773	795529.1	17.99817	2.176545	99.87540	14.88137	-5.022268	14.91536
Std. Dev.	84.54475	37.85648	44.96728	4.638047	7629596.	4.034889	6.113732	56.43303	2.598986	3.612697	9.475279
Skewness	2.008261	1.082554	0.700237	0.181614	0.398545	0.199231	0.301345	1.805731	1.357184	-0.156443	0.129350
Kurtosis	5.889862	3.887666	2.198497	3.441895	1.842870	2.088497	2.677564	5.230894	4.230377	3.443923	2.506800
Jarque-Bera	75.49155	16.88323	8.028171	1.008882	6.087436	3.051298	1.440537	55.56025	27.38500	0.909477	0.956364
Probability	0.000000	0.000216	0.018059	0.603843	0.047657	0.217480	0.486622	0.000000	0.000001	0.634614	0.619909
Sum	13335.93	1216.801	12113.09	902.9450	7.34E+08	1784.524	1003.505	11739.33	1355.161	266.3006	2521.135
Sum Sq. Dev.	521790.5	104617.2	147610.1	1570.338	4.25E+15	1188.464	2728.574	232482.2	493.0950	952.7651	6554.006
Observations	74	74	74	74	74	74	74	74	74	74	74

Table 3presents the summary of descriptive statistics of the variables included in the model from (2000Q1 -2018Q2), the statistics is quite revealing. The analysis carried out shows that the standard deviation of the exchange and real GDP growth and other variables of interest. The trend of exchange rate during the period under investigation shows high degree of instability. The analysis for the skewness and kurtosis of all the variables are also presented. All the distributions are positively skewed with the exception of RGDPG that is negatively skewed.
Conversely, variables INF, MPR, NCI and RGDPG and TOP exhibit leptokurtic (slim or long tailed) characteristics with their values greater than three. The Jarque-Bera test revealed that most of the data sets (BDC, ERG, INF NER, RGDPG and TOP) are normally distributed because the probability values of the variables are greater than 5%.

Table 4: Unit Root Test

Vol. 2, No. 06; 2018

ISSN: 2456-7760

UNIT ROOT TEST RESULTS TABLE (ADF)
Null Hypothesis: the variable has a unit root

		At Level												
		RGDPG	REER	INF	TOP	M2	MPR	NCI	ERG	BDC	EXR	IBCR	NER	PLR
With Constant	t-Statistic	-0.8889	-2.5157	-4.2826	-2.6399	1.8777	-0.9556	-3.5394	-3.0788	1.0249	-2.2467	-1.7704	0.7644	-1.5397
	Prob.	*0.7862* n0	*0.1160* n0	*0.0010* ***	*0.0898* *	*0.9998* n0	*0.7647* n0	*0.0096* ***	*0.0329* **	*0.9965* n0	*0.1921* n0	*0.3922* n0	*0.9928* n0	*0.5080* n0
With Constant & Trend	t-Statistic	-3.1690	-1.9094	-4.3859	-3.8715	-2.2496	-1.3360	-3.7927	-3.2174	-0.0662	-1.5534	-1.3697	-0.7391	-1.6500
	Prob.	*0.0993* *	*0.6396* n0	*0.0042* ***	*0.0183* **	*0.4554* n0	*0.8708* n0	*0.0226* **	*0.0897* *	*0.9945* n0	*0.8016* n0	*0.8617* n0	*0.9659* n0	*0.7631* n0
Without Constant & Trend	t-Statistic	-1.0508	0.5345	-0.5325	-1.5019	4.3414	0.2129	-0.4067	-2.6930	1.4710	-2.1877	-0.8691	2.1815	-0.7086
	Prob.	*0.2621* n0	*0.8291* n0	*0.4827* n0	*0.1238* n0	*1.0000* n0	*0.7452* n0	*0.5337* n0	*0.0077* ***	*0.9639* n0	*0.0285* **	*0.3362* n0	*0.9927* n0	*0.4064* n0
		At First Difference												
		d(RGDPG)	d(REER)	d(INF)	d(TOP)	d(M2)	d(MPR)	d(NCI)	d(ERG)	d(BDC)	d(EXR)	d(IBCR)	d(NER)	d(PLR)
With Constant	t-Statistic	-8.6035	-7.3787	-7.0727	-7.4789	-10.2702	-6.0381	-13.8288	-3.0590	-2.5130	-8.1340	-7.7517	-7.3556	-6.7333
	Prob.	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0001* ***	*0.0000* ***	*0.0001* ***	*0.0346* **	*0.1170* n0	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***
With Constant & Trend	t-Statistic	-8.5840	-7.6563	-7.0163	-7.4042	-10.8627	-6.3169	-13.7413	-3.0619	-3.1302	-6.7634	-7.8037	-7.5223	-6.6916
	Prob.	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0001* ***	*0.1238* n0	*0.1079* n0	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***
Without Constant & Trend	t-Statistic	-8.6426	-7.3346	-7.1358	-7.4810	-4.2446	-6.0637	-13.8724	-3.0848	-2.1704	-7.9892	-7.7985	-7.0573	-6.7539
	Prob.	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0025* ***	*0.0298* **	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0000* ***

Notes:
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Lag Length based on SIC
c: Probability based on MacKinnon (1996) one-sided p-values.

Table 5: Correlation matrix of the selected variables

	BDC	*ERG*	*EXR*	*IBCR*	*INF*	*M2*	*MPR*	*NCI*	*NER*	*PLR*	*REER*	*RGDPG*	*TOP*
BDC	1												
ERG	-0.10608	1											
EXR	-0.32454	0.236472	1										
IBCR	0.044198	0.215125	0.668258	1									
INF	0.267467	0.163109	0.219372	0.203689	1								
M2	0.795365	-0.30741	-0.7701	-0.3113	-0.03443	1							
MPR	0.553992	-0.29908	0.146831	0.538886	0.168313	0.411097	1						
NCI	0.061359	0.270736	-0.56169	-0.38139	-0.19958	0.316102	-0.32321	1					
NER	0.96591	-0.09392	-0.41551	-0.042	0.203808	0.847502	0.523617	0.189388	1				
PLR	-0.2439	-0.04558	0.839739	0.703688	0.225301	-0.58079	0.460938	-0.58018	-0.32414	1			
REER	0.148425	0.100203	-0.56126	-0.72638	-0.00683	0.246114	-0.61062	0.550388	0.237217	-0.66077	1		
RGDPG	-0.75641	-0.0051	0.529934	0.14255	-0.03921	-0.79138	-0.27138	-0.12982	-0.7385	0.549465	-0.15051	1	
TOP	-0.66955	0.466642	0.395992	-0.06133	-0.11151	-0.68159	-0.57214	0.02582	-0.64393	0.083179	0.033994	0.435269	1

Table 5 presents the correlation matrix which shows the magnitude and sign of the relationship between each pair of variables selected. A negative sign of a correlation coefficient shows evidence of inverse relationship between the two variables. From the correlation matrix, there exists a strong positive relationship between real gross domestic product growth and real exchange rate variations of about 52.99% during whole period study. In summary, there exists a positive correlation between real exchange and output during whole period and the period of

Vol. 2, No. 06; 2018

ISSN: 2456-7760

exchange rate deregulation.. The relationship between TOP and EXR is 39.9%, while NCI and EXR is negatively correlated with 41,55 percent and NER and M2 is 84.75 percent.

Table 6: VAR Lag Order Selection Criteria

Endogenous variables: D(RGDPG)
Exogenous variables: C D(INF) D(TOP) D(M2) D(MPR) D(NCI) D(ERG) D(BDC()) D(NER()) D(PLR)
Date: 10/06/18 Time: 09:03
Sample: 2000Q1 2018Q2
Included observations: 69

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-120.7739	NA	2.597963	3.790549	4.114333*	3.919005
1	-120.6250	0.250330	2.664682	3.815219	4.171381	3.956520
2	-120.3750	0.413048	2.725502	3.836958	4.225498	3.991105
3	-119.6644	1.153509	2.751163	3.845345	4.266264	4.012337
4	-114.5752	8.113228*	2.446480*	3.726817*	4.180114	3.906655*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 6 above presents the optimal lag structure of the variables with difference of the real GDP growth as the exogenous variable and the other variables as exogenous. There are several criterions for choosing the optimal lag length in a time series. In this case, lag length four was selected. In Table 6 (*) indicates lag order selected by the criterion. The discrimination function differs from one to another criterion.

Estimation and Testing of ARDL Model

The ARDL is a famous technique that allows researchers to simultaneously estimate the short-run and long-run coefficients of model. To systematically examine the long-run and short-run relationships between economic growth and its focus variables, the parametized version of ARDL model (Pesaran et al., 2001) with lag four is estimated. After the estimation of the parsimonious ARDL (1, 0, 3, 3, 1, 3, 0, 2, 1, 3) model, the model was tested for various and diagnostic and stability tests to show the robustness and the reliability of the model fitted. The model fitted was tested for serial correlation (Breusch-Godfrey serial correlation LM test), for heteroskedasticity (Breusch-Pagan-Godfrey), for normality (Jarque-Bera test), and for specification error (Ramsey RESET test), respectively. The results of all the diagnostic tests

Vol. 2, No. 06; 2018

ISSN: 2456-7760

conducted in this paper are presented in Table 9. The diagnostic tests indicate that the residuals are serially uncorrelated, homoskedastic, normally distributed based on Breusch-Godfrey serial correlation LM test, and Jarque-Bera test, respectively. Clearly, it implies that the model is very robust and can be used for policy recommendations and decision making. The result also confirmed that the model is well specified on the basis of the Ramsey RESET test. The existence of a stable and predictable relationship is considered a necessary condition for the formulation of economic policy strategies. Instability of a model could result from inadequate modeling of the short-run dynamics characterizing departures from the long-run relationship. Thus, it is important to include the short-run dynamics for constancy of long-run parameters. In view of this we apply CUSUM and CUSUM-of-squares (CUSUM-SQ) test, developed by Brown *et al*. (1975) (see Figure 2).

Table 7: ARDL(p,q) model developed

Dependent Variable: D(RGDPG)
Method: ARDL
Date: 10/16/18 Time: 10:53
Sample (adjusted): 2001Q1 2018Q2
Included observations: 70 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): D(BDC) D(ERG) D(INF) D(M2)
D(MPR) D(NCI) D(NER) D(TOP) D(EXR)
Fixed regressors: C
Number of models evalulated: 262144
Selected Model: ARDL(1, 0, 3, 3, 1, 3, 0, 2, 1, 3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(RGDPG(-1))	-0.304145	0.129974	-2.340041	0.0240
D(BDC)	-0.027154	0.011798	-2.301494	0.0263
D(ERG)	0.018019	0.015140	1.190222	0.2405
D(ERG(-1))	-0.016619	0.016032	-1.036605	0.3057
D(ERG(-2))	-0.006176	0.015391	-0.401300	0.6902
D(ERG(-3))	-0.023677	0.014437	-1.640000	0.1083
D(INF)	-0.027374	0.064684	-0.423186	0.6743
D(INF(-1))	0.056667	0.064757	0.875067	0.3864
D(INF(-2))	-0.050765	0.058325	-0.870368	0.3889
D(INF(-3))	0.131352	0.056877	2.309403	0.0258
D(M2)	-4.03E-07	2.82E-07	-1.429285	0.1601
D(M2(-1))	-4.11E-07	2.81E-07	-1.461894	0.1510

Vol. 2, No. 06; 2018

ISSN: 2456-7760

D(MPR)	-0.044051	0.214930	-0.204956	0.8386
D(MPR(-1))	0.337892	0.211899	1.594594	0.1181
D(MPR(-2))	0.066698	0.231048	0.288675	0.7742
D(MPR(-3))	0.695685	0.213640	3.256335	0.0022
D(NCI)	-0.007709	0.035766	-0.215527	0.8304
D(NER)	0.082381	0.029122	2.828854	0.0071
D(NER(-1))	0.041357	0.028502	1.451030	0.1540
D(NER(-2))	0.073464	0.029023	2.531281	0.0151
D(TOP)	-0.032411	0.042277	-0.766624	0.4475
D(TOP(-1))	-0.076592	0.043742	-1.750992	0.0871
D(EXR)	-0.131468	0.041904	-3.137396	0.0031
D(EXR(-1))	-0.070765	0.041635	-1.699642	0.0964
D(EXR(-2))	-0.127854	0.041681	-3.067445	0.0037
D(EXR(-3))	-0.063794	0.022289	-2.862192	0.0065
C	-1.019080	0.364398	-2.796610	0.0077

R-squared	0.602054	Mean dependent var	-0.077561
Adjusted R-squared	0.361435	S.D. dependent var	1.527569
S.E. of regression	1.220684	Akaike info criterion	3.520834
Sum squared resid	64.07303	Schwarz criterion	4.388111
Log likelihood	-96.22919	Hannan-Quinn criter.	3.865327
F-statistic	2.502106	Durbin-Watson stat	2.037586
Prob(F-statistic)	0.003743		

*Note: p-values and any subsequent tests do not account for model selection

The bounds test was conducted to show evidence of long run relationship. From the test, we observed existence of co integration relationship among the variables.

Table 8: ARDL Bounds Test

Date: 10/15/18 Time: 09:10
Sample: 2000Q4 2018Q2
Included observations: 71
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	7.544219	10

Vol. 2, No. 06; 2018

ISSN: 2456-7760

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.83	2.94
5%	2.06	3.24
2.5%	2.28	3.5
1%	2.54	3.86

The ARDL Bounds Test showed existence of cointegration relationship among the variables with F-statistics of 7.544219 greater than I (0) and I(1) bound of 2.06 and 3.24, respectively at 5 percent significant level.

Table 9ARDL (4, 3, 3, 4, 4, 2, 4, 4, 3, 4, 4, 4) Diagnostic Tests

Test	**F-Statistic**	**P-Value**
Serial Correlation: Breusch-Godfrey serial correlation LM test	1.707051	0.2244
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.341477	0.9977
Normality: Jarque-Bera test	7.949499	0.0187
Specification Error: Ramsey RESET test	1.034350	0.3277

Table 10: Short Run Model

Dependent Variable: (D(RGDPG)
Method: Least Squares
Date: 10/16/18 Time: 11:41
Sample (adjusted): 2001Q2 2018Q2
Included observations: 69 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDC)	-0.005466	0.013133	-0.416209	0.6788
D(ERG)	-0.019014	0.016695	-1.138915	0.2594
D(INF)	0.168364	0.076949	2.187990	0.0327

Vol. 2, No. 06; 2018

ISSN: 2456-7760

D(M2)	-4.43E-07	3.49E-07	-1.270039	0.2091
D(MPR)	0.043577	0.231555	0.188194	0.8514
D(NCI)	0.057507	0.043996	1.307098	0.1963
D(NER)	0.004153	0.034527	0.120274	0.9047
D(TOP)	-0.049891	0.053252	-0.936889	0.3527
D(EXR)	-0.045225	0.046633	-0.969812	0.3362
ECM(-1)	-1.399515	0.240957	-5.808148	0.0000
C	0.056769	0.301541	0.188264	0.8513

R-squared	0.457502	Mean dependent var	-0.006401
Adjusted R-squared	0.363968	S.D. dependent var	2.206393
S.E. of regression	1.759634	Akaike info criterion	4.113266
Sum squared resid	179.5861	Schwarz criterion	4.469428
Log likelihood	-130.9077	Hannan-Quinn criter.	4.254567
F-statistic	4.891283	Durbin-Watson stat	2.702761
Prob(F-statistic)	0.000042		

The results of the model estimated above measure the short-run dynamic effects and the long-run equilibrium relations the selected variables. From the output presented in Table 7 above, degree of openness is important in explaining economic growth in Nigeria and influences economic growth during the whole period and the period of exchange rate deregulation.

The variable of interest is the real exchange rate. Interestingly, the negative sign of the coefficient

during the whole period and the period of exchange rate regulation regime is not consistent with economic theory. An increase in real exchange rate by 1% led to a decrease in economic growth by 13.1% and at lag 1, a unit depreciation in exchange rate will led to a decrease in economic growth 7.65%. This implies that depreciation of the currency in Nigeria does not stimulate economic activities. This finding supported you gbaré (2008) stdy, who claimed that that fixed exchange rates constrain the ability of the economy to adjust to shocks and volatility. The model equally shows that increase in nominal exchange rate by 1% led to an increase in economic growth by 0.08% during the period of exchange rate deregulation regime in Nigeria. This suggests that exchange rate depreciation stimulates economic growth during period of exchange rate deregulation regime and it is in consonance with the aspirations of policy makers in the adoption of exchange rate reforms. This finding justifies policy of the Bank on exchange rate. These findings is in line with Levy-Yeyati and Sturzenegger (2003) who argue that for developing countries, less flexible exchange rate regimes are associated with slower growth, as well as with greater output volatility and for industrial countries. A unit increase in the bureau de change rate which is depreciation will reduce the economic activities by 0.027. This result also shows the effect of inflation on economic growth, is relevant for monetary policy formulation as it shows that monetary authority in Nigeria needs to consider inflation threshold for the country in the process of targeting single digit inflation as one of its major objectives. The

Vol. 2, No. 06; 2018

ISSN: 2456-7760

ARDL(1,0,3,3,1,3,0,2,1,3) model indicates that over 60 percent of the variations in growth real gross domestic product output were captured by the explanatory variables in the model. Each of the individual coefficients of the explanatory variables also show the expected a priori signs suggesting that while exchange rate and Inflation tends to reduce growth in economic activities.

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	2.792857	(11, 55)	0.0059
Chi-square	30.72143	11	0.0012

Null Hypothesis: C(2)=C(3)=C(4)=C(5)=C(6)=C(7)=C(8)=C(9)=C(10) =C(11)=C(12)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	-0.006746	0.044490
C(3)	0.063639	0.041268
C(4)	-0.048542	0.035383
C(5)	-2.74E-07	2.34E-07
C(6)	-0.158270	0.170506
C(7)	0.315243	0.152099
C(8)	0.044968	0.028254
C(9)	-0.025366	0.010595
C(10)	-0.017433	0.008519
C(11)	-0.016507	0.008432
C(12)	0.000838	0.012700

Restrictions are linear in coefficients.

Vol. 2, No. 06; 2018

ISSN: 2456-7760

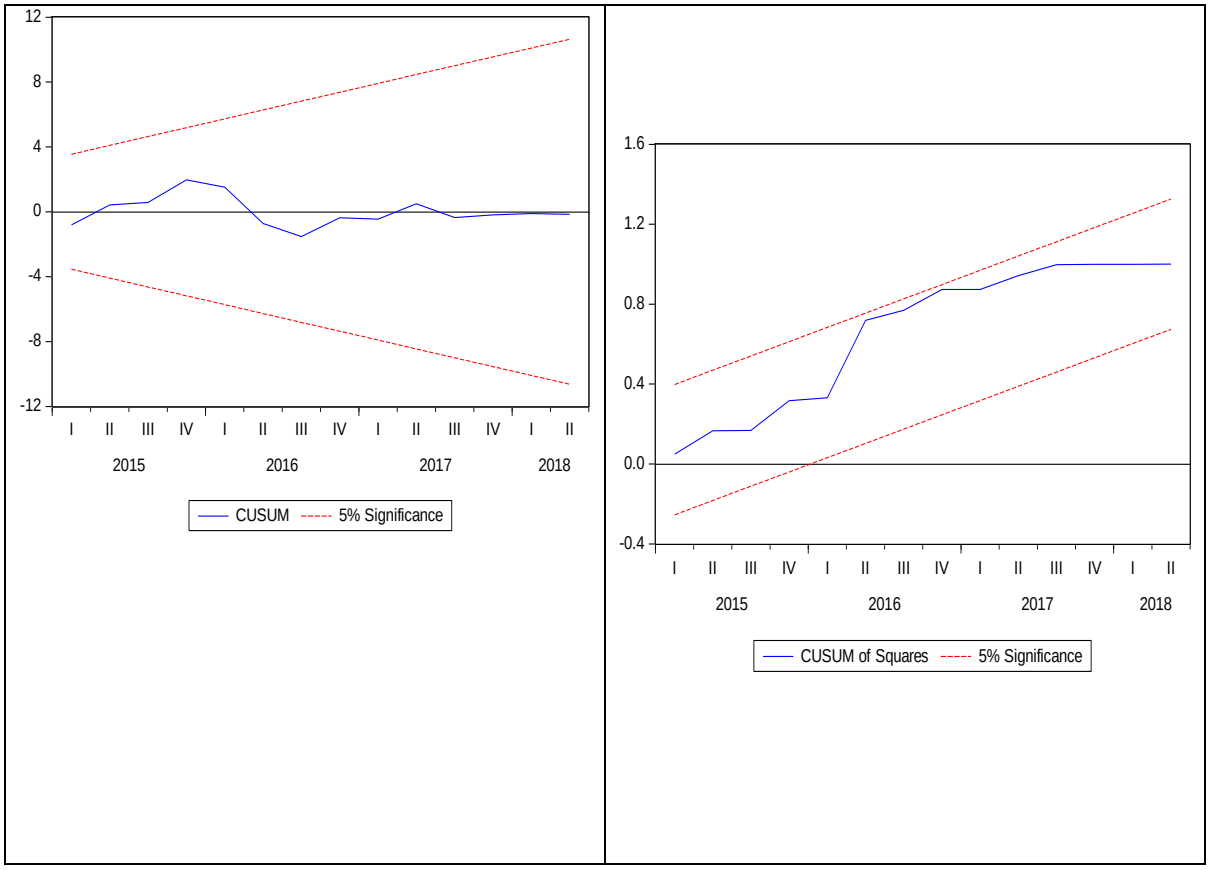


Figure 2. Cumulative Sum of Recursive Residuals and of Squares of Recursive Residuals for the RGDPG Model

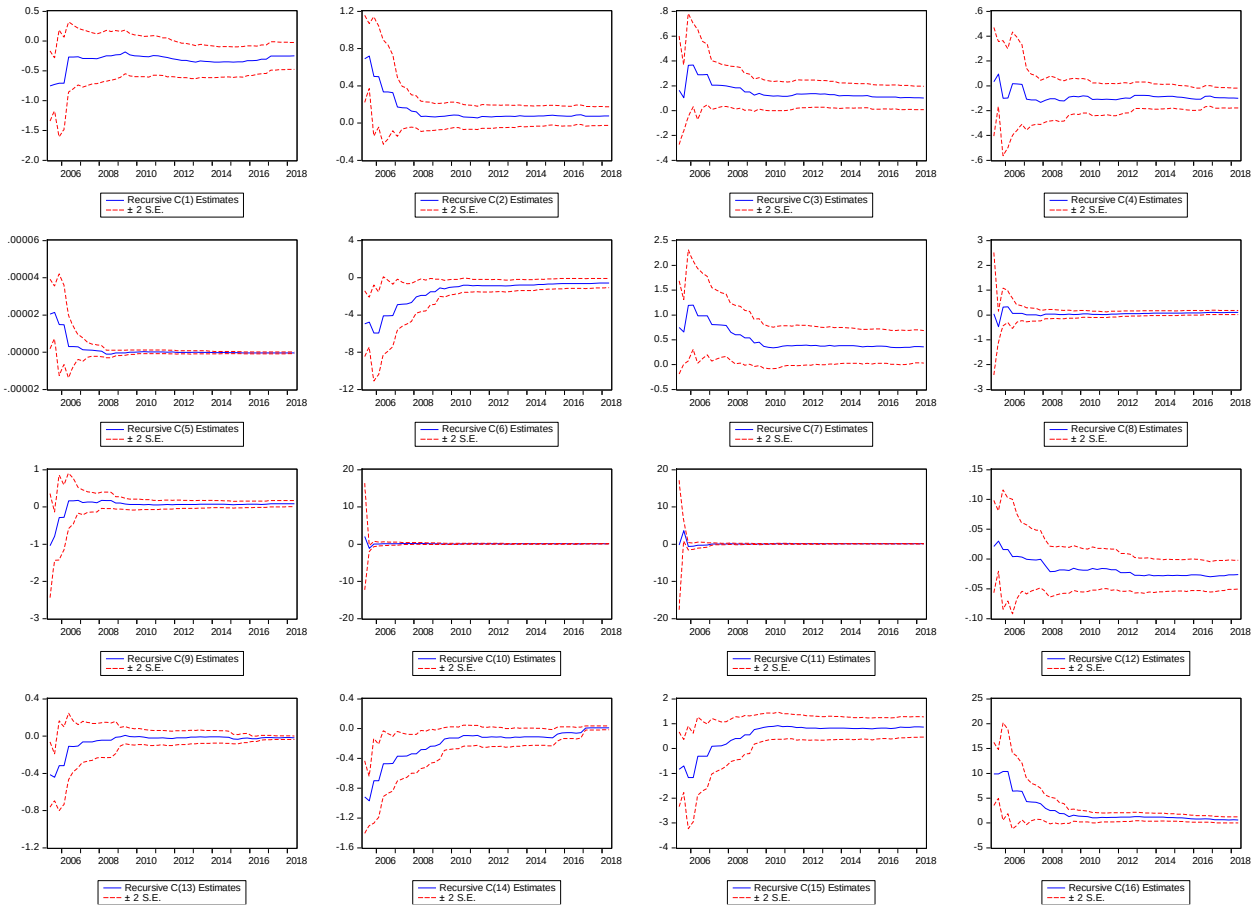
Before drawing conclusions from the estimated ARDL model, a stability test was conducted to make sure that the assumptions of the classical linear regression model were satisfied. The tests results showed no incident of instability in the variables used, as the residual variance remained generally stable within a 5 percent critical band (Figures 2a - CISUM and 2b -CUSUM of squares). The bands represent the bounds of the critical region for a test at the five-percent significance level. Under the null hypothesis, the statistic is drawn from a distribution, called the CUSUM distribution. If, the calculated CUSUM statistics appear to be too large to have been drawn from the CUSUM distribution, we reject the null hypothesis (of model stability).

Stability Diagnostics -Recursive estimation -recursive coefficients

From the output box, we conducted the "Stability Tests", "Recursive Estimates", and "Recursive Coefficients". This will give use the option of the subset of the coefficients will like to look at. The output will be a graph of each of the recursive coefficient estimates (and a 95-percent confidence interval, i.e., a two-standard error band) as T changes.

Vol. 2, No. 06; 2018

ISSN: 2456-7760



Coefficient diagnostics -

Coefficient Confidence Intervals
Date: 10/16/18 Time: 11:08
Sample: 2000Q1 2018Q2
Included observations: 70

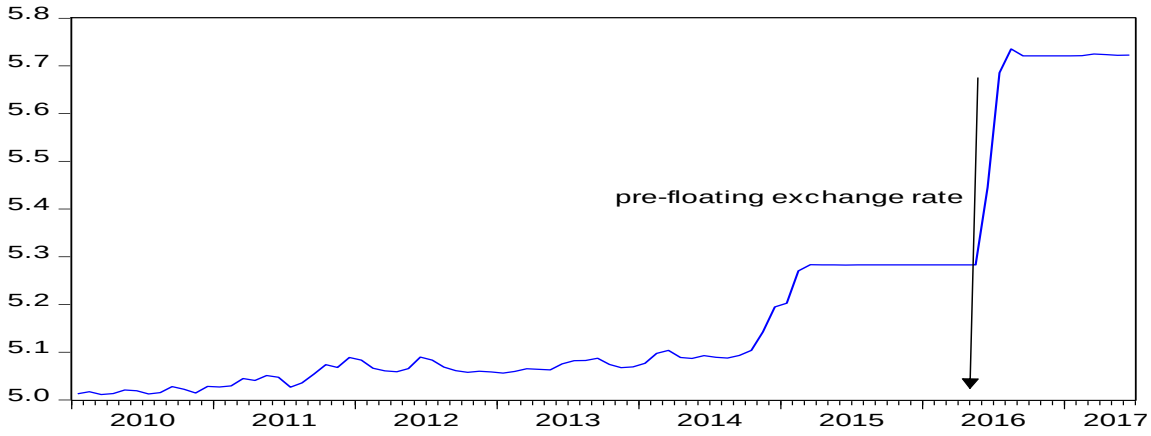
		90% CI		95% CI		99% CI	
Variable	Coefficient	Low	High	Low	High	Low	High
D(RGDPG(-1))	-0.304145	-0.522640	-0.085649	-0.566262	-0.042027	-0.654438	0.046149
D(BDC)	-0.027154	-0.046987	-0.007320	-0.050947	-0.003360	-0.058951	0.004644
D(ERG)	0.018019	-0.007431	0.043470	-0.012512	0.048551	-0.022783	0.058822
D(ERG(-1))	-0.016619	-0.043570	0.010332	-0.048951	0.015713	-0.059827	0.026589
D(ERG(-2))	-0.006176	-0.032049	0.019697	-0.037215	0.024862	-0.047656	0.035303

Vol. 2, No. 06; 2018

ISSN: 2456-7760

D(ERG(-3))	-0.023677	-0.047947	0.000593	-0.052792	0.005438	-0.062586	0.015233
D(INF)	-0.027374	-0.136112	0.081365	-0.157822	0.103075	-0.201704	0.146957
D(INF(-1))	0.056667	-0.052194	0.165528	-0.073928	0.187261	-0.117860	0.231193
D(INF(-2))	-0.050765	-0.148814	0.047285	-0.168389	0.066860	-0.207958	0.106428
D(INF(-3))	0.131352	0.035738	0.226966	0.016649	0.246055	-0.021937	0.284641
D(M2)	-4.03E-07	-8.77E-07	7.10E-08	-9.71E-07	1.66E-07	-1.16E-06	3.57E-07
D(M2(-1))	-4.11E-07	-8.84E-07	6.16E-08	-9.78E-07	1.56E-07	-1.17E-06	3.47E-07
D(MPR)	-0.044051	-0.405363	0.317261	-0.477498	0.389396	-0.623308	0.535206
D(MPR(-1))	0.337892	-0.018324	0.694108	-0.089442	0.765226	-0.233196	0.908980
D(MPR(-2))	0.066698	-0.321710	0.455106	-0.399255	0.532651	-0.556000	0.689396
D(MPR(-3))	0.695685	0.336540	1.054829	0.264838	1.126532	0.119902	1.271467
D(NCI)	-0.007709	-0.067835	0.052417	-0.079839	0.064421	-0.104103	0.088686
D(NER)	0.082381	0.033426	0.131337	0.023652	0.141111	0.003895	0.160868
D(NER(-1))	0.041357	-0.006557	0.089271	-0.016122	0.098837	-0.035458	0.118173
D(NER(-2))	0.073464	0.024675	0.122253	0.014935	0.131994	-0.004755	0.151683
D(TOP)	-0.032411	-0.103482	0.038660	-0.117671	0.052850	-0.146353	0.081531
D(TOP(-1))	-0.076592	-0.150126	-0.003059	-0.164807	0.011622	-0.194482	0.041297
D(EXR)	-0.131468	-0.201911	-0.061025	-0.215974	-0.046961	-0.244402	-0.018534
D(EXR(-1))	-0.070765	-0.140756	-0.000773	-0.154730	0.013200	-0.182976	0.041446
D(EXR(-2))	-0.127854	-0.197922	-0.057785	-0.211911	-0.043796	-0.240188	-0.015520
D(EXR(-3))	-0.063794	-0.101263	-0.026326	-0.108744	-0.018845	-0.123865	-0.003724
C	-1.019080	-1.631659	-0.406501	-1.753959	-0.284201	-2.001170	-0.036989

Figure 1: Nominal Exchange Rate



The figure 1 above represents the graph of the nominal exchange rate. From the graph, the nominal exchange rate was relatively stable between 2010 and third quarter of 2014 when it trended upwards as a result of devaluation. It stabilised however in the first quarter of 2015 till June 2016 when it spiralled again as a result of the adoption of the current exchange rate regime.

Vol. 2, No. 06; 2018

ISSN: 2456-7760

Figure 2 shows the movement in real GDP over the same period. The real GDP showed series of expansions in the period under review.

Figure 2: Movement in GDP

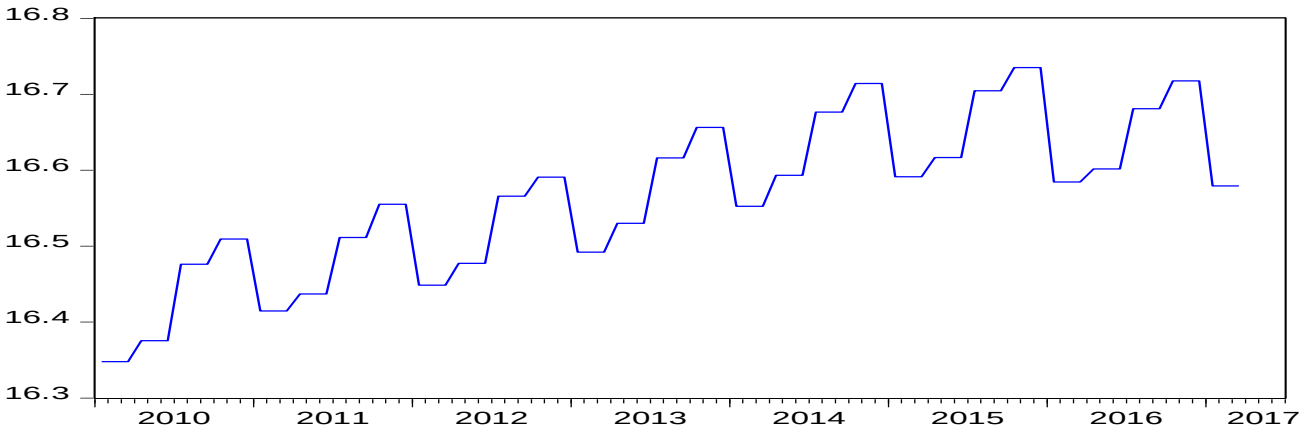


Figure 2 shows the movement in real GDP over the same period. The real GDP showed series of expansions in the period under review.

The channels for such adverse effects on oil GDP growth are not readily obvious, but there may possibly be production costs (for labour, capital, overheads and materials) which tend to rise with currency depreciation in terms of domestic currency. Also, the usual increased capital flight in periods of rapid currency depreciation may lead to a reduction in the level of oil field operations. Whatever the channels, however, this apparent adverse effect of currency depreciation calls for attention on the part of policy makers.

Implications of the Results for the Nigerian Economy

The impact of exchange rate on domestic output growth in any economy can never be overemphasized. From the study, the impact of decrease in exchange rate onoutput growth is enormous. This is because the prices of goods and services due to swing in exchange rate will impact adversely on the domestic prices and imports of intermediate goods which would adversely affect economic growth and development. Thus, this implies that a depreciation of the domestic currency exerts shock to the foreign exchange and market prices will increase inboth the primary and secondary market. From the result, the most outstanding finding is the negative sign of the coefficients of all the important explanatory variables, exchange rate variation and the inflation variable on the estimated model. The overall implication seems to be that there has been a general tendency in the Nigerian economy for Naira appreciation to promote output growth and vice-versa.

Vol. 2, No. 06; 2018

ISSN: 2456-7760

Another exceptional feature of the results is the statistical insignificance of all the coefficients of the explanatory variables in the equation fitted. The applicable value of R^2 in the respective cases also attests to the lack of explanatory power of this equation. In addition, the results also demonstrated the prevailing, significant inverse relationship between output growth and exchange rate variations in the estimated equations involving dollar-valued GDP categories. A supportive feature is the consistently negative sign of the depreciation parameter, which tests significantly at 10 per cent level. It may be noted here that the exchange rate parameter in each of the estimated equations is a kind of partial output elasticity coefficient in regard to exchange rate variations. Thus, its negative sign and its absolute value imply that a one per cent depreciation or appreciation of the naira exchange rate, ceteris paribus, would tend to result in a decrease or an increase of less than one per cent in output. Hence, contrary to the theoretical expectation, the domestic output of the Nigerian economy tends to grow less with naira depreciation and more with naira appreciation, when output is measured in US dollars, at least for the period covered. If this is taken to be indicative of the true relationship which exists between domestic output and nominal naira exchange rate variation, because of the much lower variability of the US dollars vis-à-vis the naira during the period, Nigeria should be wary of depreciating her currency especially as rapidly as was observed during SAP era of 1986, unless the economy is adjudged to be overheated. Imports tend to be more expensive with flexible exchange rate that has brought about depreciation of naira and less with currency appreciation, which may be due to the high import dependence of the economy, especially for capital goods. As noted before, generally rising costs of production and increased capital flight usually associated with a period of expected currency depreciation may also contribute to this effect. These are, of course, matters for further investigation.

Concluding Remarks

The study examined the dynamics of Nigeria exchange rate and its implications on domestic output and growth using Perasan *et al.* (2001) ARDL model for Bounds testing approach to co integration. The empirical analysis based on the bounds testing approach, supports the stable output model with dynamics of Nigeria exchange rate for Nigeria. In the long-run output model can only be firmly established when inflation rate, exchange rate, trade openness, money supply, net capital inflows, are included in the model. The nominal exchange rate is shown to be positively associated withM2 (Broad Money) with 84.75 %.

However, the inflation rate and exchange rate were found to negatively affect Real Gross Domestic Product per Capita (RGDPG) and Broad Money supply (M2). The inflation rate having a negative effect on Broad money leads credence to economic theory that: as the inflation rate increases, the demand for money falls. Giving weight to the substitution of physical assets for money balances. Stability were carried out using the CUSUM and CUSUMSQ tests to the stability of the model finding that the model is more stable when inflation rate, exchange rate, net capital inflows and trade openness are included in the model.

Vol. 2, No. 06; 2018

ISSN: 2456-7760

The study also examined the relationship between the exchange rate and interest rate which have implications for investment. Grounded on the theory of international trade and exchange rate management, flexible exchange rate is expected to promote domestic output growth in an economy.

All the results did not satisfy priori expectations. Thus researchers and policy makers need to be careful in using currency depreciation as a policy instrument for enhancing domestic output in the Nigerian economy. The findings further revealed that there is a negative relationship between growth in real GDP and the nominal exchange rate. This means that the flexible exchange rate had a contractionary effect on output. However, the study found no evidence of a significant relationship between the exchange rate and inflation in the period under review. The inflationary pressures in the economy are due to some other factors other than the exchange rate.

Consequently, the need for both fiscal and monetary policy strengthened is essential as collaboration is needed to ensure that inflation is curtailed and promote economic growth with proactive measures. It is also important to point out that dwindling export exerts pressure on the exchange rate. It is recommended that policy should focus on increasing the share of non-oil exports in order to improve the resilience of the economy to shocks arising from distortions in crude oil production and export. In addition,

i. Law makers should create policies that support increase productivity in the economy by creating an enabling environment for Investors and making provision grants to businesses in the agricultural and manufacturing sectors. This in turn would lead to exchange rate appreciation.

ii. The Central Bank of Nigeria is should be encouraged to accrue foreign exchange reserves. By increasing the level of reserves the Central bank would be able to defend the Naira against speculative attacks. The stability of the Naira in 2018 has mainly been attributed to the increase in the level foreign exchange reserves since December 2017. This has enhanced the ability of CBN in meeting foreign exchange demand.

iii. Government should encourage investment in order to raise production. Public investment should take the form of increased spending on infrastructural development. This in turn would encourage the private sector to make investments and hence lead to increased profitability.

iv. Monetary authorities should accommodate moderate levels of inflation. This is to encourage producers to expand production of goods and services. Eventually in the long-run this would lead to the appreciation of the Naira.

v. The federal government should reduce the amount of recurrent expenditure in order to increase capital expenditure. This would encourage an appreciation of the Naira.

Finally, the federal government should ensure the cost of ease of doing business is improved by improving power supply and generation. Lawmakers should also make laws that protect investors in order to encourage both domestic and foreign investment from corrupt practices.

Vol. 2, No. 06; 2018

ISSN: 2456-7760

vi. Lawmakers and policymakers should encourage exports by reduction/ abolition of excise duties and reducing the value added tax (VAT).

vii. The central Bank of Nigeria Should liberalize Interest rates so as to encourage the inflows of capital. This would lead to exchange rate appreciation.

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Vol. 2, No. 06; 2018

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