THE DYNAMICS OF OUTPUT GROWTH AND INVESTMENTS IN NIGERIA: DO EXCHANGE RATE MOVEMENTS/FLUCTUATION MATTER?

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ABSTRACT

This study examined the effect of exchange rate movements/fluctuations on output growth and investments in Nigeria between 1980 and 2016 using time series monthly data. The Non-Linear Autoregressive Distributed Lag Modelling approach to Cointegration was employed to capture the interactions and effects between the variables. The analysis revealed the stationarity of the variables at the levels, first difference and established the existence of long run relationships among the variables. The findings of the asymmetric and symmetric effects revealed the significance of exchange rate movements/fluctuations for exports and investments in the Nigerian economy. Thus, the results showed that exchange rate movement has a negative significant effect with gross domestic product, traded export, import and investments, while trade balance, interest rate and inflation all have positive and significant effects on exchange rate fluctuations. The outcomes of the result imply that government and monetary authorities should adopt appropriate policy in appreciating the value of the naira, reduce borrowing and lending charges to attract foreign investors and boost the performance of domestic and foreign investments opportunities and even promote economy diversification so as to increase growth in investment industries, total export and national output in the country.
Keywords: Exchange Rate Movements, Exports, Investments, Time Series, NARDL bounds test, and Error Correction Model.

International Journal of Economic Development Volume 13, Number 1, pp. 1-36, 2019

INTRODUCTION

The introduction of Structural Adjustment Programme (SAP) in 1986 was occasioned by the persistent fluctuations of the exchange rate, fall in output growth and investments activities, among other reasons. At that time, Nigeria changed from a fixed exchange rate regime to adopting a floating/flexible exchange rate regime where the forces of demand and supply determine the value of the domestic currency. However, since Nigeria floated her currency against other major currencies of the world by adopting a market determined exchange rate system via the foreign exchange market, the naira exchange rate has exhibited signs of continuous depreciation and instability. This fluctuation and continued depreciation of the naira in the foreign exchange market has resulted in declined investments, output growth, employment, unfavourable balance of payments, rising public debts, depletion of foreign reserves, decline in the standard of living, and increased cost of production which is being passed to the consumers in form of higher prices, among other economic hiccups that led to recession and oil price slump in Nigeria recently. It has also tended to undermine the international competitiveness of domestic products in terms of investment activities and make planning and projections difficult at both micro and macro levels of the economy (Adelowokan, Adesoye & Balogun, 2015).

Hence, the 1980s witnessed increased flows of investment and output around the world. It is apt to note that despite these witnessed increased in terms of investment flows to developing countries in the 80s and many other economic challenges, Nigeria has remained one of the most sought after destinations for foreign direct investment (FDI) and other forms of investments. In 2014, Nigeria occupied the first position in FDI capital attraction and the second highest in FDI related new projects in Sub-Saharan Africa

(SSA) (Ernst and Young, 2014). Given the significant role of FDI, other forms of investments and output growth in the developing economies, there have been several studies that tried to determine the factors that influence investment and output growth in the Nigerian economy. One of such factors is the exchange rate and its continuous movements/fluctuations in the foreign exchange market. The existing literature has been spilt on this issue with some studies finding positive effect of exchange rate movements (Amassoma & Odeniyi, 2016; Danmola, 2013) and others finding a negative effect (Adelowokan et al., 2015; Ajayi et al, 2016; Asmah & Andoh, 2013) or no effect (Aizenmann, 1992; Sung and Lapan, 2000).

Perhaps, part of the controversy may be due to the methodology and scope in terms of approaches and data periods. Nevertheless, even with the widely investigated past studies on the role of exchange rate fluctuations on investment and output growth, there is hardly any evidence on the distributional effects of exchange rate movements on investment and national output growth in Nigeria. Similarly, while most of the past studies adopted standard deviation, Ordinary Least Square, Vector Autoregressive, VECM and ARDL approaches by using the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models, others neglected exchange rate volatility measure before proceeding to estimation for its effect. This study, however, contributes to the existing literature by exploring the distributional impacts of exchange rate movements on investment and output growth in Nigeria by employing the nonlinear auto-regressive distributed lag (NARDL) modelling approach to co-integration that is different from previous approaches in terms of methodology. The advantage of the approach is that it can be applied regardless of whether variables have a unit root or are covariance stationary. Furthermore, the method corrects for endogeneity, serial correlation and allows for possibly

asymmetric (i.e. nonlinear) adjustments of investments and output growth to movements in exchange rate and other macroeconomic variables. In other words, increases and decreases in other variables are allowed to affect investment and output growth differently which some previous approaches neglected.

In addition, the import-dependent nature of the Nigerian economy makes her be at the mercy of the developed countries and international organizations at large thereby making her highly susceptible to external shocks. The price of Nigeria's primary export product (crude-oil) is quoted in US dollar instead of the domestic economy. The implication of this is that there will be high demand for the US dollar at the expense of the Nigerian naira thereby leading to the appreciation of dollar against naira. Consequently, Nigeria's currency (naira) is not spared from fluctuation which is often instigated by shocks in foreign economies especially her trading partners. In recent times, the Nigerian currency (Naira) depreciated greatly that the exchange rate stood at over ₦500 to 1USD (Oniore et al., 2016). Furthermore, the renewed emphasis on the production of alternatives to fossil-fuel energy, such as solar, wind and bioenergy in the advanced economies, has reduced crude oil demand, and consequently caused its price to slump from about $120 per barrel to below $40 per barrel between mid-2014 and late 2015 and hovers around $50 at the moment which further weakens Nigeria's foreign earnings. This and other factors like the declining external reserves, and political uncertainty, among others pushed the Dollar-Naira exchange rate to cross the 500 Naira mark in recent times for the first time in history of the nation.

This further revealed that Nigerian economy is excessively exposed to external shocks in oil prices and exchange rate movements. Therefore, estimating the net impacts of exchange rate fluctuations on investment and output growth becomes an empirical question which must be

approached very carefully, because potential issues of reverse causality, selection bias, and omitted variable bias that can lead to spurious results and wrong policy directions. It is against this background that this study empirically investigates the effects of exchange rate fluctuations on investment and output growth in Nigeria from 1980 to 2016. Hence, the problem here is to examine the relationships between exchange rate, investment and output growth and investigate whether exchange rate movements is a key driver of investment and output growth in Nigeria.

Therefore, the objective of this paper is to analyze the impact of exchange rate movements on investment and output growth in Nigeria between 1980 and 2016 given the low and persistent fall of investment and development in the country. Nigeria has the largest economy in Africa and its role in the continent has been growing significantly due to the increase in GDP, FDI flows, its openness to international trade and fluctuations in exchange rate in the past years. With an estimated population of 184 million in 2016*,* Nigeria is the most populous country in Africa and the seventh most populated country in the world (CIA World Fact Book, 2015*)*.[1] Consequently, the assumption is that Nigeria's fall in output and investment incomes and even fluctuations in exchange rate might influence the continents and global sustainable development in terms of investment flows and output growth. In addition, there are rising public concerns about the socioeconomic outcomes of high fluctuations in exchange rate particularly in the aftermath of the recent global slump in oil prices which confirms Nigeria to be susceptible to oil price shocks. Thus, this study seeks to determine whether the interaction between exchange rate movements, investments and output growth holds in the Nigerian data.

[1] The population of Nigeria represents 2.35 percent of the world´s total population which arguably means that one person in every 43 people on the planet is a resident of Nigeria.

Thus, the rest of the paper proceeds as follows: Section two presents some stylized facts on the Nigerian economy. The review of the literature is the focus of section three, while the methodological approach to the analysis of the paper is discussed in section four. Section five presents and interprets the empirical results. The conclusion and policy implications are drawn in section six.

STYLIZED FACTS ON EXCHANGE RATE FLUCTUATIONS, INVESTMENT AND ECONOMIC GROWTH

Figures 1 and 2 show the trends of exchange rate movements, real GDP output growth and total investments variables for the Nigerian economy from 1980 to 2016. It is obvious from figure 2 that the value of the Nigerian Naira to the US dollar stood at ₦0.61/US$1 while real GDP stood at ₦15258 billion in 1981. Also, exchange rate depreciated gradually from ₦0.61/US$1 in 1981 to ₦0.7649/US$1 in 1984. Investments in similar way declined from 20% as a share of GDP to 18.5% in 1983, and this affected real GDP too as the Nigerian economy recorded negative growth during this period as real GDP and total investments fell steadily to ₦13, 779 billion in 1984 and 18.5% in 1983.

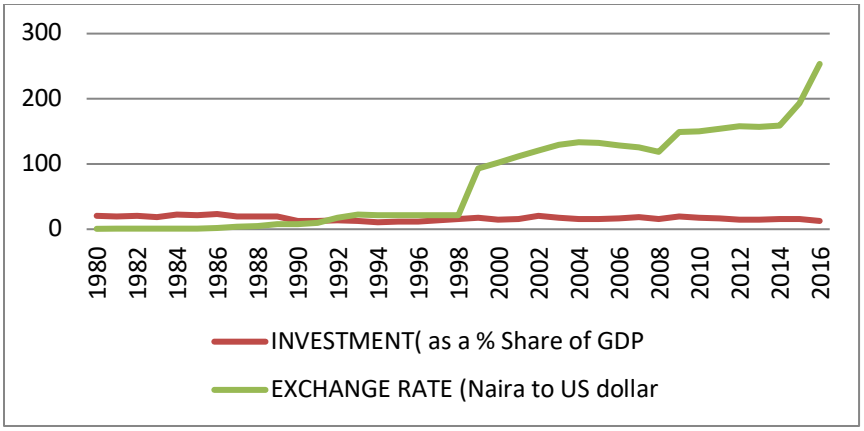

Fig. 1 Trends of Exchange Rate and Investments as a share of GDP in Nigeria (1980 -2016).
Source: Authors' Computation.

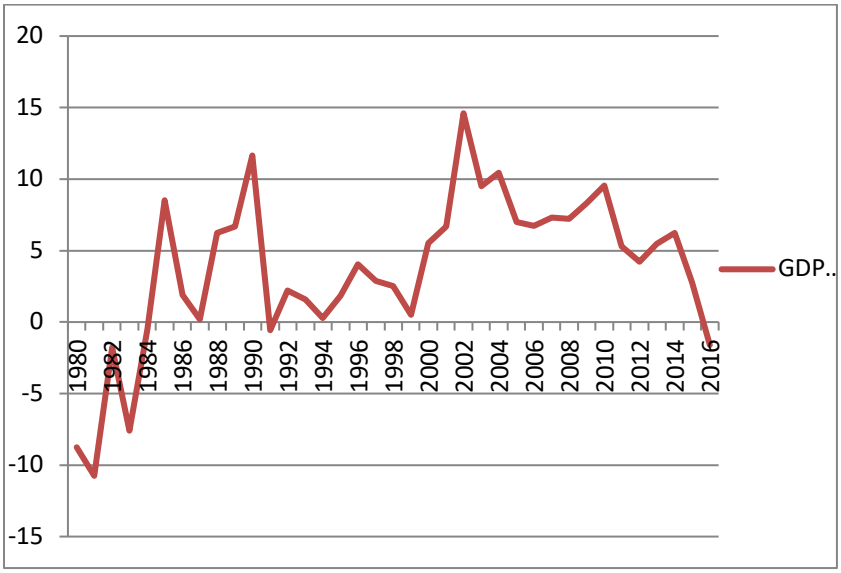

Fig. 2 Trends of GDP Output Growth Rate in Nigeria (1980-2016).
Source: Authors' Computation.

However, as depreciation in exchange rate reached ₦0.8938/US$1 in 1985, real GDP increased to ₦14,958 billion while the total investments in the economy declined to 21.9% in the same year implying that there was a positive economic growth and decline in total investments as a share of GDP despite the depreciation. This trend (depreciation in exchange rate, investment and increase in real GDP) continued during the SAP period as exchange rate and investments stood at ₦8.0378/US$1 and 23% as a share of GDP while real GDP stood at ₦19,305.63 billion. Exchange rate and investments further depreciated and declined to ₦21.8861/US$1 and 10% as a share of GDP in 1994 and was stable at this figure till 1998 before it further depreciated markedly to ₦92.6934/US$1 and ₦133.5004/US$1 in 1999 and 2004 respectively while the total investment as a share of GDP fell to 14.3% in 2000 before picking up again at 20% in 2002. Consequently, the highest in terms of investment growth was 23% of GDP in 1984. Beginning from 2002, investment growth began to fluctuate by either declining or increasing up till 2016 when 12.5% decrease was recorded. The introduction of the Structural Adjustment Programme (SAP) in 1986 depreciated the naira exchange rate such that in 1995, the Central Bank of Nigeria (CBN) intervened six times in the Autonomous Foreign Exchange Market (AFEM), meeting in full the US$1.748 billion demanded by the market. The inability of some end-users to effectively back their foreign exchange demand with naira deposit at the CBN, led to the allocation of the US$1.748billion. This action stabilized both the autonomous foreign exchange market and the parallel market rates; converging and stabilizing at ₦82.3/US$1 and ₦83.7/US$1 respectively. The CBN (1995) attributed this to its “guided depreciation” policy adopted at the beginning of that year which allowed it to intervene periodically at the AFEM at market-determined rates. In 1996, the CBN maintained a dual

exchange rate with the official rate at ₦22/US$ and the AFEM rate averaging ₦82.5/US$1.

The CBN intervention policy of 1995 was retained in 1996 to further stabilize the naira exchange. To enhance the naira rate stability, the CBN continued the suspension of the use of bills of collection and open accounts for import financing: the requirement that all imports into the country be accompanied by duly completed form as well as import duty reports (IDRS). In 1997, the dual exchange rate system was retained with the official exchange rate at ₦21.997/US$1; while the AFEM rate was ₦85/US$1. The naira exchange was ₦84.4/US$1 and ₦88.1/US$1 in the AFEM and parallel markets respectively in 1998. In 1999, the foreign exchange management in Nigeria transited from the autonomous foreign exchange market to the Interbank Foreign Exchange Market (IFEM). During the year, the CBN intervened in the foreign exchange market times against 51 times in 1998. IFEM rate in the year averaged ₦92.3/US$1; while the bureau-de-change rate (BDC) averaged ₦99.26/US$1, reducing the parallel market premium to 3.2%.

On the other hand, real GDP recorded a positive growth of 0.26 percent and 2.5 percent in 1994 and 1998 respectively (Figure 1). Furthermore, real GDP rose to ₦22, 449.41 billion and ₦35, 020.55 billion in 1999 and 2004 respectively. Interestingly, there was an appreciation in exchange rate to ₦132.147/US$1 in 2005 and it continued to appreciate until it reached ₦118.5669/US$1 in 2008 from when it began to depreciate again as it depreciated sharply to ₦148.85/US$1, ₦157.3112/US$1 and ₦253.4923/US$1 in 2009, 2012 and 2016 respectively. The CBN (2005) attributed this to a combination of the non-accommodating monetary policy stance of the CBN, the prudent fiscal policy of the federal government, increase in foreign exchange reserves arising from positive terms of trade, and significant inflow of autonomous foreign exchange. As a result, end of

the year exchange rate appreciated in nominal terms by 3.1% in the Dutch Auction System (DAS) market.

Analyzing the exchange rate on an annual basis, the CBN confirmed a depreciation rate of 3.1% compared to 6.6% in 2003; having traded on the average at ₦133.5/US$1. On the other hand, real GDP stood at ₦37.474.95 billion in 2005 and increased steadily to ₦46, 012 billion in 2008 before it grew by 8.35 per cent to ₦49856 billion in 2009. It further increased to ₦59929.89 billion and ₦69, 023 billion in 2012 and 2015 respectively. However, the Nigeria economy plunged into a recession in 2016 as real GDP growth and total investments fell by 1.58% and 15% to ₦67, 931.24 billion and 12.5% respectively.

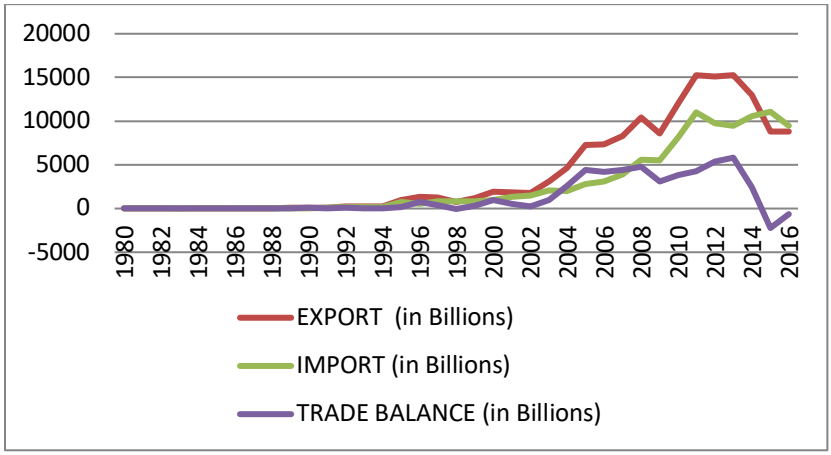

Fig. 3 Trends of Trade Balance, Exports and Imports Trade in Nigeria (1980-2016).
Source: Authors' Computation.

Figure 3 further shows the trend of Nigeria's export and import of goods and services which are often determined by the value of the exchange rate. Figure 3 shows that the value of exports and imports are almost the same between 1980 and 1995 although figure 3 shows that there was trade balance deficit between 1980 and 1983 implying that the

value of imports was more than exports during those years and the positive trade balance from 1984 upwards shows that exports exceed imports. It is also obvious that while exports increased in 1996, imports fell. From this period imports had an upward trend until 2009 when it fell slightly while exports fell in 1998, 2001, 2002 and 2009. The exchange rate experienced an appreciation for the period between 2004 and 2008 hence the upward trend in both exports and import of the Nigerian economy. From 2009, both export and import rose sharply as they peaked in 2011 and both fell the following year. Exports rose in 2013 and thereafter fell in subsequent years. On the other hand, imports rose in 2014 and 2015 but fell in 2016. These happened as a result of the movement in exchange rate.

LITERATURE REVIEW

Review of Exchange Rate Movements and Investment Nexus

Exchange rate is an important macroeconomic variable as its appreciation/revaluation or depreciation/devaluation affects the performance of other macroeconomic variables like investments in any open economy. Its value can be used to assess the overall performance of an economy. Thus, it is put into consideration during decision-making in a country. Every government seeks to avoid exchange rate variability or fluctuation because it is capable of causing a negative distortion in any economy. The knowledge of exchange rate dynamics enables economic agents make informed decisions without the fear of varying costs and prices of goods and services. And so, the instability in exchange rate movements started in Nigeria when the Nigerian government adopted the Structural Adjustment Programme (SAP) coupled with the deregulation of the foreign exchange market as a result of supply constraint in 1986 (Hashim and Zarma, 1996). The country's exchange rate policy is aimed at shielding the

economy against external shocks, preserving the external value of the domestic currency and maintaining a healthy balance of payments position.

Hence, in terms of methodologies and empirical findings, several studies have also been conducted on exchange rate movements and investment growth. Among such studies are studies by Uddin et al (2014) which examined the relationship between exchange rate, investment and economic growth in Bangladesh for a period of 41 years starting from 1973 to 2013 by using annual time series data. They employed the Augmented Dickey-Fuller Unit Root test to ascertain the stationarity of each of the macroeconomic variables and the Johansen Cointegration test to examine whether a long-run relationship exists among the variables. They employed the statistical technique, Correlation, to examine the type of relationship between exchange rate and economic growth. They also checked the direction of causality of the variables by employing the Granger's Causality Test. Similarly, Manalo, Perera and Rees (2014) examined the effects of exchange rate movements on the Australian economy using the structural vector auto-regression model using seasonally adjusted data at quarterly frequencies for the period of 1985Q1 to 2013Q2. They found out that a temporary 10 per cent appreciation of the real exchange rate that is unrelated to the terms of trade or interest rate differentials lowers the level of real GDP and investments over the subsequent one-to-two years by 0.3 per cent and year-ended inflation by 0.3 percentage points.

Chowdhry and Wheeler (2008) in an empirical analysis studied the relationship between volatility of exchange rate for the four developed countries of Canada, Japan, United State and United Kingdom. Using a number of variables this study applied vector auto regressive (VAR) approach and found that shocks to exchange rate volatility have positive and significant impact on flow of FDI in these selected countries. Akeju (2014) also examined the impact of real

exchange rate on terms of trade, investment and economic growth in Nigeria using cointegration techniques and error correction model with annual data covering from 1980-2012. It was revealed that a real exchange rate moves along the same direction with terms of trade and investments in the long run. Rasaq (2013) further examined the impact of exchange rate volatility on the macro economic variables in Nigeria and findings shows that exchange rate volatility has a positive influence on GDP, FDI and trade openness with a negative influence on the inflationary rate in the country.
However, Iuhia and Bogdan (2012) are of the view that the stability of exchange rate does not encourage economic growth and investment especially if obtained by enormous government official interventions to sustain the exchange rate regime, similar to Harms and Kertschnman (2009). Razmi et al (2012) also discovered positive relationship between investment growth and real exchange rate undervaluation. They further recommended that given the model employed in their research, if the presence of underemployment and over reliance on imported capital goods establishes important networks through which the economy is being affected by the real exchange rate affects, targeting the latter may be more operational in promoting capital accumulation and unemployment reduction in low income countries compared to developed countries.

Review of Exchange Rate Movements and Growth Nexus

Also, another prominent study is the research conducted by Sani et al (2016) which investigated the effect of exchange rate volatility on economic growth in five ECOWAS English-speaking countries. Whereas, they conducted the unit root test for stationarity using the Augmented Dickey Fuller (ADF) approach and they employed the Engle and Granger approach to cointegration to check the presence of long-run relationship between the macroeconomic variables. Since cointegration does not

indicate the direction of causality, the study made use of the Vector Error Correction Model (VECM) to derive long run vectors of cointegration. Alagidede and Ibrahim (2016) relied on annual time series data gleaned from World Development Indicators (WDI) and Bank of Ghana and Data stream. They used the Augmented Dickey Fuller, Phillip Perron and KPSS Unit root approach to check the stationarity of the series and made use of the Johansen cointegration test approach to examine the long-run relationship among the variables in the model. They also relied on the GARCH model to examine the effects of excessive fluctuations in the exchange rate on economic growth in Ghana.

In addition, Aman et al. (2013) examined the relationship between economic growth and exchange rate in Pakistan for period between 1976 and 2010. They made use of the Two Stage Least Square (2SLS) and Three State Least Square (3SLS) techniques to investigate this relationship. Adelowokan et al (2015) examined the effect of exchange rate volatility on investment and growth in Nigeria over the period of 1986 to 2014. The vector error correction method, granger causality test, impulse responses function, variance decomposition, Johansen co-integration test and Augmented Dickey Fuller (ADF) test for stationarity were employed to capture the interactions between the variables. More so, Dada and oyeranti (2012) examined exchange rate and macroeconomic aggregates in Nigeria. The result showed that there is no evidence of a strong direction between changes in the exchange rate and GDP growth. Rather, the country's growth has been directly affected by fiscal and monetary policies and other economic variables particularly the growth of exports which is majorly oil. In short, the nature of the effect of exchange rate volatility on investment and growth is yet unresolved. There is therefore the need for more empirical research on the subject matter. This is

particularly important in view of the nature of exchange rate in developing countries like Nigeria.

The study by Amassoma and Odeniyi (2016) examined the impact of Exchange Rate Fluctuation on the Nigerian Economic Growth using an annual data of forty-three (43) years covering the period (1970 – 2013). The standard deviation method was employed to capture and estimate the fluctuation inherent in the model as regards the research's objective. The study employed econometric techniques such as; Multiple Regression Model, Augmented Dickey Fuller (ADF) test, Johansen Cointegration test and the Error Correction Model (ECM). Evidence from this study exhibited that there exists a positive but insignificant impact of exchange rate fluctuation on Nigerian economic growth in both the long run and short run. This result is attributed to the ability of the Nigerian government to effectively regulate some other important macroeconomic variables which can infuriate exchange rate which has thereby helped curtail the effects of exchange rate fluctuation during the study period.

Therefore, based on the reviews of past studies on exchange rate, investment and economic growth, the exchange rate and its movement in any economy has a crucial role to play as it directly affects all the macroeconomic variables such as: domestic price indicator, profitability of traded goods and services, allocation of resources and investment decisions, which explains why the monetary authorities and private sectors seek stability in these variables (Ajakaiye, 2001). As a matter of fact, exchange rate fluctuations are now the bedrock for all economic activities globally, portraying exchange rate management as a major determinant of many countries economic policies (Todaro, 2004). Today, exchange rate becomes an essential macroeconomic variable for formulating economic policies in general and of economic reform programmes in particular in most countries where

these policies help to accelerate the achievement of set macroeconomic goals. In Nigeria, these objectives include achieving and upholding price stability, balance of payment equilibrium, full employment, even distribution of income, economic growth and development. For instance, evidence from the literatures, depicts that the choice of the right exchange rate or maintaining relative stability is essential for both internal and external balance in investment and output growth in the long run. While on the contrary, inefficient management of the exchange rate causes distortions in the patterns of consumption and production as opined by (Mordi, 2006).

Conversely, excessive fluctuation in exchange rate creates uncertainty and risks for economic agents with destabilizing effects on the macro-economy. No wonder, both the public and private sector operators are concerned about the exchange rate fluctuations because of its impacts on their portfolios which may result in capital gains or losses according to (Mordi, 2006). In line with the above, the study of Douglas and Jike (2005) noted that movements in the exchange rate are known to have ripple effects on other economic variables such as interest rate, investment, inflation rate, output growth, unemployment rate, terms of trade, and so on. This claim was corroborated by Mordi (2006) where he pinpointed that exchange rate movements equally exerts effects on inflation, prices incentives, fiscal viability, exports competitiveness, efficiency in resource allocation, international confidence and balance of payments equilibrium. All of these factors underscore the importance of exchange rate to the economic wellbeing of every country that deals in the international trade of goods and services.

METHODOLOGY AND THEORETICAL FRAMEWORK

Given that Nigeria is a small open economy, the Romers' paper on Arrow's model of Endogenous Growth theory which is known as learning by investment will be adopted in this study to examine the theoretical linkage between exchange rate, investment and growth in output where knowledge creation is taken as an input and side product of investment and output growth in the production function of the following form:

$$Y = A(R)f(R_i, K_i, L_i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where Y = aggregate output/Gross Domestic Product (GDP), A = public stock of knowledge R and R_i = stock of expenditure i, Ki and Li = capital stock and labour stock of firm i respectively. He assumes the function F is homogeneous of degree one in all its input R_i, K_i, and L_i and treat R_i as a rival good. Romer took three key elements in his model, namely externalities, increasing returns in the production of output and diminishing returns in the production of new knowledge. According to Romer, it is spill-over's from research efforts by a firm that leads to the creation of new knowledge by other firms. In other words, new research technology by a firm spills-over instantly across the entire economy. In his model, new knowledge is the ultimate determinant of long-run growth and stability which is determined by investment in research technology. Thus Romer takes investment in research technology as endogenous factor in terms of the acquisition of new knowledge by rational profit.

In terms of methodology, the Non-Linear Autoregressive Distributed Lag Modelling to cointegration (NARDL) was adopted in this study. In the attempt to establish the investment-exchange rate-growth nexus in the

Nigerian economy, two separate linear equations were estimated. The first examined the relationship between investment and exchange rate fluctuations, while the second evaluated the impacts of exchange rate movements on growth. Since the evaluation considered both the short- and long-run simultaneously, the econometric techniques of the NARDL and GARCH were employed to capture volatility in exchange rate and its impacts on investment and growth. The Non-Linear Autoregressive Distributed Lag (NARDL) model is one of the most successful, flexible, and easy to use models for the analysis of multivariate time series. It is a natural extension of the autoregressive distributed lag model to dynamic multivariate time series. This study will adapt the model specified by (Sims 1980). The model is specified as follows:

$y_t = \propto + B_1 y_{t-1} + B_2 y_{t-2} + B_3 y_{t-3} + B_p y_{t-p} + \mu_t$ …….. (2).

In linear form, we adopted and re-modified equations 1 and 2 as follows:

$INVEST_t = B_0 + B_1 GDPR_{t-1} + B_2 INF_{t-2} + B_3 EXR_{t-3} + B_4 TRB_{t-4} + B_5 EXP_{t-5} + B_6 IM_{t-6} + \mu_t$…….. (3).

$GDPR_t = B_0 + B_1 INVEST_{t-1} + B_2 INF_{t-2} + B_3 EXR_{t-3} + B_4 TRB_{t-4} + B_5 EXP_{t-5} + B_6 IM_{t-6} + \mu_t$…….. (4).

Where B_0 = Constant, B_{1-6} = Coefficients and μ_t = Error term. The apriori expectation is that a positive relationship would be established between growth, investment and the exchange rate movement. The ARDL bound testing approach for co-integration can be written as below (Pesaran et al., 2001):

$$\Delta lnGDPR_t = \propto_1 + \sum_{i=0}^{p} \beta_i \Delta lnGDPR_{t-i} + \sum_{i=0}^{p} \theta_i \Delta lnINF_{t-i} + \sum_{i=0}^{p} \delta_i \Delta lnINVEST_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta lnEXR_{t-i} + \sum_{i=0}^{p} \rho_i \Delta lnTRB_{t-i} + \sum_{i=0}^{p} \sigma_i \Delta lnEXP_{t-i} + \sum_{i=0}^{p} \tau_i \Delta lnIM_{t-i} + \mu_t \ldots. (4)$$

$$\Delta lnINVEST_t = \propto_1 + \sum_{i=0}^{p} \beta_i \Delta lnGDPR_{t-i} + \sum_{i=0}^{p} \theta_i \Delta lnINF_{t-i} + \sum_{i=0}^{p} \delta_i \Delta lnINVEST_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta lnEXR_{t-i} + \sum_{i=0}^{p} \rho_i \Delta lnTRB_{t-i} + \sum_{i=0}^{p} \sigma_i \Delta lnEXP_{t-i} + \sum_{i=0}^{p} \tau_i \Delta lnIM_{t-i} + \mu_t \ldots (5)$$

Where $\Delta lnINVEST_t$ = the natural logarithm of total investment over time. $\tau_i =$ Coefficient of imports. $\delta_i =$ Coefficient of investment. β_i = Coefficient of GDP growth rate.

$\Delta lnEXP_t$ = The natural logarithm of traded exports. γ_i= Coefficient of exchange rate.

$\Delta lnIM_t$= The natural logarithm of traded imports. $\Delta lnGDPR_t$ = The natural logarithm of GDP growth rate. ρ_i= Coefficient of total trade balance. θ_i= Coefficient of real inflation.

$\Delta lnEXR_t$ = The natural logarithm of exchange rate over time

σ_i= Coefficient of total exports.

Scope of the Study and Data Sources

The analysis of this study is between 1980 and 2016 due to data availability. Also, the choice of the period corresponds with the adoption of significant trade policy reform and exchange rate measures in Nigeria. The data on the total trade balance, GDP growth rate, total export and import, real effective exchange rate, inflation rate and investment were sourced from the World Bank World Development Indicators and the Central Bank Statistical Bulletin.

EMPIRICAL RESULTS, ANALYSIS AND DISCUSSIONS

Descriptive and Correlation Analysis

Results of the descriptive analysis and stochastic properties of the variables used in the regression analysis are reported in Table 1. Investments (INVEST); Total traded Import (IMP), Total traded Exports (EXP), Exchange Rate (EXR) and the inflation rate have higher mean, minimum and maximum values that are higher than those of any other variable of interest. However, total exports (EXP), total imports (IMP) and the inflation rate have the lowest variability with a standard deviation of about 0.283, 0.101 and 0.312 while most of the variables are skewed positively. Table 1 highlighted the mean, standard deviation, skewness and kurtosis coefficients, and the Jarque-Bera statistics to test the null hypothesis that all the variables are normally distributed. All the series are positively skewed except total trade balance and imports that is negatively skewed. In addition, the Jarque-Bera statistics reject the null hypothesis of normality for all our series. Table 2 presents the results of the pair-wise correlation analysis which is important to establish the level of association among the variables used in the regression analysis. The analysis is particularly important to determine the type of association among output growth, exchange rate and investment which have implication for their inclusion in the same models. The results suggest that the correlation coefficients between these three variables are moderate and can co-exist in the same model. According to the Dickey-Fuller and the Ng-Perron tests in Table 3, at conventional levels of significance the variables represent a mixture of first difference and stationary levels. While some of the variables (output growth (GDPR), inflation rate, trade balance, and real exchange rate) are integrated of order one, that is, I(1), some other

variables in the model are stationary at their levels (imports, exports and investment).

Thus, the unit root tests results allows the choice of NARDL to be suitable for the analysis. One of the advantages of the NARDL technique is that it can combine stationary and non-stationary variables in its estimation.

Table 1: Descriptive Statistics of the Variables

	LNTRB	LNINVEST	LNGDPR	LNEXR	LNIMP	LNEXP	LNINF
Mean	0.857	6.336	2.177	33.342	3.736	3.421	3.365
Median	0.956	5.934	2.105	7.461	3.760	3.314	3.282
Maximum	2.383	8.072	2.887	291.831	3.871	4.055	4.073
Minimum	-0.430	5.031	1.576	0.117	3.475	2.834	2.982
Std. Dev.	0.718	0.895	0.369	68.352	0.101	0.283	0.312
Skewness	-0.034	0.691	0.213	3.091	-1.361	0.729	1.027
Kurtosis	2.441	2.215	1.866	11.378	4.316	3.192	2.945
Jarque-Bera	0.462	3.684	2.140	131.015	13.330	3.153	6.152
Probability	0.794	0.159	0.343	0.128	0.001	0.207	0.046
Sum	30.003	221.752	76.194	966.943	130.745	119.741	117.787
Sum Sq. Dev.	17.550	27.262	4.624	18.154	0.348	2.715	3.314
Observations	37	37	37	37	37	37	37

Source: Author's computation

Table 2: Correlation Results

	INF	GDPR	EXR	TRB	INVEST	EXP	IMP
MI	1.000						
GDP	-0.364	1.000					
EXR	0.089	-0.198	1.000				
TRB	0.576	-0.355	0.072	1.000			
INVEST	0.391	0.219	-0.255	0.032	1.000		
EXP	-0.250	0.918	-0.296	-0.295	0.387	1.000	
IMP	-0.433	0.898	-0.014	-0.302	-0.001	0.813	1.000

Source: Author's computation

5.2 Stationarity (Unit root) Test

Table 3: Results of Unit Root Tests

Variable	Augmented Dickey-Fuller (ADF)			Phillip Perron (PP)			Decision
	Level	First Difference	I(d)	Level	First Difference	I(d)	
INF	-2.5487	-9.7647*	I(1)	-2.4245	-9.6909*	I(1)	I(1)
GDPR	0.0723	-5.3363*	I(1)	-0.0437	-5.3270*	I(1)	I(1)
EXP	-5.2466*	-6.4336*	I(0)	-2.6227***	-6.4628*	I(0)	I(0)
IMP	-3.1348**	-5.7499*	I(0)	-3.0438**	-8.9956*	I(0)	I(0)
INVEST	-3.3037**	-3.5498**	I(0)	-2.9006***	-3.5498**	I(0)	I(0)
EXR	-0.6549	-4.3304*	I(1)	-0.9252	-4.2805*	I(1)	I(1)
TRB	-0.4525	-5.7909*	I(1)	-0.4421	-5.7909*	I(1)	I(1)

Source: Authors' computation; Note: *, ** and *** imply statistical significance at 1%, 5% and 10% levels respectively, while all variables are estimated at intercept.

Estimation Technique

This investigated how exchange rate movement affects output growth and investment by using the nonlinear auto-regressive distributed lag (NARDL) modelling approach to co-integration. The nonlinear autoregressive distributed lag (NARDL) model is an asymmetric extension of the linear ARDL approach to modeling long-run level relationships. Developed by Pesaran, Shin, and Smith (2001) and advanced by Shin, Yu, and Greenwood (2009), NARDL model introduces nonlinearity by means of partial sum decompositions. By modeling the long-run relationship and the pattern of dynamic adjustment simultaneously in a coherent manner, NARDL allows to capture both the short-run and long-run asymmetries in the transmission mechanism. The NARDL method can be applied regardless of whether variables have a unit root or are covariance stationary. Furthermore, the method corrects for endogeneity and serial correlation. It also allows for possibly asymmetric (i.e. nonlinear) adjustments of inflation to

movements in other variables. In other words, increases and decreases in other variables are allowed to affect inflation differently. Following Shin et al. (2014), we adopt an error correction model (ECM) to estimate the linear relationship:

$$\Delta lnGDPR_t = \propto_1 + B_1 GDPR_{t-1} + B_2 INF_{t-2} + B_3 EXR_{t-3} + B_4 TRB_{t-4} + B_5 EXP_{t-5} + B_6 IM_{t-6} + \sum_{i=0}^{p} \beta_i \Delta lnGDPR_{t-i} + \sum_{i=0}^{p} \theta_i \Delta lnINF_{t-i} + \sum_{i=0}^{p} \delta_i \Delta lnINVEST_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta lnEXR_{t-i} + \sum_{i=0}^{p} \rho_i \Delta lnTRB_{t-i} + \sum_{i=0}^{p} \sigma_i \Delta lnEXP_{t-i} + \sum_{i=0}^{p} \tau_i \Delta lnIM_{t-i} + \mu_t \ldots. (6)$$

$$\Delta lnINVEST_t = \propto_1 + B_1 INVEST_{t-1} + B_2 INF_{t-2} + B_3 EXR_{t-3} + B_4 TRB_{t-4} + B_5 EXP_{t-5} + B_6 IM_{t-6} + \sum_{i=0}^{p} \beta_i \Delta lnGDPR_{t-i} + \sum_{i=0}^{p} \theta_i \Delta lnINF_{t-i} + \sum_{i=0}^{p} \delta_i \Delta lnINVEST_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta lnEXR_{t-i} + \sum_{i=0}^{p} \rho_i \Delta lnTRB_{t-i} + \sum_{i=0}^{p} \sigma_i \Delta lnEXP_{t-i} + \sum_{i=0}^{p} \tau_i \Delta lnIM_{t-i} + \mu_t \ldots (7)$$

Where Δ is the first difference operator; $B_1, B_2, B_{3,}, B_{4,}, B_{5,} B_{6,}$ are the error correction terms, long-run coefficients of the output growth, inflation rate, real effective exchange rate, trade balance, exports, and imports respectively; β_i, θ_i, δ_i, γ_i, $\rho_i, \sigma_i, \tau_i$are the short run coefficients. In order to determine asymmetric pass-through of openness to inflation, we follow the approach of Shin et al. (2014). This approach requires the decomposition of the variable of interest. In this case, we decompose the exchange rate variable into positive and negative sub variables. The partial sums of positive and negative changes in exchange rate are given by EXR^+ and EXR^-. Equation (6) and (7) can then be expressed by separating short and long runs asymmetric relationships:

$$\Delta lnGDPR_t = \propto_1 + B_1 GDPR_{t-1} + B_2 INF_{t-2} + B_3^+ EXR^+{}_{t-3} + B_3^- EXR^-{}_{t-3} + B_4 TRB_{t-4} + B_5 EXP_{t-5} + B_6 IM_{t-6} + \sum_{i=0}^{p} \beta_i \Delta lnGDPR_{t-i} + \sum_{i=0}^{p} \theta_i \Delta lnINF_{t-i} + \sum_{i=0}^{p} \delta_i \Delta lnINVEST_{t-i} + \sum_{i=0}^{p} \gamma_i^+ \Delta lnEXR^+{}_{t-i} + \sum_{i=0}^{p} \gamma_i^- \Delta lnEXR^-{}_{t-i} + \sum_{i=0}^{p} \rho_i \Delta lnTRB_{t-i} + \sum_{i=0}^{p} \sigma_i \Delta lnEXP_{t-i} + \sum_{i=0}^{p} \tau_i \Delta lnIM_{t-i} + \mu_t \ldots (8)$$

$$\Delta lnINVEST_t = \propto_1 + B_1 INVEST_{t-1} + B_2 INF_{t-2} + B_3^+ EXR^+{}_{t-3} + B_3^- EXR^-{}_{t-3} + B_4 TRB_{t-4} + B_5 EXP_{t-5} + B_6 IM_{t-6} + \sum_{i=0}^{p} \beta_i \Delta lnGDPR_{t-i} + \sum_{i=0}^{p} \theta_i \Delta lnINF_{t-i} + \sum_{i=0}^{p} \delta_i \Delta lnINVEST_{t-i} + \sum_{i=0}^{p} \gamma_i^+ \Delta lnEXR^+{}_{t-i} + \sum_{i=0}^{p} \gamma_i^- \Delta lnEXR^-{}_{t-i} + \sum_{i=0}^{p} \rho_i \Delta lnTRB_{t-i} + \sum_{i=0}^{p} \sigma_i \Delta lnEXP_{t-i} + \sum_{i=0}^{p} \tau_i \Delta lnIM_{t-i} + \mu_t \ldots (9).$$

Equations (8) and (9) present the cointegrating relationship between output growth, investment and positive (negative) component of exchange rate with the four control variables such as the inflation rate, total trade balance, imports, and exports. In order to test the existence of an asymmetric long-run cointegration, we proposed the bounds test which is a joint test on all the lagged levels regressors. The F-statistic tests the null hypothesis of $B_1 = B_2 = B_3^+ = B_3^- = B_4 = B_5 = B_6 = 0$ for the case of long-run asymmetry; and $B_1 = B_2 = B_3 = B_4 = B_5 = B_6 = 0$ for the case of only the long-run symmetry. If we reject the null hypothesis of no cointegration, it indicates that there is no a long-run relationship among the variables. The long-run symmetry can be tested by the Wald test of the null hypothesis $L_{exr}^+ = L_{exr}^-$. In order to test the existence of short-run symmetry, we use the Wald test to test the null hypothesis of $\sum_{i=0}^{p} \gamma_i^+ = \sum_{i=0}^{p} \gamma_i^-$. The rejection of the null hypothesis of symmetry implies that the model is asymmetric. If the null hypothesis of symmetric is rejected,

we can find the asymmetric dynamic multiplier of the change in the exchange rate EXR^+ and EXR^- respectively as: $M_h^+ = \sum_{j=0}^{h} \frac{\partial GDPR_{t+j}}{\partial EXR_t^+}$; $M_h^+ = \sum_{j=0}^{h} \frac{\partial INVEST_{t+j}}{\partial EXR_t^+}$; $M_h^- = \sum_{j=0}^{h} \frac{\partial GDPR_{t+j}}{\partial EXR_t^-}$; $M_h^- = \sum_{j=0}^{h} \frac{\partial GDPR_{t+j}}{\partial EXR_t^-}$ …… (10). Where h$\rightarrow \infty$, $M_h^+ \rightarrow L_{exr}^+$ and $M_h^- \rightarrow L_{exr}^-$.

The dynamic multipliers capture the positive and negative shocks/fluctuations in real exchange rate on output growth and investment from an initial equilibrium to the new equilibrium.

Asymmetric Effect of Exchange Rate on Output Growth and Investment in Nigeria

Table 5 shows that the estimated coefficients of the symmetric and three asymmetric exchange rate-investment and output growth models. The NARDL models comprises of estimation with long run (LR) asymmetry, short run (SR) asymmetry, and short run (SR) and long run (LR) asymmetry respectively. The symmetric auto-regressive distributed lag (ARDL) model is presented in Column 1 of Table 5. The ARDL estimation combines the short run and the long run estimation together. In the long run, there exists a significantly positive relationship between exchange rate and output growth rate in Nigeria at the 10% level of significance. This result negates the empirical results of Adelowokan, Adesoye and Balogun (2015) and supports the empirical results of Danmola (2013), Amassoma & Odeniyi (2016). Thus, a 1% increase in exchange rate increases output growth by 0.85% in Nigeria. Also, there exists a significantly negative relationship between exchange rate and investment in Nigeria at the 5% level of significance. This result supports the empirical results of Adelowokan, Adesoye and Balogun (2015), Oniore, Gyang & Nnadi (2016), Osinubi & Amaghionyeodiwe (2009). This implies that instability and continued depreciation of the naira in the

foreign exchange market has resulted to declines in investments as a result of high degree of uncertainty in the Nigeria business environment, standard of living of the populace and increased cost of production. This suggests that depreciation of currency does not stimulate investment and output growth in Nigeria.

Furthermore, output growth and exports were found to be positive and negative determinants of exchange rate in the long run. Thus, both the traded imports and exports have an inverse significant relationship with Exchange rate. At high level of imports and exports, the exchange rate will decline (depreciation) and fluctuate because the government is not able to defend the exchange rate and this discourages the foreign and local investors to invest. Consequently, the trade balance was found to be significant determinant of exchange rate while the inflation rate was found to be insignificant determinant of exchange rate in the long run.

However, in the short run, we noted a contrasting result. We found an inverse relationship between exchange rate and output growth in Nigeria. In the short run, we noted that an increase in exchange rate in the short run declines inflation, trade balance, investment and imports and improves exports by 1.141% and 0.737% in the first and second period respectively. Our result negates the findings of Osinubi *et al.,* (2004), Adeniran *et al., (*2013) and Amassoma *et al.*, (2013) but agrees with the findings of Razni (2012), Danmola (2013), Uche (2015) and Adelowokan *et al., (*2015) which proposed a negative relation between (exchange rate and inflation), (exchange rate and output growth) and lastly (exchange rate and investment) in Nigeria. The insight from this analysis is that the impact of exchange rate fluctuation on investment and output growth is influenced by the time horizon of the result. In the immediate short run, there is an adverse relationship between exchange rate and output growth in Nigeria while in the long run a positive relationship dominates.

The NARDL with the long run asymmetry is presented in Column 2 of Table 4. According to the AIC and SIC information criteria, the NARDL (3, 3) specification with long-run asymmetry is the most suitable model for the exchange rate-investment-output growth case. The estimated result revealed that exchange rate fluctuation matters and it affects investment and output growth in an asymmetric manner in the both short and long run. The asymmetric effect of fluctuation in the exchange rate is captured by EXR^{+} and EXR^{-} indicating positive and negative changes of exchange rate, respectively. The estimated coefficients of the positive and negative asymmetric changes are positive and statistically significant at the 5% for positive coefficients respectively. The asymmetric positive and negative long-run coefficients are both positive (1.245 and 1.127) and significant at 5% level, indicating that in the long run exchange rate is increasing in output growth and investment in the long run irrespective of the asymmetric nature of the variable. The asymmetric magnitude of response of exchange rate fluctuations to output and investment growth however differs in the long run. The results of the overall model showed that the asymmetric positive and negative long-run coefficient 2.122 and 2.630 respectively. They are significant at the 5% level, indicating that increases in real exchange rate (decreases) cause investment and output growth to move up and improve (down/decline). Trade balance, exports, imports and GDP growth rate are still major determinants of exchange rate in Nigeria. Inflation retained its non-significance nature. The short run model however indicated an inverse relationship between trade openness and inflation in Nigeria in the short run which is similar to the short run estimates of the restricted symmetric model in column 1. We found that an increase in exchange rate fluctuation/variability will reduce investment and output growth by 1.452% and 1.254% in the first and second period respectively in the short run. This

lends credence to our earlier findings that the impact of exchange rate fluctuation on output and investment is dependent on the horizon that we are evaluating.

Columns 3 and 4 in Table 5 present the NARDL with short run (SR) asymmetry. The result is similar to the findings of the ARDL model reported in Column 1 of Table 4. Exchange rate fluctuation affects investment and output growth positively in the LR and negatively in the SR. Results from the NARDL with short-run asymmetry revealed that one-period lagged of the positive and negative asymmetry coefficients are both negative (3.293 and 3.595 respectively) and significant at 1 per cent. They also indicated that contemporaneous increases and decreases in exchange rate in the short-run are negatively passed through to investment and output. Other short-run output and investment determinants also showed that increases (decrease) in one-time lagged of GDP growth rate, exports and trade balance cause exchange rate fluctuation to move down (up) for the period considered in this study.

Finally, the results from the NARDL that combines the long and short-run asymmetry showed that the long run positive and negative asymmetry coefficients of exchange rate are positive (1.246 and 1.924) and significant at 5 and 10 per cent level. The result also supported our findings that the concurrent increases and decreases in the value of the exchange rate in the long-run positively influenced investment and output. On the contrary, we found out that the one-period lagged value of the asymmetric positive and negative exchange rate are negatively related to output growth and investment in the short-run at one per cent significant level. The summary from these three NARDL estimations is that both output and investment responds asymmetrically to exchange rate fluctuation and there is a temporal delay in their reaction to changes in exchange rate. With reference to the model's diagnosis tests in across the four estimations in Columns 1 to 4 in Table 4, the residual

series are normally distributed from the Jarque–Bera statistics, while the Breusch–Godfrey LM test statistics indicated that the model does not have significant serial correlation problem. In addition, the ARCH test and the Ramsey RESET test respectively show that the residuals are homoscedastic and the model has correct functional form.

CONCLUDING SUMMARY

This study has shed light on the output growth-investment-exchange rate puzzle in the case of Nigeria. Most of the studies relating to exchange rate fluctuations - investment and output growth relationship have examined the issue from a cross-country perspective. There are very few studies in the single country context, and the present study is an attempt in this direction. It therefore investigated the relationship among investment, exchange rate and output growth in Nigeria between 1980 and 2016. It employed the nonlinear auto-regressive distributed lag (NARDL) modelling approach to co-integration based on the standard theoretical and empirical literature on exchange rate-investment and output relationship. Our approach allowed us to simultaneously test the short- and long-run nonlinearities through positive and negative partial sum decompositions of the predetermined explanatory variables. It also offered the possibility to quantify the respective responses of investment and output to positive and negative exchange rate shocks from the asymmetric dynamic multipliers. The empirical results in this paper, to some extent, substantiate the existing literature. This is because the evidence confirmed that while there is a significant positive long-run relationship among exchange rate, investment and output growth, there is a strong and robust negative link among exchange rate, investment and output in the short run. In addition, the obtained results indicate that exchange rate fluctuation affect

investment and output in an asymmetric and nonlinear manner.

The implication is that the negative relationship among output, investment and exchange rate is specific to a determined period of time. As the economy gets more open, the exchange rate fluctuates more and even becomes more exposed to lower rate of investment and output. Also, Trade balance, exports, imports and GDP growth rate are still major determinants of exchange rate in Nigeria. Nigeria is an oil producing economy and monetary authorities should understand the determinants of the exchange rate and its variability. This is because the economy can be so vulnerable to the factors such as external oil and exchange rate shocks which are results from more open degree of international trade and directly affect the aggregate domestic investment and output. Therefore, diversifying the economy from oil into other productive sectors should be a major policy target. The Nigerian economy depends on importation of nearly all its inputs which made it susceptible to the vagaries of external shocks. The positive impact of exchange rate on investment and output can also be as a result of monetary authorities' policy having a monopolistic power in the international markets as foreign customers, to adjust the benefits of money growth. To overcome the negative effect of exchange rate on investment and output in the short run, the policymakers and monetary authorities should adopt appropriate policy in appreciating the value of the naira as devaluation has been a mistake since 1986 in order to maintain macroeconomic stability and growth in investment, output and the total traded balance in the country. Consequently, government should also reduce borrowing and lending charges to attract foreign investors and boost the performance of domestic and foreign investments opportunities in Nigeria. Furthermore, government should gear efforts towards diversifying the economy to increase aggregate national output, exports and trade balance, among

others as this would improve the Nigeria's net export position thereby improving the exchange rate position.

Table 4: Estimation Results for Exchange Rate-Investment and Output Growth Nexus

Symmetric ARDL (1)		**NARDL with LR asymmetry (2)**		**NARDL with SR asymmetry (3)**		**NARDL with LR and SR asymmetry (4)**	
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
INF_{t-1}	-0.156 (0.922)	INF_{t-1}	-0.010 (-0.056)	INF_{t-1}	-0.565* (2.432)	INF_{t-1}	-0.509** (2.221)
$GDPR_{t-1}$	2.289* (3.264)	$GDPR_{t-1}$	2.770* (3.411)	$GDPR_{t-1}$	2.161* (3.898)	$GDPR_{t-1}$	2.434* (4.211)
IMP_{t-1}	-0.865** (2.411)	IMP_{t-1}	-0.934*** (2.211)	IMP_{t-1}	-0.346** (2.835)	IMP_{t-1}	-0.406** (3.429)
EXR	**0.850** ** **(2.122)**	$\boldsymbol{EXR^-_{t-1}}$	**1.245** ** **(2.034)**	$\mathbf{EXR_{t-1}}$	**1.110** ** **(2.841)**	$\mathbf{INVEST_{t-1}}$	0.807** (2.783)
INVEST	-0.250** (1.093)	$\boldsymbol{EXR^+_{t-1}}$	**1.127** ** **(2.169)**	$\mathbf{INVEST_{t-1}}$	0.927** (3.432)	$\boldsymbol{EXR^-_{t-1}}$	**1.924** *** **(2.268)**
TRB_{t-1}	-0.923** (2.123)	TRB_{t-1}	-0.753*** (2.044)	TRB_{t-1}	0.887** (2.383)	$\boldsymbol{EXR^+_{t-1}}$	**1.246** ** **(2.595)**
EXP_{t-1}	1.783* (3.123)	EXP_{t-1}	-0.753*** (2.044)	EXP_{t-1}	-0.565** (2.472)	EXP_{t-1}	-0.509*** (2.269)
ΔINF_{t-2}	-0.261*** (2.112)	$\mathbf{INVEST_{t-1}}$	-0.283 (-1.075)	ΔINF_{t-1}	0.999* (3.800)	ΔTRB_{t-1}	1.044* (4.051)
ΔINF_{t-3}	0.126 (1.133)	ΔINF_{t-2}	-0.350** (-2.521)	ΔINF_{t-2}	-0.149 (0.932)	$\Delta GDPR_{t-1}$	1.044* (4.051)
$\Delta GDPR_{t-2}$	-1.622 (1.012)	ΔINF_{t-3}	0.143 (1.202)	ΔINF_{t-3}	0.508** (3.391)	ΔIMP_{t-1}	-2.243*** (-2.196)
ΔIMP_{t-1}	0.508* (3.567)	$\Delta GDPR_{t-2}$	-3.148*** (-1.780)	$GDPR_{t-1}$	-2.238*** (2.206)	$\mathbf{\Delta INVEST_{t-1}}$	0.856* (5.123)
ΔTRB_{t-1}	-1.175* (3.672)	ΔIMP_{t-1}	0.690* (3.584)	$GDPR_{t-2}$	-1.698 (1.403)	$\boldsymbol{\Delta EXR^-_{t-1}}$	-2.423* (-4.202)
ΔTRB_{t-2}	-0.406 (1.718)	ΔTRB_{t-1}	-1.648* (-3.478)	ΔIMP_{t-1}	0.730* (4.715)	$\boldsymbol{\Delta EXR^-_{t-2}}$	-2.788* (-4.428)
$\mathbf{\Delta EXR_{t-1}}$	**-1.141* (3.763)**	$\mathbf{\Delta EXR_{t-1}}$	**-1.452* (-3.241)**	ΔIMP_{t-2}	-0.435** (2.732)	$\boldsymbol{\Delta EXR^+_{t-1}}$	**-2.975* (-4.939)**
$\mathbf{\Delta EXR_{t-2}}$	**-0.737** ** **(2.340)**	$\mathbf{\Delta EXR_{t-2}}$	**-1.254** ** **(-2.604)**	ΔIMP_{t-3}	-0.177 (1.842)	$\boldsymbol{\Delta EXR^+_{t-2}}$	**1.153 (1.723)**
$\mathbf{\Delta INVEST_{t-1}}$	-0.832*** (1.911)	$\mathbf{\Delta INVEST_{t-1}}$	-1.444** (-2.532)	ΔTRB_{t-1}	-1.751* (3.692)	$\boldsymbol{\Delta EXR^+_{t-3}}$	**-2.974* (-5.427)**
C	-13.979** (2.533)	$\mathbf{\Delta INVEST_{t-2}}$	0.948*** (2.002)	ΔTRB_{t-2}	1.431** (3.420)	ΔTRB_{t-1}	**0.930 (1.462)**
		$\mathbf{\Delta INVEST_{t-3}}$	-0.517 (-1.600)	$\boldsymbol{\Delta EXR^-_{t-1}}$	**-3.293* (4.201)**	$\Delta GDPR_{t-1}$	-0.131** (3.599)
		C	-17.982** (-2.758)	$\boldsymbol{\Delta EXR^-_{t-2}}$	**0.201** ** **(3.192)**	ΔIMP_{t-1}	-2.596 (-1.894)
				$\boldsymbol{\Delta EXR^+_{t-1}}$	**-3.595* (4.716)**	$\mathbf{\Delta INVEST_{t-1}}$	-0.406*** (-2.313)
				$\boldsymbol{\Delta EXR^+_{t-3}}$	**-0.113** ** **(3.190)**	ΔINF_{t-2}	1.591** (3.360)

				ΔINVEST$_{t-1}$	-2.271* (3.828)	**ΔINVEST$_{t-2}$**	3.441* (5.057)
				ΔINVEST$_{t-2}$	2.379* (4.976)	ΔINF$_{t-2}$	0.452** (3.178)
				ΔINVEST$_{t-3}$	-1.945* (4.457)	ΔGDPR $_{t-2}$	-0.228** (2.539)
				C	-18.975* (3.652)	**ΔINVEST$_{t-2}$**	-2.134* (4.773)
						C	-20.177* (-3.957)
Lexr	5.093** (0.038)	Lexr^{+}	2.122*** (1.361)	Lexr	8.069** (0.025)	Lexr^{+}	6.865** (0.028)
		Lexr $^{-}$	2.630** (2.048)			Lexr $^{-}$	2.195 (0.189)
AIC	**1.184**	AIC	**1.213**	AIC	**-0.023**	AIC	**-0.249**
SIC	**1.917**	SIC	**2.037**	SIC	**1.087**	SIC	**0.907**
JB	**1.499 (0.473)**	JB	**1.184 (0.553)**	JB	**0.173 (0.917)**	JB	**1.948 (0.378)**
ARCH	**2.485 (0.102)**	ARCH	**0.395 (0.677)**	ARCH	**0.114 (0.893)**	ARCH	**1.986 (0.158)**
Ramsey Reset Test	**0.510 (0.611)**	Ramsey Reset Test	**1.254 (0.320)**	Ramsey Reset Test	**0.174 (0.845)**	Ramsey Reset Test	**0.817 (0.504)**
LM Test	**0.021 (0.979)**	LM Test	**0.303 (0.744)**	LM Test	**0.233 (0.800)**	LM Test	**0.535 (0.622)**
Breusch-Pagan-Godfrey	**0.659 (0.792)**	Breusch-Pagan-Godfrey	**0.797 (0.675)**	Breusch-Pagan-Godfrey	**0.702 (0.757)**	Breusch-Pagan-Godfrey	**0.764 (0.709)**

Source: Author's computation; We employ a general to specific approach to select the final specification, Note: *,** and*** denote significance at 1%, 5% and 10% levels respectively while Lopen^{+} and Lopen^{-} indicates the positive and negative long-run coefficients from Wald test and values in parenthesis are the t-statistics. AIC and SIC are information criteria. JB and ARCH are the empirical statistics of the Jarque-Bera test for normality and the Engle (1982) test for conditional heteroscedasticiity, respectively. Meanwhile, in the diagnostic tests, we reported F-statistics and figures in parenthesis are the probability value. The SIC information criterion selects $p = 3$ and $q = 3$ as the optimal lag length.

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