DETERMINANTS OF EXCHANGE RATE STABILITY IN NIGERIA

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CHAPTER ONE

INTRODUCTION

1.0 BACKGROUND OF THE STUDY

Exchange rate is an important economy metric as it reflects underlying strength and competitiveness with world economies. Exchange rate refers to the rate at which one currency exchange for another (Jhingan M.L, 2003). Stability of exchange rate is a vital macroeconomic goal which monetary policy authorities and Economists seeks to achieve upon implementing a policy. In every nation the sellers of foreign currency constitute the supply while the buyers of foreign exchange constitute the demand side. Therefore the supply of foreign exchange is derived from oil export, Non-oil export, transfer /flow of financial assets to Nigeria's capital market, expenditure of foreign tourist in Nigeria, unilateral transfer from Nigerians in Diaspora. On the other hand the demands for foreign exchange consist of payment for imports, financial commitment to international organization, repayment of external debt and granting of financial assistance to foreign countries.

As a general rule when the home currency depreciates it will result in cheaper export goods, higher import prices i.e. cost push inflation and balance of payment deficit. Also when the home currency appreciates it result to lower import prices and higher domestic prices making them unattractive in the International market.

Exchange rate together with other macroeconomic variables such as Gross domestic product(GDP), Inflation rate, interest rate, balance of payment, external reserve, unemployment rate…are important economy metrics as they reflects underlying strength and competitiveness with world economies. Exchange rate has a bilateral/feedback relationship with most of these macroeconomic variables when it's tweaked its effect will result on another macroeconomic variable's movement and as such the stability of exchange rate is a vital macroeconomic objective which all monetary policy authorities(Central Banks)seeks to achieve upon implementation.

In Nigeria some of these macroeconomic variables directly affect exchange rate while some affects it indirectly. While some macroeconomic variables are generally agreed to determine exchange rates globally, some are only peculiar to Oil producing nations like Nigeria such as oil price fluctuations. Due to mono-economic nature and import dependency of Nigeria economy whenever there are fluctuations in global oil prices it results in swings in the exchange rate. Crude oil being the Nigeria's biggest source of revenue that constitutes its largest amount of export which yield a substantial amount of foreign receipt that when there are volatility in crude oil prices it leads to fluctuations and disequilibrium in macroeconomic performances.

The principal macroeconomic factors that determine exchange rate in Nigeria's economic setting include Gross domestic product (GDP), Oil price, balance of

payment, interest rate, money supply, inflation rate, trade openness, productivity differentials When there's a change\adjustment in each of these variables, It will definitely and consequently result in exchange rate variability.

Literally the dependence of the Nigerian economy on oil proceeds as the major source of revenue is capable of raising suspicion about the impact of oil price volatility on macroeconomic volatility in the country. Macroeconomic volatility implies the vulnerability of macroeconomic variables to shocks. It is the tendency of macroeconomic variables such as GDP, inflation, exchange rate, interest rate to be unstable and weak in terms of withstanding shock. It is a situation whereby little shock in the economy subjects the macroeconomic variables to fluctuations and uncertainty.

The importance of exchange rate stability in the attainment of macroeconomic policy objectives in both developed and developing economies cannot be over emphasized. Exchange rate is one of the determinants used in assessing the performance of an economy. A very strong exchange rate is a reflection of a strong and viable economy. On the other hand, a very weak currency is a reflection of a very vulnerable and weak economy. Governments, particularly in developing economies over the years have adopted different exchange rate management policies with a View to achieve realistic and stable exchange rate. Thus, most of these countries experienced high exchange rate fluctuation which translates into high

degree of uncertainty or volatility. Exchange rate volatility is associated with unpredictable movements in the relative price in the economy. It also refers to the swings or fluctuations in the exchange rate over a period of time or deviations from a benchmark or equilibrium exchange rate. Exchange rate volatility is an important contributor to risk in the financial world. During the period of excessive movements in exchange rates, foreign trade and investments could be affected negatively (Mordi, 2006).

Therefore policy makers must stay focused and keep these aforementioned factors in favorable conditions so that exchange rate effectively reflects strong condition of an economy. In a bid to achieve exchange rate stability, Nigeria's monetary authorities have adopted various exchange rate regimes\ arrangements. It shifted from fixed exchange rate system in 1980s.

Between 1970 and mid 1980 Nigeria exchange rate policy shifted from fixed exchange rate to a pegged arrangement and finally, to the various types of the floating regime since 1986 following the adoption of the Structural Adjustment Programme (SAP)

Exchange rate variability and fluctuations aggravate balance of payment position, increase inflation rate, change in gross domestic product and interest rate.

When there's adjustment\instability in this variables producers and investor's confidence is weaken because it affects their projected (planned) revenue and cost inducing their profit margin.

Exchange regimes equally plays an important role in the determination process. In a fixed exchange rate regime, economic agents adjust prices rapidly because they perceive any change in exchange rate to be permanent. However, in a flexible exchange rate regime, economic agents do not adjust their prices swiftly because they perceive changes to be temporary. In a high income country, economic agents do not adjust prices rapidly in response to exchange rate changes because higher incomes create opportunity for higher degree of competition in the domestic market, thereby constraining the pricing power of firms. On the other hand, in low income countries, the reverse is the case (Razafimahefa, 2012)

The Intensive understanding of the mechanics of the aforestated determinants of exchange rate stability is the main thrust of this research work.

1.1 STATEMENT OF RESEARCH PROBLEM

Several factors have been attributed to determination of exchange rate stability in Nigeria. These factors have contributed to overvaluation and depreciation of Nigerian currency over time since Post-Independence. (Benson , U.O and Victor, E.O, 2012) and (Aliyu S. , 2009) noted that despite various efforts by the

government to maintain a stable exchange rate, the naira has depreciated throughout the 80's to date

The issue of exchange rate management and macroeconomic performance in developing countries has received considerable attention and generated much debate. The debate focuses on the degree of fluctuations in the exchange rate in the face of internal and external shocks. It is believed that exchange rate movements would create domestic economic distortions and affect a country's economic competitiveness. There appears a consensus view on the fact that devaluation or depreciation could boost domestic production through stimulating the net export component. This is evident through the increase in international competitiveness of domestic industries leading to the diversion of spending from foreign goods whose prices become high, to domestic goods.

However despite the general notion that exchange rate depreciation will rise export and curb importation doesn't necessarily hold for Nigeria's case as the country lacks appropriate and sufficient productive capabilities to leverage the fall in value of domestic currency to attract more foreign demand for domestically produced goods.

As illustrated by (Guitan, 1976)and (Dornbusch, 1988)the success of currency depreciation in promoting trade balance largely depends on switching demand in proper direction and amount as well as on the capacity of the home economy to meet

the additional demand by supplying more goods. On the whole, exchange rate fluctuations are likely, in turn, to determine economic performance. It is therefore necessary to evaluate the effects of exchange rate fluctuations on output growth and price inflation. The changes in exchange rates will have both favorable and unfavorable impacts on economic activities and living standard of the public because of the largely globalized trade and finance involving the exchange of currencies

Nigeria's exchange rate changes have been a subject of debate among policy makers, concerned monetary authorities and academics because of the recognition of the vital role exchange rate regime plays in the achievement of sustainable growth. Government and monetary authorities in Nigeria, over the years have done a lot of work in the area of finding the appropriate exchange rate management, given the peculiarities of the economy. Since the adoption of the Structural Adjustment Program in 1986, Nigeria has adopted different types of exchange rate regimes, ranging from floating exchange rate regimes to fixed/pegged regimes.

(Sanusi, 2004) Opined the importance of maintaining a realistic exchange rate for naira, and also the need to minimize distortions in production and consumption, increase the inflow of non-oil export receipts and attract foreign direct investment

The determination of exchange rates is one of the most commonly researched areas in (Muço, M., P. Sanfey and A. Taci, 2004) the behavior of exchange rate is one of the unsettled issue of economic and finance related researches. Due to the enormous

significance of the exchange rate in an economy, no one can deny the meaning to know the foreign exchange rate market behavior. So it is very important to study about the determinants of exchange rate as well as foreign exchange market behavior in details (Uddin, K.M.K., G.M.A.A. Quaosar and D.C. Nandi, 2013)

(Aliyu S. U., 2011) Identified the determinants of real exchange rate as including terms of trade, index of crude oil volatility, index of monetary policy performance and government fiscal stance while Omojimite (2011) identified the price of oil and openness of the economy as significant determinants. Also, government expenditure, money supply, real interest rate, productivity index and openness of the economy influenced the real exchange rates volatility in Nigeria (Ajao, G. M. and Igbekoyi, E. O., 2013).

As mentioned above they are numerous macroeconomic variables that determines exchange rate stability in Nigeria. However, this research work shall principally focus or be limited to only GDP, inflation rate, interest rate and change in oil price index and with a view to ascertain the magnitude, direction, causality as well as the long run relationship with the stipulated variables.

1.2 OBJECTIVES OF THE STUDY

The general objective of this study is to identify and enumerate the macroeconomic determinants of exchange rate stability in Nigeria. Specifically, the study shall attempt to find out

1. If there is any existence of long run relationship between the exchange rate and it's identified determinants in Nigeria.
2. The nature and direction of Granger Causality between exchange rate and its stipulated determinants.
3. To offer some policy recommendations based on the findings of the study.

1.3 FORMULATION OF HYPOTHESIS

Given reference to the above outlined statement of the problem and research objectives the below listed hypothesis are formulated.

$H0_1$; There is no existence of long run relationship between exchange rate and its determinants.

H1; There exist long run relationship between exchange rate and its determinants.

$H0_2$; There is no existence of Granger Causality between exchange rate and its stipulated determinants.

H1; There exist Granger Causality between exchange rate and its stipulated determinants.

1.4 JUSTIFICATION OF THE STUDY

The Exchange rate alongside inflation rate, interest rate and Oil Price are paramount to Nigeria's economic strength and underlying competiveness with world economies. However these so-called variables are so volatile and vulnerable in nature and possess the potency to dampen macroeconomic performance. Apparently, since our economy is an import dependent and relatively mono economic these factors play a vital role in determining the fate of Nigeria's economic growth and their relevancy calls for stringent policy mix to gauge and keep them on check regularly to avert macroeconomic distortions.

This research work is believe to be of immense and enormous significance as well as resourceful to fellow existing and potential researchers, policy makers, monetary authorities, capital market stakeholders. Also this study will be of great importance to Non-Economist/Finance readers by providing them with in-depth knowledge in the mechanics of exchange rate.

1.5 SCOPE AND LIMITATIONS OF THE STUDY

This study shall cover the period of 1990-2018; a sample size of 28 years is long enough for time series analysis. The choice of this period is largely informed by

data availability, given the intended econometric technique; ARDL is relatively more efficient in the case of small and finite sample data sizes; this research work seeks to employ in carrying out analysis and also due to the fact that Nigerian economy has practiced different types of exchange rate regimes within the given period.

1.6 ORGANISATION OF THE STUDY

The study is structured into five chapters as follows

Chapter one encompassed background of the study, statement of research problem, research objectives, formulation of hypothesis, significance of the study. Furthermore chapter two consists of the theoretical framework, empirical literature and determinants of exchange rate. Moreover chapter three states the intended methodology, identifications of the variables to be used, sources of data and econometric method to be used in analyzing data. Also Chapter four Offers analysis on collected data and testing of formulated hypothesis. Finally Chapter five the last section finally draws summary and conclusion of the whole study and make recommendation based on findings.

CHAPTER TWO

LITERATURE REVIEW

1.0 CONCEPTUAL FRAMEWORK

The currencies of most countries are fully convertible to another, some at a fixed ratio and others at a ratio subject to daily fluctuations. This ratio is the number of units of one currency that are exchangeable for unit of another is termed as exchange rate. Exchange rate implies the price of one currency in terms of another. It is the ratio between a unit of one currency and the amount of another currency for which that can be exchanged at a particular time. (Ozturk.I, 2006)Posits that exchange rate like other economic variables which Include interest rate, inflation rate, Balance of payment (BOP), GDPR, unemployment rate, and money supply etc. are strong macroeconomic indicator for assessing the overall performance of an economy. Exchange rate can either appreciate or depreciate, appreciation in the exchange rate occurs if less units of domestic currency i.e. Naira, exchanges for a unit of foreign currency while depreciation is when more unit of domestic currency exchanges for a unit of foreign currency.

2.0.1 Exchange rates and Inflation rates

Inflation is the persistence and sustain rise on general price level which leads to fall in purchasing power and value of money. Basically there's a negative relationship

between general price level and purchasing power. Also the higher the exchange rate, the higher the inflation, hence the more home currency depreciates the more the inflation rate increase and ultimately made import price so higher and domestically produced goods cheaper.

For most import dependent nation like Nigeria the most common inflation is cost push inflation. Exchange rate fluctuation influence domestic prices through inflation. Generally when a currency depreciates it will result in higher import prices, while lower export price if the country is an international price taker, the potentially higher cost of imported input associated with an exchange rate depreciation increases marginal cost and leads to higher prices of domestically produced good Also import competing firms might increases prices in response to foreign competitors prices to improve profit margins (Kandil .M, 2004).

Exchange pass through (ERPT) is generally used to refer to the effect of exchange rate changes on import and export prices, consumer prices, investments or trade volumes (Frimpong, S. and Adam, A.M., 2010). (Goldberg, Pinelopi K. and Michael M. Knetter , 1997) Referred ERPT as the percentage change in local currency import prices resulting from a one per cent change in the exchange rate between the exporting and importing economies

(Woo, 1984) Refers to three channels in which exchange rate influences domestic inflation.

- The prices of imported goods directly affect the consumer price index,
- The prices of imported goods directly affect the cost of domestic goods,
- The fluctuations in the exchange rate, directly affect the current account thus the total demands and the changes in the total demands are affected.

The effect of foreign commodities on increasing prices. In addition to the above mentioned imported cost and imported input cost channels, there is also a real balance channel. Accordingly, the devaluation will increase the prices of the goods subject to the trade compared to the goods that are not subject to the trade, which will lead to an increase in the overall level of prices. As the weight of the goods used in the consumer basket increases, the increase in the general level of prices is higher.

Previous literature have explored the relationship between exchange rate and inflation, some researchers found a positive relationship between exchange rate and inflation (Muço et al.,2004) and some other researchers found a negative relationship (Arslaner, F., K. Dogan, A. Nuran and H.K. Suleyman, 2014).

2.0.2 Exchange rates and Interest rates

Theoretically interest rate is the opportunity cost of holding money, it has positive relationship to saving and negative relationship to investment. Interest, inflation rate are all highly correlated. By manipulating interest central exert influence over both inflation and exchange rate and changing interest impact inflation and currency values. Higher interest rate offer lenders in an economy higher returns relative to

other countries therefore higher interest rate attracts foreign capital and cause exchange rate to raise. Impact of higher interest is mitigated, however if inflation in the country is much higher in other or if additional factors serve to drive the currency down. Conversely, opposite relationship exist for decreasing interest rate that is lower interest rate tends to decrease exchange rate.

When a country experience a recession its interest rate are likely to fall, decreasing its chances to acquire capital. As a result its currency weakens in comparison to other countries therefore lowering the value of its currency.

(Llaudes, 2007) Studied the effects and transmission mechanism of unexpected monetary shocks in an open economy setting within the context of a VAR framework for 15 OECD countries. The study considered an economy with two sectors namely, tradable and non-tradable and employed a recursive identification scheme based on the cholesky decomposition and the structural VAR (SVAR) methodology. The author found evidence that both the tradable and non-tradable sectors were sensitive to the effects of monetary policy. Contractionary monetary policy shock that raises the level of the interest rate causes an appreciation of the exchange rate, while tradable and non-tradable output decrease in all countries in the sample.

2.0.3 Exchange rates and GDP

The impact of the productivity differential on the real exchange rate is expected to follow the well-known Balassa- Samuelson doctrine, which states that relatively larger increases in productivity in the traded goods sector is associated with a real appreciation of the currency of a country. If a country experiences an increase in the productivity of the tradable sector (relative to its trading partners), real exchange rate would tend to appreciate, because the productivity gains would push up the wages in the tradable sector which would lead to demand-driven faster increase in the price of non-tradable in the domestic economy relative to its trading partners (Mc Donald and Ricci, 2003). GDP rises when the value of a country's foreign exports exceed the value of their foreign imports.

Similarly in a study conducted by (Aliyu S. , 2009) on the Impact of Oil Price Shock and Exchange Rate Volatility on Economic Growth in Nigeria using VECM shows that Nigeria's GDP increases more by oil price increase than by exchange rate appreciation and this is consistent with the expectation.

Generally speaking GDP can affect currency exchange rates in three main ways.

Firstly, when a country's GDP rises, its currency's worth also rises. It works the same way in the other direction, too. When a country's GDP falls, its currency also weakens.

Secondly, investors and international corporations use GDP to inform many of their investment decisions.

Investors usually prefer putting their money in countries that indicate high GDP growth rates. Because investment usually strengthens the currency of that country, be it portfolio or foreign direct investment (FDI) GDP has an indirect influence over it through affecting investment decisions.

Thirdly, most national central banks, including the US Federal Reserve, also take GDP growth rates into consideration when deciding whether or not they should change interest rates.

2.0.4 Exchange rates and Oil Price

Relatively in Nigeria, Oil price's paramountcy cannot be overemphasized in determination of exchange rate movement and overall macroeconomic performance as it constitutes a significant portion of the country's foreign receipts and a larger volume in its export. However Oil price is stochastic and highly volatile in nature as its deviation affect exchange rates given the direction of change either increase or decrease. An oil price increase, all things being equal, should be considered positive in oil exporting countries and negative in oil importing countries, while the contrary should be expected when the oil price decrease. In Nigeria, higher oil revenue leads to exchange rate appreciation while

lower oil revenue leads to depreciation of the local currency (Naira ₦) vis-à-vis the United States' dollar($).

Jin (2008) posited that sharp increase in the international oil prices and violent fluctuation of the exchange rate are generally regarded as factors discouraging economic growth.

2.1 THEORETICAL FRAMEWORK

Apparently there are numerous theories attributed to exchange rate determination the likes of the Mint parity theory, Purchasing power parity (PPP), Balance of payment theory (BOP), Monetary Approach, Portfolio Balance Approach , law of one price, Mundell-Fleming Models, Salter-Swan (Dependent-economy) Models, Three-Good Model and Edward's Theoretical Models. However in the cause of this research work we shall only concentrate on few amongst them.

2.1.0 The Mint Parity Theory

The earliest theory of foreign exchange has been the mint parity theory. This theory was applicable for those countries which had the same metallic standard (gold or silver). Under the gold standard, countries had their standard currency unit either of gold or it was freely convertible into gold of a given purity. The value of currency unit under gold standard was defined in terms of weight of gold of a specified purity contained in it. The central bank of the country was always willing to buy and sell gold up to an unlimited extent at the given price. The price at which

the standard currency unit of the country was convertible into gold was called as the mint price.

2.1.1 The Purchasing Power Parity Theory

The Purchasing power Parity (PPP) developed by the school of Salamanca in the 16th century and was augmented into its modern form by Swedish Economist Gustav Cassel in 1918.

This theory states that the equilibrium rate of exchange is determined by the equality of the purchasing power between the currencies of two nations. It emphasized that the rate of exchange between two paper currencies is determined by the internal price levels in two countries.

There are two versions of the purchasing power parity theory:

(i) The Absolute Version and

(ii) The Relative Version.

(i) The Absolute Version: According to this version of the purchasing power parity theory, the rate of exchange should normally reflect the relation between the internal purchasing power of the different national currency units. In other words, the rate of exchange equals the ratio of outlay required to buy a particular set of

goods at home as compared with what it would buy in a foreign country in absolute terms.

(ii) The Relative Version:

The relative version of Cassel's purchasing power parity theory attempts to explain the changes in the equilibrium rate of exchange between two currencies. It relates the changes in the equilibrium rate of exchange to changes in the purchasing power parities of currencies. In other words, the relative changes in the price levels in two countries between some base period and current period have vital bearing upon the exchange rates of currencies in the two periods. This version takes account of relative changes between base period and current purchasing power which have crucial bearing on the equilibrium rate of exchange. The exchange rate in the current period (R_1) is determined by the equilibrium rate of exchange in the base period (R_0) and the ratio of price indices of current and base period in one country to the ratio of price indices of current and base period in another country.

Mathematically expressed as

$$\mathbf{R1} = \boldsymbol{R0} \cdot \frac{\mathbf{PB1}}{\mathbf{PA0}} \times \frac{\mathbf{PA0}}{\mathbf{PA1}}$$

2.1.2 The Balance of payment Theory (B.O.P)

The balance of payments theory of exchange rate maintains that rate of exchange of the currency of one country with the other is determined by the factors which are independent of internal price level and money supply. It emphasized that the rate of exchange is influenced, in a significant way, by the balance of payments position of a country. The relative sizes of export and import conjointly determine exchange rate of between two currencies.

A deficit in the balance of payments of a country signifies a situation in which the aggregate demand for foreign goods exceeds the aggregate supply of domestic goods in the international market. In other words, the excess of demand for foreign exchange over the supply of foreign exchange is coincidental to the BOP deficit. The demand pressure results in an appreciation in the exchange value of foreign currency. As a consequence, the exchange rate of home currency to the foreign currency undergoes depreciation. Whilst A balance of payments surplus signifies an excess of aggregate supply of foreign goods over the aggregate demand for it. In such a situation, there is a depreciation of foreign currency but an appreciation of the currency of the home country.

They are number of approaches to correcting BOP disequilibrium in an economy the Marshal-Lerner's elasticity approach and absorption approach.

Marshall-Lerner Condition

The elasticity approach to BOP is associated with the Marshall-Lerner condition which was worked out independently by these two economists. It studies the conditions under which exchange rate changes restore equilibrium in BOP by devaluing a country's currency. This approach is related to the price effect of devaluation. Thus devaluation helps to improve BOP deficit of a country by increasing its exports and reducing its imports. The condition is effective when $e_x + e_m > 1$ when the sum of price elasticities of demand for exports and imports in absolute terms is greater than unity, devaluation will improve the country's balance of payments.

Absorption Approach

The absorption approach emphasizes changes in real domestic income as a determinant of a nation's balance of payments and exchange rate. The absorption approach hypothesizes that a nation's current account balance is determined by the difference between real income and absorption, which can be written as:

$$Y - A = (c+i+g+x) - (c+i+g+m) = x - m$$

If real income rises faster than absorption, then the current account improves

$$\Delta Y > \Delta A = \Delta CA > 0.$$

If real income rises slower than absorption, then the current account worsens

$$\Delta Y < \Delta A = \Delta CA < 0$$

The approach hypothesizes that relative changes in real income or output and absorption determine a nation's balance-of-payments and exchange-rate performance.

2.1.3 Monetary Approach to Rate of Exchange

In contrast with the BOP theory of foreign exchange, in which the rate of exchange is determined by the flow of funds in the foreign exchange market, the monetary approach postulates that the rates of exchange are determined through the balancing of the total demand and supply of the national currency in each country. The monetary approach to prices and exchange rates suggests that all things being equal, increase in the rate of money supply growth is proportional to increase in the rate inflation (Price rise) and the rate of exchange rate depreciation. The approach shows that, in the long run, all nominal variables- the money supply, interest rate, price level and exchange rate are interlinked.

2.1.4 The Portfolio Balance Approach

In view of the deficiencies in the monetary approach, some scholars have attempted to explain the determination of exchange rate through the portfolio balance approach which is more realistic than the monetary approach.

The portfolio balance approach brings trade explicitly into the analysis for determining the rate of exchange. It considers the domestic and foreign financial assets such as bonds to be imperfect substitutes. The essence of this approach is

that the exchange rate is determined in the process of equilibrating or balancing the demand for and supply of financial assets out of which money is only one form of asset.

This approach postulates that an increase in the supply of money by the home country causes an immediate fall in the rate of interest, which consequently leads to fall in returns of domestic denominated assets as it leads to a shift in the asset portfolio from domestic bonds to home currency and foreign bonds. The substitution of foreign bonds for domestic bonds results in an immediate depreciation of home currency. This depreciation, over time, causes an expansion in exports and reduction in imports. It leads to the appearance of a trade surplus and consequent appreciation of home currency, which offsets part of the original depreciation.

2.2 EMPIRICAL LITERATURE

Previous literature have explored the relationship between exchange rate and its macroeconomic determinants, some researchers found a positive relationship between exchange rate and inflation and interest rates (Muço et al., 2004) and some other researchers found a negative relationship (Arslaner et al., 2014. In a nutshell the reviewed empirical literatures with respect to this research work were found to be mix and multifaceted in terms of variables employed and methodology

adopted. Given this observation it's safe to say the concept of exchange rate determination is highly diverse.

In a study conducted by (Mohamed Isse Ibrahim and Ahmed Ibrahim Nageye , 2017) in Somalia using ordinary least square (OLS) found that trade balance, money supply and external debt has a negative significant relationship to exchange rate in Somalia while Governments expenditure has a positive relationship to exchange rate.

(Ngozi E. Nwachukwu, Racheal O. Adebayo, Abdullahi M. Shettima, John O. Anigwe and Chidinma T. Udechukwu-Peterclaver1 , 2016) In their co-joint study of Real Effective Exchange Rate Misalignment in Nigeria using Autoregressive distributed lag (ARDL) Cointegration procedure ascertain that terms of trade and degree of trade openness are significant determinants of the REER, implying that trade policies matter for Naira REER movements. The error correction model indicated that 3.3% of disequilibrium error is corrected within a quarter.

Likewise (Eltayeb, 2016) in his study of determinants of exchange rate in Sudan using Autoregressive distributed lag model (ARDL) study aimed to investigate the effects of growth rate of real gross domestic product (GDP), real money supply (M), inflation rate (INF), and trade openness (OP) on exchange rate (EXR) stability in Sudan. The results reveal that, there is a long run relationships between

exchange rate and its determinants and statistically significant. An increase in growth rate of real GDP leads to stability in EXR. The coefficient of error correction model reveals that exchange rate (EXR) will restore back to its equilibrium with speed of adjustment of 23.2% whenever there is a shock to its equilibrium.

(Ajao and Igbokoyi , 2013) Investigated the degree of influence of real exchange rate, productivity, trade openness and government expenditure, real interest rate and money supply on real exchange rate volatility in Nigeria for the period between 1981 and 2008. Using GARCH and ECM, their empirical results indicates that real exchange rate, trade openness, government expenditure, real interest rate have positive impact on exchange rate volatility in Nigeria with exception of money supply and productivity.

(Asher, 2012) Examine the impact of exchange rate fluctuations on the Nigerian economic growth for period of 1980-2010, the result showed that real exchange rate has a positive effect on economic growth. In a similar study (Akpan, 2008) investigated foreign exchange market and economic growth in an emerging petroleum based economy from 1970-2003 in Nigerian, He found that positive relationship exist between exchange rate and economic growth for countries dependent on one export commodity such as oil like Nigeria.

Contrarily, (Dada A. and Oyeranti A., 2012)examined the effect of exchange rate volatility on economic growth in Nigeria using annual data for the period of 1970-2009. using vector Auto- regressive(VAR) technique the study revealed that economic growth is negatively related to exchange rate in the short run while in the long run, a positive relationship between the two variables.

Moreover, (Nucu, 2011)examined the influence of gross domestic product (GDP), inflation rate, money supply, interest rates and balance of payments on exchange rate of Romanian against the most important currencies (EUR, USD) for the period 2000-2010 and found an inverse relationship between exchange rate (EUR/RON) GDP, and money supply. While a direct relationship was found between EUR/RON, Inflation and Interest rate.

Relatively, (Imimole B and Enoma A, 2011) examined the impact of exchange rate depreciation on inflation in Nigeria for the period of 1986-2008 using Autoregressive distributed lag Cointegration procedure. The research found that naira depreciation has positive and significant long run effect on inflation in Nigeria. This implies that exchange rate depreciation can bring about an increase in inflation.

(Mapenda, 2010) Used the Johansen approach and the Vector Error Correction Model (VECM) to evaluate the long-run determinants of the exchange rate in Ghana and Nigeria, using the terms of trade, trade restrictions, domestic interest rates, foreign aid inflow, income, money supply, world inflation, government

consumption expenditure, world interest rates, capital controls and technological progress. His empirical results for Ghana revealed that any increase in government consumption expenditure, the terms of trade, net foreign aid inflow and openness significantly led to currency depreciation, while an increase in world cocoa prices appreciated the Ghanaian currency. On the other hand, an increase in world oil prices and government consumption expenditure appreciated the Nigerian currency, whereas a rise in net foreign assets devalued the Naira. His work finally showed that the Naira exchange rate was overvalued within the period 1980 to 1983 and undervalued within the period 1984 to 1991.

A study conducted by (Aliyu S. , 2009) using quarterly data from 1986-2007 in Nigeria via the Johansen VAR-based cointegration technique observed that oil price shock and appreciation in the level of exchange rate exert positive impact on real economic growth in Nigeria. The study further showed that Nigeria's GDP increases more by oil price increase than by exchange rate appreciation.

In a study (J.Frankel, 2007) revealed that real exchange rate is positively related to terms of trade, real interest rate differential and lagged real exchange rate, while capital account, per capita income and risk premium have negative effect on real exchange rate

Moreover (P.Takaendesa, 2006) has found a negative correlation between real exchange rate and economic growth in his panel study of 33 developing countries

Nigeria inclusive furthermore he opined that large swings in real exchange rate has greater uncertainty in relative prices resulting in problem such as greater risk, shorter investment horizon and high adjustment cost as production moves back and forth from tradable to non-tradable and financial instability as expectations of exchange rate changes lead to interest rate volatility.

CHAPTER THREE

RESEARCH METHODOLY

This chapter examines and specifies the method and procedures used in collecting as well as analyzing data. Statistical and econometrics techniques are employed as basic tools in analyzing data. However the research attempts to give a detailed analysis on how economic determinants (variables) affect exchange rate stability on Nigerian economy within the period of study using unit root test econometric, cointegration, error correction mechanism, granger causality and various post estimation diagnosis.

3.1 RESEARCH DESIGN

This research is designed at whether real exchange rate is significantly determined RGDP, interest rate, inflation and Oil price. Virtually this research work is a quantitative research that requires time series data to carry out its estimations and analysis. Given this notion the time frame for the time series data to be collected ranges from 1986-2018 for all the variables mentioned above.

3.2 TYPE AND SOURCES OF DATA

The study will use secondary data for its analysis. The relevant time series data are extracted from the Statistical Bulletin of the Central Bank of Nigeria (2018) and from Organization of Petroleum Exporting Countries (OPEC) statistical bulletin

(2018) for the sake of reliability and authentication. The study utilized annual time series data which was readily available for all the variables. The data collected are; RGDP, Inflation rate, Interest rate and Oil price for the period under review.

3.3 Method of data analysis

Preliminary this research shall begin its analysis by testing the descriptive statistics and unit root test and later proceed to Ramsey Test and Wald Test as linearity tests to ascertain if the relationship among the variables under consideration are linear or otherwise in order to apply the appropriate estimation procedure. (M.D. Galadima and A.A. Wambai, 2017) Mentioned three techniques capable of testing Linearity/Non-linearity which are The Ramsey Reset test, Incremental F-test, and Wald test. If the results from at least two of the tests signifies a linear relationship an ARDL model will be uphold whilst otherwise a Non-linear ARDL will be adopted. Cointegration test and ECM models shall be applied to determine the existence of long run and short run relationships, CUSUM test to test for model stability and a Granger Causality relationship to investigate the causal relationship and its direction.

3.3 MODEL SPECIFICATION

3.3.1 Unit root test

In an attempt to determined and identify the economic determinants of exchange rate stability in Nigeria, a unit root test is first employed. Unit root means the

observed time series is no stationary, while if its mean is reverting it follows that the variable will return to its trend path overtime and it might be possible to forecast future trend, it's referred to as stationary if its mean, variance and auto-covariance remains constant overtime. One of the most widely used unit root test is the Augmented-Dickey fuller (ADF) and Phillips Peron test.

The Augmented Dickey-Fuller (ADF) (1981) tests for Unit Root

Let's consider an AR(1) process

$\gamma_t = \emptyset_1 + \rho\gamma_{t-1} + \mu_t$……………………………….(1)

$\gamma_t - \gamma_{t-1} = \emptyset_1 + \rho y_{t-1} - y_{t-1} + \mu_t$…………………………..(2)

$\Delta y_t = \emptyset_1 + (\rho - 1)\gamma_{t-1} + u_t$…………………(3)

$\Delta y_t == \emptyset_1 + \delta yt\text{-}1 + \mu_t$……………………………(4)

If $\partial = 0$ ---- H0------->Non Stationary

If $\partial < 0$ ----HI--------->Stationary

Three forms of unit root are

$\Delta Y_t = \mu + \delta_t + \rho Y_{t-1} \sum_{i=1}^{\rho-1} \bar{Й}_i \Delta Y_{t-1} + \varepsilon_t$------------------------>Deterministic trend

$\Delta Y_t = \mu + \rho Y_{t-1} \sum_{i=1}^{\rho-1} \bar{Й}_i \Delta Y_{t-1} + \varepsilon_t$-------------------------> Random Walk with drift

$\Delta Y_t = \rho Y_{t-1} \sum_{i=1}^{\rho-1} \bar{И}_i \Delta Y_{t-1} + \varepsilon_t$----------> Random Walk without drift

In practice, a DF or ADF value with less than its critical value shows that the underlying series is non-stationary. Contrarily, when a DF or ADF value that is greater than its critical value shows that the underlying series is stationary. However, the null hypothsis cannot be rejected about non-stationarity based on ADF test, since its power is not strong as such. This decision can be verified using other related tests, such as Kwiatkowski-Phillips-Schmidt-Shin (1992)(KPSS) or Philips-Perron (PP) test. PP test has the same null hypothesis as ADF, and its asymptotic distribution is the same as the ADF test statistic. But in the case of KPSS test, the null hypothesis is different; it assumes stationarity of the variable of interest. The results from ADF test differ from KPSS as KPSS does not provide a p-value, showing different critical values instead. In this case, the test statistic value is compared with the critical value on desired significance level. If the test statistic is higher than the critical value, we reject the null hypothesis and when test statistic is lower than the critical value, we cannot reject the null hypothesis. However, when there is a conflicting of the tests, it all depends on the researchers aim and objective. In general, the null hypothesis for ADF reads that the series is non- stationary while KPSS reads that the series is stationary. For the treatment of serial correlation, PP reads that there is serial correlation (non-parametric) while ADF reads that there is serial correlation (parametric).

3.3.2 Ramsey RESET Test

The Ramsey's RESET (Regression Specification Error Test) could be applied to test nonlinearity in a relationship involving time series. In statistics, the Ramsey Specification Error Test (RESET) is a

Mis-specification test for linear regression usually employed for testing the following types of

Specification errors:

i. Omitted variables; X does not include all relevant variables.

ii. Incorrect functional form; some or all of the variables in Y and X should be transformed to Logs, powers, reciprocals, or some other mathematical forms.

$$y = ax + \gamma 1 y\hat{}2 + \cdots + \gamma k-1 y\hat{}k + \varepsilon$$

The test is an F-test that tests the null hypothesis that $\gamma 1$through $\gamma k-1$ are zero. If the null-hypothesis, that all the γ coefficients are zero is rejected (i.e. if the p-value of the F-statistic is significant), then the model suffers from Mis-specification.

3.3.3 Autoregressive Distributed Lag (ARDL)

ARDL approach developed by Pesaran et al. (2001), ARDL cointegration technique does not require pretests for unit roots unlike other techniques. Consequently, ARDL cointegration technique is preferable when dealing with variables that are integrated of different order, I(0), I(1) or combination of the both and, robust when there is a single long run relationship between the underlying variables in a small sample size. The long run relationship of the underlying variables is detected through the F-statistic (Wald test). In this approach, long run relationship of the series is said to be established when the F- statistic exceeds the critical value band. The major advantage of this approach lies in its identification of the cointegrating vectors where there are multiple cointegrating vectors. However, this technique will crash in the presence of integrated stochastic trend of I(2). To forestall effort in futility, it may be advisable to test for unit roots, though not as a necessary condition. Based on forecast and policy stance, there is need to explore the necessary conditions that give rise to ARDL cointegration technique in order to avoid its wrongful application, estimation, and interpretation. If the conditions are not followed, it may lead to model misspecification and inconsistent and unrealistic estimates with its implication on forecast and policy.

When one cointegrating vector exists, Johansen and Juselius(1990) cointegration procedure cannot be applied. Hence, it become imperative to explore Pesaran and Shin (1995) and Pesaran et al (1996b) proposed Autoregressive Distributed Lag (ARDL) approach to cointegration or bound procedure for a long- run relationship, irrespective of whether the underlying variables are I(0), I(1) or a combination of both. In such situation, the application of ARDL approach to cointegration will give realistic and efficient estimates. Unlike the (Johansen and Juselius, 1990) cointegration procedure, Autoregressive Distributed Lag (ARDL) approach to cointegration helps in identifying the cointegrating vector(s). That is, each of the underlying variables stands as a single long run relationship equation. If one cointegrating vector (i.e the underlying equation) is identified, the ARDL model of the cointegrating vector is reparameterized into ECM. The reparameterized result gives short-run dynamics (i.e. traditional ARDL) and long run relationship of the variables of a single model. The re-parameterization is possible because the ARDL is a dynamic single model equation and of the same form with the ECM. Distributed lag Model simply means the inclusion of unrestricted lag of the regressors in a regression function. This cointegration testing procedure specifically helps us to know whether the underlying variables in the model are cointegrated or not, given

the endogenous variable. However, when there are multiple cointegrating vectors ARDL Approach to cointegration cannot be applied. Hence, Johansen and Juselius(1990) approach becomes the alternative.

ARDL method yields consistent and robust results because it allows describing the existence of an equilibrium-relationship in terms of long-run and short-run dynamics without losing long- run information (Pesaran et al., 2001). The adoption of ARDL technique will make this commensurate with the works of (Eltayeb, 2016) and (Imimole B and Enoma A, 2011) whom also used ARDL as their estimation technique in their respective study.

Thus, this study tests the existence of the long-run relationship (co-integration) using bound testing (ARDL) technique for co-integration.

Reference to this study the model is specified as

EXR = f (RGDP, INFR, INTR, OP) ----------(5)

The econometric model expressing the relationship between exchange rate and its determinants is given in equation (2) as follows.

$EXRt = a0 + RGDPt + INFRt + INRt + OPt + \varepsilon t$----------(6)

EXRt: Exchange rate at time, t.

RGDPt: Growth rate of real gross domestic product at time, t.

INRt: Interest rate, at time t.

INFt: Inflation rate at time t.

OPt: Oil Price, at time t.

εt: The error term at time, t. is serially uncorrelated disturbance with zero mean and constant variance.

ARDL approach proposed by Pesaran et al. (2001) was formulated in equation (3) to examine the long-run relationship among

$$\Delta EXR_t = \alpha_0 + \partial_1 EXR_{t-1} + \partial_2 RGDP_{t-1} + \partial_3 INFR_{t-1} + \partial_4 OINTR_{t-1} + \partial_5 OP_{t-1} + \sum^{n}_{i=0} \beta_1 \Delta EXR_{t-i} + + \sum^{n}_{i=0} \beta_2 \Delta RGDP_{t-i} + + \sum^{n}_{i=0} \beta_3 \Delta INFR_{t-i} + + \sum^{n}_{i=0} \beta_4 \Delta INTR_{t-i} + + \sum^{n}_{i=0} \beta_5 \Delta OP_{t-i} + \varepsilon_t \quad \text{----------(7)}$$

Where: The optimal lag length n determined using Akaike Information Criteria (AIC), Δ denotes the first difference operator. The Expressions with the summation sign (∂1-∂5) represent the long-run relationship. The remaining expressions (β1-β5) correspond to the short-run dynamics of the model.

After formulating ARDL model which describe the relationship between the variables, then the long-run relationship model for exchange rate and its determinants can be estimated as in equation (4):

$$\Delta EXR_t = \alpha_0 + \partial_1 EXR_{t-1} + \partial_2 RGDP_{t-1} + \partial_3 INFR_{t-1} + \partial_4 OINTR_{t-1} + \partial_5 OP_{t-1} \text{ --(8)}$$

In order to estimate the short-run dynamics, the error correction model (ECM) was expressed in equation (5)

$$\Delta EXR_t = \alpha_0 + \sum^{n}_{i=0} \beta_1 \Delta EXR_{t-i} + \sum^{n}_{i=0} \beta_2 \Delta RGDP_{t-i} + \sum^{n}_{i=0} \beta_3 \Delta INFR_{t-i} + \sum^{n}_{i=0} \beta_4 \Delta INTR_{t-i} + \sum^{n}_{i=0} \beta_5 \Delta OP_{t-I} + \lambda ECM_{t-1} \text{ ----------(9)}$$

Where: ECMt−1: The lagged error-correction term, λ: Parameter indicating the speed of adjustment back to long run equilibrium after short run shock, λ was expected to have negative sign and significant for the long run equilibrium. The larger the error correction coefficient indicates faster adjustment back to long run equilibrium after short run shock.

3.3.4 Vector Error Correction (VECM) Technique

This is a cointegration technique which is applied when they are multiple cointegtrating vectors unlike the ARDL Bounds test that is applicable to a single cointegration vector. So basically this is a Vector Autoregressive (VAR) based cointegration technique. The VECM is used only when the variables have a long run relationship, i.e. if evidence of long run relationship exists among the non-stationary variables in Y_t. The error correction mechanism (ECM) presupposes that variable Y_t has an equilibrium path, in the short run there are adjustment to deviation from the long run path which are defined by the long run causality. The error correction model equation is as follows:

$$EXR_t = \alpha + \sum^{k-1}_{i=0} \beta_1 \Delta EXR_{t-i} + \sum^{k-1}_{i=0} \beta_2 \Delta RGDP_{t-i} + \sum^{k-1}_{i=0} \beta_3 \Delta INFR_{t-i} + \sum^{k-1}_{i=0} \beta_4 \Delta INTR_{t-i} + \sum^{k-1}_{i=0} \beta_5 \Delta OP_{t-I} + \lambda_1 ECT_{t-1} + \mu_{1t} \text{ ----------(11)}$$

$$RGDP_t = \partial + \sum^{k-1}_{i=0} \beta_2 \Delta RGDP_{t-i} + \sum^{k-1}_{i=0} \beta_3 \Delta INFR_{t-i} + \sum^{k-1}_{i=0} \beta_4 \Delta INTR_{t-i} + \sum^{k-1}_{i=0} \beta_5 \Delta OP_{t-I} + \sum^{k-1}_{i=0} \beta_1 \Delta EXR_{t-i} + \lambda_2 ECT_{t-1} + \mu_2 t \text{----------} (12)$$

$$INFR = \emptyset + \beta_3 \Delta INFR_{t-i} + \sum^{k-1}_{i=0} \beta_4 \Delta INTR_{t-i} + \sum^{k-1}_{i=0} \beta_5 \Delta OP_{t-I} + \sum^{k-1}_{i=0} \beta_1 \Delta EXR_{t-i} + \sum^{k-1}_{i=0} \beta_2 \Delta RGDP_{t-i} + \lambda_3 ECT_{t-1} + \mu_3 t \text{----------} (13)$$

$$INTR_t = \Theta + \sum^{k-1}_{i=0} \beta_4 \Delta INTR_{t-i} + \sum^{k-1}_{i=0} \beta_5 \Delta OP_{t-I} + \sum^{k-1}_{i=0} \beta_1 \Delta EXR_{t-i} + \sum^{k-1}_{i=0} \beta_2 \Delta RGDP_{t\,i} + \sum^{k-1}_{i=0} \beta_3 \Delta INFR_{t-i} + \lambda_4 ECT_{t-1} + \mu_4 t \text{----------} (14)$$

$$OP_t = \Upsilon + \sum^{k-1}_{i=0} \beta_5 \Delta OP_{t-I} + \sum^{k-1}_{i=0} \beta_1 \Delta EXR_{t-i} + \sum^{k-1}_{i=0} \beta_2 \Delta RGDP_{t-i} + \sum^{n}_{i=0} \beta_3 \Delta INFR_{t-i} + \sum^{k-1}_{i=0} \beta_4 \Delta INTR_{t-i} + \lambda_5 ECT_{t-1} + \mu_{5t} \text{----------} (15)$$

Where λ= speed of adjustment

$$ECT_{t-1} = \Delta EXR_t - \alpha_0 - \sum^{n}_{i=0} \beta_1 \Delta EXR_{t-i} - \sum^{n}_{i=0} \beta_2 \Delta RGDP_{t-i} - \sum^{n}_{i=0} \beta_3 \Delta INFR_{t-i} - \sum^{n}_{i=0} \beta_4 \Delta INTR_{t-i} - \sum^{n}_{i=0} \beta_5 \Delta OP_{t-I} \text{----------} (16)$$

3.3.5 Granger Causality Test

The Granger causality (or the endogeneity of the dependent variable) test is applied by calculating the p-value based on the null hypothesis that the set of coefficients of the independent variables are not significantly different from zero. If the null hypothesis is not rejected, then it can be concluded that the independent variables do not Granger-cause the dependent variable. For instance, if the p-value of the Y_t

(Y_t as an independent variable in the equation) is significant at the 5% level (i.e., H0: βiðLÞ ¼ 0, where i refers toY_t, is rejected at a 5% significant level), and the X_t is the dependent variable of the equation, then we can say that there is a short-run causal effect running from Y_t toX_t. The nature of relationship maybe unidirectional (left-right / right-left), bidirectional (feedback) or neutrality causality. The Granger causality can be expressed as:

$$EXR_t = \sum^{n}_{i=0} \beta_1 \Delta EXR_{t-i} + \sum^{n}_{i=0} \beta_2 \Delta RGDP_{t-i} + \sum^{n}_{i=0} \beta_3 \Delta INFR_{t-i} + \sum^{n}_{i=0} \beta_4 \Delta INTR_{t-i} + \sum^{n}_{i=0} \beta_5 \Delta OP_{t-I} + \mu_{1t} \text{----------} (17)$$

$$RGDP_t = \sum^{n}_{i=0} \beta_2 \Delta RGDP_{t-i} + \sum^{n}_{i=0} \beta_3 \Delta INFR_{t-i} + \sum^{n}_{i=0} \beta_4 \Delta INTR_{t-i} + \sum^{n}_{i=0} \beta_5 \Delta OP_{t-I} + \sum^{n}_{i=0} \beta_1 \Delta EXR_{t-i} + \mu_2 t \text{----------} (18)$$

$$INFR_t = \sum^{n}_{i=0} \beta_3 \Delta INFR_{t-i} + \sum^{n}_{i=0} \beta_4 \Delta INTR_{t-i} + \sum^{n}_{i=0} \beta_5 \Delta OP_{t-I} + \sum^{n}_{i=0} \beta_1 \Delta EXR_{t-i} + \sum^{n}_{i=0} \beta_2 \Delta RGDP_{t-i} + \mu_3 t \text{----------} (19)$$

$$INTR_t = \sum^{n}_{i=0} \beta_4 \Delta INTR_{t-i} + \sum^{n}_{i=0} \beta_5 \Delta OP_{t-I} + \sum^{n}_{i=0} \beta_1 \Delta EXR_{t-i} + \sum^{n}_{i=0} \beta_2 \Delta RGDP_{t-i} + \sum^{n}_{i=0} \beta_3 \Delta INFR_{t-i} + \mu_4 t \text{----------} (20)$$

$$OP_t = \sum^{n}_{i=0} \beta_5 \Delta OP_{t-I} + \sum^{n}_{i=0} \beta_1 \Delta EXR_{t-i} + \sum^{n}_{i=0} \beta_2 \Delta RGDP_{t-i} + \sum^{n}_{i=0} \beta_3 \Delta INFR_{t-i} + \sum^{n}_{i=0} \beta_4 \Delta INTR_{t-i} + \mu_{5t} \text{----------} (21)$$

3.4 Measurement of Variables and Sources of Data

3.4.1 Exchange Rate: An exchange rate is the value of one nation's

Currency versus the currency of another nation or economic zone. Exchange rate is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in relation to another currency. Rate of exchange between two or more currencies are determine through either fixed system where Central Bank of a country pegged a home currency to a basket of other major currencies or a floating mechanism where the market forces of demand and supply are allowed to determine the price of one currency in terms of another without any restriction. In Nigeria a managed float system is adopted to determine exchange rates where the Central Bank is considerably allowed to intervene or manipulate the free market. Reference to this study it's the target variable and the regressand, the data on monthly average of exchange rate of ₦/$ is obtained from CBN's 2018 Statistical bulletin.

3.4.2 RGDP:

Gross domestic product is the total value of all economic activities be it production, consumption, investment that took place in an economy over a period of time be it annually or quarterly. Real gross domestic product is an inflation-adjusted measure that reflects the value of all goods and services produced by an economy in a given year, expressed in base-year prices, and is often referred to as "constant-price," "inflation-corrected" GDP or "constant dollar GDP." The RGDP is also used as a proxy for economic growth which can be a positive or a negative number given the prevailing economic realities at any different time. The GDP growth rate is mathematically calculated as

$$RGDP = \frac{\text{Nominal GDP}}{\text{GDP DEFLATOR}} \times 100$$

Reference to this research work data on RGDP was sourced from CBN's 2018 Statistical bulletin computed via 2010 Constant prices.

3.4.3 Inflation Rate:

Inflation is defined as the persistent and sustained rise in the general price level which lead to a fall in the value of money. During inflation large amount of money purchased fewer bundles of goods and service, it affects the purchasing power of money in an economy. The data on inflation rate was also obtained from CBN's Annual statistical bulletin which was initially obtained from

National Bureau of Statistics (NBS) and computed via Year-on-Year changes.

Mathematically expressed as $inflation\ rate = \frac{CPI_{t-}\ CPI_{t-1}}{CPI_{t-1}} \times 100$

3.4.4 Interest Rate:

Interest rate is equally and important variable in this study which relates investors returns on assets and cost of credit which have a crucial bearing on exchange rate. It is also referred to as Monetary Policy Rate (MPR) which alongside money supply are determine by the Central Bank depending on the prevailing economic activities and macroeconomic objective. For the period under review of this study, data on interest rate is also obtained from Central Bank database.

3.4.5 Oil Price:

Oil prices are determined by global oil trade deals which is mostly traded on a futures contract. Forces of demand and supply and market sentiments are the major determinants of oil price, however organizations and institutions like the OPEC and the American government can considerably influences oil prices. Oil prices are also defined by the grades of oil that its API gravity (relative density to water), sulfur content (sweet/sour). API of more than 10% is considered light and vice versa while sulfur content of less than 0.5% is considered sweet. Lighter and sweet crude tends to be more expensive than heavy and sour crude which requires more technicalities to refine into gasoline or diesel. Given the differentials in grade they are various benchmarks such as the West

Texas Intermediate (WTI), Brent, Bonny light and OPEC reference basket(ORB) which are captured by $/barrel. Reference to this study data on Oil prices is obtained from OPEC's 2018 Annual Statistical bulletin.

Table 3.1: Definition of Variables and Data Source

Variables	Measurements	Data source
Exchange Rate	Pre-Determined by CBN on a ₦/$ basis	CBN Statistical Bulletin (2018)
RGDP	$RGDP = \frac{\text{Nominal GDP}}{\text{GDP DEFLATOR}} \times 100$ Computed via 2010 constant prices	CBN Statistical Bulletin (2018)
Inflation Rate	$Inf\ rate = \frac{CPI_{t-}\ CP_{t-1}}{CPI_{t-1}} \times 100$ Computed via 2010 constant prices	CBN Statistical Bulletin (2018)
Interest Rate	Predetermined by CBN bi-monthly during MPC alongside CRR and liquidity ratio.	CBN Statistical Bulletin (2018)
Oil Price	Forces of demand and supply. $/barrel via ORB	OPEC Statistical Bulletin (2018)

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