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An Analysis of the Impact of Monetary Policy on Exchange Rate Movement in Nigeria: A VECM Granger Causality Framework

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ABSTRACT

This study examines the impact of monetary policy on exchange rate movement in Nigeria over the period of 1981 to 2015. The data for the research was taken from Central Bank of Nigeria (CBN). Based on empirical analysis and econometrics technique, cointegration method was adopted to measure the long run relationship between exchange rate and the Monetary policy instrument such as money supply, Monetary policy rate, Treasury bill and Cash reserve ratio and the direction of causality between the variables using VECM Granger causality framework plus variance decomposition and impulse response for robust analysis. The result from Johansen's estimation revealed that broad money supply, monetary policy rate and cash reserve ratio contributed positively and significant impact on exchange rate movement in Nigeria while 3-month Treasury bill has a negative but significant impact on the exchange rate movement. There is unidirectional relationship between broad money supply and exchange rate at 5% level of significance. There is no clear causal link between monetary policy rate and exchange rate movement in Nigeria. However, variance decomposition revealed that monetary policy rate contributed 0.3351% and 3.1298% in the short and long run. Treasury bill is negative and statistically significant which means that, a 1% increase will lead to 3.24% decrease (change) on exchange rate movement. Lastly, cash reserve requirement is positive and statistically significant. These results could be a guide to policy makers in analysing monetary policy instrument towards maintaining the strength of the naira. Government should pursue strategies that are designed to neutralize the effects of such practices as round tripping, over-invoicing and under-invoicing which have characterized the activities of the banking sectors in the recent years. Lastly, foreign exchange control policies should be adopted in order to help in determination of appropriate exchange rate value. This will go a long way of strength the naira.

1. Introduction

Exchange rate is said to be an important element in the economic growth and development of a developing nation. Foreign exchange policies influence the economic activities and to a large extent, dictate the direction of the macroeconomic variables in the country. The mechanism of exchange rate determination are different systems of managing the exchange rate of a nation's currency in terms of other currencies and this should be properly done in a way that will bring about efficient allocation of scarce resources so as to achieve growth and development. Jhingan (2005) posited that to maintain both internal and external balance, a country must control its exchange rate. Optimal exchange rate policy is designed to obtain real exchange rate (RER) that maintains both internal and external balance (Agu, 2002).

The concept of real exchange rate comes from a realization that the observable nominal exchange rate movements, result from both price changes and inflation rate changes in trading economies. When the real exchange rate is optimal, domestic producers of tradable goods can compete internationally; imports are not artificially cheaper than comparable domestic alternatives. Exporters also are not disadvantaged by the exchange rate, when the real exchange rate is right (Maciejewski, 1983). What determines the exchange rate regime for an open economy is one of the oldest issues in international economics. The single most influential idea in this context 4 has been the Mundellian prescription that if shocks facing the country are mostly monetary then fixed exchange rates are optimal whereas flexible rates are optimal if the shocks are mostly real (Amartya et al.2004). The key friction underlying Mundell's results was the assumption of sticky prices in the goods market. Since the fall of Bretton-Woods system in 1970s and the subsequent introduction of floating exchange rates, the exchange rates have in some cases become extremely volatile without any corresponding link to changes in other macroeconomic variables. 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 Programme in 1986, Nigeria has adopted different types of exchange rate regimes, ranging

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from floating exchange rate regimes to fixed/pegged regimes. However, maintaining a realistic exchange rate for the naira in Nigeria is very crucial, given the structure of the economy. 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. This is expected to ensure that the naira is not overvalued in real terms, and that the external sector remains competitive. Nigeria in 1960 and in the early 1970s, maintained fixed exchange rates. Between 1970 and mid 1980 Nigeria exchange rate shifted from fixed exchange rate to a pegged arrangement and since the introduction of Structural Adjustment Programme in 1986 till date Nigeria has adopted various types of 5 floating exchange regime (Sanusi 2004).

The quest for a realistic naira exchange rate made the Central Bank of Nigeria (CBN) in the time past to employ the Purchasing Power Parity (PPP) model as a guide to gauge movements in the nominal exchange rate and to determine deviations from the equilibrium exchange rate. Although the PPP as a relative price does not provide clear criteria for choosing a base period, and is generally criticized for its insensitivity to short-term policy actions, it nonetheless, provides a reasonable framework for a comparative analysis of trading partners' performances. Nigeria, having adopted various types of exchange rate mechanism over the years with Dutch Auction System (DAS) being the latest and still the exchange rate did not maintain both internal and external balance. Thus, the ultimate questions which this research seeks to answer are: what determines exchange rate in Nigeria? Again, is there any long run relationship between the exchange rate and its identified monetary policy instrument in Nigeria?

1.2 Statement of the Problems

Monetary policy has always been seen as a fundamental instrument over the years for theattainment of macroeconomic stability, often viewed as prerequisite to achieving sustainable output growth. Thus, in the pursuit of macroeconomic stability, the managers of monetary policy have often set targets on intermediate variables which include the short term interest rate, growth of money supply and exchange rate. Among these intermediate variables of monetary, the exchange rate is argued to have a greater influence on the economy through its effect on the value of domestic currency, domestic inflation, the external sector, macroeconomic credibility, capital flows and financial stability. Increased exchange rate directly affects the prices of imported commodities and an increase in the price of imported goods and services contributes directly to increase in inflation (CBN, 2015). The adverse consequence of inflationary pressure from exchange rate depreciation have been a serious concern for the monetary authorities, economists and policy analyst, given that these variables (exchange rate and inflation rate) are the key barometers of economic performance.

Consequently assessing the nexus among monetary policy and exchange rate is pertinent because an understanding of the nexus between these variables is prerequisite for the successful conducting and adoption of inflation targeting, which the Nigerian government has also made prime objective in the attainment of its macroeconomic objective. Under inflation targeting, monetary policy stance (through changes in short term interest) affects inflation through a large set of variables including exchange rate (Mukherjee and Bhattacharya, 2011). Base on the above, this study empirically determine link among monetary policy, and exchange rate in line with studies such as (Holod (2000), Kara and Nelson (2002), Berument and Pasaogullari (2003), Muco et al (2004), Rusitara (2004), An and Sun (2008) and Khan (2008). With respect to Nigeria, studies such as Mete and Michael (2005), Folawewo and Oshinubi (2006), Okhira and Saliu (2008), Omotor (2008), Chuku (2009) and Chimobi and Uche (2010) have investigated the impact of individual effect of monetary policy on exchange rate These studies failed to take into cognizance the nature of causality among these variables. The causality approach allows us to sidestep the need for a theoretical structural model by treating all endogenous variables in the system as a function of the lagged values of all the endogenous variables in the system (Amarakoon, 2009). This is the gap this study seek to fill in the literature.

Therefore, the rest of the paper proceed as follows: section two presents a review of literature while section three presents the methodology for the study. In section four, the findings were discussed while section five summarizes the major findings and offers some policy recommendations.

1.3 Objective of the study

The broad objective of this study is to examine the impact of monetary policy on exchange rate in Nigeria. To be accomplished with the following specific objectives.

1.To explore the long-run relationship between exchange rate and the Monetary policy instrument such as money supply, Monetary policy rate, Treasury bill and Cash reserve ratio

2.To find out if there is a causal relationship between Exchange rate and money supply in Nigeria.

3.To evaluate the causal relationship between monetary policy rate and exchange rate in Nigeria.

4.To establish whether there is causal relationship between treasury bill and Exchange rate in Nigeria.

5.To analyse if there is causality between Exchange rate and inflation cash reserve ratio.

1.4 Research Questions

The followings are the basic questions surrounding this findings

1.Is there a long run relationship between Exchange rate and monetary policy instrument such as money supply, monetary policy rate, Treasury bill and Cash reserve ratio?

2.To what extent has money supply cause the exchange rate in Nigeria?

3.Is there a causal relationship between Exchange rate and Monetary policy rate in Nigeria?

4.Does Treasury bill significantly influence the exchange rate movement in Nigeria?

5.Is there a causal relationship between Cash reserve ratio and Exchange rate in Nigeria?

1.5 Research Hypothesis

1.Ho: $\beta=0$ – There is no long run significant relationship between exchange rate

2.Ho: $\beta=0$ – There is no causal significant relationship between money supply and exchange rate movement in Nigeria.

3.Ho: $\beta=0$ – There is no causal significant relationship between Monetary policy rate and exchange rate movement in Nigeria.

4.Ho: $\beta=0$ – Treasury bill does not significantly influence exchange rate in Nigeria.

Ho: $\beta=0$ – There is no significant influence between changes in cash reserve ratio and exchange rate movement in Nigeria.

2.1 Theoretical Background

Exchange rate is the rate at which one country's currency is exchanged for the currency of another country (Dornbusch, 2004). It can also be defined as the price of one country's currency relative to other countries' currency. While, Mankiw, (1997) define it as the price at which exchange between two countries take place. How to determine the exchange rate is issue that has taken the centre stage of monetary and international economics. Monetary policy authority in Nigeria is faced with the problems of having a stable and realistic exchange rate which is in consonance with other macroeconomic fundamentals. This is because exchange rate instability can have serious adverse consequences on prices, investments and international trade decisions. A realistic exchange rate is one that reflects the strength of foreign exchange inflow and outflow, the stock of reserves as well as ensuring equilibrium in the balance of payments that is consistent with the cost and price levels of trading partners (Ojo,1998).

2.2 Models of Exchange Rate Determination

In general, three models theoretical foundations of exchange rate determination exist; they include the traditional flow, the portfolio balance and the monetary models of exchange rate, Purchasing Power Parity (PPP) and 2.1.5 Balance of Payments Approach

2.2.1 Traditional Flow Model

This model posits that exchange rate is simply determined by the market flow of demand and supply of foreign exchange. Thus, there is equilibrium when the supply equals the demand for foreign exchange. The model assumes that two basic variables interact to determine the exchange rate. The variables are: relative income and interest rate differential. This is justified since foreign demand for domestic goods is a function of foreign income and vice versa, and also asset demand depends on the difference between domestic and foreign interest rates.

2.1.2 The Portfolio Balance Model

This approach to exchange rate determination conceptualizes exchange rate as the result of the substitution between money and financial assets in the domestic economy and the substitution between domestic and foreign financial assets (CBN, 1998). Macdonald and Taylor (1992) posited that an exchange rate is determined at least in the short-run by the supply and demand in the markets for wide range of financial assets would not be automatic. This is an asset pricing view of the exchange rate. The idea is that agents have a portfolio choice decision between domestic and foreign assets. Those instruments (either money or bonds) have an expected return that could be arbitraged. This arbitrage opportunity is what determines the process of the exchange rate (Dornbusch, 1988).

2.1.3 The Monetary Approach

The shortfalls of the portfolio balance theory led to the development of the monetary approach. This approach is based on the importance of money as a unit of exchange, thus, it visualizes exchange rate as a function of relative shift in money stock, inflation rate and domestic output, between a country and a trading partner economy. Frankel (1978) posits that this model of exchange rate determination attains equilibrium when existing stocks of money in the two countries are willingly held.

The monetary approach, under the flexible exchange rate can be presented in two forms the monetary approach or the asset market approach, and it emphasized on the role of money and other assets in determining the exchange. Obioma (2000) holds the view that asset market or monetary approach attributes variation in exchange rate essentially to income and expected rates of return as well as to other factors that influence the supplies of and demands for the various national monies. Thus, based on the fact that supply and demand for monies is determined by the level of income, the monetary model postulates three basic determinants of exchange rate as follows: relative money supplies, relative income and interest rate differentials.

2.1.4 Purchasing Power Parity (PPP)

The purchasing power parity approach to the exchange rate determination was, and continues to be, a very influential way of thinking about the exchange rate. The PPP posits that the exchange rate between two currencies would be equal to the relative national level prices. The PPP derives from the assumption that in the world there exists the "law of one price". This law states that identical goods should be sold at identical prices. (Note this assumption not law). The law of one price implies that exchange rates should adjust to compensate for price differentials across countries (Hoontrakul 1999). In other words, if we are in a bread-world (only bread exists), and a bread is sold in US at 1 Dollar, and the same bread is sold in Nigeria at 150 naira, then the exchange rate has to be 150 naira per Dollar.

2.1.5 Balance of Payments Approach

This approach of exchange rate determination is that there exists internal and external equilibrium. The internal equilibrium assumes that there is full employment: in it there is natural rate of unemployment. Or in other words, the unemployment is such that there are no pressures to change real wages. The external equilibrium refers to equilibrium in the balance of payments. This approach explains permanent deviations of PPP. The main problem with this approach is that in general it is extremely difficult to determine what is the exact natural rate of unemployment, or the exchange rate that is consistent with equilibrium of the external accounts. However, the model will determine where the exchange rate has to converge to; however, it provides very little guidance to the short term movements (Hoontrakul 1999).

2.3 Some stylized fact Monetary Policy and Exchange rate in Nigeria

Nigeria's monetary policy experiences could be divided into two broad policy regimes: The direct method of control (1960-1993) and the indirect control (1993-date). The direct control method was characterized by quantitative ceilings on credits, administered interest and exchange rates, aggregate/sectoral allocation of credits and stabilization securities (Mordi, 2006; Obadan, 2006). Under this regime the economy was divided into preferred sector and the less preferred sector and banks were required to allocate a given proportion of their credits to different sectors. The rationale was to moderate aggregate demand by controlling the volume and cost of credit that goes into the economy (Gbadebo and Mohammed. 2003; Ojo, 2013: Oyakhilomen andRckwot, 2014). Key instruments used include: administrative fixing of the minimum rediscount rate (MRK), cash reserve requirements, liquidity ratio, stabilization securities and transfer of federal government's (including ministries and parastatals) deposits to and from thc cerural bank. "Monetary management using direct controls faced a number of constraints which led to repressed financial market (Sanusi, 2009).

Indirect method of control employs market-based instruments and requires some level of market infrastructural development to be effective.

It relies on the power monetary authorities to influence the availability and rate of return on financial assets. Two broad regimes could be identified during the indirect method of monetary management viz: indirect control under the pre-consolidation era (1993-2005) and indirect control during the post-consolidation era (2006-date).Instruments used under this regime include open market operation (OMO) through use of the Nigerian Treasury Bills (NTB) and Certificates, CBN Bills and Special NT'Bs, reserve requirements, liquidity ratios and movement of government deposits to and fro CBN (Okafor, 2009: Uchendu. 2009; Sauusi, 2009)

A new framework for monetary policy implementation was introduced in December 2006 to enable CBN leverage on the success of the banking system consolidation. Elements of the new framework included the introduction of the Monetary Policy Rate (MPR) to replace the MRR, and a standing lending and deposit facility. Instruments under the new framework included. Open Market Operations (OMO). Cash reserve requirements (averaging system and Foreign exchange swap (Safdari ct al. 2012; Borio, 2014; Salami et al. 2010)

The strategy was to control the aggregate demand through the control of interest rates and money supply. Higher interest rates reduced aggregate demand in the following ways: discouraging borrowing by firms and households, increasing the rate of savings (the opportunity cost of spending), Business investments may also fall as the cost of borrowing increases. Some planned investment projects may so reduce the demand for lending and, therefore, reduce the growth of broad money (reduce monetary inflation).

2.4 Empirical Review

2.4.1 Evidence of Monetary policy and Exchange rate movement in Nigeria Using Johansen Cointegration and SVAR Approach

Numerous past empirical studies addressed various questions on the relationship between monetary policy and the exchange rate. One of the trends in the literature was to examine the relationship between general monetary policy and the exchange rate. Monetary policy is typically described as the interest rate for instance Chuku (2009); Folawewo and Oshinubi (2006); Mete and Adebayo (2005)

Chuku (2009) examined the effect of monetary policy innovations in Nigeria. The study used a structural vector auto-regression (SVAR) approach to trace the effects of monetary policy shocks on output and prices in Nigeria with a sample data spanning from 1986 to 2008. The study conducted the experiment using three alternative policy instruments i.e. broad money (M2), Minimum Rediscount Rate (MRR) and the real effective exchange rate (REER). The study made the assumption that the Central Bank cannot observe unexpected changes in output and prices within the same period. This places a recursive restriction on the disturbances of the SVAR and helped to generate impulse response functions that tracked the effects of monetary policy innovations on output and prices. The study found evidence that monetary policy innovations have both real and nominal effects on economic parameter depending on the policy variable selected.

The study was of the view that price-based nominal anchors (MRR and REER) do not have a significant influence on real economic activity. Whereas, innovations in the quantity-based nominal anchor (M2) affects economic activities modestly. It therefore follows that monetary policy shocks have been a modest driver of business cycle movements in Nigeria. The study concluded that the manipulation of the quantity of money (M2) in the economy is the most influential instrument for monetary policy implementation and recommended that central bankers should place more emphasis on the use of the quantity-based nominal anchor rather than the price-based nominal anchors.

Folawewo and Oshinubi (2006) examined the efficacy of monetary policy in controlling inflation and exchange rate instability in Nigeria covering the period of 1980:1 to 2000:4 and employing the rational expectation framework and time series analysis. The study observed that the effort of monetary policy at influencing the finance of government fiscal deficit through the determination of the inflation-tax rate affects both the rate of inflation and the real exchange rate, thereby causing volatility in their rates. The study found that inflation affects volatility of its own rate as well as the rate of real exchange and the study concluded that monetary policy should be set in such a way that the objective it is to achieve is well defined.

Mete and Adebayo (2005) examined whether monetary aggregates have useful information for forecasting exchange rate. The study revealed that the Treasury bill rate, domestic debt and M2 (broad money) provide the most important information about exchange rate movements. Conversely, the least important variables were the deposit rate and M1 (narrow money). Exchange rate levels, and contemporaneous value of the domestic debt, are significant in the model. The results obtained were robust across the two methods used and they concluded that although the monetary variables contained some information about inflation, exchange rate and domestic debt may be more useful in predicting inflation in Nigeria.

Jimoh (2004) tested the monetary model of exchange rate determination in Nigeria during the floating regime between 1987 and 2001 (quarterly series) using the two-step cointegration methodology. He found that the monetary approach fits the Nigerian exchange rate behaviour. Nwafor (2006) applied the Johansen's multivariate cointegration procedure to the naira–dollar exchange rates for the period 1986 and 2002 (quarterly series) and found at least one cointegrating vector which suggests the existence of a long-run monetary model of exchange rate in Nigeria. Alao et al. (2011) examined the flexible price monetary model for the naira–US dollar exchange rates using time series data for the period 1986–2008. Applying Johansen cointegration test, they found that one cointegrating vector and concluded that the variability of the nominal naira–dollar exchange rate was consistent with flexible price model. Adawo and Effiong (2014) while using the Johansen cointegration methodology found evidence of the monetary exchange rate model over the floating exchange rate regime with the estimated long-run parameters being theoretically consistent with the predictions of the monetary exchange rate model.

2.4.2 Evidence of Monetary policy and Exchange rate movement in Advanced and Emerging Market using Johansen and Engle–Granger cointegration Approach.

At the forefront of this include Papell (1984) who found that money supply not only affects exchange rates and relative price levels but also it is considered to be affected by them. Monetary policy is, therefore, activated to take care of the variations in exchange rates and relative price movements. Such 'activist' monetary policy, Papell holds, may significantly modify the nature of the observed variability of exchange rates and relative price movements.

Mark (1995) used the monetary model suggested by Meese and Rogoff with the modification for including exchange rate overshooting, for the exchange rate of the US dollar with respect to Canadian dollar, mark, yen and Swiss franc, for one-quarter, one-year and three-year horizons, over the 1981–91 period. Marks model testifies for the effect of money supply on exchange rate along with 'overshooting' over the period of study.

Taylor and Peel (2000), Taylor, Peel and Sarno (2001) and Killian and Tailor (2003) investigate the plausibility of this proposition with nonlinear models. Taylor and Peel (2000) find evidence of cointegration in a static regression that is consistent with the monetary class of models. Irfan Civcir (2003) examines the exchange rate determination of the Turkish lira–dollar exchange rate over the period January 1987 to December 2000. The study supports the sticky price version of the monetary model of exchange rate determination.

Groen (1999) emphasized the importance of cointegration in establishing a long-run link between nominal exchange rate and monetary fundamentals. In the absence of cointegration, the long-run predictability of the monetary model breaks down (Chinn and Meese, 1995; Groen, 1999; Mark, 1995). MacDonald and Taylor (1991) examined the long-run validity of the monetary model of exchange rate by employing the Johansen's multivariate cointegration technique and provide supportive evidence for both the US dollar and British pound. Choudhry and Lawler (1997) applied both Johansen–Juselius and Engle–Granger cointegration tests for Canada and found the existence of a long-run relationship for Canadian dollar–US dollar. This evidence is further supported by Kouretas (1997). Dutt and Ghosh (2000) found evidence in favour of the monetary model for the nominal Japanese yen–US dollar exchange rates. Liew et al. (2009) reports a long-run relationship for Thailand's exchange rate based on the flexible-price monetary model. Lee et al. (2007) and Long and Samareth (2008) using different cointegration approaches found evidence in support of the monetary model for the Philippines; while same conclusion is reached for Malaysia by Chin et al. (2007).

Another strand of the literature finds little evidence in favour of the monetary exchange rate model (e.g. Cusham, 2000; McNown and Wallace, 1989; Meese, 1986; Sarantis, 1994). Sarantis (1994) applied the Johansen cointegration framework to investigate three variants of the long-run monetary approach to exchange rate determination and found no statistical evidence supporting long-run equilibrium relationship consistent with the flexible-price monetary model. Cusham (2000) found cointegration relationship for the monetary model using Canadian–US dollar exchange rate but since the estimated cointegrating coefficients were inconsistent with those predicted by the monetary model, he concluded that the data do not support the monetary model.

On the other hand, Filosa (2001) finds that many central banks in emerging countries react strongly to exchange rate movements, although changes in the monetary policy regime make it difficult to assess the relative importance placed by countries on inflation control and external equilibrium. Mohanty and Klau (2005) also find a strong response of monetary policy to exchange rates for Asian countries by focusing on quarterly data between 1995 and 2002. Lastly, Frömmel and Schobert (2006) estimate a Taylor rule for six European countries. They point out that the exchange rate plays an important role in the monetary policy during the fixed exchange rate regime periods. However, this impact disappears after the introduction of flexible regimes.

3. Data and Model specification

3.1 Data

This study uses annual data covering the period from 1981 to 2015 to investigate the effect of monetary policy on exchange rate. Four widely used monetary policy instrument are employed: Monetary policy rate, board money supply, cash reserve ratio, 3-months Treasury bill. These factors have been identify among the most significant determinants exchange rate through the apex bank. Table 1 provides additional information on all the variables.

3.2 Model specification

Building on the previous work by Karras (1999) and Zettelmeyer (2004), we present our model as thus;

$$\boldsymbol{ExcR = f(M2, MPR, TBILL, CRR)} \quad (1)$$

The above equation can be written in econometric model and in their respective natural log form as thus;

$$\boldsymbol{lnExcr = \alpha_0 + \beta_1 lnM2 + \beta_2 lnMPR + \beta_3 lnTBILL + \beta_4 lnCRR + \varepsilon_t} \quad (2)$$

Where $\boldsymbol{lnExcr}$ is log of change in real exchange rate , $\boldsymbol{lnM2}$ is log of change in broad money supply, $\boldsymbol{lnTBILL}$ is log of change in 3-months treasury bill, $\boldsymbol{lnCRR}$ is the log of change in cash reserve ratio, $\boldsymbol{\varepsilon_t}$ is the stochastic error term and $\boldsymbol{\alpha_0}$ is the intercept

List of variables and explanations.

Variable	Definition and Apriori Expectations	Unit	Sources
Exchange rate	Represents the value of the domestic currency relative to the foreign currency (dollar). We expect this variable to react to changes in the monetary policy variables. It is the dependent variable.	lnExcR	CBN Statistical Bulletin (2015)
3-months treasury bill	Three month interest rates are used as a policy measure because they are sufficiently short to reflect the policy targets that the authorities set for the immediate future, but at the same time sufficiently long to react only to the extent that changes in the policy rate. See Skinner and Zettelmeyer (1995a). We expect the signs to be (+ or -) depending on the policy direction.	lnTBILL	CBN Statistical Bulletin (2015)
Broad Money supply	It represents is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign (World bank online). We expect +/-- sign	$\boldsymbol{lnM2}$	CBN Statistical Bulletin (2015)
Monetary Policy rate	Represents the rate at which CBN lend money to commercial banks, discount houses, and other financial institutions. We expect + sign .	$\boldsymbol{lnMPR}$	CBN Statistical Bulletin (2015)
Cash Reserve ratio	Represents the minimum ratio of cash holdings or requirement to total current liabilities of banks and other financial institutions. Variation in CRR affect the liquity position of banks and their lending ability. We expect + sign.	$\boldsymbol{lnCRR}$	CBN Statistical Bulletin (2015)

Source: Author's Design.

3.3 Estimation Procedure

3.3.1. Unit root Test

In time series analysis, before running the cointegration test the variables must be tested for stationarity. For this purpose, we use the conventional ADF tests. Therefore, before applying this test, we determine the order of integration of all variables using unit root tests by testing for null hypothesis $\boldsymbol{H_o: \beta = 0}$ (i.e $\boldsymbol{\beta}$ has a unit root), and the alternative hypothesis is $\boldsymbol{H_1: \beta < 0}$. This is to ensure that all the variables are integrated at I(1) to avoid spurious result.

3.3.2 Johansen Cointegration

This study adopts a dynamic vector autoregressive regression (VAR) which explores cointegration. The essence is to capture the causal dynamics relationship between monetary policy and exchange rate, and at the same time to observe the long run and short dynamics. For instance, given a VAR with possible long run cointegration amongst a set of variables.

Therefore, we start with the Johansen co-integration equation which starts with the vector auto regression (VAR) of order $\boldsymbol{p}$ is given by:

$$\boldsymbol{y_t = \mu + A_1 y_{t-1} + \cdots\cdots + A_p y_{t-P} + \varepsilon_t} \quad (3)$$

Where $\boldsymbol{y_t}$ *is a* $(\boldsymbol{n \times 1})$ *vector of variables under considertion in log form that are integrated at order one-commonly denoted 1(1), n=5* $\boldsymbol{A_P}$ *are the parameters to be estimated,* $\boldsymbol{\varepsilon_t}$ *are the random errors.* This (VAR) can be re-written as;

$$\boldsymbol{\Delta y_t = \mu + \prod y_{t-1} + \sum_{i=1}^{p=1} \Gamma_i \Delta y_{t-i} + \varepsilon_t} \quad (4)$$

Where, $\boldsymbol{\Pi = \sum_{i=1}^{p} A_i - 1}$ and $\boldsymbol{\Gamma_i = -\sum_{j=i+1}^{p} A_j}$ (5)

The above equation is a pure Johansen Cointegration test. Gragory and Hansen (1996) noted that the Johansen test is a test for co-integration that allows for more that than one co-integration relationship. If the coefficient matrix $\boldsymbol{\Pi}$ has reduced rank $\boldsymbol{r < n}$, then there exist $\boldsymbol{n \times r}$ matrices of $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ each with rank $\boldsymbol{r}$ such that

$$\boldsymbol{\Pi = \alpha \beta'} \quad (6)$$

Where $\boldsymbol{r}$ is the number of co-integrating relationship, the element is $\boldsymbol{\alpha}$ is known as the adjustment parameters in the vector error correction model and each column of $\boldsymbol{\beta}$ is a cointegrating vector. It can be shown that, for a given $\boldsymbol{r}$, the maximum likelihood estimator of $\boldsymbol{\beta}$ define the combination of $\boldsymbol{y_{t-1}}$ that yield the $\boldsymbol{r}$ largest canonical correlations of $\boldsymbol{\Delta y}$ with $\boldsymbol{y_{t-1}}$ after correcting for lagged differences and deterministic variables when present. The two different likelihood ratio test of significance of these canonical correlations are the trace test and maximum eigenvalue test, shown in equation 5 and 6 respectively below $\boldsymbol{\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \widehat{\lambda_i})}$ (7)

and

$$\boldsymbol{\lambda_{max}(r, r+1) = -T ln(1 - \hat{\lambda}_{r+1})} \quad (8)$$

Here, T is the sample size and $\boldsymbol{\hat{\lambda}_i}$ is the $\boldsymbol{i^{th}}$ ordered eigenvalue from the $\boldsymbol{\Pi}$ matrix in equation 4 or largest canonical correlation. The trace tests the null hypothesis that the number of $\boldsymbol{r}$ co-integrating vector against the alternative hypothesis of $\boldsymbol{n}$ co-integrating vector where $\boldsymbol{n}$ is the number of endogenous variables. The maximum eigenvalue tests the null hypothesis that there are $\boldsymbol{r}$ cointegrating vectors against an alternative of $\boldsymbol{r + 1}$ (see Brooks 2002).

3.3.3 Vector Error Correction Model (VECM)

After testing for cointegration among the variables, the long run coefficients of the variables are the estimated. This study uses Akaike information criteria for selected the optimal lag length. The existence of cointegration between the variables implies that causality exists in at least one direction. The short run equilibrium relationship is tested using vector error correction model (VECM). VECM is restricted VAR that has cointegration restriction built into the specification. The VECM analysis in this study is based on equation 2 and it involves five cointegrating vector as thus:

$$\begin{aligned}\boldsymbol{\Delta lnExcr_t = \alpha_0} &+ \boldsymbol{\sum_{i=1}^{n} \beta_{1i} \Delta lnExcr_{t-1}} \\ &+ \boldsymbol{\sum_{i=0}^{n} \beta_{2i} \Delta lnM2_{1_{t-1}}} \\ &+ \boldsymbol{\sum_{i=0}^{n} \beta_{3i} \Delta lnMPR_{2_{t-1}}} + \\ \boldsymbol{\sum_{i=0}^{n} \beta_{3i} \Delta lnTBILL_{2_{t-1}}} &+ \boldsymbol{\sum_{i=0}^{n} \beta_{3i} \Delta lnCRR_{2_{t-1}}} \\ &+ \boldsymbol{\lambda_1 ecm_{t-1} + \mu_t}\end{aligned} \quad (9)$$

$\boldsymbol{ecm_{t-1}}$ is the error correction term obtained from the cointegration model. The error coefficients $(\boldsymbol{\lambda_1})$ indicate the rate at which the cointegration model corrects its previous period's disequilibrium or speed of adjustment to restore the long run equilibrium relationship. A negative and significant $\boldsymbol{ecm_{t-1}}$ coefficient implies that any short run movement between the dependant and explanatory variables will converge back to the long run relationship. Indeed it recovers any long-run information that is partially lost in the system with differenced coefficient. So, that this terms are needed to gain model stability in the long run. Narayan and Smyths (2008)

3.3.4 Variance Decomposition (VDC) and Impulse response (IRF)

VDC technique focuses on the dynamics of series due to innovative shocks stemming from other series along with its own shock and also reflecting that whether the series is strongly impacted each other over the time periods. For example, using VDC analysis shows that if monetary policy assumes to cause exchange rate over the certain time horizons, the rest variation will be explained by shocks of other series including its own shock. In this way, the use of VDC analysis could be more beneficial for the researchers to isolate the relative dynamic effects of its own shock and innovative shocks stemming from other independent variables towards dependent variable of the estimation process.

Also IRF is likely to occur, when we use a system of equation in order to evaluate the effects of standard deviation shocks causing each other. For instance, if a shock to monetary policy is assumed to be statistically significant and affecting exchange rate but at the same time, we also find the insignificant effect of exchange rate on monetary policy,

indicating that we have a situation showing monetary policy causes exchange rate.

From this scenario, we tend to believe the advantage of IRF as it enables us to identify the impacts of shocks on variables over the time in a Vector Autoregressive (VAR)framework. From this, one can also conclude the dynamic causal relationship between monetary policy and exchange rate.

3.4 Diagnostic test

To ensure the goodness of fit of the model, diagnostic tests are conducted. Diagnostic tests examine the model for serial correlation, and heteroscedastici

4. Data Presentation and Analysis

Our analysis here divided into namely; descriptive statistics and empirical analysis.

4.1 Descriptive Statistics

Table 1 above provides the summary statistics, namely, sample means, maximums, minimums, medians, standard deviations, skewness, kurtosis and the Jarque-Bera tests with their p-values. It is clear that all the statistics show the characteristics common with most time series, for instance normality in the form of platykurtic there are a number of noticeable differences, between the variables. Firstly, broad money supply has the largest unconditional average of 6.2538 while treasury bill rate has the least unconditional average of 2.4541.

The standard deviation shows the level of volatility in the variables. It displays the rate at which each variable deviates from the mean value. From the table above, broad money supply is the most volatile at 2.4383 while the cash reserve ratio is the less volatile 0.2147 (approximately).

The skewness measures the asymmetric nature of the data, Skewness is a measureof the asymmetry of the probability distribution of a real-valued random variableabout its mean. A normal distribution is symmetrical at point 0. If the value is greater than zero (>0) it's positively skewed, but if less than zero (<0) it is negatively skewed (Wooldridge, 2010). From table 2, all the variables are negatively skewed

Kurtosis measures the sharpness of the peak of a normal distribution curve. It is a measure of "tailedness" of the probability distribution of a real-valued random variable (Hosking, 2006). If the value is approximately equal to 3, it is said to be mesokurtic distribution implying that it is normally distribution. If approximately greater than 3, it is leptokurtic distribution which has tails that asymptotically approach zero slowly and has more outliers than the normal distribution. While if approximately, less than 3 it is platykurtic which means that the distribution produces fewer and less outliers than the normal distribution (Wooldridge, 2010). Therefore, Table 1, all the series show evidence of platykurtic with values less than 3.

The Jarque-Bera is a test for normality of the distribution where the null hypothesis is that the distribution of the sample is a normal one. If the probability value of the Jarque-Bera test is significant, then the null hypothesis is rejected and the alternative is accepted which says that the sample is not normally distributed. If each variable is statistically significant (indicated by a zeroprobability), then the series are not normally distributed. Therefore the farther theprobability statistic of a variable is to zero, the lower the value of its Jarque-Berastatistic and the more normally distributed it is and vice versa (Hosking. 2006). From the results above, in Table 1 the Jarque-Bera tests shows that the null hypothesis is strongly accepted for all the distribution. Hence, the variables can be described to be normally distributed.

4.2 Empirical Result

4.2.1 Stationarity Test

All that data are transformed into the natural log form. To determine the order of integration of the variables, the ADF (augmented Dickey-Fuller) test which the null hypothesis is $\boldsymbol{H_0 = \beta = 0}$ (i.e $\boldsymbol{\beta}$ has a unit root), and the alternative hypothesis is $\boldsymbol{H_1: \beta < 0}$ are implemented. The results for the level and differenced variables are presented in Table 3.

The stationarity tests were performed first in levels and then in first difference to establish the presence of unit roots and the order of integration in all the variables. The results of the ADF stationarity tests for each variable show that the tests fail to reject the presence of unit root for data series in level, indicating that these variables are non-stationary in levels.

Table 1. Summary of Statistics of the variables.

	LEXCR	LM2	LMPR	LTBILL	LCRR
Mean	3.2252	6.2538	2.5105	2.4541	3.8143
Median	3.0940	6.1906	2.5649	2.5257	3.8067
Maximum	5.2598	9.8470	3.2581	3.2921	4.1759
Minimum	-0.4817	2.6722	1.7918	1.5041	3.3707
Std. Dev.	1.9412	2.4383	0.3377	0.4178	0.2147
Skewness	-0.7141	-0.0098	-0.3400	-0.4334	-0.1446
Kurtosis	2.1501	1.6173	3.0607	2.6015	2.4973
Jarque-Bera	4.0279	2.7885	0.6796	1.3271	0.4904
Probability	0.1335	0.2480	0.7119	0.5150	0.7826
Observations	35	35	35	35	35

Source: various computation from review9

Table 2. Unit root test.

	Augmented Dickey Fuller (ADF)					
Variables	**Levels**		**1st Diff**		**Order of Integration**	
	t-Stat.	P-value	t-Stat.	P-value	I(1)	
LnExcr	-1.990554	0.2894	-4.9595***	0.0003	I(1)	
LnM2	-0.763689	0.8162	-3.1731**	0.0308	I(1)	
LnMPR	-2.312212	0.1742	-4.962***	0.0003	I(1)	
LnTBILL	-2.467467	0.1323	-4.479***	0.0012	I(1)	
LnCRR	-0.162219	0.62	-5.4819***	0	I(1)	

**level of significance at 5% ***level of significant at 1%

Source: various computation from review9

Table 3. VAR lag order selection criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-94.032	NA	0.000	6.002	6.229	6.078
1	67.240	263.89*	7.35e-08*	-2.2569*	-0.8965*	-1.7992*
2	90.657	31.223	0.000	-2.161	0.333	-1.322

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

Table 4.Johansen cointegration result.

Hypothesis	Trace Stat	5% critical value	Max.Engen Value	5% critical value
excr=f(m2,mpr,tbill,crr)				
r=0	88.9918**	69.8189	53.3278**	33.8769
r≤1	35.6640	47.8561	20.3852	27.5843
r≤2	15.2788	29.7971	9.1264	21.1316
r≤3	6.1523	15.4947	4.5247	14.2646
r≤4	1.6276	3.8415	1.6276	3.8415

*level of significance at 10% **level of significance at 5% ***level significance at 1%
Source: various computation from review9

The first difference results show that these variables are stationary at 1% and 5% significance level (integrated of order one 1(1)). As mentioned in the preceding sections, a linear combination of I (1) series could be I (0) if the series are cointegrated. We thus proceed to test for cointegration of the time series.

4.2.2 Lag Selection

From the table, our optimal using Akaike information criterion is lag 1

4.2.3 Johansen Cointegration

The result of the cointegration test, based on the Johanson cointegration approach are presented in table 4. The author established lag 1 using akaike criterion (see table 3). Cointegration is tested on the long run relationship between the dependent variable exchange rate, and independent variables; M2, MPR, TBILL and CRR. The table indicates that test failed to accept the null hypothesis of no cointegration at 5% level of significance. Both the trace and Maximum Eigenvalue suggest the presence of 1 cointegrating vector. The Johansen cointegration test shows this by comparing the statistic values with the critical value, a result is chosen at the value where the statistic is greater than the corresponding critical value. In this study, it is clear that there is at most 1 cointegrating equation in the model with both trace and maximum eigenvalue value suggest 5% significance level. This implies that an equilibrium relationship exists among the cointegrating variables. In addition, no matter the movement in the short run, these variables have the tendency to return to this equilibrium path in the long run.

$$\boldsymbol{\Delta ExtR = 3.163 + 0.892M2 + 5.977MPR - 3.24TBILL + 1.64CRR + \varepsilon_t}$$

[-36.837] [-13.334] [9.885] [5.043] (10)

Equation 10 represents the normalised cointegration equation, while the values in the bracket are the t-statistics. The equation reveals that broad money supply, monetary policy rate and cash reserve ratio contributed positively significant to exchange rate movement in Nigeria while 3-month Treasury bill has a negative but significant impact on the exchange rate movement. Indeed, all the variables are in agreement with the apriori expectations.

The result reveals that M2 is statistically significant which means that 1% increase broad money supply will lead to 0.892% change (increase) in exchange rate movement.

The policy implication here is that with rise in exchange, this makes exporters goods priced in naira more expensive in foreign currency.

Indeed, such a rise in the price of exported goods leads to a drop in export demand, and so in total demand in the economy, reducing inflationary pressure. This indeed has a similar implication from monetary policy rate and cash reserve ratio which exert positive and significant impact on exchange rate movement in Nigeria. For cash reserve ratio, 1% increase in MPR will lead to 5.977% increase in exchange rate movement. This means that exchange rate is highly sensitive to a little change in MPR. 1% increase in CRR will lead to 1.64% increase in exchange rate and vice versa.

Turning to treasury bill, a 1% increase will lead to 3.24% decrease (change) on exchange rate movement. The policy implication is a fall in the exchange rate will boost export demand and so put upward pressure on inflation and interest rate. Even though all the variables played a significant role in driving exchange rate movement, more robust analysis are to confirm its responsiveness. Therefore, we apply error correction model, variance decomposition and impulse response.

4.2.4 Vector Error correction Model

Table 5 presents the results of the multivariate error correction model with the optimal lag length chosen using Akaike information criteria (AIC). The ECM(-1) coefficient is known as the speed adjustment factor, it shows how fast the system adjust to restore equilibrium. The speed adjustmentfor $\boldsymbol{lnExcR}$ is negative and significant at 5%

Table 5: Vector error correction model

		VECM Granger Causaity						
Type of Causality								
		Short run	Excluded variables					long run
Dep. Variables		D(LEXCR	D(LM2)	D(LMPR)	D(LTBILL)	D(LCRR)		ECT
D(LGDP)	**Chi-sq**	2.467383	1.209608	0.290412	2.793513	3.442901		-0.0339
	P-value	0.2912	(0.5462)	-0.6366	0.832	0.7731		[-2.289]
Diag. test								
Vec. Hetro	**164.61**	-0.788						

**5% significant level, [ ] t-statisic , ( ) p-value
Source: extract from review9 output. Modified table

Table 6. Variance Decomposition Analysis.

Variance Decomposition of LEXCR:						
Period	**S.E.**	**LEXCR**	**LM2**	**LMPR**	**LTBILL**	**LCRR**
1	0.3242	100	0	0	0	0
2	0.4563	97.6324	0.0042	0.2514	0.0257	2.0863
3	0.532	96.4943	0.133	0.3351	0.043	2.9945
4	0.586	96.1405	0.2442	0.2845	0.0659	3.2649
5	0.6308	95.5456	0.3244	0.3884	0.3854	3.3561
6	0.6688	94.6374	0.457	0.6502	0.8868	3.3686
7	0.7005	93.4694	0.6776	1.0627	1.4377	3.3526
8	0.7271	92.0988	0.9652	1.6089	2.0508	3.2763
9	0.7503	90.536	1.2975	2.3035	2.7164	3.1466
10	0.7713	88.7946	1.6711	3.1298	3.404	3.0005

Source: extract from review

level. The coefficient suggest that over 3% of the short run disequilibrium is corrected in the long run equilibrium. Meaning that every shock in the short run result is in a new equilibrium. Hence, monetary policy adjusts the disturbances to restore long run equilibrium.From the diagnostic test result (see in table 5), there is no evidence of heteroscedasticity in the vector error correction model.

4.2.5 Variance Decomposition.

The variance decomposition in this study is used in forecasting and to investigate the dynamic relationship between exchange rate and selection monetary policy variables. This study uses 10 years interval in other to provide a literal breakdown of the change in value of the variable in a given period arising from change in the same variable in addition to other variable in previous period.

It is found in Table 6 that its (exchange rate) own shock explains 96.49% and 88.79% variation of exchange rate in 3 years and 10 years. This shows that the movement of exchange rate is relatively greater in the short run than in the long run. We also found that a change in monetary policy has little influence on exchange rate which is explained by innovative shock of 0.133% and1.667% for broad money supply, 0.3351% and 3.1298% for monetary policy rate, 0.043% and 3.404% for treasury bill and 2.9945% and 3.005% for cash reserve ratio in 3 years and 10 years respectively.

4.2.6 Impulse Response Function (VAR)

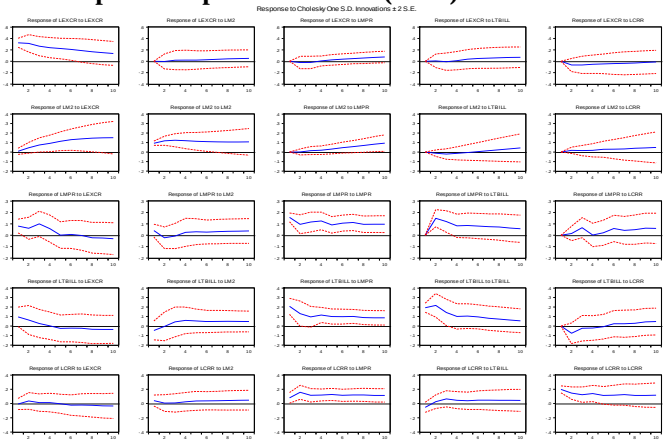

Figure 1. Impulse response function Analysis.

Source: Estimate from eview9

The impulse response function serves the pivotal role in assessing how and to what extent shocks in monetary policy influence exchange rate in Nigeria.

Fig. 1 displays the dynamic effects of a one standard deviation of a particular shock from monetary policy instrument (broad money supply, monetary policy rate, Treasury bill and cash reserve ratio) to shock on exchange rate in Nigeria over a range of 10 years period. From Fig. 1, the results of impulse response functions show that response in exchange rate due to forecast error stems from monetary policy changes.

This entails that monetary policy instrument have minimal effect on exchange rate movement. This is because in the first panel, the confidence band of impulse response function contain zero line thereby confirming our earlier explanation on variance decomposition.

4.3 Discussion of findings

From hypothesis 1, the result revealed that broad money supply, monetary policy rate and cash reserve ratio contributed positively significant to exchange rate movement in Nigeria while 3-month Treasury bill has a negative but significant impact on the exchange rate movement. Also the long run cointegration is confirmed through the error correction term which is correctly signed and significant. This finding is in line with Groen (1999) who emphasized the importance of cointegration in establishing a long-run link between nominal exchange rate and monetary fundamentals. Also it follows the finding of (Chinn and Meese, 1995; Groen, 1999; Mark, 1995). Crespo-Cuaresma et al., 2004; Groen, 2000; Mark and Sul, 2001; Rapach and Wohar, 2002; Uz and Ketenci, 2008). Groen (2000) and Mark and Sul (2001) MacDonald and Taylor (1991) who examined the long-run validity of the monetary model of exchange rate by employing the Johansen's multivariate cointegration technique.

From hypothesis 2**,** revealed that there is unidirectional relationship between broad money supply and exchange rate at 5% level of significance. The intuition here is the broad money supply causes exchange rate movement in Nigeria. Thus we reject the null hypothesis that no causal relationship between money supply and exchange rate movement in Nigeria. our finding is similar to Mete and Adebayo (2005). Maitra (2009), applying both the time domain and the frequency domain approaches of time series modelling, found that Indian money supply had a significant role in the variation of rupee/dollar exchange rate.

From hypothesis 3 There is no clear causal link between monetary policy rate and exchange rate movement in Nigeria. However, variance decomposition revealed that monetary policy rate contributed 0.3351% and 3.1298% in the short and long run. Indeed the long run influence is more pronounced in the long run compared to the short run impact.

Also, the impulse response from MPR confirms the result with significant impact in the fifth period (long run) which coincides with time confidence band is above the zero line.this similar to Jimoh (2004) who tested the monetary model of exchange rate determination in Nigeria during thfloating regime between 1987 and 2001 (quarterly series) using the two-step cointegration methodology. He found that the monetary approach fits the Nigerian exchange rate behaviour.

From hypothesis 4 revealed that Treasury bill is negative and statistically significant which means that, a 1% increase will lead to 3.24% decrease (change) on exchange rate movement.

Analysing further, variance decomposition and impulse response function give a more robust insight about the influence Treasury bill on exchange rate which records 0.043% and 3.404% in the short and long run respectively. Intuitively, Treasury bill exert more influence in short the compared to the long run link. Therefore, the null hypothesis of does not significantly influence exchange rate in Nigeria is rejected.

From hypothesis 5 the result revealed that cash reserve requirement is positive and statistically significant which means that, 1% increase in CRR will lead to 1.64% increase in exchange rate and vice versa. The intuition here is that we reject the null hypothesis that there is no significant influence between changes in cash reserve ratio and exchange rate movement in Nigeria. Adawo and Effiong (2014) while using the Johansen cointegration methodology found evidence of the monetary exchange rate model over the floating exchange rate regime with the estimated long-run parameters being theoretically consistent with the predictions of the monetary policy (CRR) and exchange rate model.

5.0 Policy Recommendation

The findings above have some implication for dynamic monetary policy formulations in Nigeria mostly in determine the real exchange rate in Nigeria. Arising from this, we propose the following recommendations for the economy.

The lag of real exchange rate have a crucially effect on expectations of future exchange rate changes, this will aid the forecasts of future economic conditions. Therefore, sound policies and management should consolidate on this lag impact so as to better the economy. The study shows that real exchange rate responds positively to real interest rates. Monetary policy is crucial here.

There is need for the monetary authority to pursue interest rate stability as swings in interest rate will post a serious threat to maintaining stability in real exchange rate. The pursuance of a stable exchange rate regime that results in a balance of payments position that is viable and sustainable is one of the ultimate goals of monetary policy. The pursuits of this objective and the extent to which they are met have important implications for investment decisions, and, indeed, international capital flows into Nigeria, especially in increasingly globalised financial markets. Hence, we suggest that the exchange rate has to be competitive, in order to attract foreign investors in Nigeria. That is, the exchange rate should, and indeed, must reflect market realities to promote efficiency in resource allocation and productivity growth. Therefore, the goal of CBN should be to pursue monetary policy that is consistent with the maintenance of a realistic and stable exchange rate regime, vis-à-vis those of our trading partners.

Depreciation in exchange rate will make Nigeria's export cheaper relative to imports, this will increase the country's export receipts and in turn improve the position of the foreign reserve. The exchange rate should not be allowed to appreciate too much, since it may reduce the foreign reserve of the country as well as to be able to import at lower cost.

Government should try to encourage monetary policies so as to maintain the strength of the naira.

Government should pursue strategies that are designed to neutralize the effects of such practices as round tripping, over-invoicing and under-invoicing which have characterized the activities of the banking sectors in the recent years.

Lastly, foreign exchange control policies should be adopted in order to help in determination of appropriate exchange rate value. This will go a long way of strength the naira.

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APPENDIX

Date	Exchange rate	broad money (m2)	Cash Res. Ratio	MPR	Treasury bill
1981	0.618	14.471	38.500	6.000	5.000
1982	0.673	15.787	40.500	8.000	7.000
1983	0.724	17.688	54.700	8.000	7.000
1984	0.767	20.106	65.100	10.000	8.500
1985	0.894	22.299	65.000	10.000	8.500
1986	1.755	23.806	36.400	10.000	8.500
1987	4.016	27.574	46.500	12.750	11.750
1988	4.537	38.357	45.000	12.750	11.750
1989	7.365	45.903	40.300	18.500	17.500
1990	8.038	52.857	44.300	18.500	17.500
1991	9.909	75.401	38.600	15.500	15.000
1992	17.298	111.112	29.100	17.500	21.000
1993	22.065	165.339	42.200	26.000	26.900
1994	21.996	230.293	48.500	13.500	12.500
1995	21.895	289.091	33.100	13.500	12.500
1996	21.884	345.854	43.100	13.500	12.250
1997	21.886	413.280	40.200	13.500	12.000
1998	21.886	488.146	46.800	13.500	12.951
1999	92.338	628.952	61.000	18.000	17.000
2000	101.697	878.457	64.100	14.000	12.000
2001	111.231	1269.322	52.900	20.500	12.951
2002	120.578	1505.964	52.450	16.500	18.880
2003	129.222	1952.921	50.900	15.000	15.020
2004	132.888	2131.819	50.475	15.000	14.210
2005	131.274	2637.913	50.175	13.000	6.995
2006	128.652	3797.909	55.700	10.000	8.800
2007	125.808	5127.401	48.750	9.500	6.910
2008	118.546	8008.204	44.254	9.750	4.500
2009	148.902	9411.112	30.700	6.000	6.130
2010	150.298	11034.941	30.425	6.250	10.250
2011	153.862	12172.490	42.000	12.000	16.750
2012	157.499	13895.389	49.719	12.000	17.200
2013	157.311	15160.290	63.205	12.000	13.340
2014	158.553	17679.287	38.281	13.000	15.990
2015	192.441	18901.303	39.561	11.000	15.900

SOURCE: CBN ANNUAL REPORTS AND STATISTICAL BULLETIN(VARIOUS ISSUES)