



## **Impact of Monetary Policy on Price Stability in Nigeria (2016 -2021)**

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### ***Abstract***

*This article investigated the impact of monetary policy on price stability in Nigeria from 2016-2021. The procedure for this investigation was achieved with Structural Autoregressive (SVAR), it was found that MPR contributed (impacted) much more in the variation of lending rate (LEND) throughout the period under consideration than to the variation (changes) in inflation rate (INF) and the nominal effective exchange rate (NEER). For example, MPR accounted for 4.25% and 4.85% of the variability in the lending rate (LEND) in the second and third month. In the same period, MPR contributed 0.98% and 1.12% to the changes in inflation rate (INF). However, this contribution within same period was much lesser to exchange rate (NEER), where the record exposed a contribution of just 0.03% and 0.04% respectively. In general, the result uncovered that MPR has much more contribution to interest rate (LEND) than inflation (INF) and exchange rate (NEER). It revealed that the greatest contribution of MPR is to interest rate (LEND), followed by the rate of inflation (INF) and eventually accompanied by exchange rate (NEER) (which receives the lowest share). In a less exact language, the result vindicated that the greatest impact (effect) of changes in MPR was on interest rate (LEND), followed by the rate of inflation (INF) and exchange rate (NEER) (in that order). Hence, this indicates that all things being equal, any change in MPR would first and foremost lead to changes in interest rate (LEND) which would in turn produce change in inflation (INF) and eventually give birth to changes in the exchange rate (NEER). Fortunately, this result has tallied with the a priori expectation, it is expected that changes in MPR should have more effect on LEND and INF than NEER which ideally*

*supposed to drive its impact from MPR via changes in inflationary pressures. Research limitation/ implication: the outcome of this analysis has disclosed that a bigger percentage of the changes in the outcome of the macroeconomic variables was explained by their own innovations within the considered period suggesting that adjustments of aggregate demand in the real sector do not necessarily adhere to shocks in monetary policy variables.*

**Keywords:** Monetary policy, price stability and structural autoregressive (SVAR), Nigeria.

## Introduction

Monetary policy is the process by which the government, central banks or the monetary authority of a country controls the supply of money, availability of money and cost of money to attain a set of objectives oriented towards the growth and stability of the economy . It can be described as the art of controlling the direction and movement of monetary and credit facilities in pursuance of stable price and economic growth in the economy (CBN 1992). The principal objectives of monetary policy include: price stability, economic growth and balance of payments equilibrium, employment, output and sustainable development (Jhingan, 2000). These objectives are necessary for the attainment of internal and external balance and the promotion of long-run economic growth (Imoughele, 2014). For many countries like Nigeria, these objectives are explicitly stated in the laws establishing the central bank, while for others they are not. In Nigeria, the major objectives of monetary policy are the

attainment of price stability and sustainable economic growth (Sanusi, 2012).

Associated objectives are those of full employment, stable long-term interest rates, price stability and real exchange rates. In pursuing these objectives, CBN recognizes the existence of conflicts among the objectives necessitating at some points some sort of trade-offs (Uchendu, 2010). The Bank manipulates the operational target (monetary policy rate, MPR) over which it has substantial direct control to influence the intermediate target (broad money supply, M2) which in turn impacts on the ultimate objective of price stability and sustainable economic growth (Okafor, 2009; Uchendu, 2009). The Central Bank of Nigeria (CBN), like other central banks in developing countries, achieves the monetary policy goals through the amount of money supplied. Money supply comprises narrow and broad money. The definition of narrow money (M1) includes currency in circulation

with non-bank public and demand deposits or current accounts in the banks.

The broad money (M2) includes narrow money plus savings and time deposits, as well as foreign denominated deposits (CBN, 2011). The broad money measures the total volume of money supply in the economy. Thus, excess money supply (or liquidity) may arise in the economy when the amount of broad money is over and above the level of total output. The need to regulate money supply is based on the knowledge that there is a stable relationship between the quantity of money supply and economic activity and that if its supply is not limited to what is required to support productive activities it will result in undesirable effects such as high prices or inflation (Sanusi, 2009; Soludo, 2009; CBN, 2010).

In Nigeria, different types of monetary policy have been adopted and applied. Sometimes, tight monetary policy has been adopted and at other times loose monetary policy was adopted mainly to stabilize prices. Unfortunately, irrespective of these different forms of monetary policies adopted and implemented, high rates of price instability have been experienced in Nigeria. Given the importance of price stability in an economy like keeping the value of money stable, eliminating cyclical fluctuations, reducing inequalities of income and wealth, encouraging economic growth and promoting economic welfare, the study therefore investigated the impact of monetary policy on price stability in Nigeria.

Inflation has become a major problem in Nigeria as it has exhibited an unpredictable tendency for some years now. Inflation in Nigeria maintained a downward trend since February, 2010: it stood at 15.60 in February, 2010 but descended to a historic single digit of 9.40 & 9.30 in July and August, 2011 respectively but bounced back to a double digit of 11.90 in February, 2012, as at December same year it stood at 12.00 but this trend change in 2013 to a single digit again in November, 2013 it was 7.9 and through 2015 it was at 9.37 not until February, 2016 it rise to 11.38, in May to 15.58, in 2017 inflation rate remain at 16.52, in 2018 reduce to 12.09, 11.40 in 2019, 13.25 in 2020 and in June, 2021 it stand at 17.75. Regardless of whatever parameter used the inflation figure of 17.75 (i.e. the figure as at the commencement of this research) is a double digit and any double-digit inflation is considered high.

More so, inflation in Nigeria which stood at 17.75 as at July, 2021 was the 17th highest in the world. Compare this with that of Ghana (9.0), South Africa (4.6), Saudi Arabia (0.4), Brazil (8.99), Malaysia (3.4), Morocco (2.2), Qatar (3.13) or Japan with the world lowest inflation rate of (-0.3) as at July, 2021. This has made Price stability difficult to tackle largely because any meaningful attempt to curb it, entails a trade-off among other important macroeconomic and social safety nets in the short run. As a monetary phenomenon, price stability cannot be sustained without accommodating increase in money supply but if money supply rises beyond the absorptive capacity of the economy, domestic prices will increase (Soludo, 2009). Despite this, the relative

contribution of monetary policy to price stability is still a subject of debate (Nnanna, 2003).

## **LITERATURE REVIEW**

Monetary policy : This is the policy of the monetary authority of a country with regard to monetary matters it could be defined as the policy that deals with the controls of financial institutions through active purchases and sales of paper assets by the monetary authority as a deliberate attempt to effect changes in money conditions. It also entails purchases and sales of paper assets resulting from the maintenance of a particular interest rates structure as well as the stability of security prices or meeting other obligations and commitments ( Jhingan,2007).

Inflation on the other hand, could be defined as an economic situation in which the increase in money supply is “faster” than the new production of goods and services in the economy (Hamilton, 2001). More often than not economists draw a line of difference between inflation and an economic condition of a onetime increase in price or when there are price increases in a narrow group of economic goods and services (Piano, 2001). Consequently, inflation signifies a general and persistent increase in the prices of goods and services in an economy (Elger,2006). Usually, the rate of Inflation is measured by the percentage change in the price index, which may be wholesale price index, producer price index, retail price index, or consumer price index. In Nigeria, inflation is measured as the percentage change in the consumer price index, which aggregates the price of a representative basket of goods and services purchased by the average consumer, and obtained through periodic survey of consumer prices (CBN, 2005; Essien, 2002).

Price stability was the primary—and sometimes sole— mandate of monetary policy. Financial stability was the realm of prudential regulation and supervision (often managed by agencies separate from the central bank). This framework found an intellectual foundation in New Keynesian models, which implied that—under broad conditions— price stability would keep output around its natural level. Monetary policy was to react to movements in asset prices and credit aggregates only to the extent that they affected inflation (and output) This was reinforced by a belief that it was too difficult to distinguish fundamental-driven movements from speculative bubbles in real time. And, in any event, the policy rate was too coarse an instrument to address the associated financial risks. If monetary policy had a role, it was to respond to the macroeconomic consequences of financial instability, if and when it materialized

### **The Monetarist Theory**

The monetarists, following the quantity theory of money (QTM), have propounded that the quantity of money is the main determinant of the price level, or the value of

money, such that any change in the quantity of money produces an exactly direct and proportionate change in the price level. The QTM is traceable to Irving Fisher's famous equation of exchange;

$$MV = PQ \dots\dots\dots (1)$$

Where M stands for the stock of money; V the velocity of circulation of money; Q the volume of transactions which take place within the given period; while P stands for the general price level in the economy. Transforming the equation by substituting Y (total amount of goods and services exchanged for money) for Q, the equation of exchange becomes;

$$MV = PY \dots\dots\dots (2)$$

The introduction of Y provides the linkage between the monetary and the real side of the economy. In this framework however, P, V and Y are endogenously determined within the system. The variable M is the policy variable, which is exogenously determined by the monetary authorities. The monetarists emphasized that any change in the quantity of money affect only the price level or the monetary side of the economy, with the real sector of the economy totally insulated. This indicates that changes in the supply of money do not affect the real output of goods and services, but their values or the prices at which they are exchanged only. An essential feature of the monetarist model is its focus on the long- run supply-side properties of the economy as opposed to the short run dynamics.

The QTM also gives undue importance to price level as if it is the most important phenomenon of economic system, overlooking factors like interest rate as one of the causative factors between money and prices (Mordi et al, 2007; Jinghan, 2002). Despite these deficiencies, the theory could still be used to analyse inflation in relation to monetary policy . The general message of the theory is that increase in money supply is the causal factor of inflation and hence reduction in money supply will tackle the menace of inflation.

### **The Purchasing Power Parity (PPP) Theory**

This theory states that the rate of exchange of a currency can be explained in terms of the purchasing power of the domestic currency. In essence, the theory attempts to establish a close relationship between the rate of inflation and the exchange rate of a currency. The theory argues that a high rate of inflation will lead to depreciation in exchange rate (i.e. a depreciated currency) and vice versa (Idika, 1998). In its absolute version, the purchasing power parity of different currencies is equalized for a given basket of goods. In the relative version, the difference in the rate of change in prices at home and abroad (the difference in the inflation rates) is equal to the percentage

depreciation or appreciation of the exchange rate. PPP exchange rate (the real exchange rate) fluctuations are mostly due to different rates of inflation between the two economies. Aside from this volatility, consistent deviations of the market and PPP exchange rate are observed, for example (market exchange rate) prices of non-traded goods and services are usually lower where incomes are lower. (A U.S. dollar exchanged and spent in Nigeria will buy more cotton than a dollar spent in the United States). Basically, PPP deduces exchange rates between currencies by finding goods available for purchases in both currencies and comparing the total cost for those goods in each currency (Wikipedia, 2010).

### **Empirical review**

Quite a number of researches have been conducted world over on monetary policy and macroeconomic variables and how these variables respond to shocks in monetary policy. Few of these researches are considered relevant and hence reviewed here under;

Joao and Andrea (2006) developed an international monetary aggregate for US, Euro, Japan, UK and Canada to examine its indicator properties for global output and inflation. Applying a structural VAR approach, the two scholars established that after a monetary policy shock, output decline temporarily with the downward effect reaching its pinnacle within the second year, and the global monetary aggregate drops significantly. More so, the price level rises permanently in response to a positive change in the global liquidity aggregate.

Chuku (2009) used a structural vector auto regressive model with quarterly data from 1986:1 to 2008:4 to measure the effects of monetary policy innovations in Nigeria. Variables used in his model were: real gross domestic product (GDP), consumer price index (CPI), broad money (M2), minimum rediscount rate (MRR) and real effective exchange rate (REER). His study found out that monetary policy innovations carried out on innovations on the price based nominal anchors (MRR and REER) had neutral and fleeting effects on output. While the quantity-based nominal anchor (M2) had modest effects on output and prices with a very fast speed of adjustment implying that the quantity of money (M2) in the economy is the most influential instrument for monetary policy implementation in Nigeria.

Cheng (2007) examined the impact of a monetary policy shock on output, prices, and the nominal effective exchange rate for Kenya using quarterly data from 1997–2005 with economic variables: real GDP and prices, money stock, short-term interest rates, and the nominal effective exchange rate. Based on the vector auto regression technique, the main results suggested that an exogenous increase in the short-term interest rate tends to be followed by a decline in prices and appreciation in the nominal exchange rate, but had insignificant impact on output. His key finding showed that,

variations in the short-term interest rates accounted for significant fluctuations in the nominal exchange rate and prices, while accounting little for output fluctuations.

Omofa (2000) using the Quantity Theory of money (QTM) established a positive but not significant relationship between money supply and price level. This means that though money supply contributes to price determination in Nigeria, it is not the major causal factor. Other variables of significance are price level lagged and exchange rate. They are both positively related to current price level and their coefficients are both high and significant.

Moreover, Nkoro (2005) studies on monetary policy and macroeconomic instability in Nigeria (1980-2000) concluded that factors responsible for excess liquidity and inflationary pressure in Nigeria included; instability of the financial sector, which was attributed to bank distress and lack of managerial efficiency, resulting to financial institution failures, non-harmonization of fiscal and monetary policies and increase in government expenditure.

Folawewo and Osinubi (2006) used rational expectation approach to conclude that the effort of Monetary Authority in Nigeria at using its credit and reserves as monetary tools in checking inflation and the rate of exchange has affected the volatility of the two variables over the years. Thus, monetary policy, if not well targeted could yield negative results. This is because the speculations of the private agents may frustrate monetary effort (Berg and Pattillo, 1999), just as improper inflation targeting could affect real exchange rate volatility

Additionally, several studies (Idowu, 2010; Uchendu, 2009; Okafor, 2009 and Nkoro, 2005) have established that huge public spending has constrained the efficacy of monetary policy in Nigeria. They buttressed that huge public spending by the three tiers of government, over the years, had hampered monetary management resulting in the missing of monetary targets by wide margins, while inducing serious pressure on the general price level. Moreover, the poor state of economic infrastructure, resulting from past neglect, influence monetary management adversely.

### **Monetary Policy and Inflation 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 is characterized by quantitative ceilings on credits, administered interest and exchange rates, aggregate/sectorial allocation of credits and stabilization securities. 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. Key instruments used include: administrative fixing of the minimum rediscount rate

(MRR), cash reserve requirements, liquidity ratio, stabilization securities and transfer of federal government's (including ministries and parastatals) deposits to and from the central 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 levels of market infrastructural development to be effective. It relies on the power of 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 NTBs, reserve requirements, liquidity ratios and movement of government deposits to and fro CBN (Okafor, 2009; Uchendu, 2009 and Sanusi, 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, Repurchase Transaction (repo and reverse repo), Expanded Discount Window operations (EDW), Cash reserve requirements (averaging system) and Foreign exchange swap.

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 also become unprofitable thus leading to a fall in aggregate demand. Higher interest rates could also reduce the demand for lending and, therefore, reduce the growth of broad money (reduce monetary inflation).

### **Interest rate and inflation**

Interest rate and inflation are keys to investment decisions, since they have direct impact on the investment yield. When prices rise, the same unit of a currency is able to buy less. A sustained deterioration in the purchasing power of money is called inflation. Investors aim to preserve the value of their money by opting for investments that generate yields higher than the rate of inflation. In most developed economies, banks try to keep the interest rates on savings accounts equal to the inflation rate. However, when inflation rate rises, companies or governments issuing debt instruments would need to lure investors with a higher interest rate (Wikipedia, 2012).

Monetary Authorities use the interest rate to control money supply and, consequently, the inflation rate. When interest rates are high, it becomes more expensive to borrow money and savings become attractive. When interest rates are low, banks are able to lend more, resulting in an increased supply of money. Alteration in the rate of interest can be used to control inflation by controlling the supply of money in the following ways.

A high interest rate influences spending patterns and shifts consumers and businesses from borrowing to saving mode. This influences money supply. A rise in interest rates boosts the return on savings in building societies and banks. Low interest rates encourage investments in shares. Thus, the rate of interest can impact the holding of particular assets. A rise in the interest rate in a particular country fuels the inflow of funds. Investors with funds in other countries now see investment in this country as a more profitable option than before. Inflation has a significant impact on the time value of money (TVM). Changes in the inflation rate (whether anticipated or actual) result in changes in the rates of interest. Banks and companies anticipate the erosion of the value of money due to inflation over the term of the debt instruments they offer. To compensate for this loss, they increase the interest rates. The central bank of a country alters interest rates with the broader purpose of stabilizing the national economy. Investors need to keep a close watch on interest and inflation to ensure that the value of their money increases over time (Wikipedia, 2012).

### **Monetary Policy and Interest Rate;**

To begin with let us bear in mind that the economy is a wheel with money as the gas, monetary policy is the power of the government to control the flow of money in its society. When interest rates are high, the tendency of people is to control their spending and as much as possible stay away from borrowing money. This in turn slows down the movement of money in society. So, one strategy the government employs is to lower the interest rates, to attract people to borrow money and spend them on projects or businesses.

When the economy is in danger of overheating (when growth is too fast, threatening a rise in inflation), the government increases interest rates to make access to excess money more expensive and arrest spending. Normally, such policies are implemented by a central bank that has more influence with creditors such as banks and other financial institutions. The main reason that governments undertake such measures is to spur or to impede the economic growth through introduction of the monetary policy. Interest rates become a tool to help manage the economy.

In effect, the monetary policy can be gleaned to be tied up with interest rates. However, just as stated earlier, there are a lot of macroeconomic factors that affect interest rates. Inflation, supply and demand for money and other general economic indicators are

normally related to one another, which in turn dictates which interest rate to peg (Michael, 2010).

### **Inflation, Interest and Price Stability**

The exchange rate and interest rate can be kept low and stable only if we succeed in keeping inflation low and stable over time (Sanusi, 2012). If the Central Bank artificially keeps the interest rate low, the economy must be prepared to live with a depreciated exchange rate. In most monetary policy regimes, interest rate is used as a policy instrument while low Inflation and stable exchange rates are the policy objectives. Interest rate could be varied to fight inflation and positive real interest rate is the norm. For interest rate to fall on sustained basis inflation must fall and inflationary expectations must be low. If interest rate and exchange rate are controlled as was done in Nigeria in 1970s-80s, then we should be prepared to live with any level of inflation outcome that will result from such controls (Soludo, 2009). Hence, the conclusions that can be drawn are as follows:

Under a high inflation environment, a low nominal interest rate regime is not only inconsistent but is also not feasible, as creditors would demand a high interest rate to compensate them for parting with their funds and the erosion of the purchasing power induced by the high inflation. In such circumstances, the policymaker desirous of achieving low and stable inflation (price stability) will be compelled to raise its base policy rate to: Signal a tight monetary policy stance, influence (drive-up) market interest rates to constrain aggregate demand (through lower consumption and investment spending) and ultimately lower inflation. Over time, this outcome will expectedly elicit a lower interest rate regime when all adjustments must have taken place (MPC, 2012).

A low interest rate regime in an environment of high inflation leads to an inefficient use/allocation of financial resources, as “sub-optimal” investments which do not promote economic growth will be undertaken.

### **DATA AND METHODOLOGY**

Monetary policy actions are transmitted through a series of connections among macroeconomic variables. For this reason, VAR models have been a popular framework for the study of monetary policy in recent years, as they are able to embody the interaction between the conduct of monetary policy and the economy without ascribing to a particular theoretical model (Okafor, 2009). VAR effectively captures linkages among macroeconomic variables since it is a dynamic system that permits simultaneity of activities among included variables. In other words, the variables in the system express themselves freely at the same time and the impulse response function serves to trace out the actions due to each variable in the entire system

Structural Autoregressive (SVAR) model was used to achieve the objective of the study. The choice of SVAR was informed by its ability to allow modeling non-recursive structures of the economy with a parsimonious set of variables and above all it facilitates the interpretation of the contemporaneous correlations among disturbances (Joao and Andrew, 2006)

The study made use of data mainly from secondary sources, particularly unpublished data from the research as well as monetary policy departments of CBN. Data from the published works in CBN official websites, Statistical Bulletins, monthly journals, financial reviews as well as annual Reports and various Communiqués of the monetary policy committee meetings was used. Another source of data for the study included statistics and published materials by the National Bureau of statistics (NBS), Nigerian Economic Society, newspapers, magazines, journals, seminar papers as well as my previous lecture notes and similar studies conducted in the department. The variables involved in the study are monetary policy rate (i), market rate of interest (l), inflation rate (In), and exchange rate (x).

**Model Specification**

The specified model for the vector of endogenous variable,  $Y_t$  includes  $i_t$ ,  $In_t$ ,  $x_t$  is represented in a SVAR model founded by Granger’s (1969) specification of causality and endogeneity. Thus, we consider the standard form of our VAR model with lag order  $p$  as:

$$Y_t = C_0 + \sum_{i=1}^p A_i Y_{t-i} + \epsilon_t \dots \dots \dots (1)$$

Where  $Y_t$  represents the vector of endogenous variables,  $C_0$  is a vector of constants;  $A_i$  denotes the matrices of autoregressive coefficients and  $\epsilon_t$  is a vector of white noise processes.

According to Anguyo (2008) identification of the structural shocks is achieved through the appropriate ordering of the variables of interest and applying Choleski decomposition to the variance covariance matrix of the reduced form residuals  $\epsilon_t$ . In estimating the standard SVAR model depicted in (1) above, the variables must be stationary.

The model which seeks to explain the effects of monetary policy innovations on endogenous variables is a simple unrestricted SVAR model (adopted from Joao and Andrea, 2006) written as:

$$Y_t = AY_{t-1} + \epsilon_t \dots \dots \dots 2$$

$Y$  is a vector of endogenous variables and  $A$  is a matrix of polynomials in the lag operator and  $\epsilon_t$  is a vector of random errors.

The above variables must be stationary in order to run SVAR; if not this might lead to spurious regressions. Hence Augmented Dickey fuller and Phillip Peron test were conducted to establish the absence of a unit root while, the Akaike information (AIC) and Schwarz Criteria (SC) were used to determine the appropriate lag order.

**Estimation Technique**

**1 Unit Root Test**

The empirical analysis started by checking the time series properties of the variables using the Augmented Dickey Fuller (ADF) test to establish the order of stationarity. This became necessary in order to avoid the incidence of spurious regression estimates. The test involved estimation of the following regression equation given in (3) below.

$$\Delta x_t = \alpha + \beta t + \delta x_{t-1} + \sum \Delta x_{t-1} + \varepsilon_t \dots\dots\dots 3$$

Where, x in the above equation is the variable under consideration. Thus, the ADF unit root test states that  $H_0 : \beta = 0$  and  $H_1 : \beta < 0$ , where the ADF statistics was compared with the observed Mackinnon critical values.

**2. Impulse Response Function**

A shock to a particular variable may not only directly affect the variable but is also transmitted to all of the other endogenous variables. An impulse-response function traces the effect of a one-time shock to one of the innovations on the current and future values of the endogenous variables. The impulse-response, therefore, tells us how macro variables respond to innovations in monetary policy rates. In order words, an impulse-response will be applied to trace the reactions of interest rate, inflation and exchange rate to innovations in monetary policy rates in Nigeria. Equation 3 explains the response in question;

$$\begin{pmatrix} l_t \\ x_t \\ in_t \\ i_t \end{pmatrix} = A_1 \begin{pmatrix} l_{t-1} \\ x_{t-1} \\ in_{t-1} \\ i_{t-1} \end{pmatrix} + \dots + A_p \begin{pmatrix} l_{t-p} \\ x_{t-p} \\ in_{t-p} \\ i_{t-p} \end{pmatrix} \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{pmatrix} \dots\dots\dots 4$$

Where  $l_t$  is the market rate of interest (or the long term interest rate or the prime lending rate in this case),  $x_t$  is the exchange rate (or the nominal effective exchange rate in this case),  $in_t$  is the rate of inflation (or the headline inflation in this case) while,  $i_t$  is the monetary policy rate (or the short term interest rate) at a particular period of time. More so,  $\varepsilon$ 's denotes serially uncorrelated white noise error terms for each series at time  $t$ . 'A<sub>1</sub>' represents the coefficients of first lagged parameters while 'A<sub>p</sub>' denotes the coefficients of the parameters up to lag  $p$  which was determined by Akaike-information and Schwarz criterion

### 3.Variance Decomposition

While impulse-response functions trace the effects of a shock to one endogenous variable on to the other variables in the SVAR, the Variance Decomposition provides information about the relative importance of each random innovation in affecting the random variables in the SVAR (Hamilton, 1994). Therefore, Variance Decompositions show the magnitude of the variations in the macro variables due to policy variables.

### Results and Discussions

The empirical analysis started with the investigation of the time series properties of each variable employed in the study by using both the Augmented Dickey Fuller (ADF) and Phillip Peron (PP) tests to determine the order of integration of the series. Table 1 below shows that the two tests were consistent, signifying that the MPR, NEER, INF as well as LEND are all stationary at first difference which implied that, they were all integrated of order one.

**Table 1: Results of Unit Root Test**

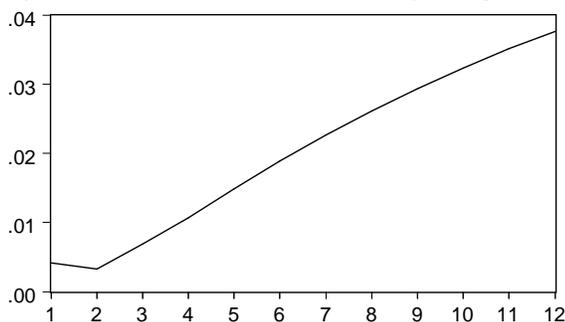
Variable	Augmented Dickey Fuller (ADF) Test		Phillip Peron (Pp) Test		Order of Integration
	Levels	First Difference	Levels	First Difference	
<i>MPR</i>	-1.121654	-4.495014	-1.426835	-7.126216	I (1)
<i>NEER</i>	-2.116657	-4.040414	-1.963850	-5.166931	I (1)
<i>INF</i>	-1.594496	-4.336490	-1.798398	-6.841454	I (1)
<i>LEND</i>	-1.334733	-4.147539	-1.556317	-7.360347	I (1)

Notes: The ADF and PPT critical value at 5% level is -3.4969. All the series had intercepts with trends respectively. The critical values are based on Mckinnon criterion. The optimal lag is selected on the basis of Akaike Information Criterion (AIC). The null hypothesis of the test is: a series has a unit root. The rejection of the null hypothesis is at the 5% level of significance. I (1) shows the level of integration.

### IMPULSE FUNCTION

Response to Cholesky One S.D. Innovations:  
Response of LOG (NEER) to LOG (MPR)

### RESPONSE



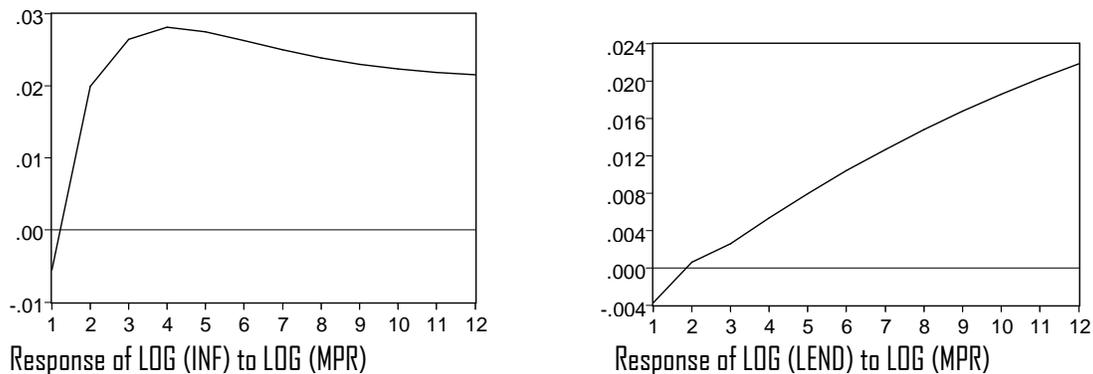


Figure 2 below showed the responses of inflation ( $In_t$ ), market rate of interest ( $i_t$ ) and nominal effective exchange rate ( $\chi_t$ ) to shocks in the monetary policy rate ( $i_t$ ). A value of zero means that the shocks in monetary policy rate have no effect on macroeconomic variables, implying that it does not influence them. On the other hand, a positive or negative value reveals respective increase or decrease in the monetary variables as a result of shocks in monetary policy rate. A lag length of two was chosen based on the Akaike information (AIC), Schwarz Criteria (SC) and Hannan-Quinn criteria (HQ). This lag was also justified owing to the fact that in Nigeria, CBN expects macroeconomic variables to take like two months to adjust to changes in monetary policy rate. Perhaps, this could be the more reason why the twelve members of the monetary policy committee of CBN meet every other month (bimonthly) to review MPR among other macroeconomic variables in line with the domestic economic conditions as well as the international challenges facing the Nigerian economy. From the graph, a positive shock in MPR did not have immediate impact on the value of naira, but this became apparent only in the second month (justifying the choice of the lag length of two). Consequently, at the end of the second month further increase in MPR automatically led to increase in the exchange rate (value of naira). This outcome was not far from CBN's expectation, quantity theory of money as well as the a priori expectation.

Another way to justify the result is that increase in MPR (contractionary policy) would lead to low inflation by exerting downward pressure on aggregate demand (i.e. by discouraging borrowing and encouraging savings). Undoubtedly, low inflation makes domestic goods and services cheaper and imported products dearer; this situation *ceteris paribus*, could lead to low demand for import (which could be mirrored as demand for foreign currency) as well as high demand for export (which could be viewed as the demand for local currency). The end product of this (all things being equal) would be increase in exchange rate (or the value of Naira).

TABLE 2: Result of the Variance Decomposition of MPR

<i>Period</i>	<i>S.E.</i>	<i>MPR</i>	<i>NEER</i>	<i>INF</i>	<i>LEND</i>
1	0.541043	100.0000	0.000000	0.000000	0.000000
2	0.784671	94.74262	0.028842	0.980136	4.248397
3	0.971818	93.98084	0.044715	1.121250	4.853195
4	1.124149	93.61196	0.096085	1.142685	5.149268
5	1.254172	93.44685	0.181391	1.108944	5.262818
6	1.368550	93.33390	0.293642	1.064398	5.308057
7	1.471383	93.23801	0.421720	1.023387	5.316880
8	1.565313	93.14686	0.555880	0.991513	5.305745
9	1.652139	93.05762	0.688752	0.970584	5.283040
10	1.733134	92.96996	0.815373	0.961001	5.253666
11	1.809238	92.88402	0.932736	0.962615	5.220633
12	1.881161	92.79981	1.039278	0.975050	5.185863

To examine the effects of monetary policy rate (MPR) on inflation, interest and exchange rate the researcher implore the use of variance decomposition depicted in table 2 above. From the said table, it was glaring that MPR contributed (impacted) much more in the variation of lending rate (LEND) throughout the period under consideration than to the variation (changes) in inflation rate (INF) and the nominal effective exchange rate (NEER). For example, MPR accounted for 4.25% and 4.85% of the variability in the lending rate (LEND) in the second and third month. In the same period, MPR contributed 0.98% and 1.12% to the changes in inflation rate (INF). However, this contribution within same period was much lesser to exchange rate (NEER), where the record exposed a contribution of just 0.03% and 0.04% respectively.

In general, the result uncovered that MPR has much more contribution to interest rate (LEND) than inflation (INF) and exchange rate (NEER). It revealed that the greatest contribution of MPR is to interest rate (LEND), followed by the rate of inflation (INF) and eventually accompanied by exchange rate (NEER) (which receives the lowest share). In a less exact language, the result vindicated that the greatest impact (effect) of changes in MPR was on interest rate (LEND), followed by the rate of inflation (INF) and exchange rate (NEER) (in that order). Hence, this indicates that all things being equal, any change in MPR would first and foremost lead to changes in interest rate (LEND) which would in turn produce change in inflation (INF) and eventually give birth to changes in the exchange rate (NEER). Fortunately, this result has tallied with the a priori expectation, it is expected that changes in MPR should have more effect

on LEND and INF than NEER which ideally supposed to drive its impact from MPR via changes in inflationary pressures.

Lastly indications from the outcome of this analysis has disclosed that a bigger percentage of the changes in the outcome of the macroeconomic variables was explained by their own innovations within the considered period suggesting that adjustments of aggregate demand in the real sector do not necessarily adhere to shocks in monetary policy variables.

### **Policy recommendations**

- The current monetary tightening stance of the CBN is a step in the right direction but should be used with caution. Considering the dual objective of CBN, the monetary policy should be tailored to promote real sector lending while trying to achieve low and stable inflation.
- There is the need for policy harmonization between the monetary and fiscal authorities. Budget deficit should be avoided and more fund be appropriated for capital as against the recurrent expenditures.
- CBN should license more banks to operate non-interest banking so as to boost financial deepening and inclusion. The large informal sector in the country that cripples the transmission mechanism of monetary policy and constraints the ability of CBN to control money supply was to some extent caused by cultural and religious belief that interest is unlawful; this could be avoided by introducing more non-interest banks.
- There is the need for proper enlightenment of the public about any new CBN policy initiatives (e.g. non-interest banking & cash-lite policy). The communication strategy should be clear and concise.
- The CBN should reduce or strike out any unnecessary stringent documentation requirement for the purchase of forex in the official market. This would kill patronage and by extension the life of parallel market/street trading.
- The Oil and Gas sector should be fully deregulated, corruption in the sector and other sectors of the economy be fought to the latter and above all the saved subsidy proceeds be used to boost physical infrastructure. This would reduce pressure on forex demand as well as cost of doing business and in addition boost external reserve in the country.

### **Conclusion**

The study concludes that both interest (prime lending rate) and exchange rates respond quickly and almost in a predictable way to shocks in MPR. However, changes in MPR do not automatically and consistently produce changes in inflation and above all inflation responds to shocks in MPR only in a volatile manner (a pattern that is almost

unpredictable). Hence of all the three variables, inflation is the most difficult to deal with (stability of which could lead to stability in the remaining two) and could not be totally addressed by mere manipulations of MPR. Hence low and stable inflation is a necessary condition for the achievement of low and stable interest and exchange rate. And that MPR is also responsive to Monetary Policy Committee (MPC) meetings

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