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MONETARY TARGETING STRATEGY AND MONETARY POLICY OBJECTIVES IN NIGERIAN ECONOMY, 1986- 2017

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Abstract: **The study aims at ascertaining if the monetary policy operating strategy is appropriate for achieving monetary policy objectives of price stability, sustainable economic growth, balance of payment equilibrium, and full employment in Nigeria between 1986 and 2017. The study adopted *ex-post* quasi -experimental design approach using quarterly time series data collected between 1986 and 2017. The monetarist framework of monetary policy using the Vector Autoregression (VAR) model analysis techniques was adopted in the study. The empirical model contains broad money supply (MS2) growth rate, monetary policy rate, and exchange rate as monetary policy variables, while price stability (PS), sustainable economic growth (GDP), balance of payment (BoP), and unemployment rate (UNEMP) are monetary policy target objective variables. Examination of the time series properties of the variables shows that all the variables were not stationary at level. However, they became stationary after 1st differencing. Cointegration analysis revealed that the variables are cointegrated. Estimate of the impulse response functions of the policy objectives to policy variable shocks shows that the policy objectives do not respond significantly to shocks from the policy variable. The forecast error variance decomposition reveals that variances of all the policy objectives due to shocks from the policy variable are not significant even after 10 quarters. It therefore implies that the monetary policy operating strategy is not appropriate for achieving the policy objective in Nigerian economy. The study concludes that there is need to change the operating strategy of monetary policy in order to make monetary policy effective in Nigerian economy**

Keywords: **monetary targeting, objective variables, operating strategy, policy variable.**

I. INTRODUCTION

The application of macro-economic policy as stabilization measure is necessitated by the fact that the economy, contrary to the classical economists claim, is not inherently stable. Again, if left unattended to, and waiting for the long run, it may take the economy longer time to recover from any shock, and in the long run, which the classical economists looked on to, we all may be dead (Keynes, 1937). There is, therefore, the need for government interventions to recover from any disequilibrium. The government intervenes in the economy through macro-economic policies. Basically, there are two broad categories of macro-economic policies. There is fiscal policy which has to do with deliberate changes in the level and structure of government expenditure and or revenue in order to achieve a stated objective (Tom-Ekine, 2005). The other is monetary policy which is a deliberate action of the central bank which changes the level of money supply and credit in the economy in order to achieve certain objectives (Gbosi, 2005).

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Monetary policy has become a potent instrument for macro-economic stability. It is basically employed in steering the economy in a direction that will achieve certain macroeconomic objectives. Specifically, the overriding objective of the monetary policy in Nigeria is price stability (CBN, 2007). There are some other added objectives, such as sustainable economic growth, balance of payment stability, finance system stability, and full employment generation. The activities of the monetary authority play critical roles in attaining these objectives. Monetary policy is important because the impact pervades all sectors of the economy and has significant influence on the decisions of economic agents. The critical importance of monetary policy is the basis for the interest in understanding how it works and the need for effectiveness of monetary policy.

However, effective monetary policy depends on the understanding of the relationship between monetary policy variables and monetary policy objectives, the timing, and the efficacy of certain institutions. Therefore, effective monetary policy entails good understanding of the relationship between monetary policy instruments and the target objectives, as well as the channel of transmission.

It is evident that Nigerian economy is still grappling with the challenges of price instability, sluggish economic growth rate, balance of payment problems, and unemployment. The Central Bank of Nigeria has been making frantic effort in promoting price stability and sustainable economic growth. Yet, the Nigerian economy is still being assailed by unprecedented depreciation of the naira and price instability. The naira deprecated by more than 120% between 2015 and 2016. In the same period, measured consumer price index rose by 37% (NBS, 2017).

From 1986, when Structure Adjustment Programme (SAP) was adopted in Nigeria, the Nigerian financial system has witnessed a lot of innovations, which has changed the nature of the system and, of course, the relationship between demand for money and macro-economic variables, and equally made complex the transmission mechanism of monetary policy in Nigerian economy. Despite the changes that have occurred in the Nigerian financial system, the monetary authority is still using monetary aggregate targeting as a strategy of monetary policy. Given this scenario, the Central Bank of Nigeria's monetary policy strategy is therefore called to question. The effectiveness of the monetary authority's policy strategy is debatable and can only be resolved through empirical examination.

Therefore, the problem of the study is to empirically examine the effectiveness of monetary policy operating strategy for achieving monetary policy objectives in Nigerian economy. The study will examine the operating strategy of the Central Bank of Nigeria monetary policy and the effect on selected monetary policy objectives of price stability, sustainable economic growth, balance of payment stability, and full employment between 1986 and 2017.

A study of this nature is highly significant. The findings of this study will rebound to invaluable benefits to the society, considering the important role of monetary policy in the society. The important role, and the desirability of price stability, sustainable economic growth, full employment and stable balance of payment justify the need for re-evaluation of the monetary policy operating strategy in Nigerian economy.

The remaining parts of study is organized into four sections as follows: Section two (2) is the literature review and presents a review of relevant theoretical and empirical literature of the study. Section three (3) is the method of the study. Method employed for the collection and analysis of the study data as well as the empirical model is presented and explained in this section. section four (4) is for, presentation of empirical results and discussion of findings. Section five (5) is devoted to summary of the study and conclusion from the study.

II. LITERATURE REVIEW

This section reviews the literature that explains the relationship between monetary policy variables and policy objectives. The choice of monetary policy objectives, primary and intermediate targets, and the overall framework of monetary policy are all based on the axioms and explanted from theories. Some of the most frequently cited theories which have influenced the framework of monetary policies are presented below.

The argument of the Monetarists centres on the relation between price level and changes in monetary aggregate. The controversy between the Keynesian and the Monetarist arise from whether changes in monetary aggregate affect the velocity of money and the output level (Diptimai, 2000, p.14). The Monetarists are of the opinion that, in the long run, velocity of money demand is independent of changes in monetary aggregates. Therefore, changes monetary aggregate

have no effect on the velocity of money. The direct implication of this is that changes in monetary aggregates leave demand for money the same, but brings a corresponding change in the level of expenditure (since expenditure is equal to the (MV). Hence, over the long run, monetary policy has a significant effect on the level of expenditure and aggregate demand. This is a sort of contradiction to the Keynesian assertion, which claimed that changes in monetary aggregate have impact on the velocity; but the impact is unpredictable and therefore, monetary policy is not a reliable instrument for managing aggregate demand (Keynes, 1936 p.170).

Another important monetarist attack on the Keynesian economist is the argument that the national output level is inelastic in the long run, but elastic in the short run. Based on this, the output in the long run is determined independent of aggregate. It implies that, in the long run, any change in aggregate demand represented by change in MV, which could come only from changes in monetary aggregate, is fully transmitted to price level. Hence, the rate of growth of monetary aggregate determines the rate of growth of inflation in the economy. The monetarist believe that monetary policy has definite and predictable effect on output and employment in the short run. However, monetary policy does not have any effect on output and employment in the short run.

Thus, changes in money supply have effect on aggregate demand. The monetarists believe that the money demand function is relatively stable due to minor role played by the speculative demand for money. Again, they equally believe that interest elasticity of investment is not inelastic, but relatively elastic. Thus, monetary policy is more effective than the Keynesians assumed. This also implies that the indirect transmission mechanism is possible and faster than Keynes and the Keynesians assumed.

However, the monetarist observed that the direct transmission mechanism may be slow. Also, they admit that the velocity of money may fall in the short run as a result of fall in the yield of near money assets. Thus, the demand for money can change in an unpredictable manner in the short run. Therefore, monetary policy is not a good stabilization instrument in the short run.

In the long run, velocity of money is stable, and there is enough time for the direct transmission mechanism to work out. Thus, in the short run, monetary policy has a predictable effect on aggregate demand and employment and, therefore, can be used as a stabilization instrument to bring about stability in the level of output, employment, price level and the external balance. The monetarist, therefore favour a long run approach to monetary policy using monetary variables as operating instrument. The monetarist subscribes to targeting the long run growth of monetary aggregate instead of using the interest rate and fixing it.

A lot of empirical studies have been done on the relationship between monetary policy variables and monetary policy objectives. This section presents the empirical studies and their findings as follow.

Ujuju and Etale (2016) examined the role of monetary policy in controlling inflation in Nigeria. They used annual time series data from 1982 to 2011 and multiple regression analysis techniques. Monetary policy rate, minimum rediscount rate, liquidity ratio and cash reserve ratio represented monetary policy instruments; while inflation rate as measured by consumer price index proxy inflation rate. The study found that interest rate, minimum rediscount rate, liquidity ratio and cash reserve ratio have no significant effect on inflation rate in Nigeria. They therefore, recommend the shift from monetary targeting to inflation targeting in Nigeria.

The effectiveness of monetary policy for controlling inflation was examined by Ngeregbo (2016) in Nigerian economy. The study used annual time series data from 1985 to 2012 and a multiple regression model which has broad money supply, narrow money supply, monetary policy rate, prime lending rate, and Treasury bill rate, as monetary policy instruments and consumer price index as monetary policy objective target. The study observed that maximum lending rate, prime lending rate, minimum lending rate, and treasuring bill rate have no significant effect on inflation, while growth rate of broad, and narrow money, and credit to the public sector have significant effect on inflation rate in Nigeria. The study recommended that controlling monetary aggregate growth rate as a strategy for controlling inflation in Nigeria.

Commodore (2016) the effect of monetary policy on inflation in Ghana using annual time series data from 1980 to 2014 and Auto- Regressive Distributed Lag (ARDL) model analysis method. Monetary policy was proxy by monetary policy instrument of broad money supply M_2, narrow money M_1, M+, monetary policy rate, exchange rate and interest rate. The

result shows that there is a significant relationship in both long run and short run, between monetary aggregates and inflation rate in Ghana.

Emerenimi and Eke (2014) examined the effect of monetary policy instruments on price inflation in Nigeria during the period 2007 to 2013. The study employed quarterly data and co-integration analysis techniques, and included broad money supply (M_2), Treasury bill rate, monetary policy rate, exchange rate level as monetary policy instruments and consumer price index as proxy or inflation. The study showed that broad money supply growth rate and exchange rate level have positive and significant impact on inflation rate, while monetary policy rate and Treasury bill rate do not have significant impact on inflation. They recommended controlling the growth rate of broad money supply as a strategy of managing inflation in Nigerian economy.

Raymond (2014) used ordinary least square (OLS) regression analysis method to examine the effect of monetary policy on inflation in Nigerian economy from 1980 to 2010. He regressed broad money supply, monetary policy rate, cash reserve ratio, liquidity radio and exchange rate, as monetary policy variables, on consumer price index. The analysis revealed that liquidity ratio, monetary policy rate, and exchange rate are effective instruments for controlling inflation in Nigerian economy.

Uduakobong (2014) studied the relationship between inflation and money supply in Nigeria between the period 1970 to 2011. He used Vector Error Correction Model (VECM) approach and annual time series data. The study revealed that there is a positive and significant relationship between money supply and inflation in Nigerian economy. He recommended controlling the supply of money to reduce inflationary pressure in Nigerian economy.

Cevik and Teksoz (2013) carried out a study to determine the factors behind inflation dynamics in Libya. Their study used quarterly data and co-integration analysis techniques. The multiple regression models have government spending, exchange rate, imposition and removal of sanctions, world inflation rate, and money supply growth rate as the independent variables. The result indicated that money supply growth rate, among other things, is a significant cause of inflation in Libya.

In a related study, Koyuncu (2014) study the impact of money supply growth rate on inflation in Turkey. He used annual time series data from 1987 to 2013 and co-integration analysis techniques, and Granger causality analysis. The result revealed that there is a positive and significant relationship between money supply and inflation. The Granger causality test shows that there is no causality from inflation to money supply, but from money supply to inflation.

Onyeiwu (2012) studied the effect of monetary policy on economic growth and balance of payment in Nigeria. His study used annual time series data ranging from 1981 to 2008 and Ordinary Least Square (OLS) regression analysis techniques. The study's data analysis revealed that monetary policy, proxy by increase growth of money supply, have positive and significant effect on economic growth and balance of payment in Nigeria.

Uduakobong and Ime (2017) studied the effect of monetary policy on economic growth in Nigerian economy. They used annual time series data covering the period 1970 to 2016 and Ordinary Least Square (OLS) regression analysis techniques. The multiple regression models have broad money supply, prime rate, exchange rate, and government expenditure as the explanatory variables and real GDP growth rate as the dependent variable. The result indicated a positive and insignificant relationship between money supply and economic growth. Also, there was no causality from money supply to economic growth. The study therefore recommended that money supply should be effectively and efficiently monitored and controlled in Nigeria.

Duskobilov (2017) examined the impact of monetary policy tools on economic growth in Uzbekistan. He employed annual data and regression model which contain interest rate, mandatory reserve rate and stabilization volume to GDP ratio. The result revealed that monetary policy tools have positive and significant effect on economic growth in Uzbekistan.

Kamaan (2014) studied the effect of monetary policy on economic growth in Kenya using Vector Auto regression (VAR) approach, and quarterly data from 1992 to 2012. The study revealed that one standard deviation in monetary policy socks, proxy by Central Bank Rate (CBR) has negative, but significant impact on economic growth after two-month lags which

become positive and insignificant in the next six months. The study therefore recommends that the monetary authority should stick to low inflation rate to encourage economic growth.

In a study by Adamu and Itsede (2014), the impact of monetary approach on the Balance of payments was fully examined for the West African Monetary Zone (WAMZ) countries for the period 1975–2008. From the empirical results, it was found that money supply played a significant impact in determining the Balance of payments, a result that validated the monetary approach to the Balance of payments for the WAMZ countries.

Imoisi, Olatunji and Ekpenyong (2013) similarly carried out a study on the efficacy of monetary policy in achieving Balance of payments stability in Nigeria within the period 1980 to 2010. The study employed the Ordinary Least Squares (OLS) technique of multiple regressions and the estimated result found a positive relationship between the monetary variables of money supply, exchange rate, interest rate and BoPs. Furthermore, the study indicated a positive significant relationship between broad money supply (M2) and interest rate (ITR) with BOPs while exchange rate (EXR) was found to be statistically insignificant.

Ivrendi, M. and Z. Yiidirim (2013) investigated the effect of domestic monetary policy on macro-economic variables in six emerging economies of Brazil, Russia, India, China, South Africa and turkey called BRICS-T. They applied structural VAR model and data from 1998 to 2012. The result shows that monetary policy has significant effect on exchange rate value in Turkey.

Ashima and Arora (2010) examined the impact of conventional monetary policy on exchange rate in India. They employed monthly data set from 2002 to 2008 and the generalized Autoregressive Conditional Heteroscedasticity (GARCH) model. The result revealed that restrictive monetary policy depreciates the Indian currency. They recommended the expansion of credit channel to assist appreciators of the exchange rate.

West (2004) investigated the effect of monetary policy on exchange rate volatility in New Zealand. He used quarterly data from 1992 to 2002 and Vector Auto Regression Model. The result revealed that monetary policy has significant effect on exchange rate volatility in New Zealand.

Bjornland (2018) examined the interdependence between monetary policy and exchange rate movement in Norway. He used Structural VAR model, and quarterly data from 1990 to 2007. The result shows interdependence between monetary policy and exchange rate. Contrationary monetary policy precedes exchange rate appreciation in Norway. He therefore recommended controlling monetary variables growth rate to reduce exchange rate volatility in Norway.

Chukwu (2009), analyzed the effect of monetary policy innovations in Nigeria. The study used a Structural Vector Auto-Regression (SVAR) approach to trace the effects monetary policy stocks on output and prices in Nigeria. The study also analyzed three alternative policy instrument, that is, broad money (M2), minimum rediscount rate (MRR), and the real effective exchange rate (REER). The study found evidence that monetary policy innovations have both real and nominal effect on economic parameter depending on the policy variable selected.

Leeper, Sims, and Zha (1996) investigated the role of monetary policy in the US using a VAR model and a range of monthly macroeconomic variables in the period from January 1960 to March 1996. The results suggest that a contractionary monetary policy shock causes a rise in unemployment.

Korenok and Radchenko (2004) analysed the monetary policy effects on the business cycle fluctuations in the US using a plucking factor augmented vector autoregressive (PFAVAR) model and a range of quarterly aggregate economic variables in the period from June 1959 to September 2002. They found that contractionary monetary policy shock leads to a decline in the level of employment.

Ravn and Simonelli (2007) examined the dynamic effects on the labour market of four structural technology and policy shocks in the US using a 12-dimensional SVAR (structural vector autoregressive) model and quarterly data of real government spending, relative investment price, labour productivity, real wages, inflation rate, capacity utilisation, average hours worked, consumption share, the investment share, unemployment, vacancies, vacancies–unemployment-ratio and the Federal funds rate in the period from September 1959 to March 2003. They found that contractionary monetary policy shock increases unemployment.

Erjavec, Cota, and Bahovec (1999) analyzed the relationship between monetary-credit and real economic activity in Croatia using a VAR model and monthly data of industrial production, money supply, prices, credit supply and unemployment in the period from January 1992 to December 1998. Conducted Granger causality tests showed that money supply does not cause unemployment.

Alexius and Holmlund (2007) analysed the relationship between monetary policy and unemployment fluctuations in Sweden using a SVAR model and quarterly data of domestic output gap, unemployment, monetary conditions index (MCI), foreign output gap, technology and government deficit in the period from March 1980 to March 2005. Obtained results suggests that expansionary monetary policy increases the output gap and decreases unemployment.

III. METHOD OF THE STUDY

This section describes the method employed for the collection and empirical analysis of the study data.

3.1 Model Specification

The monetarist model is adopted as the analytical framework of this study. In the long run, velocity of money is stable, and there is enough time for the direct transmission mechanism to work out. Thus, in the short run, monetary policy has a predictable effect on aggregate demand and employment and, therefore, can be used as a stabilization instrument to bring about stability in the level of output, employment, price level and the external balance. The monetarist, therefore favour a long run approach to monetary policy using monetary variables as operating instrument. The monetarist subscribes to targeting the long run growth of monetary aggregate instead of using the interest rate and fixing it. Based on the foregone, a simplified model of the relationship between monetary policy variables and monetary policy objectives variables could be expressed as an implicit model as follows:

PS= f(MS2, MPR EXR GDP) 3.1

GDP= f(MS2, MPR EXR, GDP) 3.2

BoP = f(MS2, MPR EXR GDP) 3.3

UNEMP= f(MS2, MPR EXR, GDP) 3.4

Accordingly, the econometric form of the model is stated as:

$$PS=\gamma_1+\gamma_2 MS2_i+\gamma_3 MPR_1+\beta\gamma_4 EXR_i+\gamma_5 GDP_i+\mu_i \quad 3.5$$

$$GDP=\beta_1+\beta_2 MS2_i+\beta_3 MPR_1+\beta_4 EXR_i+\beta_5 GDP_i+\mu_2 \quad 3.6$$

$$BoP=\phi_1+\phi_2 MS2_i+\phi_3 MPR_1+\phi_4 EXR_i+\phi_5 GDP_i+\mu_3 \quad 3.7$$

$$UNEMP=\theta_1+\theta_2 MS2_i+\theta_3 MPR_1+\theta_4 EXR_i+\theta_5 GDP_i+\mu_4 \quad 3.8$$

Where

PS is price stability variable, GDP is economic growth variable, BoP is balance of payment variable, and UNEMP is full employment variable. These are monetary policy objective variables. MS2 is broad money supply growth rate, MPR is monetary policy rate, and EXR is exchange rate. These last three are monetary policy variables. μ_i, μ_2, μ_3 and μ_4 are white noise error terms,

Examining the impact of monetary policy on monetary policy objectives necessitates specifying a model which will allow isolating the impact of policy intervention or changes in any of the policy variable on the ultimate target objective variables. The model should tell us how a change in any of the model perimeters is linked to monetary policy variable or action. Again, target objective might be subject to several non-policy variables. Some parameters designating or representing monetary policy variables may appear as argument in the monetary policy reaction function and or as explicit variable in the ultimate target function. Thus, the variables are interdependent and affect one another via expectation. This implies that there is no complete exogeneity between monetary policy variables and monetary policy ultimate target variables. There is simultaneity among the variables. Therefore, any model which attempts to specify the impact of monetary policy variable on policy objective must acknowledge this phenomenon. Any effort to predict the

impact of monetary policy variables on monetary policy target objectives by changing any of the policy instruments or equations and holding other equations in the model constant, which is exactly what the implicit functions specified in equations 3.5 to 3.8 above implies, will fail, because other variables and equations will change if the policy variables or any of the policy variables changes (Lucas' Critique) (Lucas,1976).

The Vector Autoregressive (VAR) model developed by Sim (1980) is the most appropriate model for specifying the type of interactive relationship between monetary policy variables and monetary policy objectives The VAR model provides a clearer and better insight into the dynamics of the system and therefore avail us the opportunity to observe the feedback mechanism among the variables of the model. We examine the impact of the policy variables shocks on the ultimate target objective variables and how the target influences the policy variables. The VAR has the important advantage of being simple with high predictive power (Sim, 1987).

Again, the VAR is a-theoretic because it uses less prior information and the researcher is relieve of the problem of specifying endogenous and exogenous variables because all the variables are considered endogenous (Gujarati, 2004). The VAR model has become popular in contemporary literature on monetary policy research. The model has achieved important height in data description and in forecasting. However, the model has not completely overcome the Lucas' Critique, and is less suitable for forecasting out of sample. However, the emphasis of the study is not to estimate the parameters of the model, but on analysing the impact of monetary policy shocks on the endogenous variables; that is, how changes in monetary policy variables affect the policy objectives. For this type of analysis, the VAR model is a better choice.

For a VAR model to provide relevant information on monetary policy, it must include monetary policy objective variables such as price level indicator, output and the external sector performance indicators, and monetary policy variables as indicator necessary to provide the market for interbank reserves (Christiano, Eichenbaum & Evans, 1996; Bernanke & Mihov, 1998). That is, a good VAR model for monetary policy analysis must contain a measure of price changes, output changes, monetary policy instrument, interest rate or volume of trade and the monetary policy rate. A general vector autoregressive (VAR) model is represented as:

$$\boldsymbol{X_t} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1 X_{t-1}} + \in_1 \qquad 3.5$$

Where

$$X_t = \begin{bmatrix} GDP \\ INF \\ BOP \\ UNEMP \\ MS2 \\ MPR \\ EXR \end{bmatrix}, \beta_0 = \begin{bmatrix} \beta_{10} \\ \beta_{20} \\ \beta_{30} \\ \beta_{40} \\ \beta_{50} \\ \beta_{60} \\ \beta_{70} \end{bmatrix}, \boldsymbol{\beta_1} \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} & \beta_{16} & \beta_{17} \\ \beta_{21} & \beta_{22} & \beta_{23} & \beta_{24} & \beta_{25} & \beta_{26} & \beta_{17} \\ \beta_{31} & \beta_{32} & \beta_{33} & \beta_{34} & \beta_{35} & \beta_{36} & \beta_{37} \\ \beta_{41} & \beta_{42} & \beta_{43} & \beta_{44} & \beta_{45} & \beta_{46} & \beta_{47} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & \beta_{55} & \beta_{56} & \beta_{57} \\ \beta_{61} & \beta_{62} & \beta_{63} & \beta_{64} & \beta_{65} & \beta_{66} & \beta_{67} \\ \beta_{71} & \beta_{72} & \beta_{73} & \beta_{73} & \beta_{74} & \beta_{76} & \beta_{77} \end{bmatrix}, X_{t-1} = \begin{bmatrix} GDP_{t-1} \\ INF_{t-1} \\ BOP_{t-1} \\ UNEMP_{t-1} \\ MS2_{t-1} \\ MPR_{t-1} \\ EXRt_{t-1} \end{bmatrix}, \in_1 = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \epsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \\ \varepsilon_7 \end{bmatrix}$$

3.2. Definition and Measurement of Variables in the Model

This section explains the variables employed to represent monetary policy framework in Nigerian economy. The variables were selected based on the latest monetary policy framework of the Central Bank of Nigeria. Specifically, the model has policy and objective variables. The seven variables depict the Nigerian economy. The seven variables are classified into two blocks. The first block consists of the ultimate/objective target variables of monetary policy and also represent non-policy variables. Variables in this category are economic growth, price stability, balance of payment, and full employment variables. The second block of variables consists of policy variables. The variables in this block are broad money aggregate (MS_2) and the exchange rate which are the intermediate variables and represents the transmission from the interest rate and the exchange rate channels, and the Monetary Policy Rate (MPR) which represent the operating target.

A. Non-Policy/ Objective Target Variables

Economic Growth: Economic growth is a long term rise in the countries capacity to produce diverse goods and services to its population (Kutznet, 1956). Economic growth is measured as the annual rate of change of the gross domestic product. Growth of real gross domestic product which is the annual rate of change of price deflated income would be

employed in this study. Real GDP growth rate is a better measure of economic growth (Jhingan, 2005) and sustainable economic growth is an implicit objective of monetary policy in Nigeria. In the New Keynesian framework, output stabilization around a potential output level is a target objective. Inflation is detrimental to achievement of output stabilization. Thus, the policy rule contains these two variables: the policy rule attempts to minimize the deviation of the actual output from the target potential level and also the actual.

Price Stability: Price stability is a situation where the change in the general price level is small and predictable. Price stability is a core objective of monetary policy in Nigeria. If the annual rate of change of the general price level is between 0 and 3%, then price is stable. Price stability is measured as changes in inflation rate and proxy by annual change in the consumer price index. In estimating price expectation, economic agent makes use of all information available to the agents at the time of decision making. The information includes the past period performance of the economy, expected future performance level, and future policies that are likely to have impact on the expected variable. Past inflation level, output gap and expected inflation gap are key variables that are most likely to have effect on expected price level. Hence, economic agents would build their rational expectation about inflation in any period based on the current inflation level, expected inflation gap, expected output gap and random component of macroeconomic policy represented by the growth of money supply (monetary shocks) (Prestoris, 1994).

Balance of Payments (BOPs): The Balance of payments is a record of a country's transaction with the rest of the world which involves inflow and outflow of money. The Balance of payments has a current and capital (financial) account. Current account Balance of payments measures transactions for goods and services called visible and invisible items and comprise of trade balance i.e. trade in goods and the balance for trade in services. The financial account (capital) measures inflows of capital for both short term and long term and this includes foreign direct investment and purchase of securities by investors. In a floating exchange rate, a current account deficit must be matched by a surplus on the financial accounts. The Balance of payments is measured in millions of naira and sourced CBN statistical bulletin (Various Issues).

Full Employment (UNEMP): This variable is proxy by unemployment rate. It is measured as the number of people, age between 16 and 64, who are able and willing to work, and have searched for jobs, available to start in the next 2 weeks, but cannot find any jobs. It is measured in percentage

B. Policy Variables

Broad Money Supply (MS_2): broad monetary aggregate is the intermediate target variable in the central bank monetary policy framework. The intermediate variable is the variable which is not in direct control of the monetary authority, but which it can influence indirectly. The intermediate target variable in Nigeria's monetary policy framework is the broad monetary aggregate MS_2. Broad monetary aggregate is made up of currency in circulation plus demand deposit. Plus, small denomination time deposits, foreign denominated deposit (CBN, Monetary Policy Department, 2006; Ezirim, 2004). The Central Bank of Nigeria adopted monetary targeting using broad money as the intermediate target in 1986. Changes in this target affect the level of the ultimate targets.

Monetary Policy Rate (MPR): The monetary policy rate is an interest rate that the monetary authority (i.e. the central bank) sets in order to influence the evolution of the main monetary variables in the economy (e.g. consumer prices, exchange rate or credit expansion, and balance of payment among others). The policy interest rate determines the levels of the rest of the interest rates in the economy, since it is the price at which private agents, mostly, private banks obtain money from the central bank. These banks will then offer financial products to their clients at an interest rate that is normally based on the policy rate (Focus Economics, 2019).

Different central banks have different monetary policy interest rates. The most common are the overnight lending rate (interbank lending rate), discount rate (minimum rediscount rate) and repurchase rate (of different maturities). Normally, central banks use the policy interest rate to perform contractionary or expansionary monetary policy. A rise in interest rates is commonly used to curb inflation, currency depreciation, excessive credit growth or capital outflows. On the contrary, by cutting interest rates, a central bank might be seeking to boost economic activity by fostering credit expansion or currency depreciation in order to gain competitiveness.

The monetary policy rate can be thought of as a mathematical equation that determines the appropriate level for the central bank's policy instrument as a function of one or more economic variables that describe the state of the economy. The Central Bank of Nigeria monetary policy rate (MPR) is operating instrument of monetary policy in Nigeria. It is the interest rate for lending to the deposit money and for the buying and selling of reserves. The ruling interest rate is the interbank rate. The interbank rate is the operating instrument of the Central Bank in the monetary policy framework and the monetary policy rule or instrument rule defines the level of the operating instrument (operating target) as a function of some economic variables. The instrument rule or Change in the operating target is expected to have definite effect on the level and structure of broad money (intermediate target).

Exchange Rate (EXR): Exchange rate is the rate at which a country's currency exchanges for another or is converted to another. Exchange rate stability implies that the movement of the exchange rate of the domestic currency is small and predictable. It forecloses wide swings or extreme volatility in the external value of the domestic currency (Dornbush, 1985). Exchange rate of naira to the U.S dollars was used because Nigeria conduct about 40% of her international trade in oil with the United States and the naira is pegged to the dollars (Owoye & Onaforuwa, 2007).

The data for the study is secondary in nature. The data consist of quarterly time series data of the variables in equation 3.5. All data were collected from 1st quarter 1986 to 4th quarter 2017.Data for real gross domestic product, inflation rate, balance of payment, broad money supply, exchange rate and monetary policy rate were collected from the Central Bank of Nigeria (CBN) Statistical Bulletin (various issues). Data for unemployment level were collected from the National Bureau of Statistics (NBS) Supplementary materials were sourced from the World Bank development index (WDI) on the internet, International Monetary Fund Country Specific Financial Statistics, text books, published and unpublished works of other researchers (with credit to the authors).

3.3 Method of Analysis

The Vector Error Correction Model (VECM) regression analysis techniques were employed for the estimation of the model. In the use and estimation of VECM model, there are basic issues that must be addressed. The basic issues addressed in estimation of VECM model are:

- Variable Stationarity
- Co-integration
- Optimal Lag Order
- VAR Model Stability Test
- Residual Diagnostic Analysis
- Impulse Response Function Analysis
- Forecast Error Variance Decomposition, and
- Granger Causality/Wald Block Exogeneity Analysis

IV. RESULTS AND DISCUSSION

4.2.1 Descriptive Statistics

In empirical studies, it is important to examine the statistical properties of the data employed in the model. This will reveal the behaviour of the data and the likely chance of any problem in the data. The descriptive statistics of the data are shown in Table 4.2 below.

Table 4.1: Descriptive Statistics of Variables in the model

	GDP	PS	BOP	UNEM	MS2	MPR	EXR
Mean	5882677.	202.2836	15050.76	7.754839	5947.327	13.84073	99.00510
Median	1762243.	112.1000	6895.150	7.515625	1550.700	13.50000	117.6600
Maximum	29169069	1741.330	59756.50	29.28750	24996.41	26.00000	306.7900
Minimum	15874.40	16.00000	986.2000	3.068750	26.10000	6.000000	0.182800
Std. Dev.	8014013.	287.7906	16017.79	3.648701	7707.324	3.859833	78.65513

Skewness	1.371925	3.234324	1.106433	3.640973	1.125311	0.686961	0.605742
Kurtosis	3.468250	14.42710	2.833821	18.43367	2.853253	4.615556	3.108496
Jarque-Bera	40.03118	890.8472	25.44269	1504.661	26.28199	23.23803	7.643894
Probability	0.000000	0.000000	0.000003	0.000000	0.000002	0.000009	0.021885
Sum	7.29E+08	25083.17	1866294.	961.6000	737468.6	1716.250	12276.63
Sum Sq. Dev.	7.90E+15	10187281	3.16E+10	1637.502	7.31E+09	1832.492	760955.5
Observations	128	128	128	128	128	128	128

Source: E-view computer output.

The table above shows the descriptive statistics of variables in the regression model. From the table, there are 128 observations. During the period under review, the Monetary Policy Rate (MPR) had a minimum of 6%. The maximum value of this variable was 26%; while the mean and median of the monetary policy rate were 13.80% and 13.500% respectively. Also, during the period under investigation, price level, measured by consumer price index, reached the minimum of 16.00; while it achieved the maximum value of 1741.33. The general price level averaged 196.31 during the period under review. In the 128 quarters, which is a period of 32 years, broad monetary aggregate (MS2) averaged ₦5,947.327 billion naira per quarter? The highest value during the period was ₦24,996.41 billion; while the minimum value per quarter was #26 .10 billion. Gross Domestic product (GDP) had an average of ₦58,877 billion. The maximum and minimum values of the GDP were ₦291,690.69 billion and ₦15,874.6600 billion respectively. The maximum and minimum values of the exchange rate were ₦306.7900 and ₦0.182800. The mean value of the exchange was ₦99.005**.**

The mean value for Balance of Payment (Bop) is $150,507,6 billion, while the maximum and minimum value for the variable are $59756.50 billion and $986.200 billion respectively. Unemployment rate has mean of 7.75% during the period under review and maximum value of 29.28%. The minimum value during the 128 quarters was 3.06%

The Skewness values for all the variables, apart from Monetary Policy Rate (MPR) and exchange rate (EXR) are greater than 0.00. This implies that the distributions of these variables are positively skewed. The Skewness values for monetary policy rate (MPR) and Exchange Rate (EXR) are very close to zero, and so the distributions of these variables could be taken as central. The Kurtosis values for MPR, PS, GDP, UNEM and EXR are greater than 3.000. Thus, they have excess kurtosis and are leptokurtic, that is, their distributions have tops that are more pointed than the normal distribution. The kurtosis value for MS_2 and Bop are less than 3.00. This mean that the distribution of has flatter top than the normal distribution. They are platykurtic. The Jacque-Bera (JB) test of normality for the variables shows that the distributions of all the are not normal. The P-value of the JB statistics for all the variables are less than the critical 0.05.

Correlation Matrix

Table 4.2: Correlation Matrix of Variables in the Model

	GDP	PS	BOP	UNEM	MS2	MPR	EXR	IPU
GDP	1.000000							
PS	0.728686	1.000000						
BOP	0.550986	0.327642	1.000000					
UNEM	0.501602	0.750049	0.173812	1.000000				
MS2	0.955849	0.812902	0.588022	0.601035	1.000000			
MPR	-0.200457	0.019070	-0.469529	0.038114	-0.237138	1.000000		
EXR	0.793900	0.806252	0.536637	0.687947	0.861576	-0.265200	1.000000	
IPU	0.821371	0.676944	0.648853	0.534732	0.866225	-0.366147	0.722181	1.000000

Source: E-view computer printout

Table 4.2 show the VECM correlation matrix for the variables in the model. From the table, none of the pair-wise correlation coefficient is greater than .90. Thus, there is no reason to suspect the problem of multi-co linearity in the model (Gujarati, 2005, P.254). Therefore, the variables can be combined in a meaningful economic model without fear of multi-co linearity.

4.2.2 Unit Root Test Results

The tests of unit root results are presented in Table 4.3 below. The unit root test employed both the Augmented Dickey – Fuller (ADF) and the Phillips- Perron (PP) approaches at 5% probability level.

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Table 4.3: Unit Root Test Results

	Augmented Dickey-Fuller (ADF)		Phillips- Peron (PP)		
Variable	Level	First Difference	Level	First Difference	Order
GDP	- 2.1887	-3.0333	- 0.2139	-13.4213	I (1)
INF	- 1.9629	-3.7105	- 2.9027	-4.2954	I (1)
EXR	- 1.3593	- 8.9100	-1.2259	- 8.7884	I (1)
MS_2	.1.4860	-16.1308	.1.9947	-16.6124	I (1)
MPR	-1.3652	-5.9924	-2.8018	-12.0351	I (1)
IP	-0.940	-8.5422	-1.0331	-8.2011	I (1)
BOP	-2.0607	-5.5907	-3.3354	-8.2799	I(1)
UNEMP	-3.1762	-6.7331	-3.0926	7.2996	I(1)
	1% = -3.4829		5% =-2.8848	10% =-2.5790	

Source: E-view computer output

The results of both the ADF and the PP test show that all the variables were not stationary at level. That is, all the variables have unit root. After first differencing, all the variables became stationary. Hence, they are first difference stationary or I (1) series, because they were differenced once to make them stationary. Having seen the order of integration of the variables, and the indication that the model would be built using the difference of the variables, that is built using the first difference of the variables, it is important to select the optimal lag length of the model. Selecting the optimal lag length is the next step in the estimation process.

4.2.3 Co-integration Rank Test Results

Having seen that the variables in the model are integrated of order one, that is, the variables are I(1) series, it becomes necessary to examine whether they are co-integrated. There are many procedures for testing co-integration among integrated variables. But the Johansen (1988) method seems to have gained upper hand for testing the co-integration rank of VAR model. The Johansen method is popular because of its Gaussian assumptions and the shortcomings in other methods. The Johansen approach has been found to have good asymptotic properties even in cases where the data generating process (DGP) is not Gaussian (Lutkepohl, 2006). The results of the Johansen co-integration tests are shown below.

Table 4.4a: Co-integration Rank Test Results (Trace Statistics)

Hypothesized No. CE	Trace Statistic	5% Critical
r≤0	216.2091*	125.6154
r≤1	139.7329*	95.7536
r≤2	96.2793*	69.81889
r≤3	58 .5467*	47.85613
r≤4	24.67563	29.79707
r≤5	7.422710	15.49471
r≤6	0.084318	3.841466

Source: E-view computer output

Table 4.4b: Co-integration Rank Test Results (Maximum Eigen Value)

Hypothesized No. CE	Maximum Eigen Value	5% Critical
r≤0	76.47624*	46.23142
r≤1	43.45354*	40.07757
r≤2	37.73348*	33.87687
r≤3	33.87025*	27.58434
r≤4	17.25292	21.13162
r≤5	7.338392	14.26460
r≤6	0.084318	3.841466

Source: E-view computer output

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From the results, both the Trace and maximum Eigen value statistics show that there are at least four (4) co-integration rank equations in the model. It therefore implies that the model should be re-parametized and estimated as a Vector Error Correction Model (VECM) and in first difference to capture the co-integration among the variables.

Before estimating the impulse response and the forecast error variance decomposition, it is important to examine the stability of the VECM, serial correlation, heteroskedasticity, and residual normality.

4.2.4 VAR Stability Test

To guide against the possibility of inconsistency in the impulse response and forecast error variance decomposition or the under estimation of the true error variance, the stability of the VECM model was examined using the graph of the inverse roots of the characteristic polynomial. In a multivariate VECM model, Lutkepohl (1993) proved that the stability of the VECM model requires that all the inverse root of the characteristic polynomial must be less than unity or lie within the unit circle. Thus, the necessary and sufficient condition for stability is that all the inverse roots of the characteristic polynomial lie within the unit circle. The E-view computer output of the graph is presented in Figure 4.1 below.

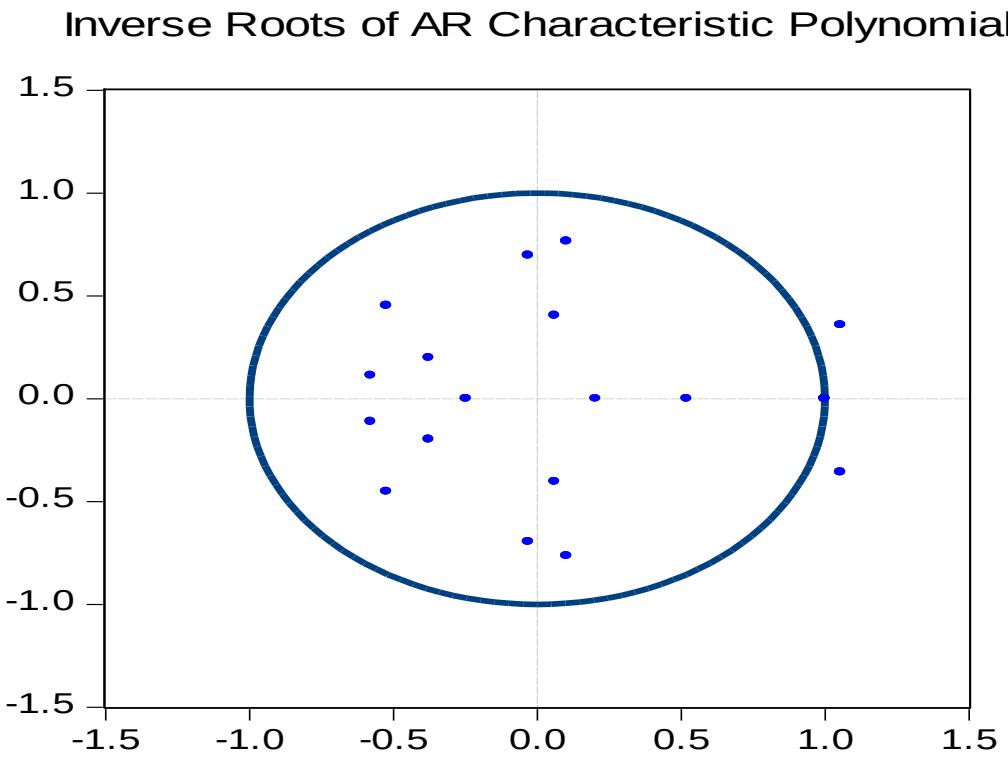

Figure 4.1

From the figure above, it is clear that all the inverse roots are within the unit circle. This implies that the necessary and sufficient requirements for stability of the VECM model are met. Therefore, it is safe to conclude that the empirical VECM model is stable. Another very important implication of the VECM stability condition is that valid and consistent impulse response function and error variance decomposition can now be estimated.

VEC Residual Heteroskedasticity Tests

Table 4.5: VEC Residual Heteroskedasticity Tests Result

Chi-sq	Df	Prob.
21.5496	405	0.0831

Source: E-view computer output

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The result of the heteroskedasticity test is shown in Table 4.6 above. From the result, there is no sufficient evidence to reject the null hypothesis that the error terms are homoscedastic. The probability value of the empirical Chi-square statistic is greater than the critical value of 0.05. Therefore, the null hypothesis is maintained at 005 levels of significance.

2. Serial Correlations

Table 4.6: VEC Residual Serial Correlation LM Tests Null Hypothesis: no serial correlation at lag order *I*
Included observations: 125

Lags	LM-Stat	Prob
1	124.2130	0.0000
2	31.90187	0.2979
3	16.26443	0.1621
4	29.42538	0.1590
5	25.52847	0.2501
6	21.49995	0.6644
7	11.27200	0.9915
8	18.51091	0.8199
9	12.87341	0.9780
10	14.43691	0.9536
11	8.784967	0.9989
12	21.26121	0.6780

Source: E-view computer output

The possibility of serial correlation in the estimated residuals was examined using the Breusch-Godfrey Lagrange Multiplier approach at lag 12 under the null hypothesis of no serial correlation. The results support the acceptance of the null hypothesis at 5% probability levels up to 12 lags. Apart from the first lag, all other lags show no evidence in support of rejecting the null hypothesis. Since, the lag chosen for estimating the model is greater than 1 it can be accepted that there is no statistically significant evidence to suspect the problem of serial correlation among the variables.

3. Residual Normality

Table 4.7: Jacque-Bera Normality Test Result

Component	Jarque-Bera	Df	Prob.
1	2 .2874	2	0.0145
2	1 .6097	2	0.0601
3	0 .6850	2	0.2100
4	6 .2309	2	0.1970
5	2 .8524	2	0.0560
Joint	13.6654	10	0.0561

Source: E-view computer output

The Jacque-Bera test of normality result is presented in Table 4.8 above. The result does not support the rejection of the null hypothesis at 0.05 levels of significance. The empirical Chi-square statistic is less than the critical Chi-square value at 10 degree of freedom and 5% probability level. Therefore, the null hypothesis is maintained at 0.05 levels of significance. It therefore implies that the residuals distribution is normal.

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Having seen that the VAR model is stable, and there is no evidence of serial correlation or heteroskdasticity, the analysis proceeded to estimate and analyse the impulse response function and forecast error variance decomposition. The impulse response function of the VECM was estimated and the results are presented graphically as follows:

4.2.5 monetary policy operating target and monetary policy intermediate target

In this section, the impulse response of the monetary policy intermediate target, the broad monetary aggregate to Cholesky one standard deviation shock from the operating target was analysed and presented. Likewise, the variance decomposition of the policy intermediate variable due to shocks from the operating instrument and other policy variables, and the objectives are presented and also analysed below.

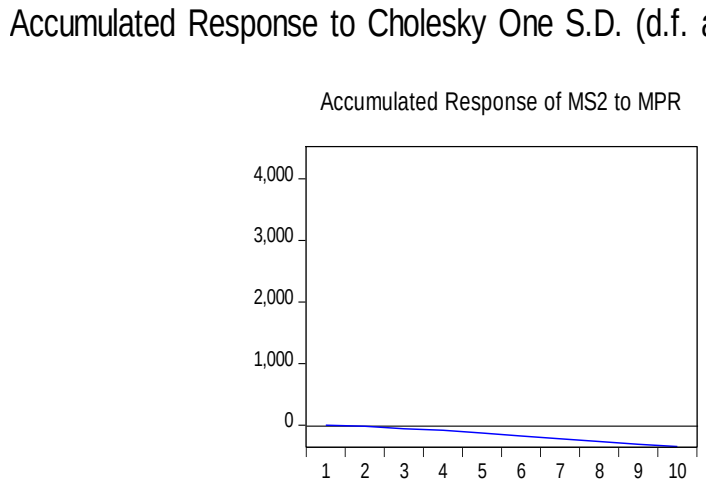

Figure 4.2:

The figure shows that the response of the intermediate target, broad monetary aggregate, MS2 to one standard deviation innovation(shocks) in monetary policy rate (MPR) is significant. From the figure, there is a noticeable impact of monetary policy operating instrument on the intermediate target instrument. It is quite significant. It shows that positive shocks, that is increase in the policy rate, will lead to fall in broad monetary growth rate, all things being equal. This implies that the monetary policy operating target instrument has strong influence on the intermediate variable. There is, therefore, a strong connection between the operating target and the intermediate target instrument.

In this case, using monetary policy rate, which is the operating instrument of the monetary authority, to target broad monetary growth rate will be effective. The instrument will most probably meet the target variable. The response is significantly below the zero line. In the first period, MS2 falls and continues decreasing throughout the 10 quarter

Table 4.8: Variance Decomposition of Monetary Policy Intermediate Instrument

Period	S.E.	GDP	PS	UNEM	BOP	MPR	MS2	EXR
1	809.2553	3.972450	0.444011	0.972482	5.750067	0.266429	88.59456	0.000000
2	965.1988	4.727277	7.752419	4.451045	5.359453	0.189565	77.51933	0.000907
3	1146.593	5.015625	11.05247	6.566754	9.689774	0.162139	67.34785	0.165388
4	1315.246	6.639431	10.97266	9.928245	9.255068	0.123276	62.88423	0.197088
5	1484.775	8.546111	10.16253	13.82061	8.462051	0.114296	58.66989	0.224518
6	1668.106	11.09457	9.094029	18.16839	8.353321	0.110205	52.90059	0.278890
7	1867.608	14.02511	7.575308	22.15924	8.594018	0.102390	47.20463	0.339306
8	2083.360	17.27362	6.101072	25.48071	8.704932	0.094493	42.02146	0.323714
9	2319.345	20.67348	4.988873	27.94006	8.928554	0.084547	37.10279	0.281693
10	2576.854	24.07294	4.401123	29.28508	9.387212	0.072458	32.54566	0.235527
11	2854.171	27.23698	4.421792	29.59993	9.964211	0.060359	28.52468	0.192051
12	3148.010	30.02606	5.012167	29.06543	10.60789	0.049665	25.07320	0.165583

Source: E-view computer output

The table shows the variance decomposition of the monetary policy intermediate target instrument, the broad monetary aggregate, MS2. From the table, monetary policy rate, the operating instrument of the monetary policy strategy, MPR has very weak influence on the intermediate target variable, MS2. That is, MS2 is weakly endogenous or that the operating target instrument is strongly exogenous (the influence of the operating target on the intermediate target is weak). Another important and notable trend in the impact of the operating target on the intermediate target is that the influence fluctuates and faded in the long run. In the first period, the influence was 0.266%. It decreased to 0.189% in the second period; to 0.162% in the third period, and to 0.123% in the 4th period and continue till the 12th quarter when it became 0.049%. Thus, apart from being weak, the influence of the monetary policy operating instrument on the intermediate target is unstable and diminishes with time. This implies that with time, the operating target instrument losses impact on the intermediate variable.

The effect of the past values of the monetary policy intermediate target on itself is strong, but unstable. The impact takes effect almost immediately, but fades slowly. It does not die out fast like the influence of the operating target on the intermediate target. The impact dies out as we go further. Price level variable, that is, Inflation has significant influence on the monetary policy intermediate target instrument. However, the influence is variable, and peaks after 3 quarters. It starts falling after the third quarters. GDP, that is, output, has strong impact on the intermediate target. Its impact is without lag and increases as the time periods increases. It increases throughout the twelve quarters. Thus, output gap has least exogeneity effect on the instrument. Exchange rate has insignificant impact on the intermediate variable.

Monetary Targeting Strategy and Monetary Policy Objectives

In this section, the impulse response of the monetary policy objectives due to Cholesky one standard deviation shock from the intermediate policy target instrument, that is, broad monetary growth rate, was analysed and presented. In addition, the fluctuations in the policy ultimate objective variables due to the policy variables and the other objective variable are presented and also analysed below. The emphasis here is on the variance of the policy objective variables caused by fluctuations in the monetary policy intermediate variable, MS2.

Accumulated Response to Cholesky One S.D. (d.f. adjusted) Innovations

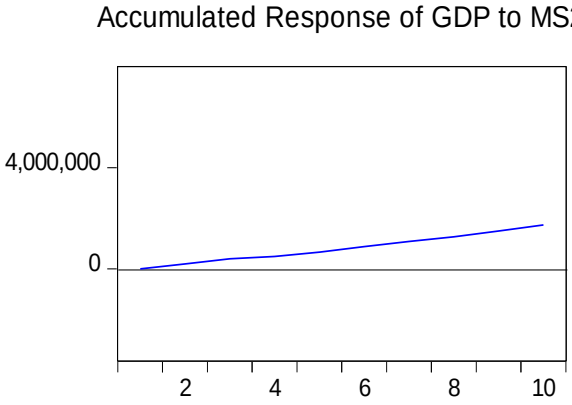

Figure 4.3:

Figure 4.2 show the response of national income growth to monetary policy shocks. Specifically, it shows the response of the Gross Domestic Product (LOGGDP) growth rate, which is proxy for sustainable economic growth, to innovation of one standard deviation in the intermediate variable. The figure indicates that the monetary policy intermediate target instrument has impact on sustainable economic growth in Nigeria. The response of sustainable growth target to monetary policy innovations is positive and significant, even after ten (10) quarters. This shows that the intermediate target instrument is effective for sustainable growth. Therefore, targeting monetary variable, or monetary targeting as strategy for sustainable economic growth is an effective policy strategy for sustainable growth of the Nigerian economy.

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Table 4.9: Variance Decomposition of Sustainable Economic growth

Period	S.E.	GDP	PS	UNEM	BOP	MPR	MS2	EXR
1	1381384.	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1891235.	94.47908	0.004554	0.001180	0.082344	0.001794	1.102274	4.328770
3	2166996.	93.35945	0.065539	0.004344	0.062937	0.011802	1.744779	4.751153
4	2393006.	91.37843	0.815060	0.064386	0.106101	0.208542	1.547461	5.880022
5	2618997.	90.16725	0.807663	1.352428	0.129619	0.460639	1.693670	5.388734
6	2815470.	87.66265	0.939050	3.811634	0.159398	0.510026	2.051691	4.865545
7	2974265.	83.39121	1.733722	6.933522	0.168011	0.548040	2.287630	4.937869
8	3132151.	77.46849	3.591085	10.52465	0.236954	0.642126	2.381737	5.154952
9	3318887.	69.97600	6.015501	15.19260	0.555308	0.717695	2.538419	5.004472
10	3546974.	61.47155	9.504264	19.79469	1.249596	0.720605	2.664776	4.594519
11	3822910.	52.92755	14.28310	23.22201	2.137163	0.678183	2.668856	4.083143
12	4155004.	45.08685	19.91429	25.05122	3.234938	0.614956	2.577749	3.519997

Source: E-view Computer output

Table 4.9 shows the forecast error variance of the economic growth (LOGGDP). The table reveals that the intermediate target variable (MS2) has weak impact on the objective of sustainable economic growth. Thus, the Central Bank of Nigeria intermediate target is weakly endogenous to sustainable growth objective. In the first period, the impact of the intermediate variable is not noticeable. However, the impact started at 1.1022% in the 2nd quarter and increased to the level of 1.744 % in the 3rd period. The influence reduced to 1.5474% in the 4th period; increased to 1.69% in the 5th period; increased to 2.05% in the 6th period, and reached the level of 2.54% in the 12th quarter. The impact of the intermediate variable (MS2) is not significant and it is variable. Again, the response of economic growth to monetary policy shocks from the broad monetary aggregate is with lag. This negates one of the assumptions for the use of monetary targeting as a strategy for monetary policy.

Economic growth has noticeable and strongly endogenous impact on itself. In the first period, the impact was 100%. In the 2nd period it was 94.47%; falls to 93.35% in the 3rd period and reduced to 61.47% in the 10th period. One thing is remarkable here: output gap has strongly endogenous influence on economic growth, but the influence dies slowly with time. Price stability variable, Inflation has strong exogeneity influence on output growth. In the 1st period, the influence was 0%. It increased to 0.0045% in the 2nd quarter; increased to 0.065% in the 3rd quarter. It remained relatively stable above 0.80 % till the 7th quarter when it reached 1.7%. The impact is increasing and reached 9.5% in the 10th quarter. The impact of monetary policy rate on economic growth rate is weak and has lag of one quarter. Monetary policy rate had the highest impact of 0.72 % in the 10th quarter and thereafter started decreasing. Exchange rate as monetary policy instrument has impact lag of one quarter on economic growth. Its impact increases from the 2nd quarter to 5.15% in the 8th quarter and fall to 4.59 % in the 10th quarter. The influence also fluctuates and dies slowly.

Accumulated Response to Cholesky One S.D. (d.f. adjusted) Innovations

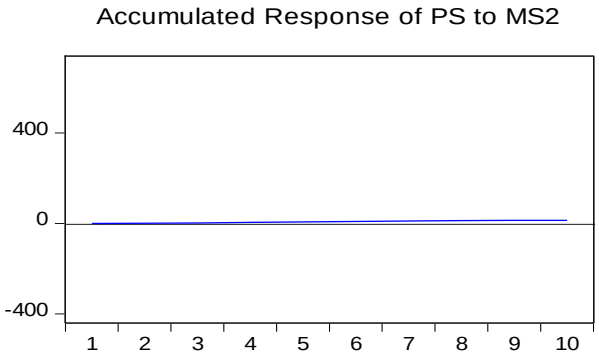

Figure 4.4:

This figure presents the response of price inflation to monetary policy shocks. Price stability is the prime objective of monetary policy in Nigerian economy. The basic assumption of the monetary authority is that there is a stable relationship between monetary aggregates and macroeconomic variables, and therefore, monetary policy through shocks from monetary aggregate will produce a definite and predictable change in the price level. The blue colour in figure 4.3 shows the response of price level (PS) to monetary shocks. It reveals that monetary shocks have no significant influence on price level. The effect is not noticeable even after eight (8) quarters. It remains low throughout the ten (10) quarters. This signifies the presence of impact lag in monetary policy in Nigeria. Monetary policy shocks have no noticeable impact on price stability in both the short and long run. Therefore, using the strategy of monetary targeting to aim at controlling price level is not an optimal policy strategy for price stability. The presence of impact lag will render the strategy ineffective. The strategy has failed the second test of achieving price stability by its ineffectiveness on the monetary policy objective target of price stability.

Variance Decomposition of price stability

Table 4.10: Variance Decomposition of Price Stability Variable (LOGPS)

Period	S.E.	GDP	PS	UNEM	BOP	MPR	MS2	EXR
1	30.72943	13.67682	86.32318	0.000000	0.000000	0.000000	0.000000	0.000000
2	52.21401	24.35200	74.70355	0.071407	0.847780	0.003051	0.004596	0.017618
3	78.47404	26.07775	70.30294	0.212540	3.329848	0.007192	0.053145	0.016588
4	108.0927	27.00865	66.86514	0.208496	5.486380	0.011421	0.082076	0.337846
5	140.7195	27.09247	65.32506	0.126366	6.696459	0.035820	0.077392	0.646434
6	175.7343	26.80275	64.34411	0.165522	7.610416	0.064946	0.063156	0.949098
7	211.5577	26.02144	63.67861	0.431885	8.464610	0.097634	0.054910	1.250913
8	247.6716	24.78382	63.17487	1.035248	9.204289	0.138035	0.046831	1.616907
9	283.2743	23.28269	62.69939	2.048539	9.736214	0.185898	0.038988	2.008280
10	317.8988	21.58368	62.08883	3.572707	10.09763	0.236983	0.031803	2.388368
11	350.9483	19.75065	61.22511	5.645649	10.31013	0.289024	0.026139	2.753307
12	382.1117	17.84495	60.01971	8.293733	10.37257	0.341368	0.022285	3.105385

Source: E-view Computer output

Table 4.10 shows the forecast variance decomposition of price stability objective variable (LOGPS). From the table, one could see that price stability variable is affected more by past value of inflation gaps and output Inflationary gap or inflationary expectation is strongly endogenous to price stability. Inflationary gap has strong impact on price stability in Nigerian economy. The impact of inflationary gap on price stability is without lag and relatively stable throughout the ten periods. On the average, the impact is 61% per period. Output gap has weak exogeneity on price stability. This implies that output gap has strong influence on price stability. The impact of output gap on inflation is strong and stable at above 20% after the 1st quarter till the 10th quarter. The influence started declining after the 8th quarter. The variance of price stability variable due to output gap is variable, and smaller relative to the variance due to price expectations.

The monetary policy intermediate variable (MS2) has weak impact on price stability variable. Again, it has 0% impact in the 1st quarter and the impact fluctuates, reaching the maximum of 0.08% in 4th quarter. Exchange rate (EXR) and the monetary policy rate (MPR) instrument have strong exogenous influences on price stability. This implies that the contributions of these instruments to price stability variable variations are weak. These monetary policy instrument variable do not account for significant variations in the level and changes in price inflation in the economy

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Accumulated Response to Cholesky One S.D. (d.f. adjusted) Innovations

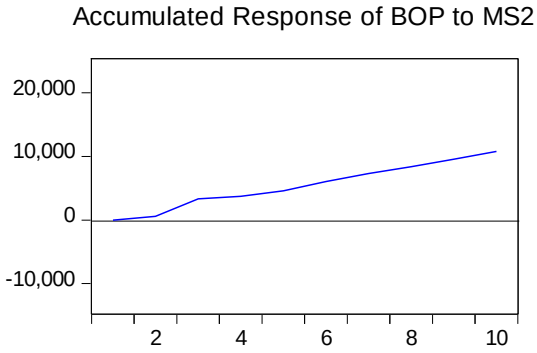

Figure 4.5:

The response of balance of payment to monetary shocks is depicted in figure 4 .4 above. The figure reveals that monetary policy has positive influence on balance of payment movement. However, the figure shows that the influence on balance of payment is positive, because the impulse response is above the zero line. Starting from the first quarter after the shock, the value of the balance of payment in a positively till the 3rd quarter when it peaks and thereafter maintained increasing slope throughout the ten quarters. This implies that, in the ten quarters following monetary policy innovations, there will be improvement in balance of payment position

Table 4.11: Variance Decomposition of Balance of Payment (BoP)

Period	S.E.	GDP	PS	BOP	UNEM	MS2	MPR	EXR
1	12092.52	8.584410	16.47726	74.93833	0.000000	0.000000	0.000000	0.000000
2	12466.01	8.321405	18.42691	72.56994	0.066932	0.213394	0.291263	0.110152
3	13955.50	6.684712	24.90478	58.40718	0.998128	4.100052	1.524736	3.380420
4	14310.18	6.571638	23.94019	59.06428	0.974790	3.974480	1.784996	3.689628
5	14894.99	6.093399	23.02063	59.57385	1.652369	4.010495	2.213798	3.435458
6	15228.31	6.123953	22.44791	58.16096	2.106786	4.755948	2.802398	3.602040
7	15498.19	6.842479	21.67418	56.88167	2.246144	5.232925	3.342311	3.780290
8	15756.01	7.600481	21.13529	55.83046	2.395150	5.515750	3.836546	3.686322
9	16037.08	8.603878	20.79420	54.30365	2.416234	5.876640	4.433723	3.571669
10	16371.12	9.901643	20.79411	52.25839	2.319411	6.208915	5.084829	3.432702
11	16763.84	11.14582	21.27459	49.90749	2.337340	6.366275	5.674148	3.294331
12	17187.76	11.97874	21.92836	47.51060	2.648716	6.462511	6.236665	3.234413

Source: E-view Computer output

The table show the variance decomposition of balance of payment objective variable. From the table, balance of payment has strong endogenous impact on itself. Inflation level is strongly endogenous to balance of payment. That is, inflation has strong influence on exchange rate stability variable. The influence of price inflation is without lag, and relatively stable. The impact of output gap is weakly exogenous. That is, output gap has strong influence on exchange rate stability. The impact of output gap is without lag, stable and is increasing as the time goes by monetary policy intermediate target variable. that is, the broad money supply growth rate (MS2) is weakly endogenous to balance of payment equilibrium objective. The impact has impact lag of 1one quarter and builds up as the time progresses. Monetary policy rate (MPR) insignificant impact on balance of payment objective variable. The impact has lag period of one quarter. However, the impact is relatively small and with impact lag. The impact builds up till the 10th quarter. Exchange rate variations contribute very little to variations in the level of balance of payment. The impact of exchange rate variation is with lag that lasts up to one quarter. The impact is also variable and remain on the average of 3.2% per quarter after the 2nd quarter.

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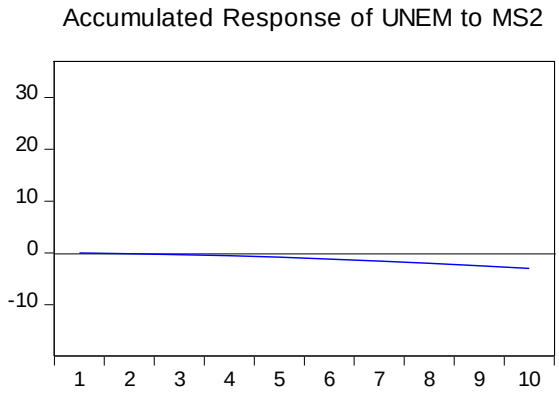

Figure 4.6

The response of unemployment as proxy to full employment objective is shown in figure 4.6 above. The figure reveals that the response of unemployment to monetary policy shocks is negative, but insignificant till after 6six quarters. This implies that, though monetary policy shocks have negative impact on unemployment, this impact is not significant till after 6 quarters. Translating this to full employment objective variable, it means that monetary policy shocks moves the output level towards or away from the full employment output level depending on the stance of the policy. Growth in the broad monetary aggregates has the potential of moving the economy towards the full employment output level.

Variance Decomposition of Unemployment

Table 4.12: Variance Decomposition of Unemployment

Period	S.E.	GDP	PS	BOP	UNEM	MS2	MPR	EXR
1	1.198136	23.07526	0.727365	0.005296	76.19208	0.000000	0.000000	0.000000
2	2.009916	8.563239	0.275037	0.285846	89.43368	0.738141	0.006819	0.697237
3	3.120346	6.879466	0.759493	0.215089	89.45447	0.672745	0.037146	1.981595
4	4.490358	10.88082	2.803230	0.171559	83.10642	0.471133	0.174687	2.392145
5	6.243039	14.34855	4.465879	0.440855	78.36481	0.477210	0.205522	1.697171
6	8.293595	18.31803	7.039928	1.054579	71.86571	0.462894	0.158644	1.100214
7	10.64426	22.49491	10.19274	1.691407	64.34281	0.419888	0.114704	0.743546
8	13.26115	26.04786	13.64986	2.473402	56.87176	0.372247	0.083832	0.501031
9	16.11112	28.74568	17.00308	3.376441	50.13364	0.342159	0.059315	0.339691
10	19.15583	30.76886	20.33374	4.327587	43.94815	0.315896	0.041972	0.263798
11	22.34680	32.28908	23.61089	5.250600	38.26821	0.288765	0.033114	0.259334
12	25.62427	33.33507	26.75809	6.151949	33.14668	0.262946	0.031934	0.313343

Source: E-view computer printout

The table shows the decomposition of the forecast error variance of unemployment. Full employment is an important objective of monetary policy in Nigeria. the monetary authority uses the intermediate target instrument to achieve a predetermined level of full employment. Thus, the growth rate of broad money must have a significant impact on the variance of full employment level. From the table, the impact of the monetary policy intermediate target variable on full employment variable is with lag. The impact lag is one quarters. The impact per quarter is less than 0.5%. This implies slow response. The impact of monetary policy rate (MPR) on variation of full employment level is also with lag and even less than the impact of the intermediate variable on full employment. Exchange rate impact on full employment is also with one quarter lag. The impact of exchange rate fluctuates. It gets to its peak after 4 quarters.

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V. SUMMARY AND CONCLUSIONS

The monetary policy operating framework in Nigeria uses monetary targeting strategy using monetary policy rate as the monetary policy operating target and broad monetary aggregate as the intermediate target variable to achieve its monetary policy objectives of price stability and sustainable economic growth, balance of payment equilibrium, and full employment. In setting the optimal target rule, the monetary authority selects as its intermediate target instruments that instrument: (1) which is not directly in control of the monetary authority, but can indirectly be controlled by changes in the value of another variable in the firm control of the monetary authority. This implies that the operating instrument variable must have significant influence on the target instrument variable. (2) The instrument must be accurately measurable and stable over time. This is talking about the choice of monetary aggregate, the availability of its data, and the accuracy in measuring it volume and trend over time. (3) the optimal intermediate target variable must have significant influence on the monetary policy ultimate target objectives. This third criterion means that there must be a stable and predictable influence of the intermediate variable instrument of monetary policy on the monetary policy objectives of price stability, sustainable economic growth, balance of payment variations, and employment rate. These basic criteria of an optimal monetary policy target rule imply monetary policy transmission mechanism from operating target intermediate target to price stability, sustainable growth, balance of payment variations, and full employment level (the monetary policy ultimate objective targets). Hence, the present study examined the Central Bank of Nigeria monetary policy operating strategy, and the effect on the monetary policy objective of price stability, sustainable economic growth, balance of payment equilibrium, and full employment level. The aim of the study was to ascertain if the Central Bank of Nigeria monetary policy operating strategy is appropriate for achieving monetary policy objectives in Nigerian economy.

The result from the impulse response function and the variance decomposition showed that the intermediate variable, broad monetary aggregate, responds marginally to the shocks from the operating target. The response of the intermediate variable to the monetary policy operating target is not noticeable and insignificant. From the variance decomposition, change in the value of the monetary policy operating target could account for less than 0.1 % variation in the value of the intermediate target after 10 months lags. It was also noticed that that the impact varies, beginning from slow but positive value until it thins off. To complete the transmission channel, the impacts of the intermediate target variable on the monetary policy ultimate targets were examined. It was observed that the intermediate target does not cause any significant change on sustainable economic growth. There was also no noticeable impact on price stability, balance of payment, and full employment. In order words, the basic line of action, the link between the operating target and the intermediate target is not effective, and monetary policy intermediate variable does not have any noticeable effect on price stability, sustainable economic growth, balance of payment, and full employment levels. Based on these findings, the following conclusion was drawn.

The results from the the study has proved that the monetary policy operating strategy, using monetary policy rate as the operating target and broad monetary aggregate as the intermediate, is not effective for achieving the monetary policy objectives in Nigeria. The operating target variable has lost its influence on the intermediate target which in turn lacks stable and significant effect on the monetary policy objective variables. Therefore, changing the monetary policy operating instrument, the monetary policy rate, will not produce any definite and predictable influence on monetary policy objective variables. Using monetary policy rate to target the growth rate of broad monetary aggregate will not produce the targeted outcome. It becomes evident to conclude that monetary targeting strategy is no longer an optimal strategy for achieving monetary policy objectives in Nigerian economy. The operating instrument and intermediate policy variable have gone their separate ways as the link between them has been severed.

There is need to re-specify or redefine the nature of the intermediate target variable, the broad monetary aggregate. However, this is another difficult, if not impossible task. It is clear that the current measure of the intermediate target is losing grip on the core policy objectives and targeting broad monetary growth rate (monetary targeting strategy) as a strategy of monetary policy is equivalent to targeting a subset of the main set. The effectiveness of the monetary instrument on the target objective requires a predictable and stable relationship between the intermediate target instrument and the ultimate target objective. Earlier in this paper, we have alluded to the instability of the money demand function which has been established by many other scholars. The instability of the money demand function means that the relationship between monetary variables and other macroeconomic variables is not predictable. Thus, changes in monetary variable statistics will not have significantly and predictable influence on real economic variables. The conclusion from the analysis so far is that there is a break in the transmission of monetary policy shocks from the operating instrument to the intermediate target and intermediate target instrument cannot achieve the four (4) main

objectives of monetary policy in Nigeria. Therefore, the Central Bank of Nigeria operating strategy is not appropriate for achieving the monetary policy objectives in Nigerian economy. Based on the findings of the study, it is important that the monetary authority should change its current operating strategy of monetary targeting to either GDP or inflation targeting and give clear preference to one core objective, especially, the objective of price stability.

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