



EFFECT OF SELECTED MACROECONOMIC VARIABLES ON MONEY SUPPLY IN NIGERIA

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Abstract:

With the large observed discrepancies between money supply target and outcome overtime in Nigeria despite the assertion that money supply growth is independently and exogenously determined by the central bank, this study principally centred on the effect of selected macroeconomic variables on money supply in Nigeria, using annual time series data from 1970-2011. The main objectives of the study were to ascertain how changes in selected macroeconomic variables affect money supply growth as well as testing the money supply endogeneity hypothesis in Nigeria. To achieve the above objectives, the study employs the Augmented Dickey Fuller (ADF) and Philip-perron (PP) unit root test, cointegration test, Granger causality test and Error correction mechanism (ECM) in testing and in the estimation of the relevant equations. The results of the cointegration tests showed that there is a long-run relationship among the macroeconomic variables in the model. The results of the short-run and the long-run estimates revealed that income (GDP), credit to the private sector (CPS), net foreign asset (NFA), government expenditure (GEXP), consumer price index (CPI), interest rate (IR) and exchange rate (EXCH), all have both short-run and long-run significant effect on money supply. Furthermore, the results of the granger causality test showed that money supply is endogenously determined in Nigeria; thereby supporting the post-Keynesian postulation that money supply is endogenous. This indicates that macroeconomic variables had greater influence in determining the rate of money growth in Nigeria. From the findings, it was recommended that in order to achieve a sustainable level of money supply growth that will be consistent with the projected growth rate of the economy, more credit should be allocated to the core private sector of the economy. To achieve this, there is need for the monetary authorities to make credit, cheaper via reduction in lending rate. It is also recommended that monetary authorities should incorporate proactive and strategic analysis of the feedback effect of movement

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of key macroeconomic variables on money supply growth in its formulation of monetary policy and money supply targeting in Nigeria.

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1. Introduction

In free enterprise economies, its economic health is a function of money supply. In such an economy, key macroeconomic variables such as national income, prices, exchange rate, interest rate, government expenditure and money supply play a vital role in determining the pace of economic growth and maintaining macroeconomic stability (Kakar & Kakar, 2005). Hence, economists, researchers and policy makers have shown keen interest in the investigation of the causal relationship between money supply growth and other key macroeconomic variables such as income, price, interest rate, exchange rate (Tajudeen, Adedokun, & Yaqube, 2012). Understanding the effect of these macroeconomic aggregates on money supply movement enhances the formulation and measurement of the effectiveness of monetary and macroeconomic stabilization policies by the monetary authorities.

According to Bakare (2011), money supply refers to the total amount of money in circulation in an economy at a given point in time. It is sometimes referred to as money stock. As a major tool of money policy, its deliberate expansion or contraction by the monetary authorities affects the investment growth and other economic activities in any economy.

In economic literature, a well-known area of debate has been the nature of the causation between money supply growth and key macroeconomic variables (Mehra & Musai, 2010). Monetary theorists and empirical analysts have long been concerned with the nature of the causation between money supply and key macroeconomic aggregates since the effectiveness of monetary policy largely depends on clear understanding of this relationship by policy makers. As noted by Rasheed (2011), if movement in money stock is independently determined by changes in macroeconomic aggregates, then monetary policy makers would be less powerful. However, if changes in money supply significantly cause changes in key macroeconomic aggregates, then monetary policy actions would be very strong. If a bi-directional relationship exists between money stock and macroeconomic variables in an economy, then monetary authorities need to formulate monetary policy with due consideration of the feedback effects of movement of macroeconomic variables on money supply growth.

This cause-effect relationship between macroeconomic variables and money stock has been broadly investigated by researchers in both developed and developing countries during different samples and using a number of approaches. However, the outcome of these investigations has been conflicting (Ahmed & Suliman, 2011). Some

economists like Sims (1972), Omoke & Ugwuanyi (2010), Friedman (1963) hold that money supply causes changes in real or macroeconomic variables such as prices, output, interest rate etc. While others like Chaudhary & Ahmed (1995), Rasheed (2010), Chigbu & Okorontah (2013) argue that it is real output, prices etc. that has significant effect on changes in money supply. Till now there is no consensus on this. Empirical research also does not conform unidirectional causation. For instance, Abbas (1999), Lee & Li (1983), Joshi (1985) pin pointed a bi-directional causality between money supply, income and price in their various studies. The aim of this work is to investigate the effect of selected macroeconomic variables on money supply taking into account different prevalent monetary policy regimes in Nigeria. As asserted by Agu (2007) the responsibility for monetary policy formulations in Nigeria rest with the Central Bank of Nigeria (CBN), and the main objective of monetary policy among others is the maintenance of price stability and promotion of non-inflationary growth. To achieve the above stated objectives, the Central Bank of Nigeria adopts monetary targeting.

On the assumption that there is that there is a stable money demand function in the economy, the Central Bank set aggregate money supply targets and depend on the open market operations (OMO) among other policy tools to achieve the target. However, these targets are hardly met. Disparity has always been observed between money supply targets and outcome overtime. The margin and persistence of the variations are quite high and often time one cannot easily relate targets to outcomes meaningfully (Agu, 2007).

Hence, in developing country like Nigeria, the fiscal operations of government are factors in the assessment or measurement of monetary policy. In Nigeria, a greater percentage of government fiscal deficits is finance by the Central Bank and deposit money banks through ways and means and bank credits. Hence, with persistence fiscal deficits by the government, fiscal dominance is often time look at for much of the observed discrepancies between money supply targets and outcome in Nigeria. Also, following the reforms in the Nigeria economy which led to the liberalization of the financial sector, interest rate became market determined and soon goes higher than the target benchmark. The persistent rise in interest rate and the wide disparity between lending and deposit rates negative affect investment in the real sector but rather encourage investment in financial instruments (Agu, 2007). This contributed in no small measure in the discrepancies observed between money supply targets and outcomes overtime.

According to Horesh (1993) the United Nations Economic Commission on Africa (UNECA) in its "African Alternative Framework for Structural Adjustment Programmes", have identified exchange rate depreciation as a major factor that influence money supply in Nigeria. Thus, exchange rate induces changes in relative prices of goods and services, and the level of spending by individuals and firms. An appreciation in the value of an exchange rate makes imported goods and services relatively cheap, while depreciation makes export become cheaper to foreign buyers, thereby inducing higher competition in export markets at home. Changes in exchange

rate therefore, have implication for individual spending and investment behaviour of firms, all of which can affect aggregate demand, hence money supply.

Inflation rate is another factor that could lead to failure in monetary aggregates since it impairs economic efficiency. In a high inflation economy like Nigeria, real interest rate on currency is always negative. As a result of the negative real interest rate on money, the value of money declines and economic agent reduce their money holding. Saving is discouraging and real resources are consumed just to adopt to a changing monetary yardstick rather than to make productive investments. This influence component of money supply and money supply growth.

According to Saiyed (2012), classical economists believed that money supply is exogenous determined. The monetarists also maintain that the stock of money is under the exclusive control of the central bank. In fact, the monetarists maintain that the independent determination of money supply by the monetary authorities is the only answer to stability of macroeconomic aggregates. Based on the above assertion, Keynes and most of the monetary theorists just take the supply of money to be exogenously determined by the central bank.

However, the Post-Keynesian economists refute these claims. The post-Keynesian rather postulated that money supply is endogenously determine within the economic system through the demand for bank credit and that the demand for bank credit is not control by the monetary authorities but rather by the level of economic activities. Acceptance of the Post-Keynesian endogenous money postulations indicates that fluctuations in monetary aggregates can be determined endogenously (Pallye, 2006). This therefore, implies that the correlation between failure of macroeconomic variables and contraction of monetary aggregates has nothing to do with central monetary policy.

Hence, given the reforms in the Nigerian economy such as the liberation of the external trade and payment systems, substantial degree of financial deepening and innovations in the banking sector, the adoption of a managed float exchange rate system, the elimination of price and interest rate controls etc., this study attempts to provide empirical evidence on the effect of selected macroeconomic variables on money supply given the wide disparity between targets and outcomes as well as testing the money supply endogeneity hypothesis in Nigeria.

2. Statement of the Problem

The Central Bank of Nigeria adopts broad money supply (M_2) as an intermediate target for monetary policy. This is based on the acceptance of the Monetarist claim by the monetary authorities that money supply is exogenous and a balance level of money supply growth is one, which grows in line with the projected growth rate of the economy. Thus, the Central Bank of Nigeria succumb to monetarist prescriptions which recommend targeting of monetary aggregates on the assumption that changes in the exogenous money supply leads to macroeconomic stability.

To achieve or determine the optimum money stock that will yield the desired macroeconomic objectives, the Central Bank of Nigeria sets aggregate money supply targets and depend on the open market operations (OMO) and other policy instruments to achieve the target. However, the outcome of this measure has been undesirable. There has been a large observed discrepancies between monetary targets and outcome over time. Monetary targets have been missed in most of the years and in most cases, it is even difficult to link targets to outcomes. The magnitude and persistence of the variations are quite high. For instance, growth of broad money (M_2), has been shown to have average more than 24 percent between 2001 and 2005 (CBN, 2010). The outlook is not particularly on the upside as broad money (M_2) growth since 2009 has been 8 percent short of target and despite various policy measures to ensure adequate liquidity in the banking system, reserve money consisting of currency in circulation and bank deposit with CBN, was largely below the indicative benchmark (CBN, 2010).

However, the unsatisfactory performance of money targeting put to doubt the efficacy of monetarist prescriptions recommending targeting of monetary aggregates and their claims that money supply is exogenously determined by the monetary authorities and that changes in money supply by the central bank is the principal cause of macroeconomic fluctuations. The Post-Keynesian monetary theory refutes the monetarist claim and rather postulates that money supply is endogenously determined by factors within the economy. Acceptance of the Post-Keynesian monetary theory implies that fluctuations in monetary aggregates can be driven endogenously, and an observed correlation between macroeconomic failure and contraction of money supply has nothing to do with monetary policy measures.

Hence, given the large observed discrepancies between aggregate money supply target and outcome in Nigeria overtime, does the monetarist claim that money supply is exogenously determined by the central bank hold? Or is there any correlation between these discrepancies in monetary aggregates and fluctuations in selected macroeconomic variables given the reforms in the Nigeria economy? How efficient is the monetarist prescriptions recommending targeting of monetary aggregates and its application in Nigeria. Thus, the problem therefore is to investigate whether fluctuations in monetary aggregate can be driven endogenously in Nigeria in line with the Post Keynesian postulations.

2.1 Objectives of the study

The focus of this study is to empirically investigate the effect of selected macroeconomic variables on money supply in Nigeria (1970-2011). Specifically, the objectives of the study are:

- 1) To ascertain the extent to which changes in selected macroeconomic variables such as exchange rate, net foreign assets (NFA) government expenditure (GEXP), price level (CPI), interest rate on their own affects money supply growth in Nigeria.

- 2) To ascertain the extent to which the money supply endogeneity hypothesis which states that money supply growth is endogenously determined by bank credit and national income holds in Nigeria.

3. Research Hypotheses

In testing the effect of selected macroeconomic variables on money supply growth in Nigeria, two hypotheses were formulated to guide the study and include:

H₀₁ There is no significant relationship between changes in selected macroeconomic variables such as exchange rate, government expenditure, net foreign asset, interest rate, price level and money supply growth in Nigeria.

H₀₂ Money supply growth in Nigeria is not endogenously determined by bank credit and national output.

The remainder of this study shall be divided into four sections, the first being the literature review and theoretical framework which will be immediately followed by research methodology. Others will include data analysis and discussion of findings, summary of findings, conclusion and recommendations.

4. Literature Review and Theoretical Framework

4.1 Theoretical Framework

Though this work will briefly review the views of the classical, Keynesian and the monetarist schools of thought such as Fisher (1973), Kenyes (1936), Friedman (1963), in respect of the direction of causality or the effect of selected macroeconomic variables on money supply, the theoretical foundation of this study is on the Post-Keynesian Monetary theory. According to early Post-Keynesian scholars such as Joan Robinson (1956), Kaldor (1970) and Moore (1988), money supply is determined endogenously that is within the economic system by economic agents' need for bank credit.

According to Rasheed (2011) the relationship of money with real variables is one of the oldest doctrines in monetary economics literature and is known as the quantity theory of money. The classical view of how money affects the economy may be considered in terms of the Fisher formulae (sometimes referred to as the equation of exchange) which is:

$$MV = PY \quad \dots\dots\dots (1)$$

Where,

- M = Quantity of money in nominal terms
- V = Velocity of money or how many times the supply of money turnover or change hand
- P = General price index and
- Y = GNP in real terms

The equation of exchange states that the quantity of money in the economy times the velocity of money is equal to gross national product in real terms multiplied by general index of prices of newly produced goods and services (Truett and Truett, 1987).

This identity usually known as the equation of exchange according to Rasheed (2011) has generated several debates among economists. Firstly, it has been debated whether the causation in the equation runs from left to right MV causes PY or from right to left PY causes MV. Secondly, whether velocity (V) and output Y are fixed (constant) or not. Thirdly, whether money supply (M) is fixed by the central bank or not.

The quantity theory of money hypothesizes that money supply is exogenous and change in money supply leads to rise in general price levels and output level remains fixed at full employment level. In the classical model output is taken as determined by availability of capital and labour. Velocity is assumed fixed therefore any exogenous change in money supply leads to change in price level. Money in this case does not have any impact on the real variables and is said to be a veil over the real workings of the economy.

The Keynesians believe that expansionary monetary policy increases the supply of loanable funds through the banking system which leads to fall in interest rates. Keynes, in his *General Theory* (1936), criticized the classical theory and advocates the view that there is no direct, simple and predictable relationship between the quantity of money and its value or prices. Keynes provided the causal process by which changes in the quantity of money brings changes in the price level.

The apostles of Keynes posit that the relationship between money and prices is indirect through the rate of interest (Ekpo and Osakwe, 1991). The Keynesian position is that money is not a "Veil" rather it affects real variable in the economy.

As for the role of money in the economy the transmission mechanism is that when there is an increase in money supply, the first impact of this change is to reduce the rate of interest. A lower interest rate has the tendency to increase investment since the latter is a decreasing function of interest. An increase in investment raises aggregate demand and brings about a rise in income, output and employment. Implicit in the above view is the idea that an increase in money supply affects prices only when the level of employment has been reached and not before.

Therefore, the Keynesian monetary transmission mechanism is indirect. By monetary transmission mechanism, we refer to the chain of events emanating from a change in money supply and other real variables. Keynesians argue that changes in the money supply do not affect consumer spending directly but only indirectly through sequence, schematically shown in figure 2.1

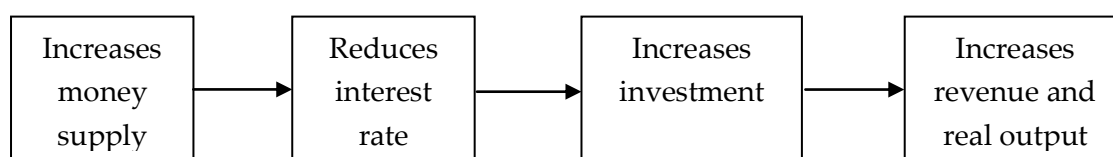


Figure 2.1: Keynesian Monetary Transmission Mechanism

The Keynesian economist postulate that money does not play any important role in determining income and prices as changes in income necessitate changes in money stock through a higher demand for money.

Monetarists, on the other hand, relied on the equation of exchange as a theoretical framework for explaining the relationship between money and income. In their framework, given that the income velocity of money is stable; money has a direct and proportional effect on income. In the long-run money has a neutral effect on income since prices change proportionally to change in money leaving the real value of income unchanged.

Monetarist views the relationship between the quantity of money and national income as more stable, because, like the classical economists they believe that the velocity of money is nearly constant in the short run. In a diagrammatic and equation forms, the monetarists' monetary transmission mechanism are shown in figure 2.2 and equation respectively.



Figure 2.2: Monetarists' Monetary Transmission Mechanism

In equation form, we have that:

$$\text{GNP} = f(\uparrow M_s \text{ through increased spending}) \dots\dots\dots (1)$$

Where:

GNP = Gross National Product

$\uparrow M_s$ = Money supply

Both figure 2.2 and equation 1 support the monetarists' view that money supply is a strategic variable affecting output and income directly. Monetarists also, in general maintain that monetary authorities exercise effective control over the stock of money, while others, especially those who share the new view of monetary theory state that the determination of money stock is a part of the simultaneous solution for all variables in the financial and real sectors of the economy. Monetarist do not necessarily deny this fact but, postulates that the behavior patterns of the public and banking system are stable and predictable which can enable monetary authorities to control the stock of money (Sims, 1972). Hence, Keynes and most of the monetary Theorists simply treated the supply of money as exogenously given by monetary authority.

4.2 The Post-Keynesian Monetary Theory

From the orthodox monetary theory, money supply is assumed to be exogenously determined by the monetary authorities. The classical economists and the monetarists simply treated the supply of money exogenous variable, determined by the objectives of

monetary policy at any point in time. However, as asserted by Pollin (1991), one of the major breakthroughs of the Post-Keynesians economists of recent has been the advancement of the money supply endogeneity. In challenging the monetarist claim that money supply growth is independently under the firm control of the central bank, the Post-Keynesian posit that money supply is endogenously determined through economic agent new for credit.

The Post-Keynesian economists have seriously questioned the validity of this general perception that money supply is exogenously determined. Based on historical events and empirical evidences, scholars have strongly maintained money supply is an endogenous parameter and this has been regarded as the Post-Keynesian invention (Haghighat, 2011). As noted by Pollin (1991) the implication of the Post-Keynesian assertion is fundamental both from macroeconomic theory and policy perspective. The Post-Keynesian postulations imply a rejection of the traditional monetarist that assign major independent influence to the behaviour of the money supply. In terms of policy analysis, it suggests that monetary authorities' interventions in controlling the growth of money supply is not as effective as assumed in reality.

The endogeneity of money supply occupies a central place in Post-Keynesian economics. Within the Post-Keynesian framework, money supply is determined endogenously through economic agent demand for bank credit and the demand for bank credit is not controlled by the Central Bank (Palley, 2006). The early Post-Keynesian scholars maintain money appears in the economy along with production when bank agree to honour firms demand for credit (Reasheed, 2011). Hence, money supply growth depends on the demand for bank credit and the demand for bank credit is a function of the level of economic activities. As the economy booms, the demand for bank credit increase in order to reward factors of production engage in the production activities. According to Robinson (1956) and as argued by the Post-Keynesian in general, money supply either expands or contracts with the needs of production, in response to expectations of aggregate demand, through the banking system.

According to Rasheed (2011), there are three distinct theories of money supply endogeneity. There are those presented by accommodationists, structuralists and the liquidity preference school. These schools are briefly discussed below:

- 1) Accommodationists school: The proponents of this view include Nicholas Kaldor (1982), Sidney Weintraub (1978), and Basil Moore (1988). This school of thought maintain that when banks hold insufficient reserve to meet economic agent need for bank credit, the central banks must as a matter of necessity accommodate their needs as tender of last resort. This approach is also known as horizontalism view the central bank as the tender of last resort which must supplement the reserves of commercial banks when the need arises. Accommodationism basically deals with the attitude both commercial and central banks towards the prime movers of the economy which are the economic agent and the firms in particular Haghighat (2011). Moore (1998) presented this approach as the money supply function drawn on a horizontal line with the interest rate on the vertical

axis. Hence, given the interest rate, the money supply is determined by the demand for credit which the central bank cannot control (Rasheed, 2011).

- 2) Structuralist school: The structuralists maintain that full accommodation is never a necessity. This school argues that if central bank desire to restrict the growth of non-borrowed reserves, then commercial banks can generate additional reserves within the financial system through effective asset and liability management activities of the banks. The structuralist maintained that the banking system can effectively circumvent reserve constraints placed by the central bank in the long run banking services innovation and by providing more liquid financial assets (Rasheed, 2011).
- 3) Liquidity preference school: The liquidity preference theorists posited that the decision to borrow and the decisions to hold increased deposits are determined by the relative interest rates. Arestis and Howells (1996) concluded that it is the changes in relative interest rate which reconcile the demand for additional loans with the demand for additional deposits. Here, bank credit expansion depends on the behaviour of the economic agent as regard their deposit and in connection with commercial banks respond in the form of their asset management policies (Haghighat, 2011).

More specifically, according to Ahmed & Ahmed (2005), in the Post-Keynesian framework, the growth in money supply is often viewed as endogenous. The Post Keynesians in general maintain that money supply growth both in terms of its fluctuations and credit availability is determined by factors within the financial system. According to this argument, the monetary authorities are unable to control the volume of money stock since the creation of money is demand determined.

Hence, the Post Keynesian approach challenges monetarists claims that macro-economic fluctuations are the product of misguided monetary control by central banks and the efficacy of monetarist prescriptions recommending targeting of monetary aggregates (Palley, 2006). This study therefore seeks to test this Post Keynesian hypothesis in the Nigerian context by examining the effect of selected macroeconomic variables on money supply growth in Nigeria as well as testing the money supply endogeneity hypothesis.

4.3 Review of Empirical Literature

The levels of economic activities, production and money supply in an economy are interrelated. The central issues have been whether it is the quantity of money supply that determines the levels of economic activities and production, or on the contrary whether economic activities and production are the variables that actually determine the level of money supply in an economy. Indeed the endogeneity and exogeneity of money supply is still an unsettled issue. Various studies have analyzed the causality between these macroeconomic variables. The results of the various studies are not consistent and controversy is there.

Some studies have established unidirectional causality running from income to money, and from money to income, some have established bi-directional causality

while others have found no evidence of any causality. Many economist works on this topic in different countries of the world and by so many other variables included with the money income causality such as prices, interest rate, government expenditure, exchange rate, etc.

Some studies have specifically investigated the endogenous money hypothesis. Chaudhary & Ahmed (1995), have studied the endogeneity hypothesis in Pakistan. The study was intended to identify the causes of inflation; they also studied the nature of money supply that is, whether it is endogenous or exogenous. They used annual data for the period 1972-1992. All variables were converted to log form and then employed in simultaneous equation framework. The econometric technique employed for estimating parameters is ordinary least square (OLS). They found that while the execution of monetary policy is undertaken by the Central Bank, the overall formation of policy is heavily dependent on the fiscal decisions made by the government. They also found that money supply is not exogenous, rather it depends on the position of international reserve and fiscal deficit, and according to them money supply emerged as an endogenous variable.

Fazal Husain & Kalbe Abbas (2006), examine the causal relationship between money and income and between money and prices in Pakistan. They used annual data from 1948-50 to 1998-99, and investigated the causal relationship through the trivariate causality approach. Unit Root Test developed by Philips & Perron (1988) was used to examine whether the time-series data is stationary. In the study, a two-step procedure was used to examine bi-variate causality between money and income and between money and prices. A three step procedure was used to examine tri-variate causality between money and income conditional on the presence of prices and between money and prices conditional on the presence of income. In the first step, unit root test was performed on the variables. In the second step, co-integration between the two series, X_t and Y_t , was tested, and in the third step Granger causality test was used. The result shows the existence of a long run relationship among these variables. The findings of the study were that unidirectional causality runs from income to money and that bi-directional causality exists between money and prices.

Sims (1972), in his seminar paper, developed a test of causality and applied it to the USA data to examine the causal relationship between money and income. Its results indicated unidirectional causality from money to income as claimed by the monetarists. However, his result was not supported by subsequent studies.

Abbas (1991), performed a causality test between money and income for Asian countries, and found bi-directional causality in Pakistan, Malaysia and Thailand; Omoke & Ugwuanyi (2010) study the empirical relationship between money, prices and output in Nigeria. Money supply was seen to Granger cause both output and prices.

Nyong & Odubejan (2002), in their study using ordinary least squares estimation procedure, showed that monetary financing of deficits leads to an increase in the money supply which affect inflation in Nigeria.

Kul Luintel (2002) investigated the exogeneity status of money stock (M_1 and M_2) vis-à-vis price level and real GDP through tests of various concept of exogeneity (weak-

exogeneity, strong and super exogeneity) in four South Asian economics, India, Nepal, Pakistan and Sri Lanka. He used annual data and the sample period was 1959-1996 for India, 1966-1997 for Nepal, 1961-1997 for Pakistan and 1957-1996 for Sri Lanka. Data was obtained from IMF CD-ROM, 1998. He used the tri-variate VAR framework. The variables in VAR were alternative measures of money stock (M_1 and M_2), consumer price index (CPI) and real GDP. The overall findings were that money stock, price level and real output are cointegrated and M_1 and M_2 are endogenous for all countries.

Muhd Zulkhibri (2007) examines the causality relationship between monetary aggregates, output and prices in the case of Malaysia. The study used a vector auto regression (VAR) model applying the Granger no-causality procedure developed by Toda and Yamamoto (1995). The results indicate a two-way causality running between monetary aggregates, M_2 and M_3 and output which is consistent with theoretically conjecture by Keynesian and Monetarist views whereas there is a one-way causality running from monetary aggregate, M_1 and output. In addition, the results suggest that all monetary aggregates have a strong one-way causality running from money to prices but no evidence for the opposite causality. Thus, the results add the empirical support to the argument in the literature that inflation is a monetary phenomenon.

Rasheed (2010), study the relationship between money supply and real variables in Pakistan. The examined period was between May 1972 and June-2008. He divided the data into two sub-periods and one full period. The variables studied were; real and nominal GDP, Reserve Money (M_0), Broad Money (M_2), call money rate (interest rate), consumer price Index (CPI), private credit and net foreign assets. The empirical tests conducted begin with unit root and Johansen cointegration tests to test for stationarity of the variables, and to determine whether the variables are cointegrated. Standard Granger causality test was used to test whether there is one-way or bidirectional causality in the long run and in the short-run. Multivariate VAR tests developed by Toda and Yamamoto were also used to test causality. The results provide several important and useful insights. In the credit planning regime most post Keynesians claims were accepted, that is, private credit causes M_0 (reserve money), income causes money supply (M_2), inflation causes money supply (M_0 and M_2) and interest rate causes income. In the market – oriented monetary policy regime period starting from early 1991 in which various financial sector reforms; were undertaken, traditional neoclassical views was supported by the findings. Reserve money causes interest rate and reserve money causes broad money (M_2). When both regimes were combined, he obtained mixed results.

Chigbu & Okorontah (2013), investigated the exogeneity of the money supply in Nigeria using annual rate from 1970-2008. The tests applied investigated the plausibility of the classical hypothesis. The employed the two stages least square method, the Johansen's cointegration procedures and the Granger causality approach. The findings show that there exists a long run relationship between money supply and the included variables. The real interest rate and real income Granger cause the growth of money. Moreover, Granger's causal relation between them was unidirectional from real interest rate, real income to money supply. The study revealed that money supply was

endogenous with respect to the value of money, real income and real interest rate meaning that the monetary policy had influence to some extent on money supply but economic activities had greater influence in determining the rate of money growth.

Tajudeen, Adedokun & Omolara (2012), examine the dynamic causality between money and macroeconomic activity such as output, interest rate, exchange rate and prices in Nigeria from 1960 to 2011. The methodology adopted are descriptive statistics, stationarity test using unit root methods such as Augmented Dickey fuller approach and Philip-Perron method, followed by multivariate cointegration test and Granger causality test in vector error correction and VECM. The results of the cointegration test indicates that a long run relationship exist among the macroeconomic variables. The vector error-correction model results revealed that in the short-run exchange rate and price stand out econometrically exogenous, the presence of causal relationship among the variables shows that money supply is neutral in the short-run and cannot be efficient in the stabilization of both output and price level.

Ahmad & Ahmed (2006), using standard Granger causality test, examine the long run and short run endogeneity of money supply in Pakistan. The study demonstrates that money supply in Pakistan for the period 1980-2003 is not exogenously determined in the short run. Empirical results support the structuralist view as well as liquidity preference view on money endogeneity. However, it also provides partial support to accommodationists view of money endogeneity. Nevertheless, in the long run, a time span exceeding twenty-four months, it is the base money that determine the total bank advance. Hence, central bank has considerable influence on money supply in the long run.

This cause-effect relationship between real economic variables and money supply has been broadly examined in both theoretical and empirical literature for both developed and developing countries during different sample periods, providing conflicting evidences on this issue.

Time series analysis is employed as a means of testing cause-effect relationships between money and real economic activity. In the last three decades, various econometric techniques have been developed to test these cause-effect relationships. Very little effort has been devoted to this issue in an oil dependent economy as Nigeria. Earlier attempts might not have produced the desire results because of problems associated with, the time period considered, statistical techniques used and the number of economic variables incorporated in the model. The results obtained are sensitive to these factors.

This study attempt to fill this gap by carrying out an analysis based on a long period from 1970 to 2011. The study equally employed Granger causality test and the relent techniques to examine the endogeneity of money hypothesis. An economic variable is generally influenced by more than one variable; therefore, models involving more variables may be more useful (Rasheed, 2011). Hence, the analysis incorporated more variables.

The aim of this study is to appropriately fill this gap by examining the effect of selected macroeconomic variables on money supply in Nigeria as well as testing the money supply endogeneity hypothesis base on the Post Keynesians postulation.

5. Research Methodology

5.1 Research Design

This study used the exploratory design jointly with the ex-post facto research design. The exploratory design was helpful in access relevant literatures that aid concept and construct development while the ex-post facto design aided the collection of data for analysis and hypotheses testing. Data for this study were predominantly secondary sources from CBN statistical bulletin and other relevant government publications, the internet, text books, etc.

5.2 Model Specification

The model for this study is built base on the postulation of the post – Keynesians monetary theory with slight modification to achieve the objective of the study. Within the post Keynesian framework, money supply is endogenously determined via bank credit.

Also Fry (1985) maintained that change in money supply is determined by domestic credit expansion to private sector, domestic credit to public sector, net foreign asset and nets other items. Hence, based on the above assertion, the macroeconomic variables and money supply model can be specified as:

$$M_2 = f(\text{GDP, CPS, NFA, GEXP, CPI, INTR, EXCH}) \dots\dots\dots (1)$$

Where:

- M_2 = Broad Money Supply
- GDP = Gross Domestic Product
- CPS = Credit to the Private Sector
- NFA = Net Foreign Assets
- GEXP = Government Expenditure
- CPI = Consumer Price Index
- INTR = Interest rate
- EXCH = Exchange Rate

The model in its econometric linear form can be expressed as:

$$\Delta M_2 = \beta_0 + \beta_1 \Delta \text{GDP} + \beta_2 \Delta \text{CPS} + \beta_3 \Delta \text{NFA} + \beta_4 \Delta \text{GEXP} + \beta_5 \Delta \text{CPI} + \beta_6 \Delta \text{INTR} + \beta_7 \Delta \text{EXCH} + U \dots\dots\dots (2)$$

Where:

β_0 to β_7 are the parameters to be estimated and U is the stochastic error term.

5.3 Estimation Technique

Several techniques are employed in this study to test and estimate the relevant equations. These include the unit root test, the cointegration test, granger causality test and the error correction model.

5.3.1 The unit root test

The unit root test is used to detect the stationarity of the various macroeconomic variables captured in this study. The test is undertaken for two major reasons. First, the unit test performed to avoid the problem of spurious regression. Second, a basic assumption underlying the application of causality test is that the time series in question should be stationary. Hence, in order to implement this test the Augmented Dickey-Fuller (ADF) and Phillip-Perron(PP) tests are applied to detect the stationarity of the variables. Therefore, employing the Dickey and Fuller (1979), the following equation is estimated:

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta y_{t-1} + \sum_{j=1}^j \beta_j \Delta y_{t-j} + \varepsilon_t \dots \dots \dots (3)$$

Where:

- ΔY_t = $Y_t - Y_{t-1}$ is the difference of series Y_t ;
- ΔY_{t-1} = $Y_{t-1} - Y_{t-2}$ is the first difference of Y_{t-1}
- e_t = Stochastic error term

α_0, α_1 and β_i are the parameters to be estimated.

If $\alpha_1 = 0$, the null hypothesis of non – stationary is accepted.

But if $\alpha_1 < 0$ and statistically significant, the null hypothesis of non-stationarity is rejected.

Similarly, using the Phillips-Perron (1988) test, the following equation is also specified as:

$$y_t = \beta_0 + \phi y_{t-1} + v_t \dots \dots \dots (4)$$

Where:

- β_0 and ϕ are parameters to be estimated; and
- v_t is the random error term.

The null hypothesis using PP test requires that if $\phi = 1$, then the series is non stationary or has a unit root but if $\phi < 1$, then the series is stationary.

5.3.2 Cointegration test

This involves testing of the presence or otherwise of co integration between the series of the same order of integration through forming a co integration equation. The general concept of co integration between variables suggests that there exists equilibrium or a long-run relationship between a set of time-series variables, provided that the series is integrated of the same order. A lack of co integration suggests that such variables have

no long-run relationship: in principal they can wander arbitrarily far away from each other (Dickey, Jansen and Thornton, 1991).

According to Granger (1988), if there is evidence of cointegration between two or more variables, then a valid error correction model should also exist between the two variables, Granger (1969, 1986, 1988) & Sim (1972) further stated that, if two variables are co-integrated, causality must exist in at least one direction, either unidirectional or bidirectional.

Johansen and Juselius (1990) multivariate cointegration approach was employed to investigate the long-run equilibrium relationship among the selected macroeconomic variables in the model. The vector autoregression model of order p (VAR (p)) is constructed as a following equation:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta y_{t-i} + C + \varepsilon_t \dots \dots \dots (5)$$

Where ΔY_t is ($n \times 1$) vector of macroeconomic variables in period t , μ is ($n \times 1$) vector of constant terms, Γ_i ($i = 1 \dots k-1$) represents the ($n \times n$) coefficient matrix of short-run dynamics, Π is the $n \times n$ long term impact matrix, and ε_t is ($n \times 1$) vector of error term and it is independent from all explanatory variables. The cointegration test is conducted using trace test and maximum Eigen value test.

The null hypothesis and alternative hypothesis for the co-integration are stated as follows:

$H_0: b_2 = b_3 = b_4 = b_5 = b_6 = b_7 = 0$ (There is no long – run relationship, hence no co-integration)

$H_A: b_2 \neq b_3 \neq b_4 \neq b_5 \neq b_6 \neq b_7 \neq 0$ (There is long – run relationship, hence there is co-integration).

The decision rule is that if the calculated trace and maximum Eigen values are greater than the critical values, then the null hypothesis of no co-integration is rejected and it is concluded that there is existence of a long – run relationship between the variables in the model.

5.3.3 Granger causality test

Next, we proceed to test whether there is any causal relationship between money supply growth and the various components captured in the model. According to Granger (1988), if two variables are co-integrated, then there is possibility of causality between the two at least in one direction. The Granger causality test is applied here to test for the exogeneity/ endogeneity of money in Nigeria. The Granger causality test for the series can be specified as:

$$MS2_t = \sum_{i=1}^j \delta_{11i} MS2_{t-i} + \sum_{i=1}^j \delta_{12i} GDP_{t-i} + U_{1t} \dots \dots \dots (6)$$

$$GDP_t = \sum_{i=1}^j \delta_{21i} GDP_{t-i} + \sum_{i=1}^j \delta_{22i} MS2_{t-i} + U_{2t} \dots \dots \dots (7)$$

$$CPS_t = \sum_{i=1}^j \alpha_{31i} CPS_{t-i} + \sum_{i=1}^j \alpha_{32i} MS2_{t-i} + U_{3t} \dots \dots \dots (8)$$

$$MS2_t = \sum_{i=1}^j \alpha_{41i} MS2_{t-i} + \sum_{i=1}^j \alpha_{42i} CPS_{t-i} + U_{4t} \dots \dots \dots (9)$$

5.3.4 Error correction model

An error correction model (ECM) is used to detect the dynamics of short-term and long term of a variable around its stationary equilibrium value. Thus, for an adjustment error correction requires that the sign of the coefficient of the residual is negative and statistically significant. In this regard, the higher the absolute value of the coefficient is higher, faster we reach the long-run equilibrium. The short – run relationship can be expressed as Error correction Mechanism (ECM) as follows.

$$\Delta MS2_t = \lambda_0 + \sum_{i=1}^j \lambda_{1i} \Delta MS2_{t-i} + \sum_{i=1}^j \lambda_{2i} \Delta GDP_{t-i} + \sum_{i=1}^j \lambda_{3i} \Delta CPS_{t-i} + \sum_{i=1}^j \lambda_{4i} \Delta NF_{t-i} + \sum_{i=1}^j \lambda_{5i} \Delta GEXP_{t-i} + \sum_{i=1}^j \lambda_{6i} \Delta CPI_{t-i} + \sum_{i=1}^j \lambda_{7i} \Delta INFLA_{t-i} + \sum_{i=1}^j \lambda_{8i} \Delta EXCH_{t-i} + \phi ECM_{t-i} + U_t \dots \dots \dots (10)$$

Where: U_t is the white noise error term; ECM is error correction factor.

6. Data Analysis and Discussion of Findings

6.1 Analysis of Empirical Results

6.1.1 Unit root test

The results of the unit root test of stationarity using the Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) test are reported in table 4.2 and 4.3 below.

From the result presented in table 4.2 below, it can be found that none of the variables was stationary at level. Thus, the null hypothesis of the presence of unit root cannot be rejected. However, the series was stationary, when it was differenced once. This means that all variables were integrated of order 1(1).

Table 4.2: Augmented Dickey-Fuller (ADF) Unit Root Test

Variable	ADF Statistics		Order of Integration
	Level	1 st Difference	
LMS ₂	-0.427755	-3.501328	1(1)
LGDP	-0.187290	-5.672597	1(1)
LCP _s	-0.085999	-4.612443	1(1)
LNFA	-0.782098	-5.436093	1(1)
LGEXP	-0.874035	-7.913010	1(1)
INT	-1.539142	-9.993997	1(1)
LCPI	-1.558166	-6.028025	1(1)
EXCH	0.643718	-5.859370	1(1)
Test critical values: 1% =		-3.605593	
5% =		-2.936942	
10% =		-2.606857	

Source: Researcher's computation from E-views 7.1.

Table 4.3: The Phillip-Perron (PP) Unit Root Test

Variable	PP Statistics		Order of Integration
	Level	1 st Difference	
LMS ₂	-0.038009	-3.201159	1(1)
LGDP	-0.199981	-5.671547	1(1)
LCP _s	-0.077325	-4.398769	1(1)
LNFA	-0.663969	-8.003958	1(1)
LGEXP	-0.729937	-7.867399	1(1)
INT	-1.991017	-10.07826	1(1)
LCPI	-1.590672	-6.043522	1(1)
EXCH	-0.623132	-5.857931	1(1)
Test critical values: 1% =		-3.600987	
5% =		-2.935001	
10% =		-2.605836	

Source: Researcher's compilation from E-view 7.1.

Just like the case of Augmented Dickey-Fuller (ADF) test in the previous section, the Phillip-Perron test presented in table 4.3 above showed that no variable was stationary at level. This is to say that, none of the variables was integrated of order 1(0). The series was however stationary when it was differenced once.

Given the fact that the series is integrated of order 1(1), suggests the presence of long-run relationship among the variables in the model. To establish this long-run relationship, we conduct the cointegration test. The test was based on the Johnansen and Jesulius (1990) multivariate cointegration test, using the trace and maximum Eigen value tests. This is reported in tables 4.4 and 4.5 below.

6.1.2 Cointegration test

The result of the trace test as presented in table 4.4 below indicates seven cointegrating equations at 5 per cent level. This is because the trace statistic values in each of the seven cointegrating equations are all greater than their critical values at 5 per cent level of significance. Based on the trace test therefore, we can conclude that there is the presence of long-run relationship among the variables in the model.

Table 4.4: Unrestricted cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.999691	1139.534	159.5297	0.0001
At most 1 *	0.998649	824.2900	125.6154	0.0001
At most 2 *	0.997541	566.6236	95.75366	0.0001
At most 3 *	0.980027	332.3054	69.81889	0.0001
At most 4 *	0.955843	179.6835	47.85613	0.0000
At most 5 *	0.659843	58.00369	29.79707	0.0000
At most 6 *	0.283461	15.94809	15.49471	0.0427
At most 7	0.072816	2.948531	3.841466	0.0860

Series: MS2 GDP CPS NFA GEXP CPI INT EXCH

Trace test indicates 7 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Researcher's computation from E-views 7.1

Similarly, the results of the maximum eigenvalue test are reported in table 4.5 below.

Table 4.5: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.999691	315.2436	52.36261	0.0001
At most 1 *	0.998649	257.6664	46.23142	0.0000
At most 2 *	0.997541	234.3183	40.07757	0.0001
At most 3 *	0.980027	152.6218	33.87687	0.0000
At most 4 *	0.955843	121.6799	27.58434	0.0000
At most 5 *	0.659843	42.05560	21.13162	0.0000
At most 6	0.283461	12.99956	14.26460	0.0784
At most 7	0.072816	2.948531	3.841466	0.0860

Series: MS2 GDP CPS NFA GEXP CPI INT EXCH

Max-eigenvalue test indicates 6 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The result of the maximum eigenvalue test as shown in table 4.6 above indicates six cointegration equations at 5 per cent level of significance. This is so because, the maximum eigenvalue statistic values in the six equations are all greater than their respective critical values at 5 percent level of significance. The result based on the maximum eigenvalue test also showed that there is long-run relationship among the variables in the model.

6.1.3 The long-run estimation

Given that the series are cointegrated, there is need to estimate the long-run coefficients. The long-run coefficient measures the long-run effect of the independent variables on the dependent variable.

From the cointegration test analyzed in the preceding section, the normalized long-run estimates are presented and reported in table 4.7 below.

Table 4.6: The normalized long-run estimates dependent variable: M_2

Variable	Coefficients	Std. Errors	t-statistics
GDP	0.557377	0.04286	13.00460
CPS	1.013053	0.10933	9.26601
GEXP	-1.82678	0.32998	-5.53594
NFA	-75E-06	5.1E-08	-34.31373
CPI	87.02262	33.1410	2.62583
INT	-950.8099	285.512	-3.33019
EXCH	-2264.696	959.528	-2.36022

Source: Author's compilation from E-view 7.1

The result of the normalized long-run estimated as reported in table 4.6 above showed that gross domestic product (income), credit to the private sector and the price level, have significant positive relationship with money supply in the long-run. This means that an increase in these variables will have a significant positive relationship with changes in money supply in the long run in Nigeria.

On the other hand, government expenditure, net foreign assets, interest rate and exchange rate, have significant negative long-run relationship with money supply. This implies that an increase in these variables will lead to a decrease in money supply in the long-run. The result further showed that all variables were statistically significant at 5 per cent level despite the fact that some did not turn out with their correct expected signs. This means that all variables will have significant effect on money supply; some positive effect and some others negative.

6.2.3 The short-run estimation

According to the Granger representation theorem, when variables are cointegrated, there must also be an error correction model (ECM) that describes the short-run dynamics or adjustments of the cointegrated variables towards their equilibrium values. However, before the short-run error correction model is estimated, the over-parameterized model was first estimated. This model contains more parameters than the original model by including the preceding values of the variables in the model. The aim is to examine the effect of past values of both the dependent and the independent variables on the current value of the dependent variables.

The lag value of each variable is six at 2, based on Akaike information criteria (AIC). The results of the over-parameterized model one presented in table 4.7 below.

Table 4.7: The over-parameterized short-run estimation

Dependent Variable: D(M ₂)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	923.1007	778.4327	1.185845	0.2541
D(MS2(-1))	-0.209408	0.085538	-2.448146	0.0271
D(MS2(-2))	-0.110281	0.104841	-1.051889	0.3095
D(GDP)	0.049973	0.004849	10.30583	0.0000
D(GDP(-1))	0.103965	0.020374	5.102700	0.0001
D(GDP(-2))	-0.035148	0.016398	-2.143411	0.0489
D(CPS)	0.247632	0.076210	3.249321	0.0054
D(CPS(-1))	-0.110843	0.115395	-0.960551	0.3520
D(CPS(-2))	0.149985	0.040993	3.658796	0.0023
D(GEXP)	0.000206	0.059867	0.003442	0.9973
D(GEXP(-1))	0.747941	0.052874	14.14573	0.0000
D(GEXP(-2))	0.663993	0.024598	26.99327	0.0000
D(NFA)	-2.00E-08	1.49E-08	-1.344241	0.1988
D(NFA(-1))	-8.37E-08	2.43E-08	-3.448814	0.0036
D(NFA(-2))	4.74E-07	4.66E-08	10.15810	0.0000
D(CPI)	-1.841026	12.37816	-0.148732	0.8837
D(CPI(-1))	-36.58150	9.808637	-3.729519	0.0020
D(CPI(-2))	-118.8517	18.48158	-6.430822	0.0000
D(INT)	-375.7173	274.5156	-1.368656	0.1913
D(INT(-1))	270.5775	233.1340	1.160609	0.2639
D(INT(-2))	50.48554	262.2231	0.192529	0.8499
D(EXCH)	985.8945	543.8042	1.812959	0.0899
D(EXCH(-1))	-2401.215	316.1859	-7.594313	0.0000
D(EXCH(-2))	396.9735	391.0688	1.015099	0.3262
R-squared	0.999992	Durbin-Watson stat		1.059438
Adjusted R-squared	0.999980	F-statistic		82210.99

A glance at the results of the over-parameterized model in table 4.7 above showed that the model has a very high explanatory power. This is given by the high value of the adjusted R-squared. The model is also statistically significant at all conventional levels. This is established looking at the high value of F-statistics (82210.99).

To estimate the short-run error correction model for short-run dynamics, the statistically significant variables were selected and included in the error correction model, while the insignificant variables were dropped as required by the rule.

The results of the short-run dynamics as presented in 4.8 below showed that the parsimonious short-run model has a good fit on the data. This is given by the high value of the adjusted R-squared. According to the result, 98 per cent of the systematic variations in money supply have been explained by changes in income (GDP), credit to the private sector (CPS), net foreign assets (NFA), government expenditure (GEXP), price levels (CPI), interest rate (INT) and exchange rate (EXCH).

Table 4.8: Short-run error correction model (ECM)

Dependent Variable: DM₂

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1473.731	1164.228	1.265844	0.2188
D(MS2(-2))	0.020598	0.019347	1.064629	0.2986
D(GDP)	0.056962	0.003369	16.90868	0.0000
D(GDP(-1))	0.088971	0.002184	40.74108	0.0000
D(GDP(-2))	-0.037884	0.004618	-8.203906	0.0000
D(CPS)	0.207112	0.026131	7.925834	0.0000
D(CPS(-1))	-0.175870	0.014582	-12.06047	0.0000
D(GEXP(-1))	0.636722	0.037188	17.12164	0.0000
D(GEXP(-2))	0.650535	0.029665	21.92944	0.0000
D(NFA(-1))	-1.05E-07	7.82E-09	-13.39394	0.0000
D(NFA(-2))	4.54E-07	6.94E-09	65.51669	0.0000
D(CPI(-1))	-27.60289	1.934622	-14.26784	0.0000
D(CPI(-2))	-115.0334	6.496957	-17.70574	0.0000
D(INT)	-830.8314	244.1057	-3.403572	0.0025
D(EXCH)	855.9548	91.98865	9.305005	0.0000
D(EXCH(-1))	-3046.908	174.8555	-17.42530	0.0000
ECM(-1)	-0.301053	0.038226	-7.875669	0.0000
R-squared	0.999960	F-statistic		34300.88
Adjusted R-squared	0.999931	Durbin-Watson stat		2.142780

Source: Author's compilation from E-view 7.1

In the same vein, the high value of F-statistics (34300.88) shows that the overall model is statistically significant. The overall significance of the short-run model implies the joint significance of all explanatory variables in explaining short-run changes in money supply in Nigeria.

Further examination of the result shows that there is no problem of autocorrelation in the model. This is so because the Durbin-Watson statistic value of 2.14 falls within the acceptance region of no autocorrelation. From the policy stance, this means that the finding of this study can be applied for policy purposes in the Nigerian economy.

Meanwhile, the error correction factor has a negative sign and statistically significant as theoretically expected. The coefficient of the error correction factor shows that 30 percent of the short-run disequilibrium has been corrected each year. This is rather a slow speed of adjustment from short-run disequilibrium to long-run equilibrium.

Analysis of the short-run estimates showed that changes in the previous two periods of money supply have a significant impact on the current value of money supply in Nigeria. The result also revealed that changes in the current and previous one period level of income (GDP) have positive and significant effect on money supply in the short-run. A 1 percent positive change in current and previous one period income lead to a positive change in the current level of money supply by 0.06 percent and 0.09 percent, ceteris paribus. Similarly, changes in credit to private sector also exert a positive and significant effect on the current level of money supply in Nigeria. A 1

percent increase in credit to the private sector leads to an increase in money expansion by 0.21 percent in the short-run. Further, examination of the results showed that previous periods (lagged one and two) of government expenditures have significant positive effect on the current level of money supply in Nigeria. This implies that a 1 percent increase in previous periods of government expenditure will lead to 0.64 percent and 0.65 percent increase in money supply respectively. The previous value (lagged two) of net foreign asset *also* exerts a positive and significant effect on the level of current level of money supply in the short-run in Nigeria.

As expected, there is a negative relationship between price level and money supply. As prices rises in the economy, the monetary authorities will have reduce the supply of money, so as to control the inflationary pressures. As the results indicates, previous periods (lagged one and two) prices have significant negative effect on money supply. A 1 percent increase in the previous (lagged one and two) level of prices will lead to a decrease in money supply by 27.60 percent and 115.03 percent respectively. The coefficient of interest rate is also negative, in line with theoretical expectation. An increase in exchange rate (depreciation) will lead to an increase in domestic money supply, arising from increased receipts from abroad. However, previous one period exchange rate has negative but significant relationship with current money supply in Nigeria. One striking finding from the short-run model is that the explanatory variables all have significant effect on money supply, even though some of them were wrongly signed.

6.2.4 The Granger causality test

The Granger causality test is employed here to test for the direction of causality among the variables in the model. And specifically, this test is also employed to test the exogeneity/endogeneity of money supply hypotheses. Grander causality tests are conducted to determine whether the current and lagged values of one variable affect another.

The Pairwise Granger causality approach is adopted here to carry out the causality test. In order to test the exogeneity/endogeneity of money, the study follows major theoretical postulations and proposes the following:

If $M_2 \rightarrow Y$ (GDP), that is if money supply granger causes income, then the monetarist postulate of the exogenous money supply holds.

If $CPS \rightarrow M_2$ i.e. if credit to the private sector granger causes money supply, then the post-Keynesian postulate that money supply is endogenous holds.

If $GDP \rightarrow M_2$ i.e. if income (GDP) granger causes money supply, then the monetarist and the Keynesian view that money supply is exogenous.

If $GDP \leftrightarrow M_2$ i.e. if there bi-directional causality between income (GDP) and money supply (M_2), then the structuralist/accommodationist postulation of endogenous money holds.

If $CPS \leftrightarrow M_2$ i.e. if there is a bi-directional causality between credit to the private sector and money supply, then the liquidity preference hypothesis holds and hence, money is endogenous.

Based on the above theoretical propositions, the short-run and long-run causality tests between money supply, bank credit to the private sector and income in Nigeria, utilizing the VECM estimation are presented in table 4.9 below.

Table 4.9: Granger Causality Test Results

Granger Relation	F-statistics	Prob.	Conclusion
GDP to M ₂	36.9616	2.E-09	M ₂ ↔ GDP
M ₂ to GDP	40.2439	8.E-10	
CPS to M ₂	25.5531	1.E-07	CPS ↔ M ₂
M ₂ to CPS	25.7928	1.E-07	

Source: Author's compilation from E-view 7.1

The results from the first causality equation showed that there is a bi-directional causality between income (GDP) and money supply (M₂). This result confirms proposition (iv), and structuralist/accommodationist postulation that money supply is endogenous in Nigeria.

Similarly, the causality test from the second equation indicated that there is also a bi-directional relationship between bank credit to the private sector and money supply, hence confirming the liquidity preference hypothesis that money supply is endogenous. The overall empirical results of the granger causality are strongly in consistent with the post-Keynesian hypothesis that money supply is endogenous. Based on the overall result, we conclude that money supply is endogenous in Nigeria. Thus, the null hypothesis of exogenous money supply is rejected in favour of alternative hypothesis of endogenous money supply.

7. Discussion of Findings

This study was an attempt to achieve two main objectives: (i) To examine the short-run and long-run effects of selected macroeconomic variables on money supply growth in Nigeria and (ii) To test whether money supply is endogenous or exogenous in Nigeria. Based on the findings from the analysis of results, empirical evidence appears to support the view that it is macroeconomic factors that had greater influence in determining the rate of growth of money stock and money supply is endogenously determine in Nigeria contrary to neoclassical notion that the supply of money is exogenously determined through the central bank initiatives. The results of the long-run estimation showed that the explanatory variable have significant long-run effect on money supply in Nigeria. This result is supported with the assertion of Tajudeen, Adedokun & Omolara (2012) which stated that a long-run relationship exist a between macroeconomic activity such as output, interest rate, exchange rate, prices and money supply in Nigeria. They posited that the causal relationship among the variables shows that money supply is neutral in the short-run and cannot be efficient in the stabilization

of both output, prices rather it is these real economic variables that had greater influence on money supply growth in the long-run.

As shown by the results, an increase in income (GDP) and credit to the private sector will lead to an increase in money supply in line with the Post-Keynesian view that money supply is endogenous with causality running from gross domestic product and credit to private sector to money supply. Ahmad and Ahmed (2006) in their empirical investigation of the endogenous money supply hypothesis in Pakistan also revealed that money supply growth is endogenously determined by bank credit, GDP and that money supply does not determine economic activity in the long-run. In a similar vein, the long-run positive relationship between price level (CPI) and money supply is in consonance with the structuralist view that it is an increase in prices that spurs increases in money supply. This is also in agreement with Rasheed (2010) finding which stated that it is price level that causes growth in money supply in support of the structuralist claim. The negative long-run effect of interest rate on money supply is also consistent with theoretical expectation, indicating that an increase in interest rate (i.e. lending rate) will lead to a fall in the demand for money and hence the fall in the money supply. On the contrary, the long-run estimate showed that government expenditure, net foreign assets and exchange rate, all have long-run negative but significant effect on money supply. This is in contrast with the findings of Chaudhary & Ahmad (1995) which revealed that money supply is not exogenous rather it depends on the position of foreign asset, government expenditure real price of foreign exchange and a long run positive relationship exist between money supply and these variables. The negative effect of government expenditure on money supply may be due to fiscal discipline on the part of public authorities, which reduces frivolous spending. Concerning the negative effect of net foreign assets on money supply, the negative effect may have been due to reduction in foreign investment by the government, given the current global economic and financial crisis.

The results of the short-run dynamics showed that income (GDP) has a short-run positive and significant effect on money supply, in line with the finding of Chigbu & Okorontah (2013) which revealed that it is growth in income that translates to growth in money supply both in the short run and long-run and that money supply was endogenous with respect to real income. In the similar manner, the significant positive short-run effect of credit to the private sector on money supply stressed the importance of credit channel in increasing money stock in the economy. According to Robert (1991) increased credit via lower interest rate and leads to increased demand for money and hence growth in money supply in the economy. Further examination of the results showed that increases in government expenditure and net foreign assets also lead to increase in money supply in the short-run in Nigeria. This is not surprising as productive public expenditure creates wealth effect and hence an increase in money supply.

The positive short-run effect of exchange rate on money supply is supported with the assertion of Omoruyi (1990) who found out in his study that there is a strong relationship between money supply and exchange rate. His analysis revealed that the

movement of exchange rate is positively related to the movement of money supply in Nigeria. For instance, an increase in money supply usually leads to the depreciation of exchange rate. The depreciation of the currency in turn leads to the expansion in money supply arising from increased receipts from abroad due to largely increased exports. From the above analysis of the findings, the study indicated that given the reforms in the Nigeria economy, the observed discrepancies between money supply target and outcome over time is largely induced by movement in macroeconomic variables. Hence, though monetary policy had influence to some extent on money supply but economic variables had greater influence in determining the rate of money supply growth in Nigeria.

8. Summary of Findings, Conclusion and Recommendations

8.1 Summary of Findings

The main objective of this study was to examine the effect of selected macroeconomic variables on money supply as well as testing the exogeneity/endogeneity of money supply in Nigeria. From the results obtained, the following summaries of major findings are presented as follows;

The results of the unit root tests of stationarity using the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests showed that no variable was stationary at level and hence the null hypothesis of unit root cannot be rejected. However, the series was stationary when it was differenced once.

The results of the cointegration test using the Johansen and Juselius (1990) multivariate trace and maximum eigenvalue tests showed that the variables are cointegrated and hence there is a long-run relationship among them.

The results of the long-run estimation showed that income (GDP), credit to the private sector and consumer price index (CPI), all have positive and significant effect on money supply in the long-run in Nigeria. On the other hand, the result revealed that there is significant negative relationship between money supply and government expenditure, net foreign asset, interest rate and exchange rate in Nigeria.

The Granger causality test of exogeneity/endogeneity of money supply revealed that the supply of money in Nigeria is endogenously determined. This result was in tandem with the post-Keynesian hypothesis that the supply of money is endogenous. Thus, the result contradicted the traditional monetarist theory that the supply of money is exogenously determined.

8.2 Recommendations

Based on the results obtained, the following recommendations are made;

- 1) The positive effect of income (gross domestic product) on money supply showed that increased income (GDP) has a positive effect on the growth in money supply in Nigeria, which again is reinvested for more output production. For this reason, there is need for the government to implement policies aimed at boosting productivity in Nigeria. The provision of basic infrastructures such as steady

power supply, efficient transport and communication systems, functional water supply, etc are pre-conditions in this respect.

- 2) The positive effect of bank credit to the private sector on money supply also calls for more allocation of credit to the core private sector as this is capable of increasing the level of money supply in Nigeria. To achieve this, there is need for the monetary authorities to make credit cheaper via reduction in lending rate so that more credit can be lent to the private sector of the economy.
- 3) There is also need for the government to increase its expenditure but on productive activities as this is capable of increasing the level of money supply and hence the extent of monetization in Nigeria. However, care should be taken to avoid excessive spending that could fuel inflationary conditions in the economy.
- 4) The negative effect of net foreign asset on money supply in Nigeria suggests that not enough income and other foreign receipts have been received in recent time. The government can overcome this by increasing the number and value of its foreign assets by investing more on productive foreign assets.
- 5) The negative effect of prices on money supply further calls for more policies to be implemented aimed at keeping prices down. As shown by the result, an increase in prices, has resulted to the central bank reducing the money supply so as to curtail the inflationary pressures in the country.
- 6) Meanwhile, the negative effect of interest rate on money supply showed that high interest rate reduces the level of money supply in Nigeria. There is therefore need for the government via the central bank to reduce interest rate on money lent to the investing public so as to encourage borrowing and hence increase the level of money negative effective of exchange rate on money supply calls for appropriate policies aimed at stabilizing the exchange rate in economy so as to prevent macroeconomic instability associated with wide fluctuations of the exchange rate.
- 7) To achieve the desired growth of money supply that will enhance the growth of the economy, monetary policy need to be formulated with special consideration of the feedback effect of these key macroeconomic variables on money supply.

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