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MONETARY POLICY TRANSMISSION MECHANISM AND ECONOMIC DEVELOPMENT: EVIDENCE FROM NIGERIA

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Abstract

The study investigated the transmission channels of monetary policy shocks on real per capita output in Nigeria for the period 1981 to 2017 using Vector Auto-regressive framework. The results of the impulse response functions showed that real per capita output, exchange rate, private sector credit and inflation responded heterogeneously to unexpected monetary shock and hence, provide a useful indicator for determining the effectiveness of monetary policy in the domestic economy. In the case of the forecast error variance decomposition the study revealed that shocks to monetary policy rate explained the largest variation in real per capita output followed by private sector credit and exchange rate. These shocks have a progressive impact on real per capita output except private sector credit, while the average contributions of shocks from equity price channel is below one percent. Therefore, the basic channels of monetary transmission are monetary policy rate, credit and exchange, while equity prices might not be a relevant channel of monetary policy innovation in Nigeria. Furthermore, the forecast error variance decomposition of inflation revealed that the sources of inflation are the monetary policy rate and private sector credit channel. The study therefore recommends that there should be judicious management of interest rate, credit and exchange rate policy to promote real per capita output in Nigeria.

Keywords: Monetary Policy, Monetary Transmission Channels, Economic Development, VAR Model

INTRODUCTION

Monetary policy is a tool of macroeconomic management to stimulate economic stability and to promote economic development among other macroeconomic objectives. Relatively, monetary policy is a flexible and powerful instrument which can be adjusted quickly in response to macroeconomic developments.

In formulating monetary policy, the monetary authorities usually set targets whose values they want to change. The targets could be ultimate goals (final goals, such as output, price level and employment) or intermediate variables (variables that the monetary authorities seek to influence such as money supply or interest rate) or operating variables (variables the monetary authorities can influence directly using the instruments at its disposal). At least three issues arise in the selection and use of the goals, intermediate variables, operating targets and instruments by the monetary authorities. The first concerns the existence or otherwise of stable and predictable relationships between the ultimate goal variables, intermediate variables and operating targets. The second has to do with whether the monetary authorities can actually achieve the desired level of the operating targets with the instruments at their disposal. The third deals with the lag structure (short or long) of the relationships with the implication that prediction of the future course of the economy will be increasingly less precise in the presence of long lags (CBN, 2011).

However, the effectiveness of monetary policy in changing aggregate economic activity and economic development largely depends on how monetary policy is conducted and the independency of the central bank to choose the appropriate monetary tools. Also, the success of any economic policy in achieving sustainable growth and development depends on information accuracy of the effectiveness of the policy on the economy. Therefore, it is vital to note that an appropriate monetary policy helps in economic development through the adjustment of policy variables to the needs of development. Monetary policy is expected to bring about economic development via its influence on macroeconomic objectives. Its influence on macroeconomic objectives is through movements in the intermediate variables which would alter the cost of capital and investment in the productive sector. For instance, investment is interest elastic, a fall in interest rate leads to more investment which leads to increase in aggregate demand and in turn brings about positive real income, output and employment, consequently impacting positively on the welfare of the citizenry. Therefore, the attainment of the macroeconomic objectives has to do with the transmission mechanism that can effectively affect key macroeconomic variables, thereby stabilizing the economy as well as impacting on economic development.

At this point, it is important to conceptualize monetary policy transmission mechanism. According to Ireland (2005), monetary transmission mechanism describes how policy-induced changes in the nominal money stock or the short-term nominal interest rate impact on real variables such as aggregate output and employment. Also, it describes channel of how the changes associated with the alteration of money supply affect prices of goods and services, output of sectors and employment (Ogbonna and Umar, 20014). This implies that transmission mechanism of monetary policy entails the process by which changes in monetary decision of the monetary authorities affect economic growth and inflation rate. Hence, in order to make proper assessment of an economy, the policy makers must be knowledgeable on the mechanism by which the monetary policy impacts on the real economic activity and inflation (Bovin et al, 2010). Therefore, monetary policy mechanism is the channel by which monetary policy is transmitted to the real economy. Better still, the transmission mechanism depicts how policy-induced changes in monetary policy actions impact on macroeconomic policy goals. However, for there to be an efficient and effective transmission mechanism there must be an economically safe and sound environment characterized by a competitive banking system (Sanusi, 2009).

Understanding the response of the economy to various monetary policy transmission mechanisms is important for a number of reasons. This is imperative given that different channels have different intensities that generate different responses in output which in turn affect welfare. With this, the monetary authorities will be properly informed when analyzing the transmission mechanisms of monetary policy as it relates to economic growth and development. In addition, knowledge of the magnitude, timing, and persistence of monetary policy shocks (actions) on economic activities provides the monetary authorities with vital information required to fine-tune policy initiatives towards stabilizing the macroeconomy as well as achieving sustainable development. Empirical evidence has shown that the effect of monetary policy on output may delay for up to two years (Bernanke and Blinder, 1992 and, Christiano, Eichenbaum and Evans, 1994).

However, monetary policy transmission mechanism has continued to generate active research interest over a number of years (Bernanke & Gertler, 1995 and Christiano *et al.,* 1997). A lot of studies (Kamaan, 2014, and CBN, 2014) have focused on the transmission mechanism effects of monetary policy on the economy and sectors in developed and emerging economies. However, many of these empirical studies on monetary policy transmission were done in developed economies. Relatively, most of the studies carried out in developed countries focused on prices (interest rate, exchange rate, and other asset prices) rather than quantities, while the studies done in developing countries focused on quantities (money, credit, base

money, bonds, foreign assets, etc.) rather than prices. This disparity can be attributed to factors such as; weak institutional frameworks, oligopolistic banking structure, shallow financial markets, and extensive central bank intervention in foreign exchange markets in developing countries (Kamaan, 2014). Furthermore, there has been disagreement among scholars about how monetary policy transmission mechanisms affect the economy. Different scholars weigh in different channels through which monetary policy works. Taylor (1995) and Kamaan, (2014) take strong position in favour of interest rate and exchange rate channels as against McCarthy (2000) which concluded that the exchange rate channel does not play a significant role in economic growth. On their part, Obstfeld and Rogoff (1995) stressed on the relative importance of the exchange rate channel. Also, CBN (2014) reveals that interbank call rate and money supply are the most monetary policy channels while the results on the asset price and credit channel are mixed in various countries(Kamaan, 2014). Furthermore, Ezeaku, Ibe, Ugwuanyi, Modebe and Agbaeze(2018) observed that private sector credit, interest rate, and exchange rate are the effective channels of monetary policy transmission. In view of the above, the following question is raised: What are the key channels of monetary policy transmission to promoting economic development in Nigeria? This calls for an empirical investigation.

The rest of the work is structured as follows; section two discusses monetary policy in Nigeria, section three provides reviews of the related and relevant literature, section four explains the method of analysis, section five focuses on the empirical results and discussions and, section six presents the conclusion and recommendations.

MONETARY POLICY IN NIGERIA

Over the years, the objectives of monetary policy have basically remained achieving internal and external balances, and the promotion of non- inflationary growth in output. Specifically, the aim of monetary policy is to maintain stable inflation rate, stimulate growth and, reduce pressure on the balance of payments in order to maintain stable exchange and positive interest rates. The Central Bank of Nigeria (CBN) is saddled with this responsibility. In pursuant of it targets, monetary authorities in Nigeria have made some fundamental changes in the strategies and instruments employed in the conduct of monetary policy as the financial environment evolves. These changes are in two distinct phases. The phases are direct era (pre-SAP) and indirect era (post-SAP). The era of direct monetary policy involved the use of monetary controls, whereas the indirect era depends on price mechanism.

Era of Direct Control (Pre-SAP Period)

After independence, due to the relatively underdeveloped nature of money and capital markets in the country and, the quest for national development, monetary policy actions focused on the establishment of a strong financial base and the promotion of domestic financial infrastructure, such as the money and capital market institutions. Hence, the monetary policy framework placed emphasis on direct monetary controls aimed at encouraging the deposit money banks (DMBs) to channel substantial amount of their credit to the productive sectors of the economy as well as sterilizing excess liquidity. The monetary framework relied heavily on sectoral credit allocation; credit ceilings and cash reserve requirements; administrative fixing of interest and exchange rates; as well as imposition of special deposits. During this period the set monetary targets were hardly realized. Instead, the strategy created a lot of distortions and bottlenecks in resource allocation and utilization, resulting in wide spread inefficiencies.

The direct method of monetary policy lasted from 1959 – 1985. Between 1960 and 1962, the CBN operated a passive monetary policy regime in which the focus was on developing and maintaining a sound domestic currency. In 1962, the focus changed to development issues with the need to ensure adequate supply of credit to the economy with minimal inflationary pressures. In the latter part of 1964 and 1965, the primary objective of monetary policy changed to the achievement of balance of payments equilibrium and the policy tool was credit rationing in the form of guidelines that placed ceilings on the rate of expansion of commercial bank advances.

Period of Indirect or Market Approach (Post-SAP Era)

In line with economic deregulation embodied by Structural Adjustment Programme (SAP) in the mid 1980s, there was a paradigm shift from the repressive direct monetary control method to an indirect approach anchored on the use of market instruments in monetary management. This was borne out of the desire to eliminate the distortions and inefficiencies in the financial system and the need to engender competition among banks and other operators in the financial system.

In this era, monetary policy authorities relied on intermediate targets to influence the ultimate objectives of monetary policy. A number of monetary targets and instruments were adopted during the short-term (one-year) monetary policy framework (1986 – 2001). Open Market Operation (OMO), conducted wholly using the Nigerian Treasury Bills (NTBs) was introduced in 1993, continued to be the primary instrument of monetary policy. This was complemented by the cash reserve requirement (CRR) and the liquidity ratio (LR). Other policy instruments employed included the discount window operations, mandatory sales of special

NTBs to banks and a requirement of 200 per cent treasury instrument to cover for banks' foreign exchange demand at the Autonomous Foreign Exchange Market (AFEM). Interest rate policy was deregulated through the proactive adjustment of minimum rediscount rate (MRR) to signal policy direction consistent with liquidity conditions. On the external front, the official and interbank exchange rates were unified in 1999.

To curb the challenge of excess liquidity in the economy, the CBN in the period between 1998 and 2002 adopted some policy measures as a response. These measures include: intervention at the weekly OMO and foreign exchange market to moderate the effects of expansionary fiscal policies, Adjustment of CRR to embrace total deposit liabilities (demand, savings and time deposits) instead of the earlier method of computing demand deposits alone; deregulation of interest rates, upward review of the minimum rediscount rate (MRR) and cash reserve requirements as well as the commencement of the medium term monetary policy framework. These measures are aimed at containing credit expansion. In 2002, the CBN commenced a two-year medium-term monetary policy framework, aimed at freeing monetary policy from the problem of time inconsistency and minimizing over-reaction due to temporary shocks. The new monetary policy framework, still in operation, is based on the evidence that monetary policy actions affect the ultimate objectives with a substantial time lag.

Between 2003 and 2007, monetary policy measures geared towards promoting stable macroeconomic environment through the achievement of single digit inflation, exchange rate stability, financial sector soundness and a non inflationary GDP growth. To achieve this, in 2006 the CBN introduced the Monetary Policy Rate (MPR) which replaced the Minimum Rediscount Rate (MRR). The 2004/2005 monetary policy and credit guidelines were fine-tuned in 2005 in the light of changing environment. New policy measures introduced included maintenance of a tight exchange rate band of plus/minus 3 per cent, two-week maintenance period of cash reserve requirement and the injection/withdrawal of public sector deposits from the DMBs. The new framework geared towards achieving stable aggregate prices, including the exchange rate of the domestic currency through stability in short- term interest rates. The interbank rate was expected to converge around the MPR which had become the Operating Target. The MPR serves as an indicative rate for transactions in the money market. There was an improvement in monetary policy outcomes with the new monetary framework. Other policy measures undertaken included the use of deposit and lending facilities, amongst others. The liquidity management efforts of the CBN yielded the expected results as single-digit inflation (CBN, 2008 and 2014).

Between the period 2008-2012, the conduct of monetary policy was hampered by the global financial crisis which originated from United States and later spread to other regions,

Nigeria was not speared. The crisis created liquidity problem in the banking system due to large capital outflows which exerted pressures on the foreign exchange market as well as induced large volume of non-performing loans in the banking sector and a crash in stock market prices. This forced the cost of living to rise above the income and expectation of ordinary Nigerians. In reaction, the CBN adopted ease monetary policy measure in order to address the problem of liquidity shortages. Some of the measures adopted include: suspension of OMO, reduction of cash reserve requirement (CRR), reduction of liquidity ratio (LR), introduction of Expanded Discount Window (EDW) to increase DMB's access to facilities from the CBN, and by July 2009 was replaced with CBN Guarantee of interbank transactions, progressive reduction of monetary policy rate (MPR), progressive reduction of Net Open Position (NOP) limit of deposit money banks and injection of N620 billion as tier 2 capital into troubled banks. Following the restoration of stability and easing the problem of excess liquidity in the banking system, the CBN reverted from ease to tight monetary policy stance from September 2010 to December 2011

To sustain the already moderated rate of inflation and, limiting pressure on the exchange rate, boosting the external reserves position, sustaining stability in the money market and reducing the spread between lending and deposit rates, monetary policy authorities adopted a mixed-grill of a number of instruments in 2013. These instruments include: the Monetary Policy Rate (MPR) which was the principal instrument used to control the direction of interest rates and anchor inflation expectations in the economy. The other intervention instruments included Open Market Operations (OMO) (was the other major tool for liquidity management), Discount Window Operations, Cash Reserve Ratio (CRR) and foreign exchange Net Open Position (NOP). The Monetary Policy Committee (MPC) successively maintained MPR at 12.0 per cent and Cash Reserve Ratio (CRR) was increased for public sector deposits with the DMBs, in order to further tighten money supply. Beside the change in the CRR on public sector deposits, other existing policies were retained, and complemented with administrative measures. The Net Open Position (NOP) limit, Liquidity Ratio (LR) and the mid-point of the exchange rate were retained. The decision of the MPC to retain most of the existing measures was to assure the market of the continuity of the tight monetary policy regime. However, in 2014 Monetary Policy Rate (MPR), and other intervention instruments such as the exchange rate mid-point, Open Market Operations (OMO), Discount Window Operations, Cash Reserve Ratio (CRR) and Foreign Exchange Net Open Position (NOP) limit were raised except Liquidity Ratio that was retained, in order to address liquidity surplus in the banking system. The interbank and open buy back (OBB) rates remained locked-in within the retained policy rate corridor of MPR in second half of 2014, except in December, 2014. However, the daily Nigerian Interbank Offered rates (NIBOR) experienced occasional variations but were generally stable. CBN adopted tight

policy stance with a view to ensuring that electioneering spending and, as a result of injections into the system arising from maturity of FGN Bonds and NTBs as well as AMCON bonds in 2013 in order to smoothen the liquidity cycle, and reduce pressure on the price and exchange rate.

The overall performance of the economy showed that between 1993 and 1997 real GDP growth averaged 2.8 percent. It gradually increased to an average of 4.0 per cent in the period 1998-2002. Also, the growth in real GDP peaked during the period 2002-2006 to 6.34 per cent. Furthermore, in 2007 real output growth grew to an average of 7 percent while between 2008-2013 output growth increased on an average of 7 percent (NBS, 2013 and CBN, 2014). Real output growth in the third quarter of 2014 was 6.23 per cent down from 6.54 per cent in the second quarter. Between 2014 and 2017 real output growth averaged 2.2 percent. This was attributed to the increased ability of banks to lend following the banking sector consolidation exercise of 2005/2006 which improved the capital base of banks. In addition, between 1990-2017 Gross National Income (GNI) per capita expressed in 2011 PPP$ increased progressively.

Generally, both the direct and indirect policy regimes have the same objectives of channeling funds from surplus to deficit sectors, with the aim of extending the frontiers of growth and development (CBN, 2014). To achieve this, the CBN employs various instruments of monetary policy to influence price, interest and exchange rate consistent with the required growth and development. This is pursued through a number of channels. The anchor instrument is the accommodation instrument (MPR), supplemented by open market operations. Most instruments used by CBN focus on market-oriented policy measures which seek to guide or encourage financial institutions to take certain actions on a voluntary basis rather than compelling financial institutions. The central bank uses the MPR rate as an indicative rate for transactions in the money market. Other major instruments used by the central bank include; the open market operations, reserve requirement ratios and the discount window operations. However, despite the different monetary policy measures taken by CBN, the exact channel of monetary policy transmission mechanism has continued to generate active debate among researchers, hence, the need to ascertain the key monetary policy transmission channels in promoting economic development in Nigeria.

THEORETICAL REVIEW

Theoretically, there are two extreme cases regarding the influence of monetary policy on economic growth, as well as economic development. Monetarists believe that there is a direct link between money and economic growth and, thereby advocate for the use of monetary policy in influencing economic growth. Monetarists' argument on the effectiveness of monetary policy

in impacting on economic growth is based on the classical economists' equation of exchange as proposed by Irvin Fisher which states that velocity and output in the equation of exchange are regarded as fixed. This is based on the notion that the economy is always at or near the full employment (output). Monetarists consent to the classical economists' view of monetary policy (the quantity theory of money) that velocity is constant which indicates a one-to-one relationship between changes in the stock of money and changes in the value of national income. This implies that changes in money supply can only bring about changes in output. Therefore the direct link between the monetary sector and economic growth comes from the argument of a constant velocity. This explains the basis for the monetarists' argument that changes in monetary policy influence economic growth, as well as economic development. However, monetarists consent to the Keynesians view that the economy may not always be operating at the full employment level of output as against classical economists' view of output being at full employment level. Hence, they believe that in the short-run, expansionary monetary policies increase the level of real output by increasing aggregate demand while in the long-run the expansionary monetary policy only lead to inflation and do not affect the level of real output since the economy operates at the full employment level. They also have the view that, to promote stead output growth, money supply should grow at a constant rate, instead of being regulated and altered by the monetary authorities. Furthermore, they argued that money can be held in different forms such as liquid, bonds, equities, physical goods and human capital other than anticipated transaction and, each forms of this wealth has a unique characteristic and a different yield. This implies that there is link between the supply of money, price level and output.

On the other hand, the Keynesians objected the monetarists' view that the relationship between money, price and output is direct, but insist that the relationship between money and real output (economic growth) is very weak, and therefore suggest that there is an indirect link between both. To this regards, the Keynesians reject the view that the economy is always at or near the full employment level which means that real output is fixed, and also reject the view that velocity of circulation of money is constant. They believe that the relationship is indirect through the rate of interest. As a result, changes in the stock of money will not lead to changes in output directly but through interest rate. Keynesians are of the view that expansionary monetary policy increases the supply of loanable funds available through banking system, causing interest rates to fall. Consequently, lower interest rate will lead to increase in aggregate expenditures on investment and interest-sensitive consumption goods, which in turn will cause real output to rise. Therefore, monetary policy affects real output indirectly.

These conflicting views between the Keynesians and the Monetarists economists concerning the impact of monetary policy on economic growth as well as economic development are built up from the explanation of the transmission mechanism. However, monetary policy is transmitted through various channels as reviewed by theories which include: interest rate channel, exchange rate channel, credit channel and asset price channel. The effectiveness of each of these channels has led to debate amongst scholars. The channels of monetary policy transmission mechanism are explained below:

Interest Rate Channel

The interest rate channel of monetary policy transmission that is presented below is a standard Keynesian channel for analyzing monetary policy effects on the economy which operates within the IS-LM framework. According to the Keynesians, monetary policy affects the real economy through changes in interest rates. This essentially works through the liability side of the banking sector's balance sheet. This is because the Keynesians were of the view that there are only two financial assets, money and bonds which can be substituted for one another, where the latter represents the whole capital market. In the view of the Keynesians, the transmission mechanism works thus; a monetary tightening (Negative monetary shocks) will lead to excess demand for money balances, inducing action to substitute money for bonds, which in turn lead to increase in interest rates. Consequently, this translates into increases in real interest rates and raises the user cost of capital, because of the assumption of imperfect price adjustments. The increase in the user cost of capital leads to fall in investment and consumption demand, which in turn reduce output. The implication of the fall in consumption demand is fall in the welfare of the citizenry which is an indicator of economic development. According to Taylor (1995), financial market prices are key components of how monetary policy affects real economic activities, in which case a contractionary monetary policy raises short-term interest rates. The Keynesians view of how monetary tightening is transmitted to the real economy through interest rate channel can be presented schematically as observed by Mishkin (1995):

$$\mathbf{MP}\downarrow \rightarrow \mathbf{IR}\uparrow \rightarrow \mathbf{INV}\downarrow \rightarrow \mathbf{Y}\downarrow$$

Where, (*MP*↓) indicates contractionary monetary policy resulting from government sales of securities in the open market leading to a rise in real interest rates (IR↑), which in turn raises the cost of capital. The high user cost of capital discourages both firms and consumers spending, causing a decline in investment (*INV*↓), thereby leading to a decline in aggregate demand and eventually a fall in output. In this channel, therefore, interest rates provide more information than money supply changes.

Exchange Rate Channel

Exchange rate links monetary policy to spending pattern of the people, firms and ultimately on goods and services which in turn affect output. According to Taylor (1995) and Obstfeld and Rogoff (1995), the exchange rate channel works through the aggregate demand as well as the aggregate supply effects which is more effective under the flexible exchange rate regime. This channel of monetary policy involves interest rate effects. This relates interest rate differentials to expected exchange rate movements (interest rate parity condition). A contractionary monetary policy brings about a rise in domestic real interest rate relative to foreign interest rates making domestic deposits more lucrative in comparison to foreign deposits, thus leading to a rise in the value of the domestic currency relative to other currencies. This will now lead to an appreciation of the exchange rate and consequently a fall in the net export and output. A rise in the domestic currency's purchasing power will bring about proportional currency appreciation in the foreign exchange market under purchasing power parity (Taylor, 1995; Mishkin, 1995 and Obstfeld and Rogoff, 1995). Also, this change in exchange rate affect import prices. Changes in the exchange rate affect import prices directly, and it influences the output. A rise in exchange rate leads to an increase in the net import of goods and services.

The transmission of monetary policy to the real economy through exchange rate channel can be presented schematically as observed by Mishkin (1995):

$MP\downarrow \rightarrow IR\uparrow \rightarrow EXR\uparrow \rightarrow NX\downarrow \rightarrow Y\downarrow$

Where, ($MP\downarrow$) indicates contractionary monetary policy resulting from government sales of securities in the open market leading to a rise in real interest rates (IR↑), which in turn leading to a rise in the value of the domestic currency relative to other currencies and deposits. This gives rise to increase in exchange rate, thereby causing a fall in both net exports ($NX\downarrow$) and output ($Y\downarrow$). This means that contractionary monetary policy is expected to cause appreciation of exchange rate which eventually impacts on export performance and economic growth.

The Credit Channel

Credit channel is made up of a set of factors that assist and support the effects of the conventional interest rate. This implies that, the credit channel is not a truly independent or parallel channel but an enhancement mechanism. The channel assumes that financial markets are imperfect and segmented. Therefore, emphasizing on asymmetric information and costly enforcement of contract as the main causes of credit market imperfections. This channel stresses that the heterogeneity among borrowers might make it more difficult or expensive for

some borrowers to obtain external funds than others. For instance, households and small firms cannot readily obtain funds from capital markets or external sources and thus have to rely on intermediated loans and internal finance. The credit channel admits the role of financial intermediaries (banks), unlike the other channels. This is because banks are considered to be particularly well-suited to dealing with certain types of borrowers, especially small firms and individual households who, because of the problems of asymmetric information, cannot easily access non-bank forms of credit (Boamah, 2009). The credit channel is usually described as working through two main routes: narrow credit channel and the broad credit channel. These are distinct channels but complementary ways whereby imperfections in financial markets might affect real economic activities. These channels focus on how changes in the financial positions of lenders and borrowers affect aggregate demand which in turn affects output (Arestis and Sawyer, 2002).

The **Narrow Credit Channel** also known as *bank lending channel* (Hall, 2001) focuses on the role of banks as lenders or as financial intermediaries (Bernanke and Blinder, 1988). Banks rely heavily on demand deposits subjected to reserve requirements as an important source of funding economic activity. According to Arestis and Sawyer (2002), changes in monetary policy will result change in total reserves, bank reserves would be affected, thereby affecting their supply of loans to the private sector, this in turn affects aggregate demand and output. According to Hall (2001), this channel may be potentially significant if a contractionary monetary policy leads to a reduction in the supply of bank loans (credit) and if these loans are imperfect substitutes for other forms of finance. Thus a monetary policy that operates through a bank lending channel can be represented as:

$$MP\downarrow \rightarrow BD\downarrow \rightarrow BCL\downarrow \rightarrow INV\downarrow \rightarrow Y\downarrow$$

Where, $MP\downarrow$ denotes contractionary monetary policy leading to decrease in bank reserves and deposits $BD\downarrow$ this now lead to decrease in quantity of bank loans $BCL\downarrow$. This in turn will lead to fall in investment and output. For instance, if banks cannot substitute deposits with other sources of funds, then a contractionary monetary policy that decreases bank reserves and bank deposits is likely to reduce the quantity of loans that banks can supply and, so leads to lower investment spending and output (Ishioro, 2013). The implication of this is that any kind of monetary policy change has the potential to affect real economic activities. For instance, a contractionary monetary policy can raise banks' reserves requirements with the aim of reducing both the total volume of commercial bank assets and the proportion of commercial banks earning assets to total assets. Also, a contractionary monetary policy that leads to sales of treasury bills and government development stock reduces commercial banks' reserves-as

depositors will substitute commercial banks deposits with more attractive financial assets (Ishioro, 2013).

The **Broad Credit Channel** also known as *balance sheet channel* (Hall, 2001) focuses on how the financial health of borrowers can affect the supply of finance and ultimately aggregate demand as well as output (Bernanke et. al. 1999). The broad credit channel of monetary policy arises because a contractionary monetary policy will not only affect the interest rate, but will also lower the net worth of borrowers. A contractionary monetary policy directly weakens borrowers' balance sheets (net worth) in at least two ways. First, rising interest rates directly increase interest expenses, reducing net cash flows and weakening the borrower's financial position. Second, rising interest rates are also typically associated with declining asset prices, which among other things shrink the value of the borrower's collateral. The indirect effect of contractionary monetary policy on net cash flows and collateral values is the deterioration in consumer expenditure (Ishioro, 2013). The firm's revenues will decline while its various fixed or quasi-fixed costs do not adjust in the short run. Thus a monetary policy that operates through balance sheet channel can be represented as:

$MP\downarrow \rightarrow P_e \downarrow \rightarrow$ Adverse selection $\uparrow \rightarrow$Moral hazard $\uparrow \rightarrow$lending $\downarrow \rightarrow INV \downarrow \rightarrow Y\downarrow$

Where, *MP*↓ indicates contractionary monetary policy, which leads to decrease in corporate asset prices (lower net worth) $P_e\downarrow$. Lower net worth implies that business firms (borrowers), in effect, have less valued collateral for their loans and are therefore of higher risk, due to higher policy-induced interest rates. Consequently, adverse selection problem rises as banks cannot distinguish borrowers' risk types. Lower net worth of firms may also increase the moral hazard problem because it means that owners' equity stakes in businesses fall and thus give them more incentive to engage in risky investment projects. In response to the adverse selection and moral hazard problems, banks may reduce the amount of lending (loans) and eventually leads to a decrease in investment spending finance INV↓ as well as output Y↓**.**

Assets Price Effect or Equity Price Channel

However, the Keynesians transmission mechanism channel is not without criticism. The primary source of criticism is from the monetarists. Their major criticism of the Keynesians transmission mechanism channel is its focus on one relative price, the interest rate. Thus, monetarists argued that rather than focus on one interest rate, it is better to look at how monetary policy affects the universe of relative asset prices and wealth. The monetarists channel involves two sub channels through which monetary policy is

transmitted. These two sub channels include: the Tobin *q* theory of investment and wealth effects on consumption.

The **Tobin's *q* Theory of Investment** provides a mechanism through which monetary policy affects the economy through changes in equity value. According to Tobin (1969), q is defined as the market value of firms divided by the replacement cost of capital. A high q, means the value of the firm is high compared to the replacement cost of capital, implying that investment in new plant and capital equipment is cheap relative to the market value of business firms. Firms will issue equity and get a high price for it relative to the cost of the plant and equipment they are buying. A contractionary monetary policy that raises the interest rates makes bonds more attractive relative to equities, thereby causing the price of equities to fall. Monetarists argue that when money supply falls, economic agents respond by reducing spending. This implies that lower equity prices (Pe ↓) will lead to a lower q (q ↓) which in turn leads to a lower investment spending (INV↓), and output (Y↓). If demand for equities falls, their price relative to the replacement cost of capital reduces and this lowers the q, investment spending, and output. This is represented schematically as:

$$M\,\mathrm{P}\downarrow \rightarrow P_{\mathrm{e}}\downarrow \rightarrow\ q\downarrow \rightarrow\ INV\downarrow \rightarrow Y\downarrow$$

Where, MP↓ denotes contractionary monetary policy leading to decrease in prices of equity Pe↓ and this leads to decrease value of the firm relative to the replacement cost of capital q. Consequently, there will be a fall in investment *INV*↓ and output Y↓. Conclusively, this channel is similar to the standard Keynesian interest rate channel because the higher interest rates that result from a contractionary monetary policy makes bonds more attractive relative to equities, and lowers equity prices and hence investment and output (Mishkin, 1995).

The **Wealth Effect on Consumption** is another monetary transmission channel through other assets prices. This is regarded as the wealth channel of monetary transmission. The wealth channel was advocated by Modigliani (1971).in line with the life-cycle hypothesis of consumption, in which households' wealth is a principal determinant of consumption spending. A major component of the households' life-time wealth is financial wealth which is common stocks. The wealth channel of monetary policy transmission emanating from this hypothesis is that a contractionary monetary policy lowers stock prices, reduces the value of households' wealth and consumption spending and then output. Ahmad (2008) argued that monetary policy transmission emanates from the relationship between interest rates and asset prices (especially common stocks). This implies that a fall in asset prices lead to a decrease in the value of financial wealth households, thereby decreasing the lifetime

resources of consumers, hence consumption and output are expected to fall. This can be presented schematically as:

$MP\downarrow \rightarrow P_e\downarrow \rightarrow$wealth$\downarrow \rightarrow$ consumption$\downarrow \rightarrow Y\downarrow$

Where, $MP\downarrow$ indicates contractionary monetary policy leading to decrease in equity prices $P_e\downarrow$, this will now leads to decrease in financial wealth which in turn leads to a fall in consumption and output $Y\downarrow$. Contrarily, expansionary monetary policy will lead to increase in equity prices, this will increase the households' lifetime resources and wealth of households which in turn leads to an increase in consumption and output.

Summarily, it is observed that interest rate is cardinal in any of the channels of monetary policy as it relates to the real sector performance. Therefore, the channel that formed the basis for the subsequent analysis as posited by Nwosa and Saibu (2012) is represented schematically with modification as:

$MS\uparrow \rightarrow IR\downarrow \rightarrow PSC\uparrow \rightarrow P_e\uparrow \rightarrow EXR\downarrow \rightarrow INV\uparrow \rightarrow Y\uparrow \rightarrow EW\uparrow$

Where, $MS\uparrow$ indicates expansionary monetary policy resulting from government purchases of securities in the open market, leading to a fall in real interest rate(IR), which in turn: (a) increases the amount of credit by banks to the private sector(PSC); (b) increases in the price of security prices(P_e) given the inverse relationship between security prices and interest rate and (c) decreases the exchange rate (EXR); these effects stimulate investment(INV), output(Y) and consequently improve economic welfare (EW) given the direct relationship between price of security prices (P_e), wealth and consumption.

EMPIRICAL REVIEW

A number of empirical studies have been conducted on the effects of monetary policy shocks on the economies of both developed and developing. Some of these studies include; Romer and Romer (1989), Bernanke and Blinder (1992), Bernanke and Gertler (1995), Dale and Haldane (1995), Christiano *et al*. (1997), Yue and Zhou (2007), Llaudes (2007), Nwosa and Saibu (2012), Ishioro (2013) and CBN (2014). These studies have been able to show that different monetary policy shocks do have different impact on the economy.

Romer and Romer (1989), using post-war US monthly data, investigate whether there are any identifiable relationships between monetary contractions not caused by output disturbances and real output in US using Vector Autoregressive (VAR) model. In their analysis, they estimated two forecasting models for two measures of real activity: industrial production index (IPI) and unemployment. The models variables include monthly dummies and dummies for periods of contractionary monetary shocks. Their findings revealed that following monetary

contractions, real activity, after a six-month lag during which it rises, then falls: the maximum impact occurs 33 months after the shock. At this time, when measured by IPI, industrial production index is approximately 12 per cent below the pre-shock level; and when measured by unemployment, unemployment is 2 per cent above the base level. For both measures of activity, the effect of the shock does not die over the 36-month forecast horizon. Bernanke and Blinder (1992) examine the effect of monetary policy on the economy and the channel of transmission with monthly US data over 1959-78 using Vector Autoregressive (VAR) model. Their measure of monetary policy is the Federal Funds Rate (FFR). Other variables that were included in the model are; unemployment rate, log of the CPI, and log levels of three bank balance-sheet variables (deposits, securities, and loans). In their analysis of the impulse response functions, it was observed that a positive innovation in the FFR reduces the volume of deposits held by money deposit institutions immediately and maximally after twelve months. Although there is some recovery, the plunge in deposits appears to be permanent. Given bank assets and loans, it was also observed that bank assets fall along with deposits but the pattern of fall varies. The findings revealed that first six months after a policy shock, the fall in assets is concentrated almost entirely in securities, while loans hardly move. Shortly after, however, securities holdings begin to increase, while loans start to fall. After two years, securities holdings return almost to their original value and the entire decline in deposits is reflected in loans. The study further revealed that that in the first eight months after policy shock there is no effect on unemployment. However, from the ninth month unemployment begins to rise, increasing gradually to a peak in about two years, before declining back to zero. The finding revealed good connection of the estimated timing of the unemployment and loan response. From the above, it is observed that both the conventional money demand and the credit mechanisms operate; and after two years, the entire long run impact of the decline in deposits is reflected in loans. Therefore, Bernanke and Blinder (1992) support the operation of a credit channel. Similarly, Christiano *et al*. (1997) investigated the effects of a contractionary monetary policy shock (measured by FFR) on measures of real wages and profits with quarterly data of the United State using Vector Autoregressive (VAR) model. Other variables included in the model are real GDP, the GDP deflator, commodity price, non borrowed reserves, total reserves and net funds raised through financial markets. From the non-recursive and recursive identification assumptions their analysis found that an initial persistent rise in the Federal Funds Rate (FFR), and persistent drops in non-borrowed reserves and the growth rates of broad money, while after a quarter real GDP declines. The shock also generates a persistent decline in the index of commodity prices. Furthermore, they observed that the GDP deflator was unresponsive to the

shock for about eighteen months before it declines, and monetary policy not to have an effect on real balances in the long run.

Examining the monetary transmission mechanism in Japan with VAR models, Morsink and Bayoumi (2001) employ quarterly data. The measure of monetary policy stance is the uncollaterised overnight call rate - the operating target for monetary policy. Morsink and Bayoumi(2001) first estimated a four-variable VAR with the ordering as: economic activity (real private demand), prices, interest rates, and broad money. Four main results emanate. First, interest rate shocks appear to depress economic activity significantly, after a six-quarter period of puzzle. Second, broad money shocks have significant effects on output, even with interest rates in the model. This they interpret as being consistent with the idea that non-policy monetary shocks are important for determining economic activity. Third, much of the effect of interest rate shocks on output is transmitted through broad money. Finally, there is a price puzzle in the initial quarters. Next, Morsink and Bayoumi (2001) extend the VAR in different directions to examine alternative aspects of the monetary transmission mechanism. Extending the base VAR by base money, with the variable ordered after the interest rate but before broad money; the authors found that base money has no significant impact on output. In the same vein, Lawson and Rees (2008) examined the effect of unanticipated changes in monetary policy on expenditure and production components of GDP in the Australian economy using Structural Vector Autoregressive (SVAR) model for the period 1983 – 2007. The findings of the study revealed a heterogeneous response of the components of GDP to monetary policy impulses. Specifically, they found that dwelling investment, as well as machinery and equipment investment were the most interest sensitive expenditure components of GDP, while construction and retail trade sectors were the most interest sensitive production components of GDP.

Alam and Waheed (2006) investigated the monetary transmission mechanism in Pakistan at the sectoral level using VAR framework for the period 1973 – 2003. Particularly, their findings revealed that manufacturing, construction, finance, insurance, real estate and business services sectors respond more negatively to changes in interest rate when compared to aggregate output. Contrarily, agriculture, forestry and fishing, mining and quarrying, electricity, gas and water were relatively insensitive to interest rate changes. These results confirmed the existence of sector-specific variation to the real effects of monetary policy changes. The short term interest rate was used as a measure of monetary policy stance, while the unrestricted VAR was employed in their analysis with three variables for the aggregate economy as well as for each sector: the level of output, the level of prices (represented by the consumer price index), and a monetary policy indicator. Contrarily, Yue and Zhou (2007) examined monetary policy transmission through the interest rate channel in China using the

granger causality test and result showed that there was no causality between investment expenditure and the market interest nor between household consumption and the market interest rate, which suggested that the transmission of monetary policy in China was uncertain. In the same vein, Catao et al (2008) examined monetary transmission in typical emerging-market economies such as Brazil, using a structural model (SVAR) that incorporates key features of emerging-market economies which including a bank credit channel and the role of external debt accumulation on country risk premia and exchange rate dynamics for the period 1999 – 2007. The result showed that interest rate changes have swifter effects on output and inflation compared to advanced economies and that exchange rate dynamics plays a key role in this connection. Importantly, the results showed that the response of inflation to monetary policy shocks has grown stronger and the output-inflation trade-off improved since the introduction of inflation targeting. This implies that the transmission mechanism works much faster compared with the United States and other advanced countries, with the bulk of the effects on output and inflation taking place within a year, which is consistent with the structural features of the Brazilian economy.

Cheng (2006) examined the impact of a monetary policy shock on output, prices, and the nominal effective exchange rate for Kenya using VAR over the period 1997-2005. Based on the findings the study observed that an exogenous increase in the short-term interest rate tends to be followed by a decline in prices and appreciation in the nominal exchange rate, but has an insignificant impact on output. Moreover, the study further revealed that variations in the short term interest rate account for significant fluctuations in the nominal exchange rate and prices, while accounting little for output fluctuations. Similarly, Nampewo et al (2013) investigated the sectoral effects of monetary policy in Uganda using pairwise granger causality test and recursive VAR over the period 1999 to 2011 through the interest rate, bank credit and the exchange rate channels. The considered key sectors of Uganda's GDP growth include; agriculture, manufacturing and service sectors. The findings revealed that a positive shock in exchange rate result in increase in output of agriculture and service sectors, while the output in the manufacturing sector declined. The findings also revealed that the exchange rate channel is the most effective monetary policy transmission channel to all the three sectors considered, while the interest rates and bank credit channels remain relatively weak, especially within the manufacturing sector. Kamaan (2014) investigated the effect of monetary policy on economic growth in Kenya using VARs. The variables included in the model are; Kenya’s gross domestic product, credit to the private sector, Central Bank of Kenya Rate, treasury bills, short-term interest rate, lending rate, the nominal effective exchange rate and consumer price index. The findings indicated that one standard deviation monetary policy shock proxy by the Central Bank

of Kenya Rate has a negative and insignificant effect on the output in the first two months which then becomes positive and insignificant in the next four months. However, a one standard deviation shock of the interbank rate to inflation is positive and significant for the first two and a half months. The effect continues to be positive but insignificant upto the sixth month. The study also fondd the interest rate channel followed by the credit channel to be the most effective channels in influencing economic growth while an exogenous, unexpected, and temporary rise in the Central Bank of Kenya's interbank rate is not followed by an impact on output.

Nwosa and Saibu (2012) investigated the transmission channels of monetary policy impulses on sectoral output growth in Nigeria. The study employed the unrestricted VAR and the Granger causality on quarterly data that spanned the period 1986 – 2009. The result revealed that interest rate and exchange rate are the most effective monetary tools to influence sectoral output growth in Nigeria. The interest rate channel was most effective in transmitting monetary policy to agricultural and manufacturing sectors, while the exchange rate channel was most effective for transmitting monetary policy to building and construction, mining, service and wholesale/retail sectors. Similarly, Ishioro (2013) examined the channels of monetary transmission mechanism in Nigeria using annual time series data from 1970 to 2011. The Granger causality test was adopted in the estimation of the relationship between the various channels and selected macroeconomic aggregates. The variables used include; interest rate, exchange rate and private domestic credit extended by the banking system. Real Per capita Gross Domestic Product is used as a proxy for economic growth. Based on the findings, the study concludes that three channels are functional in Nigeria-the interest rate, exchange rate and the credit channels. Also, Ogbonna and Uma (2014) examined monetary policy transmission mechanism in Nigeria by reviewing previous empirical studies. Their review of previous empirical studies showed that interest rate, credit and exchange rate channel are among the channels of monetary policy transmission to the economy. This is line with Oyaromade (2006) that sees bank credit as being significant in the transmission mechanism of monetary policy. CBN (2014) investigated the effect of monetary policy on different components of real output, by employing the structural vector autoregressive (SVAR) framework. The study employed policy and non-policy macroeconomic variables based on quarterly data spanning the period 1993Q1 and 2012Q4. The variables employed comprise six variable for aggregate output variables (baseline model) and seven variables for the disaggregated output. The variables include: the policy variables- money supply, nominal exchange rate, interbank call rate, monetary policy rate and the non-policy variables- consumer price index and real gross domestic product. The five sectoral GDP components are; agriculture, building and construction, manufacturing, services, and wholesale and retail. The result of the impulse response functions

revealed that sectoral output responded heterogeneously following contractionary monetary policy shocks, with some immediately responding negatively (services and wholesale/retail sectors), while others displayed lagged negative responses (manufacturing, building and construction, and agriculture). This result is consistent with economic theory, as output in each sector is expected to decline following monetary tightening. Furthermore, the result of the forecast error variance decomposition showed the most important monetary policy variables that explain the variation in sectoral output are interbank call rate and money supply while innovations from the monetary policy rate and exchange rate do not significantly explain the variations in output. Obafemi and Ifere (2015) compared the Factor-augmented vector–auto regression (FAVAR) framework which exploits large data set of 53 with the traditional VAR model that estimates 6 variables to ascertain the exact channel of transmission of monetary policy. The findings revealed that both models generate qualitatively related results, but the FAVAR model is a superior alternative over VAR on grounds that monetary policy shocks are better identified using the FAVAR model. Also the FAVAR model does not exhibit the prize puzzle problem found in the VAR but allows for the computation of impulse responses of a large number of variables. Also, the results from both models showed that interest rate and credit channels are dominant and strongest channels of monetary policy transmission in Nigeria. Exchange rate and money channels were not significant and pronounced. Ezeaku, et al (2018) assessed the industry effects of monetary policy transmission channels in Nigeria within the period 1981-2014. Techniques of analysis employed in the study are the Johansen cointegration and the error correction model (ECM). The variables used are; real output (measured as annualized percentage contribution of the industrial sector to GDP), the credit channel (measured as the ratio of private sector credit to GDP), the interest rate channel (this is the real lending rate) and the exchange rate channel. The results revealed that, in the Nigerian case, monetary policy transmission channels jointly have a long-run relationship with real output growth of the industrial sector. The finding also revealed that the private sector credit, interest rate, and exchange rate channels have negative effects on real output growth, both in the long run and in the short run. The results further showed that, relatively, the degrees of the established effects are higher in the long run than in the short run.

There are quite a number of studies that have investigated the transmission mechanisms of monetary policy in both developed and developing economies, Nigeria inclusive. The results from these studies revealed that different monetary policy stancs have different effects on output and inflation due to differences in country (ies) of study, financial environment, time period and methodology used. Hence, there is lack of general consensus as to why some of the monetary policy actions do not affect economic growth through some channels. Most of

the perivous studies adopted unrestricted and structural vector autoregression model in assessing the dynamic responses of output and inflation to monetary policy shocks. This is on the ground that VAR provids a coherent and credible approach to data description, forecasting, structural inference and policy analysis. Also, VAR was adopted since it is hypothesized that the variables are contemporaneously related and therefore using single equation framework will not be appropriate because of the problem of endogeneity. Furthermore, the studies used quarterly and annual data in the analysis of the transmission mechanisms of monetary policy. However, to the best of our knowledge there has been little or no empirical study on the transmission channels of monetary policy on economic development, particularly, Nigeria. There is therefore the need to investigate the transmission channels of monetary policy on economic development in Nigeria since development captures the welfare of the citizenry which economic growth may not necessarily capture. This present study adopts VAR-innovation technique since it represents standard practice in assessing the dynamic responses of output to monetary policy shocks. Unlike Nwosa and Saibu (2012) and CBN (2014), that used quarterly data within the context of VAR, this study used annual data within the context of VAR because of non-availability of quarterly or monthly data. In addition, this study adopted CBN (2014) first model that examined the effect of monetary policy shocks on the aggregate output but with little modification in the area of variables. Most importantly, this study investigated the effect of monetary policy shocks on economic development (real per capita Gross domestic product) as against Nwosa and Saibu (2012) and CBN (2014) that examined the effect of monetary policy shocks effect on real output.

RESEARCH METHODOLOGY

Data and Sources

The annual data for this study were basically from secondary sources. Specifically, the data were obtained from Central Bank of Nigeria (CBN) statistical bulletin, various issues, Securities and Exchange Commission, Nigeria (2017) and World Development Indicators (WDI). The annual data covers the sample period, 1981-2017. The choice of the period and frequency of data was because of availability of data. To examine the relationship between the monetary policy transmission channels and economic development, different transmission variables were used as acknowledged in the literature. The transmission variables include; interest rate (monetary policy rate)(MPR), exchange rate(EXR), private sector credit(PSC) extended by the banking system, money supply (M2) and equity prices(PE). PE is captured by the average price-earning ratio (%) which also captures the Tobin's q channel of monetary transmission mechanism. The non-policy variables included are; inflation rate (INF), an indicator of the

general price level which helps to prevent "puzzle"-in results which have been indentified inconsistent with conventional theory or empirical observations (Nwosa and Saibu, 2012) and real per capita gross domestic product which is a measure of economic development (RPGDP).

Model Specification

The model for this study follows that of Nwosa and Saibu (2012) and CBN (2014) but with little modification. Nwosa and Saibu (2012) and CBN (2014) used quarterly data within the context of unrestricted VAR and structural VAR respectively; this study used annual data within the context of unrestricted VAR because of non-availability of quarterly or monthly data. In addition, this study adopted CBN (2014) first model that examined the effect of monetary policy shocks on the aggregate output but with little modification in the area of variables, however, the transmission variables are in line with Nwosa and Saibu (2012). The real per capita gross domestic product, monetary rate and exchange rate entered the unrestricted VAR are expressed in logarithmic form except for the interest rate, equity price and inflation which entered in their respective percentage term. The unrestricted VAR model for this study is specified as follows:

$$X_t = \alpha + b_1X_{t-1} + b_2X_{t-2} + b_3X_{t-3} + \ldots. + b_nX_{t-k} + u_t \quad (1)$$

$$X_t = [RPGDP, MPR, EXR, PSC, EP, INF] \quad (2)$$

Where, X is a *k x1* – dimensional Vector of the endogenous variables, α is a *k x1* - dimensional vector of constant and b_1…….. b_n are *k x k* dimensional autoregressive coefficient matrices and *u* is *k*-dimensional vector of the stochastic error term nominally distributed with white noise properties N (0, σ^2).

The impulse response function framework (IRF) and forecast error variance decompositions (FEVD) framework were derived from equation (1). The derivations are very rigorous and cumbersome, hence, the study never bothered about the derivation.

Method of Data Analysis

The study employed the unrestricted vector autoregression (VAR) model. This method represents standard practice in assessing the dynamic responses of macroeconomic variables to monetary policy shocks. The unrestricted VAR system consists of six variables: monetary policy variables (monetary policy rate, exchange rate and credit to private sector), asset price, inflation and economic welfare. However, before estimating the unrestricted VAR model, the

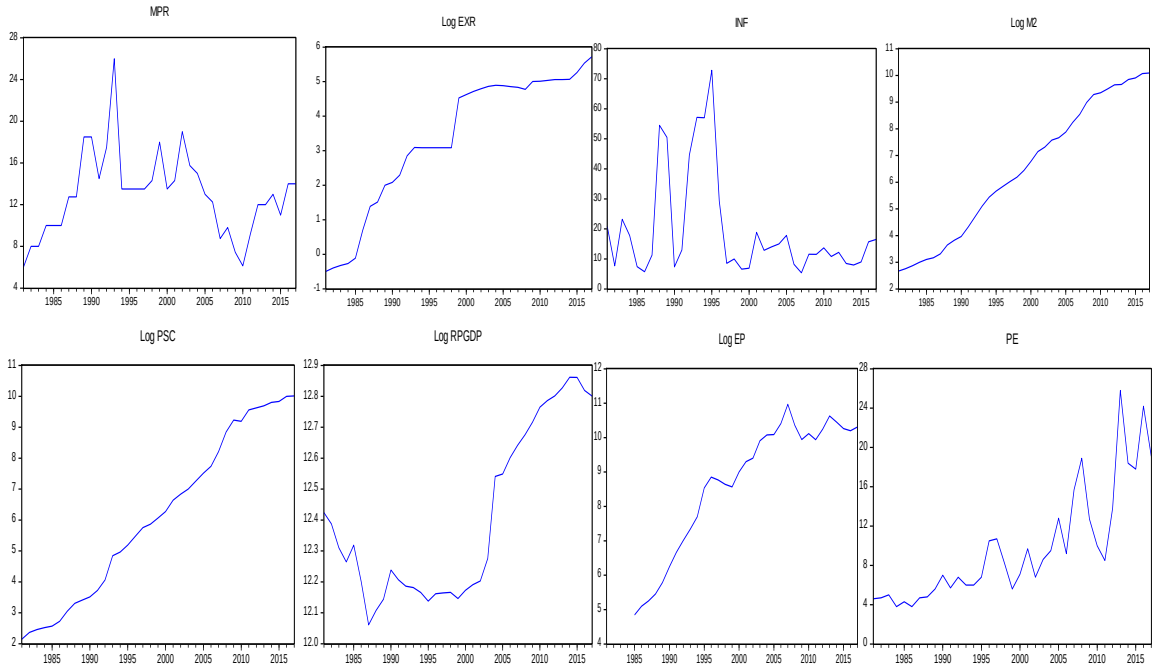
properties of the variables were examined to substantiate the stationarity and long run relationship of the variables. Also, the effect of monetary policy on economic development was investigated. Consequently, the monetary policy transmission channels were examined in relation to economic development. The implication of this is to account for the effect of monetary policy shocks (channels) on economic development. For the choice of appropriate lag length of the unrestricted VAR model, the LR, FPE, AIC, SC and HQ criteria for an optimal lag length were employed in the study. This is done in order to avoid VAR model misspecification that often generates autocorrelation error. A stability test was undertaken to ascertain the reliability of the selected VAR model using the autoregressive (AR) root stability test.

RESULTS AND DISCUSSION

Preliminary Examination of the Data

Unit Roots Test

Figure 1: Plot of non-stationary Variables



A cursory look at graphical presentation of series revealed the presence of unit roots in the variables (figure 1), indicating that the variables are non-stationary. To further verify the features of the variables the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test for stationarity were employed.

Table 1: ADF/PP Statistics for Testing Unit Roots in the Variables

Variable	Series	ADF-Test		PP-Test	
		At Level	1st Diff	At Level	1st Diff
Real Per Capita GDP	**RPGDP**	-2.307165	-4.518710*	-2.277304	-4.518710*
Monetary Policy Rate	**MPR**	-3.149422	-6.227483*	-3.052395	-7.665611*
Exchange Rate	**EXR**	-1.213744	-3.803112**	-0.182718	-3.797297**
Bank Credit to Private Sector	**PSC**	0.240430	-6.669052*	0.195276	-6.675290*
Equity Prices	**EP**	-3.123603	-5.843775*	-3.214564	-7.061048*
Inflation Rate	**INF**	-3.893012**	-5.439090*	-2.771045	-9.883574*
Broad Money Supply	**M2**	-3.848692**	-8.054250*	1.288181	-6.337136*
Critical Values	**1%**	**-4.234972**	**-4.243644**	**-4.234972**	**4.243644**
	5%	**-3.540328**	**-3.544284**	**-3.540328**	**-3.544284**

Note: *(**) significant at 1% (5%) level. ADF/PP Unit root tests with constant and trend.

Source: Calculations by Authors using Eviews 9.

The unit root tests reported in Table 1 show that the variables are non-stationary at level but unequivocally stationary at first difference at 5 percent level, implying that they are I(1) properties. Since the point of interest lies in the dynamic interrelationships among the macroeconomic variables, the VARs were estimated in levels to avoid losing economic information embedded in the variables, as it is common in monetary literature. In addition, by carrying out level form estimation, the study implicitly assumed that there are long run relationships among the underlying variables (CBN, 2014).

Selection of Optimal Lag Length for VAR Model

Table 2: Selection of Optimal VAR model Lag Length

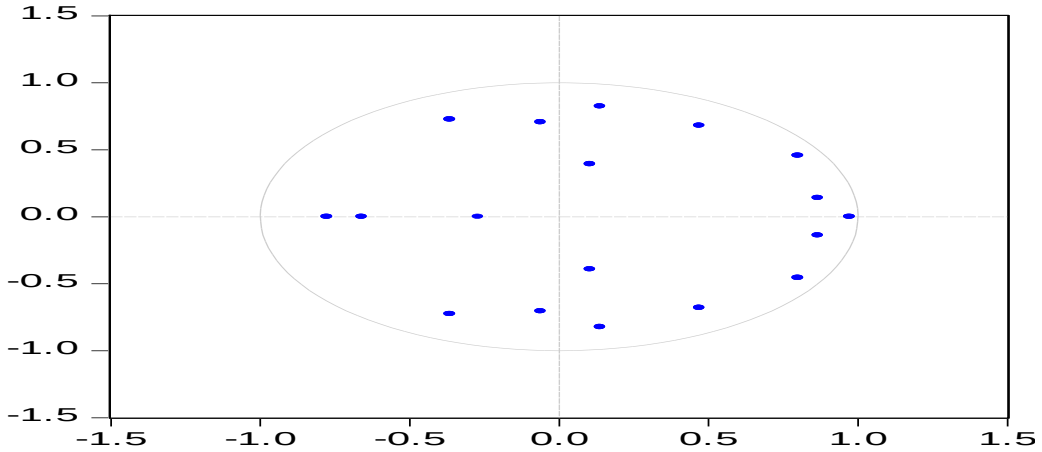
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-389.7518	NA	519.2360	23.27952	23.54888	23.37138
1	-224.0749	**263.1339***	**0.261853***	15.65147	**17.53697***	**16.29448***
2	-185.5578	47.57998	0.278497	15.50340	19.00505	16.69756
3	-147.4120	33.65809	0.457252	**15.37717***	20.49497	17.12249

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

Source: Calculations by Authors using Eviews 9.

Table 2 reports each criterion with its maximum lag. The result shows that LR and SC have a maximum lag of 1 while FPE, AIC and HQ have a maximum lag of 4 and VAR residual serial correlation LM test is carried out to choose the appropriate lag length. The VAR model is estimated for each of the lag length suggested by different criteria. The model that minimizes AIC and SC is chosen as optimal, and produces no autocorrelation. In this particular case, an optimal lag length of order 3 was employed in the study as selected by AIC criteria.

Figure 2: Stability Test

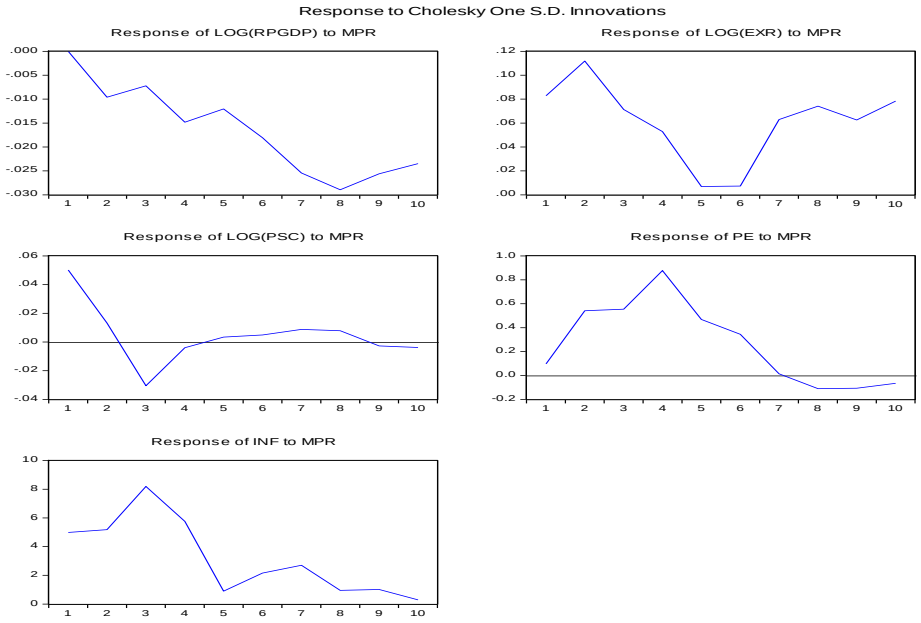


To ascertain the reliability of the chosen VAR model, a stability test was undertaken using the autoregressive (AR) root stability test. The estimated result proved to be stable since all roots lie inside the unit circles.

Impulse Response Graph Analysis

The impulse response function traces the effect of monetary policy shock on other variable in VAR model. The monetary policy rate (MPR) is the official rate of the Central Bank of Nigeria and serves as the anchor rate, as well as the operating range or band of other short term interest rates in the money market. The source of shock transmission in the model is assumed to be from MPR and affects the real per capita output through different channels. Hence, the monetary policy shock is measured in terms of the MPR. Therefore, the responses of RPGDP, EXR, PSC and INF to unexpected monetary shock (MPR) provide a useful indicator for determining the effectiveness of monetary policy in the domestic economy.

Figure 3: Impulse Response of Variables to MPR



From figure 3, it shows that the response of real per capita output to monetary policy shock is positive and significant but fluctuates. As time goes on the effect of the shock begins to die down. This is consistent with theory which stipulates that monetary policy may impact on output in the short-run and becomes neutral in the long-run (CBN, 2014). Following a monetary shock, the exchange rate initially depreciated significantly and later began to appreciate. This is not in line with theory which stipulates that an increase in interest rate is expected to raise portfolio induced inflows, increase demand for local currency and leads ultimately to currency appreciation immediately. In the case of inflation, monetary shock puts an upward pressure on prices and later it begins to fluctuate. The fluctuation in inflation is a definite factor in the price spiral. However, the major driving force for the price spiral may be from the exchange rate. Also, monetary shock leads to a significant decrease in credit but it later begins increase. This implies that monetary shock exhibited a significant influence on the financial health of borrowers through the interest expenses and net cash flows which in turn influenced the supply of funds. Furthermore, it is revealed that monetary shock has a positive influence on the equity price initially but later begins to fall. This shows that monetary shock is strongly associated with equity price which in turn influence the households' lifetime resources and wealth, consequently influencing consumption and output.

Variance Decomposition

Forecast Error Variance Decomposition (FEVD) is used to determine the most significant monetary policy channels in economy. In line with Nwosa and Saibu (2012), the monetary policy variable which accounted for the largest proportion of the variation in output is taken as the most significant channel through which monetary policy is transmitted to real sector. Table 3 presents the estimates of the variance decomposition generated from the unrestricted VAR model.

Table 3: Forecast Error Variance Decomposition of Real Output

Period	S.E.	LOG(RPGDP)	MPR	LOG(EXR)	LOG(PSC)	LOG(PE)	INF
1	0.068500	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.095188	94.54648	1.016795	0.039843	3.145189	0.046839	1.204853
3	0.109233	88.31697	1.208549	0.237103	8.092686	0.041696	2.102998
4	0.119107	83.95428	2.565880	2.383011	9.003326	0.061153	2.032354
5	0.127189	82.40851	3.148799	4.161282	8.014502	0.191359	2.075546
6	0.134260	81.51888	4.635227	4.270515	7.209605	0.213367	2.152403
7	0.140766	78.94830	7.484955	3.969911	6.580417	0.568909	2.447510
8	0.145776	74.92212	10.92329	4.090236	6.202095	0.889346	2.972913
9	0.150122	71.33463	13.20774	4.391480	6.583117	0.861801	3.621232
10	0.154817	67.51724	14.71769	4.722404	8.059876	0.835244	4.147554

Note: This table shows the relative contribution of innovations in monetary policy rate (mpr), exchange rate, private sector credit (psc), asset price (pe), inflation rate (inf) to variations in the forecast error for real per capital output (rpgdp)

Note: S. E. means standard errors

Source: Calculations by Authors using Eviews 9.

From Table 3, it is evident that shocks to monetary policy rate explained the largest variation in real per capita output followed by private sector credit and exchange rate. These shocks have a progressive impact on real per capita output except private sector credit while the average contributions of shocks from equity price channel is below one percent. This result is consistent with the hypotheses that monetary policy rate, credit and exchange rate channels play significant role in transmitting monetary policy impulse to the real per capita output. Some of the findings are consistent with Oyaromade (2006), Nwosa and Saibu (2012), Ishioro (2013),Ogbonna and Uma (2014) and Kamaan (2014) but inconsistent with CBN (2014) that posited that monetary policy rate and exchange rate do not explain the variations in output. The implication of this result is that the monetary policy rate, credit and exchange rate as monetary policy instruments have influence on real per capita output (economic development). A possible explanation to the influence of these channels on the real per capita output could reflect the high demand domestic investment, consumption purpose and import of goods and services, as well

as foreign inputs whose prices are determined mostly by variations in exchange rate. These have a serious implication on the spending pattern of the people, firms and ultimately on prices of goods and services which in turn affects the welfare of the people. However, the evidence provided in this study does not support the hypothesis that asset price plays significant role in transmitting monetary policy impulse to the real per capita output. This supports the argument of Nwosa and Saibu (2012) that the inefficiency of the asset price channel under high inflation could also be attributed to the absence of longer-term debt instruments; as these instruments are important because the longer the life cycle of the instrument the greater the impact of interest rate changes on the value of the asset. Also, the underdeveloped nature of the financial market in Nigeria greatly hampered the effectiveness of asset price channel on the real per capita output. Hence, asset price might not be a relevant channel of monetary policy innovation in Nigeria. Therefore, the basic transmission mechanism detected by this study is shown as follows;

MS↑→IR↓ →PSC↑→ EXR↓→INV↑→Y(EW)↑

The implication of the above channel is that, an expansionary monetary policy will lead to fall interest rate, fall in real interest rate will leads to increase in quantity of bank loans (credit) as well as exchange rate depreciation. The combined effect of fall in interest rate, increase in quantity of bank loans (credit) and fall in the value of domestic currency will boost investment, which subsequently boost real per capita output (welfare) of the economy.

Table 4: Forecast Error Variance Decomposition of Inflation

Period	S.E.	LOG(RPGDP)	MPR	LOG(EXR)	LOG(PSC)	PE	INF
1	0.068500	0.270439	25.40330	1.810109	2.363910	8.635671	61.51657
2	0.095188	4.282971	29.79682	4.807120	2.967622	13.63424	44.51122
3	0.109233	17.65550	35.09574	11.46487	4.610264	7.568705	23.60492
4	0.119107	15.47063	39.31607	10.27225	6.032913	8.220481	20.68765
5	0.127189	16.76722	32.25201	9.652538	15.23864	8.597374	17.49222
6	0.134260	14.66177	28.80431	9.426353	21.08661	10.41830	15.60266
7	0.140766	14.27107	27.37828	8.909152	23.65708	10.54580	15.23863
8	0.145776	14.60171	26.79731	8.807745	23.83685	10.81865	15.13773
9	0.150122	15.41669	26.37159	8.702909	23.49217	11.21015	14.80650
10	0.154817	15.38683	26.19459	8.720229	23.84448	11.14825	14.70562

Note: This table shows the relative contribution of innovations in monetary policy rate (mpr), exchange rate, private sector credit (psc), asset price (pe), inflation rate (inf) to variations in the forecast error for real per capital output (rpgdp)

Note: S. E. means standard errors

Source: Calculations by Authors using Eviews 9.

Table 4 shows the variance decomposition of inflation, that is the response of inflation to real per capita output, monetary policy rate, exchange rate, private sector credit and equity price. It is readily seen that about 62% of the variation in inflation is explained by its own innovation while monetary policy rate (MPR) and equity price account for about 25%, and 9%, respectively. The shocks from private sector credit, exchange rate and real per capita output explain less that 3% of change in inflation. However, the result shows a progressive influence of monetary policy rate (MPR), equity price, private sector credit and exchange rate on inflation. The proportion of the variation in inflation attributable to MPR and PSC are much higher than other variables as they account for more than 20%. Thus, this study infers that the monetary policy rate (MPR) and private sector credit are the key variables influencing inflation.

CONCLUSION AND POLICY RECOMMENDATIONS

This study investigated the channels of monetary policy transmission mechanism on real per capita gross domestic product (economic development) using annual data spanning the period 1981 and 2017. To achieve the objective of study the competing theoretical views on monetary policy channels and economic growth were explored while unrestricted vector autoregressive (VAR) methodology was employed for the analysis. The findings from the Impulse response functions showed that RPGDP, EXR, PSC, PE and INF responded heterogeneously to unexpected monetary shock (MPR) and hence, provide a useful indicator for determining the effectiveness of monetary policy in the domestic economy. In the case of the forecast error variance decomposition, the study revealed that shocks to monetary policy rate explained the largest variation in real per capita output followed by private sector credit and exchange rate. These shocks have a progressive impact on in real per capita output except private sector credit, while the average contributions of shocks from equity price channel is below one percent. Therefore, the basic channels of monetary transmission are monetary policy rate, credit and exchange, while equity prices might not be a relevant channel of monetary policy innovation in Nigeria. Furthermore, the forecast error variance decomposition of inflation revealed that the sources of inflation are through the monetary policy rate (MPR) and private sector credit. Based on the empirical evidence, the study therefore recommends that there should be judicious management of interest rate, credit and exchange rate policy to promote real per capita output in Nigeria. Also, there should be constant regulatory reforms and the strengthening of monetary policy implementation in order to improving monetary policy efficiency on real per capita output. Some of these reforms should be implemented in the short term to strengthen the interest rate, credit and exchange rate channel. In addition, to ensuring significant influence of the asset price, the monetary authority should maintain a low and stable

inflationary level. The study recommended for further study, in the area of monetary policy transmission mechanism and industrial sector in Nigeria.

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