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MONETARY POLICY AND BANK PERFORMANCE IN NIGERIA: A VECTOR AUTOREGRESSION (VAR) APPROACH

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ABSTRACT

This paper investigated the effectiveness of monetary policy in enhancing the performance of the Nigerian Commercial Banks in terms of their Profitability, Liquidity and Credit performances for the period 1980 to 2017. The monetary policy variables used were, monetary policy rate, Treasury Bill rates, cash reserve ratio and money supply growth. Applying Vector Autoregression analysis (VAR) on the variables, the study found that overall, monetary policy conduct was effective in enhancing commercial banks performance in Nigeria over the period. Specifically, it was found that monetary policy rate and Treasury Bill rates were positively related to profitability of commercial banks in Nigeria. Also, monetary policy rate, money supply and cash reserve ratio were very effective in improving the credit performance of commercial banks in Nigeria. Furthermore, both monetary policy rate and money supply movements produced positive impact on the liquidity performance of commercial banks at various magnitudes. Hence, the study recommended that a good mix of policy instruments be used to enhance the returns on investment in the Nigerian banking system.

KEYWORDS: Monetary Policy, Effectiveness, Commercial Banks, Performance, Vector Auto Regression, Nigeria.

INTRODUCTION

The banking sector is an important sector in the economy as the financial needs of all the other sectors are met by the financial sector mostly through the banking system. Therefore, the performance of the macro economy is dependent on the corresponding performance of the banking sector. The banking sector has to be efficiently positioned to cater for the liquidity and credit needs of the economy, failing which, leads to financial and general slowdown of growth in the economy. Monetary policy works mainly through the banking system. As Ajayi and Atanda, (2012) pointed out, the instruments of monetary policy do not affect economic activities directly rather they work through their effects on the banking system. Thus, monetary policy may have their first impact on the deposit taking institutions through their influence on the availability of liquid resources of the system. More than that, the dominance of the commercial banks in the out play of financial performance of most emerging economies is not disputed, and Nigeria is a witness to this fact in her economy.

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While the banking system exists to bridge the financial gap of savers and borrowers, the Central Bank performs the umpire role to the banking system. The activities of the central bank in performance of the this role could be summed up in at least two cardinal objectives. These are price stability and financial stability. While the latter could be tackled by the supervisory role of the apex bank and the stability of the payment system, the former is achieved mainly through monetary policy mix. With the monetary policy role in mind, the central bank becomes the sole actor in national currency stability and moderating inflation. However, in recent times, this monetary function of the central bank has been supplemented with other auxiliary functions. As noted by Ekpo (2018), the role of monetary policy has extended to include, but not limited to, price stability, foreign exchange market stability, financial market stability, high employment, economic growth, efficient resource allocation, increased industrialization, smoothening of business cycle, favourable balance of payments, preventing financial crisis, stabilizing long term interest rates and real exchange rate, export promotion and maintaining internal and external balance. This extension makes the work of the central bank cumbersome and the result is failure in its original oversight functions. Ncube (2005) sympathized with the African central banks, when he said 'Central Banks in Africa are still trying to grapple with the intricacies of their functions, and are further being wished away by protagonists of the libertarian variety'.

The phase of monetary development of a region may affect the conduct of monetary policy of that region. For most economies, monetary development is continually being reformed to suit the general growth characteristics of the economy. For instance in Nigeria, the economic policy thrust of Structural Adjustment Programme (SAP) has divided our financial sector into phases. Thus, financial development literature categorizes monetary policy in Nigeria as passing through regimes such as pre and post SAP and pre and post consolidation of the 2005. More than this, the phase of development of the financial sector itself from controlled to uncontrolled financial regimes has affected the development of monetary policy, changing the policy instruments from direct to indirect. The general argument is that by their changes, these phases have either intrinsically or explicitly reshaped the behaviour of monetary policies and hence their outcomes in the general economy (Ajayi and Atanda, 2012).

A review of empirical literature revealed a staggering deterioration in the performance indexes for Nigerian commercial banks over time. For instance, the return on equity declined from 114.3% in 2001 to 4.12% in 2006 and further declined to -0.46% in 2016. Also, the non-performing loans of the banking system rose up to 47.4 % in 1989 and 45.5% in 1999, and, even when it had reduced, only settles at 14.2% in 2010, higher than the 3% globally accepted for a sound banking system. Many studies on monetary policy and bank performance have cropped-up over the years for Nigeria (Ayodele, 2014; Ndugbu and Okere, 2015; Onodugo, Okoro, Amujiri and Onodugo, 2016; Obioma and Onyebueke, 2018). But their methodological strength revolved around the Ordinary Least Square Regression. Ajayi and Atanda (2012) pointed out that this methodological gap is a weakness in financial development literature.

This paper is an attempt to contribute to the growing debate on the strength of monetary policy in smoothening economic performance, but this time, with special attention on the performance of the commercial banks as the core of the financial system in Nigeria. The study is significant in many ways. First, the world financial meltdown of the recent past

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continues to produce spill-over effect on susceptible economies, thus requiring continuous examination of our policies in mitigating such trend. In-fact, as could be gleaned from the crisis, the management of monetary portfolio is not a smooth business. Second, now that the Nigerian economy is out of recession, policy fine tuning for improved sectorial performance is imperative for it to stay in positive growth trajectories. Moreover, global changes through technology, trade and investment continues to expose each community in the global space to new economic challenges. Thus, a policy stance that was once plausible may not be effective any more. Given the above scenarios, an understanding of the dynamics of monetary policy process in galvanizing financial sector development is essential for appropriate implementation by concerned academics and policy makers in their various domains (Ekong and Ukoha, 2018).

The rest of the paper is structured as follows: section two discusses some theoretical, conceptual and empirical issues. Section three discusses stylized facts on the monetary policy and commercial banks performance in Nigeria. Section four discusses the method of study while section five presents the empirical results. Policy recommendations and conclusion are made in section six.

THEORETICAL AND CONCEPTUAL ISSUES

The conduct of monetary policy in most economies today is rooted in strong theoretical foundations. For instance, in market-oriented economies, monetary policies follow a liberalised system. The economic rationale for this approach is that growth in the economy should be private sector driven with no or minimal government interference. Often credited to Mckinnon (1973) who argued for financial liberalization and also accepted by the World Bank (1989), the key strength of the liberalization hypothesis is that higher real interest rate discourages consumption at the advantage of higher savings or investment in other financial assets. In the savings-investment nexus, higher savings generates greater investment. According to Roberts (1997), other benefits of higher real interest rate include improved quality of investment by ensuring that only those projects with positive net returns in real terms are financed. Positive interest rates are also an integral part of financial deepening, whereby different financial instruments of a longer maturity and sophistication are developed to better suit the requirements of both savers and borrowers.

However, in most other economies monetary policy path is rather sticky. This is credited to theorizing of Keynes and his affiliate schools who detest the liberalized market views. In their views, the market clearing assumptions of the financial markets never hold and the peak and troughs of the business cycles are only corrected by regulations. Thus, monetary policies that follow this path are purely premised on economic smoothening. Often regarded as financial repression hypothesis, policy regulation ensures, among other things, that underserved sectors are efficiently catered for to promote equity in financial distribution.

There are also arguments that monetary policy is necessary to minimize distortions in relative prices due mainly to inflation and market imperfections. According to Roberts (1997), these realities of the credit market increase biases in lending; and financial markets are intrinsically subject to market failures which render the concept of 'market-clearing' interest rates inapplicable.

For the African sub region, there are issues on the evolution of monetary policy framework. As pointed out by Ncube (2005), monetary policy in Africa has evolved through four regimes,

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namely, the currency board, the printing press, the rationing and credit ceiling and the market clearing regimes (Honohan and O'connell, 1996). These regimes began with the colonization of Africa and span through the various stages of perceivable financial development. According to Ncube (2005), almost all former British colonies had pass through these regimes, including Nigeria.

The investigation of commercial bank performance has been conducted in the context of different other theories. Structure-Conduct-Hypothesis (SCH) paradigm is one of them. The main idea in this theory is that market structure determines the performance (profitability) of Commercial Banks. Put it differently, markets with high concentration level induces firm to behave (conduct) in a collusive way. As a result, "performance" of the firms is ensured. The hypothesis suggests that only firms with large market share and well differentiated portfolio (products) can win their competitors and earn monopolistic profit. One of the earliest empirical tests of validity of Structure-Conduct-Performance paradigm for banking system was performed by Kaufman (1966). In his research of Iowa banking system for the period 1959-1960, the author found statistically significant positive but not strong relationship between concentration level of the market and performance of banks operating in that market.

Another theoretical framework for studying the performance of commercial banks is the Efficient Structure Hypothesis (ESH) brought about by the weakness of the SCH proposition. Demsetz(1973) showed that higher profits of banks are not due to their collusive behavior but because of high efficiency level, which, in turn, leads to larger market shares that banks possess. In other words, performance of commercial bank is determined not by the market concentration but by bank efficiency. Market share of the bank is assumed to be a measure of efficiency. Thus, efficient banks in the market tend to increase in the firms' size and market share due to their aggressive behavior. This behavior of the efficient banks allows such firms to concentrate and earn higher profits which further enhance their market share. Such firms can maximize profits either by maintaining the present level of product price or service charge and firms' size or by reducing their service charge and expanding the firm size (Smirlock, 1985).

The Balanced portfolio theory, sometimes called Modern Portfolio Theory (MPT), argues that banks seek to maximize returns while minimizing risk through the creation of portfolios that include investments that are not positively correlated with one another. Modern Portfolio Theory (MPT) is an investing method where the investor attempts to take minimal level of market risk to capture maximum-level returns for a given portfolio of investments. Often credited to Harry Markowitz (1952), MPT suggests that banks can limit the volatility in their portfolio while improving their business performance by spreading the risk among different types of securities that do not always behave the same way. According to Olweny and Shipho (2011), balanced portfolio theory also added additional dimension to the study of bank performance. It states that the portfolio composition of the banks, their profits and the returns to the stake holders are the results of the decisions made by the management and the overall policy decisions. According to MPT, a portfolio (a combination of individual investments) exhibits risk and return characteristics based on its composition and the way those components correlate with each other may affect the possible outcome. An optimal portfolio will provide neither the highest returns, nor the lowest risk of all possible portfolio combinations. It will attempt to balance the lowest risk for a given level of return and the greatest return for an

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acceptable level of risk and hence the Balance Portfolio Proposition. This meeting point of each level of risk and reward, where optimal portfolios reside, is called the "Efficient Frontier." The efficient frontier is a concept represented by a set of portfolios that offer the highest expected return for a given level of risk.

The structuralist approach to bank performance is that commercial banks performance is related to the state of development of the economy. Three stages of economy are identified, a more backward economy, a moderately-developed economy and a more advanced economy. In the backward economy, commercial banks performance is low and development is economy-led. In the moderately-developed economy, commercial banks performance is improved and development is dual-led between the economy and the commercial banking system. However, in the more advanced economy, commercial banks performance improved the more and the commercial banking system lead development in the economy.

Many of the theories of bank performance discussed so far focus on the profitability of the bank as a proxy for performance. However, another theory which takes into account other factors is the Expense-Preference behavior theory (EPBT). In EPBT, the main goal which managers pursue is to maximize not profit but own utility or utility of the firm, which is usually achieved via increasing salaries or other staff expenses (Williamson, 1963). For Smirlock and Marshall (1983), the specific postulate of expense preference theory is that monopoly power in the product market enables managers to pursue goals such as the hiring of excess staff that are inconsistent with profit (and hence stakeholder's wealth) maximization. The theory envisages the firm as maximizing utility through the pursuit of non-profit maximizing policies. In particular, managers' increase (beyond the profit maximizing point) staff expenditures, managerial emoluments, and discretionary profit for which they have a positive preference.

MEASUREMENT ISSUES

Development literatures provide various criteria for gauging the performance of commercial banks. In most cases, bank performance is assessed in terms of profitability, Liquidity and Credit worthiness and Management (Ekong, 2015; Kumbirai and Webb, 2010). Selected variables often used to gauge the performance of the banking system are as provided in Table 1.

Table 1.An overview of selected performance measures for the banking system

Measures of Bank Performance	Their Measurement	Definition
1. Return on assets	Net income ÷ Average total assets	The commercial banks' ability to make profits from its assets.
2. Return on equity	Net income ÷ Average total equity	The returns to shareholders on their investment capital (equity).
3. Cost-to-income ratio	Operating expenses ÷ Operating revenues	The ability of commercial banks to generate profits from a given revenue stream.
4. Net interest margin	Net interest income ÷ Assets (or interest-bearing assets)	The gap between the interest income the bank receives on loans and securities and interest cost of its borrowed funds
5. Net loans to total asset ratio	Net loans ÷Total assets	The percentage of assets that is tied up in loans. The higher the ratio, the less liquid the banks are.

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6. Net loans to deposit and borrowing	Net loans ÷ Total deposits and short term borrowings	The proportion of the total deposits locked into non-liquid assets. Higher values shows lower liquidity stand.
7. Non-Performing Loan Ratio	Non-Performing loans ÷ Total loans	A measure of the credit performance of banks
8. Bank assets to GDP	Bank total assets ÷ GDP	The size of the banking system in servicing production.
9. Bank credit to deposits	Bank total credit ÷ deposits	How much a bank lends out of the deposits it has mobilized. A higher ratio indicates more reliance on deposits for lending and vice versa.

Source: Authors' computation based on information from Ekong, 2015; Kumbirai and Webb, 2010;

More recently, some scholars have started considering the performance of commercial banks away from the profitability of banks but rather, based on their contribution to other sectors of the economy. For instance, Ajayi and Atanda, (2012) and Odeleye, (2014) considered their productive efficiency by proxing total credits of banks in considering the performance of commercial banks in Nigeria. Elsewhere, real GDP growth is seen as a good measure of bank performance in terms of stability (Moyo, Nandwa, Odour and Simpasa, 2014). A rise in real GDP growth is a good indicator of banking stability. A booming economy increases lending and profits leading to more banks. Conversely, declining real GDP growth is an early warning of bank distress due to slower economic activities, unemployment and increase in non-performing loans on the bank's portfolio.

With regards to monetary policy however, the choice of variables has often been on the instrument of monetary policy, be it direct instruments or indirect instruments. The literature often argues that divergence in the use of instrument is an issue of the development stage of the economy in question. Hence, a market oriented economy is adjudged to favour indirect instruments of monetary policy than the direct instruments and vice versa. Many studies have favoured using monetary policy instruments for gauging policy effectiveness around the globe (Panditand Vashisht, 2011; Nguyen, Vu and Le (2017; Onoh, 2017). However, some scholars are now looking at the response of monetary policy variables in terms of policy targets. The argument is that any good policy should produce traceable outcome that is felt in the economy. Thus, scholars have used credit to the economy or credit to some sectors as indicator of policy stance as well as interest rate (Okoye and Eze, 2013; Ndubuaku, Ifeanyi,Nze, and Onyemere, 2017).

REVIEW OF EMPIRICAL STUDIES ON MONETARY POLICY AND BANK PERFORMANCE

Osim (2011) considered the impact of monetary policy on commercial bank lending in Nigeria using First Bank of Nigeria as a case study from 1975 to 2009. Applying multiple regression analysis on the data obtained for the case study, he found that monetary policy variables had positive but insignificance influence on bank lending behavior of First Bank Nigeria. In a similar examination for Zenith Bank of Nigeria from 2005 to 2012 using both descriptive and secondary data, Udeh (2015) found that the profitability of Zenith Bank of Nigeria hung only on minimum rediscount rates; other policy rates had no useful impact on the bank's profitability.

Panditand Vashisht(2011), in a study of the Indian economy and six other Emerging Market

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Economies of Brazil, Chile, Korea Republic, Mexico, Turkey and South Africa from 2002 to 2010 in a panel data analysis showed that, at a controlled environment, monetary policy rate, especially changes in policy rates dictate the pace of demand for credit in Indian banks. The intermediate outcome was that the pace of economic activities in the area was intrinsically linked to movements in the policy rate of the country.

For Ayodele (2014), monetary policy can exert inadequate pressure on the lending portfolio of commercial banks in Nigeria. In one of such studies between 1988 and 2008 using Vector Error Correction Mechanism, the author found that monetary policy instruments were ineffective in stimulating commercial bank loans and advances in the long-run. He thus, suggested that the Central Bank of Nigeria should make efforts to develop indirect policy instruments and exercise appropriate control over the monetary sector.

Ekpung, Udude and Uwalaka (2015) investigated the impact of monetary policy on the entire banking system in Nigeria from 1970 to 2006 using Ordinary Least Square regression technique. In their study, they proxied deposit liabilities as a performance index. Their result showed that taken by the individual policy tool, deposit rate and minimum rediscount rate exerted negative pressure on deposit liabilities in Nigerian banks while exchange rate was the one that delivers positive deposit liabilities relationship. Their result also showed that the conduct of monetary policy in the country can make or mar savings mobilization for the general economy. Hence, proper used of the tools can create enabling business-friendly environment.

Ndugbu and Okere (2015) examined the impact of monetary policy and the functioning of deposit money banks in Nigeria from the period 1993 to 2013. They applied ordinary least square technique on the data obtained for the purpose. Of the variables of monetary policy used, only bank deposit rate was found to produce negative impact on the operations of deposit money banks in Nigeria in the period. The liquidity ratio instrument provided positive but insignificant impact on bank performance. Overall, there was no causal link between monetary policy and bank performance in diverse periods. They therefore, concluded that the apex bank should make more use of bank deposit rates as a policy instrument for Nigeria.

Akomolafe, Danladi, Babalola and Abah (2015) applied a micro panel analysis on policy rate instruments to assess the impact of the policy on commercial banks' performance in Nigeria, using data set from five major banks, namely United Bank for Africa, First Bank, Zenith Bank, Diamond Bank and Access Bank for the period 2003 to 2013. Their interest was on profitability of commercial banks, hence they proxied profit before tax as performance index. After their fixed effect analysis, they found strong evidence of positive relationship between monetary policy (money supply) and the profitability of Commercial banks in Nigeria but not on interest rate. It may appear that interest rate was not business friendly for borrowers to rely on in the period. A 1 percent to 1.25 percent benefits runs through money supply to Banks profit, the study showed.

Onodugo, Okoro, Amujiri and Onodugo (2016) showed that the monetary policy regime period can affect the performance of commercial banks in Nigeria. Applying regression analysis and Pearson Product Moment analysis in SAP period (1986-1999) and post SAP period (2000-2013) they found that post SAP periods monetary policies helped Nigerian banks to deliver positively on deposit mobilization and credit dissemination among competing users. A near similar case was also found for the Kenyan economy by Nyorekwa and Odhiambo (2014).

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Mutwol and Kubasu (2016) investigated the effects of selected monetary policies on loans portfolio performance among 30 Commercial Banks in Kenya using both primary and secondary data. The selected policy variables were open market operations, central bank rate, minimum reserve requirements and Kenya bankers' reference rate on loans portfolio performance. Their outcome showed no positive correlation between open market operations, central bank rate, Kenya bankers' reference rate and loans portfolio performance so much so that they push for downward reduction in these rates for meaningful effect to be felt sooner. Their results were somehow different from that reported by Maigua and Mouni (2016). In their similar study of 26 commercial banks in the country using multiple regression analysis, they found that discount rates, inflation rates and exchange rates correlate positively with bank performance in Kenya, even when reserve requirement ratio may tend to slow down such performance in the country.

Onoh (2017), investigated the effect of monetary policy on the turnover of commercial banks in Nigeria from 1980 to 2015. Applying multiple regression analysis on the data, the author found that liquidity ratio was negative and significant in relation with bank turnover rate, while money supply had a positive and significant effect in relation with bank assets, and that cash reserve ratio had a negative and significant impact on bank loans and advances.

Nguyen, Vu and Le (2017), investigated the case of monetary policy and commercial anks' profit in Vietnam from 2007 to 2014. Applying panel data regression on at least 20 banks operating in the Vietnam, they found evidence of a strong monetary policy-commercial bank profit nexus for the Vietnam economy. Among the variables representing State Bank of Vietnam's monetary policy, only monetary base had a significant positive impact on bank's profit at a reasonable level of significance. They therefore argued that if the State Bank of Vietnam would continue to focus attention on the workings of monetary base, better performance and stability of the banking system could be achieved.

It may be possible for banks in Nigeria to improve on the quality of their asset as a result of good policy mix of the apex bank. Obioma and Onyebueke (2018) showed that this is so for Nigerian banks from 1980 to 2015. Their study used Ordinary Least Square technique on bank performance indices proxied by Turnover rate, Bank Asset and Loan and Advances. Their result showed that bank performance measure is sensitive to the type of monetary policy instrument used. Therefore, they concluded that the strength of monetary policy lies on the combination of the various instruments.

STYLIZED FACTS ABOUT THE CONDUCT OF MONETARY POLICY AND COMMERCIAL BANK PERFORMANCE

Figure 1 presents the behaviour of the banking system in terms of profit performance in relation to the conduct of monetary policy in Nigeria between 1980 and 2016. As the figure shows, the net interest margin (NIM) of commercial banks grew from 3.5% in 1980 to 15.1% in 1992 before falling to 7.5% in 1994.

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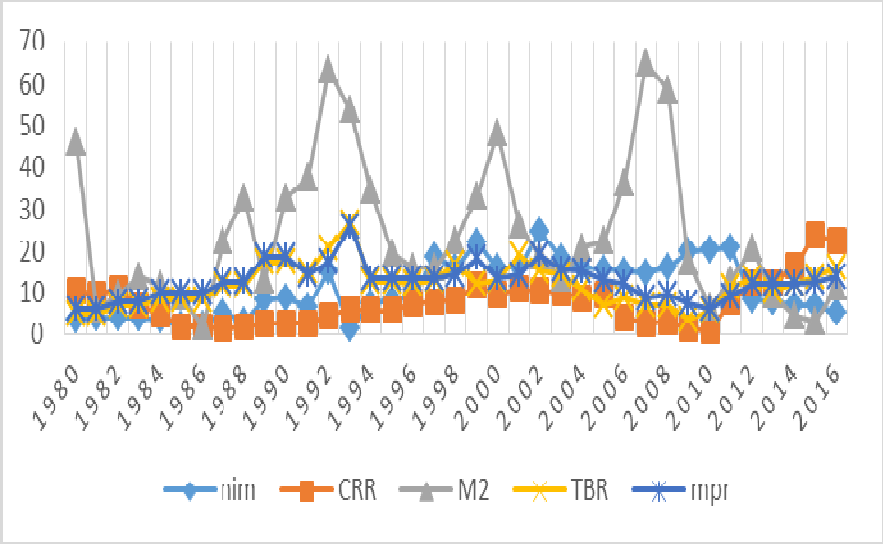

Figure 1.Profit performance and monetary policy conduct (1980-2016)

It however grew again from 8.5% in 1995 to 21.9% in 1999. From the year 2000 to 2011, NIM maintained an undulating double-digit growth rate with the highest being 24.6% in 2002 and the lowest being 14.8% in 2007. Beyond 2011, NIM fell to single digit growth rate, declining from 8.4% from 2012 continually to 5.2% in 2016. The steady rise of monetary policy rate (MPR) from 6% in 1980 to 18.5% in 1990 may have been a possible accounting factor after smoothening economic activities to positive growth from 1988 to 1994. MPR however fell, after reaching a peak of 26% in 1993 to 14.31% in 2001. From 2002, MPR declined from 19% continuously to 6.13 in 2010, before accelerating again to 14% in 2016. The cash reserve ratio (CRR) grew at a declining rate from 10.7% in 1982 to 1.4% in 1987, before accelerating grudgingly to 6%in 1993. However, from 1994, CRR has witnessed increase growth from 5.7% to 11.7% in 1999. Away from these periods, CRR has continued to show a downward trend from 10.8% in 2001 to 1.3% in 2009. Thereafter, the growth has been on a steady increase to a peak of 22% in 2016.

The Treasury bill rate (TBR) witnessed tremendous fluctuations in the study period, tenaciously following the trend of MPR. For instance, TBR grew from 5% in 1980 to 17.5% in 1990. Thereafter, TBR maintained an undulating pattern with a peak of 26.9% in 1993 and a trough of 18.88% in 2001, before taking a downward trend to 3.72% in 2009. Commercial banks may have capitalized on the rising TBR to woo more incomes from the banking public who may want to take advantage of investing their money on the rising TBR. Between 2010 and 2016, the lowest TBR was 5.6% in 2010 and highest TBR was 16% in 2016. A different behaviour is observed in the trend of money supply growth. The growth rate of money supply produced peaks and troughs different from other policy instruments. From 46.11% in 1980, M2 declined to 1.95% in 1986. It grew from 22.41% in 1987 to 63.3% in 1992 before decreasing to 22.3% in 1998. It also declined from 48.1% in 2000 to 20.7% in 2004. Up until the end of the study period, the growth rate has been cyclical, producing a peak of 64.9% in 2007 and a trough of 3% in 2015. According to Nigerian apex bank, money supply growth follows the nominal needs of servicing economic activities, hence the unparalleled peaks and troughs (CBN, 2016).

Figure 2 shows the behaviour of the banking system in terms of liquidity performance with respect to the conduct of monetary policy

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from1980 to 2016. As the figure shows, the only interacting policy variable with the liquidity performance index was money supply (M2). Its trend varied widely from other policy rates. The liquidity performance index grew from 46.11% in 1980 to over 65% in 1985 and falling to 36.1% in 1986. However, the rising growth of M2 (1.95%) from the same year to about 63.3% in 1992 increases the liquidity ratio further, thus maintaining an undulating growth from 1986 to 64.1% in 2000. Again, further rise in M2 growth from 13.5% in 2003 to about 64.4% in 2007 ensure that the falling liquidity performance of 52.9 in 2001 is raised to 55.7% in 2006 and 63.2% in 2013. As earlier stated on the wide variance of money supply growth, the liquidity ratio serves almost the same purpose. It serves to lubricate short term borrowings that the system has to meet in keeping the economy running financially. For instance, of the prudential limit set by the apex bank for the growth of liquidity performance at end 2016 to be 30%, the actual outcome exceeded that by 11.25% to 41.25%.

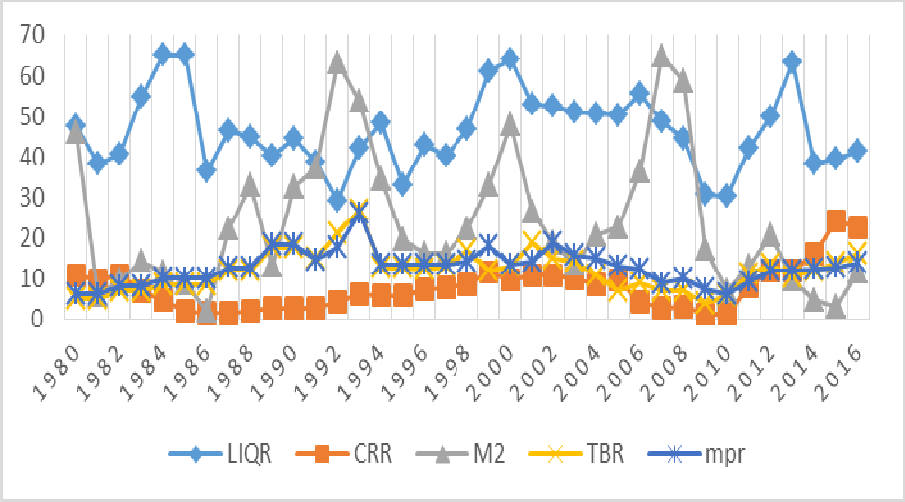

Figure 2.Liquidity performance and monetary policy conduct (1980-2016)

The behaviour of the banking system in terms of credit performance vis-a-vis the conduct of monetary policy between 1980 and 2016 is shown in figure 3. Here, the credit performance showed an upward trend of over 12% in 1980 to 47.4% in 1989 and maintained a much-smoothened growth from there to 45.2% in 1999.

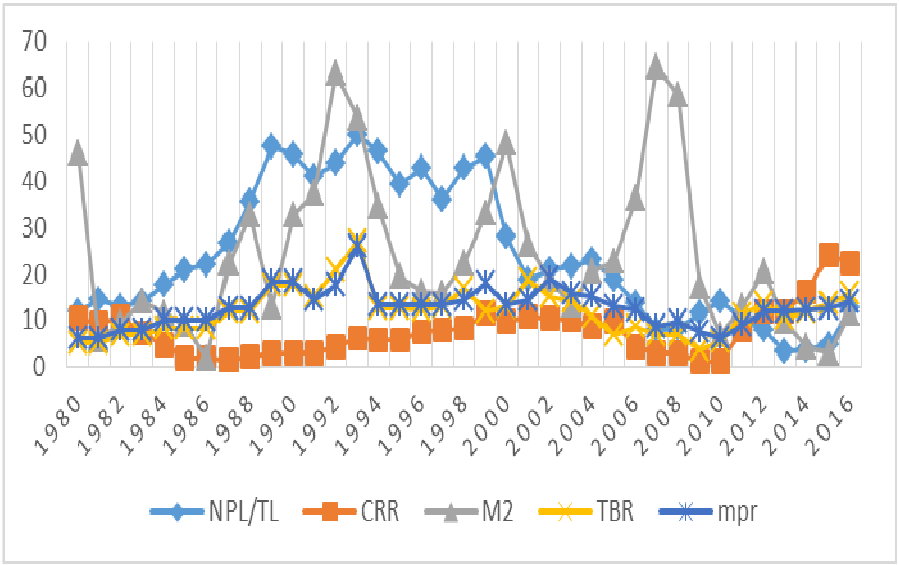

Figure 3.Credit performance and monetary policy conduct (1980-2016)

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However, beyond 1999, non-performing loans rate has maintained a continuous downward trend to about 23% in 2004 and further declined to 4.9% in 2015. It appears the credit performance become more yielding to the workings of monetary policy beyond 1999 up to 2016 following its downward trend.

More generally, certain factors may have accounted for the overall observed trends. First, the economy was adjusting to the full effect of the liberalized thinking enshrined in the World Bank/IMF's Structural Adjustment Programme (SAP) that actually began in 1986 in the banking sector. Hence, most of the policy variables took on ascending trend in the early periods. Second, because SAP was nascent to the banking sector, it produces discouraging outcomes, such as discouraging borrowing for investment. As a result, years following SAP were marked by monetary policy reversal. For instance, there were interest rate policy reversals between the years 1987 and 1996.

As Edirin and Ekwueme (2015) noted, these reversals created volatility in interest rate that exerted negative impact on investment and undermined the efficacy of policy operations and stability of the banking system. Again, the banking sector reforms of 2005 aimed at creating strong capital base for players in the industry may have accounted for the growing liquidity strength of the banking system and money supply. Finally, not to be forgotten so soon is the role of global financial crises in downsizing the world financial system. The ripple effect of the global financial meltdown on the Nigerian banking sector is well above one billion naira. It could be expected that these effects will produce lasting influences on the performance of the banking sector.

METHOD OF STUDY

MODEL SPECIFICATION

We specify our monetary policy-bank performance relationship in a vector autoregression (VAR) system as follows:

$$yt = Ƚ1\ yt\text{-}1 + \ldots.. + Ƚqyt\text{-}q + \beta xt + \mu t \qquad (1)$$

where $\mathbf{y_t}$ is a vector of endogenous variables, $\mathbf{x_t}$ is a vector of exogenous variables, $\mathbf{Ƚ_1 \ldots Ƚ_q}$ and $\boldsymbol{\beta}$ are matrices of coefficients to be estimated, and $\boldsymbol{\mu_t}$ is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables. VAR model treats every endogenous variable in a system as a function of the lagged values of all of the endogenous variables in the system. The vector autoregression (VAR) is used for forecasting systems of interrelated time series variables and for analyzing the dynamic impact of random disturbances on the system of variables. A VAR model is free of simultaneity bias since only the lagged values of the endogenous variables appear on the right-hand side of the equation. Estimates from VAR are consistent and efficient due partly to identical regressors and freedom from simultaneity bias.

In line with our Monetary Policy and Bank Performance consideration, we present our VAR model thus:

$$BP_t = \propto + \sum_{j=1}^{n} \delta_j BP_{t-j} + \sum_{j=1}^{n} \beta_j \ q_{t-j} + \mu_t \qquad (2)$$

Where BP_t is a measure of bank performance, be it profitability, liquidity stance or credit performance at time $_t$; q_t is a measure of monetary policy; and μ_t is the error term. Expanding equation (2) to cater for our specific interest produces the following set of equations.

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$$\pi_t = \alpha_3 + \sum_{j=1}^{n} \beta_j \ \pi_{t-j} + \sum_{j=1}^{n} \rho_j \ Mpr_{t-j} + \sum_{j=1}^{n} \delta_j Ms_{t-j} + \sum_{j=1}^{n} \gamma_j \ Crr_{t-j} + \sum_{j=1}^{n} \varphi_j \ Tbr_{t-j} + \sum_{j=1}^{n} \omega_j \ gdp_{t-j} + \sum_{j=1}^{n} \theta_j \ Inf_{t-j} + \ \varepsilon_{1t} \quad (3)$$

$$Liq_t = \alpha_3 + \sum_{j=1}^{n} \beta_j \ Liq_{t-j} + \sum_{j=1}^{n} \rho_j \ Mpr_{t-j} + \sum_{j=1}^{n} \delta_j Ms_{t-j} + \sum_{j=1}^{n} \gamma_j \ Crr_{t-j} + \sum_{j=1}^{n} \varphi_j \ Tbr_{t-j} + \sum_{j=1}^{n} \omega_j \ gdp_{t-j} + \sum_{j=1}^{n} \theta_j \ Inf_{t-j} + \ \varepsilon_{2t} \quad (4)$$

$$Cp_t = \alpha_3 + \sum_{j=1}^{n} \beta_j \ Cp_{t-j} + \sum_{j=1}^{n} \rho_j \ Mpr_{t-j} + \sum_{j=1}^{n} \delta_j Ms_{t-j} + \sum_{j=1}^{n} \gamma_j \ Crr_{t-j} + \sum_{j=1}^{n} \varphi_j \ Tbr_{t-j} + \sum_{j=1}^{n} \omega_j \ gdp_{t-j} + \sum_{j=1}^{n} \theta_j \ Inf_{t-j} + \ \varepsilon_{3t} \quad (5)$$

From equations (3) to (5), π_t is commercial bank's profitability index proxied by net interest margin; Liq_t is commercial bank's liquidity performance index proxied by the liquidity ratio of the banking system; Cp_t is credit performance of commercial banks proxied by Non-Performing loans to total loans ratio of the banking system; Mpr_t is Monetary Policy Rate; Ms_t is Money Supply; Crr_t is Cash Reserve Ratio; Tbr_t is Treasury Bill Rate; gdp_t is Gross Domestic Product; and Inf_t is Inflation rate; t is the time subscript; ε's are the error terms for each equation; and α, ρ, β, γ, δ, θ, ω, ϕ are the expected parameters. All the variables are expressed in percentages.[1]

DEFINITION OF VARIABLES AND SOURCES

- **NET INTEREST MARGIN (NIM):** This represents the gap between the interest income the bank receives on loans and securities and interest cost of its borrowed funds and represent the net income to the firm. The higher the net interest margin, the higher the banks profit and the more stable the banking system.
- **LIQUIDITY PERFORMANCE:** A Bank's liquidity position indicates the ability of the bank to live up to its liquidity requirements as demanded by the economy. It shows how effectively the banking system will service other sectors of the economy. This study used the liquid assets to deposit ratio as a proxy for liquidity performance of commercial banks. It shows the percentage of short term obligations that could be met with the bank's liquid assets on demand.
- **CREDIT PERFORMANCE:** Credit performance evaluates the risks associated with the bank's asset portfolio, that is, the quality of loans issued by the bank (Kumbirai and Webb, 2010). Banks fight as much as they could to reduce this risk to stay afloat in the system. Non-Performing loans to total loans ratio is used in our analysis, as a proxy for credit performance by commercial banks.
- **MONETARY POLICY MEASURES:** These are the instruments used by the monetary authorities to steer the economy in the desired direction.

[1]We acknowledge that equations (3) to (5) have six endogenous equations not specified here.

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Among the instruments used in this study are money supply, monetary policy rate (MPR), Treasury bill rate (TBR), and Cash Reserve Ratio (CRR).

- **CONTROL VARIABLES:** The Gross Domestic Product (GDP) and inflation rates were used as control variables. The performance of the banking system largely depends on the performance of the aggregate economy. Also, inflation is believed to exert a negative influence on the banking sector due to asymmetric information problem.

All our dataset for the study runs from 1980 to 2016 and was obtained from the Central Bank of Nigeria Statistical Bulletin.

A priori, we expect MPR, TBR and CRR to maintain negative relationships with profitability, liquidity and credit performances of commercial banks.

PRESENTATION OF EMPIRICAL RESULTS

Our analysis began with the determination of the functional forms of the relationships between monetary policy and bank performance in Nigeria. The results reported on Tables A4, A5 and A6 at appendix showed that the various bank performance indices to monetary policy conduct in the country were dissimilar. For instance, the functional form of the relationship between bank profitability and monetary policy was semi log; the functional form of the relationship between commercial bank liquidity performance and monetary policy was double-log; while the functional form of the relationship between commercial bank credit performance and monetary policy was simply linear.

We also considered the descriptive properties of the variables. As shown on Table A1 at the appendix, most of our variables were multivariate normal. The basic idea behind normality check is that a normal distribution (with any mean or variance) has a skewness coefficient of zero, and a kurtosis coefficient of three. Checking our variables, only the liquidity ratio of the banking system showed evidence of non-normality that should be interpreted with caution. All the variables were positively skewed except the control variable GDP.

Next, we investigated the stationarity properties of the variables. The result, reported on Table 2 showed that of the different test methods used (Dickey Fuller GLS (ERS); Augmented Dickey Fuller and Philips-Perron), liquidity ratio, money supply and gross domestic product's growth rate were stationary at level whereas other variables (net interest margin, non-performing loans to total loans, monetary policy rate, cash reserve ratio, inflation rate and treasury bill rate) exhibited various levels of stationarity not exceeding first difference. All the variables were accepted at 5 percent level of significance.

Having satisfied with the stationarity properties of the variables, we consider the lag length to be included in the model. We followed Ekong and Ekong (2017) and Bjørnland (2000) on the importance of this exercise. Improper lag specification leads to loss of valuable information inherent in our variables, thus making our estimates ill-best. Our lag selection criteria result for commercial bank profitability-monetary policy nexus, reported on Table 3 shows that key selection criteria indices favoured lag of order one.[2]

[2]The lag selection results for other bank performance indices are reported on the appendix.

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Table 2.Unit root test

Variables	ADF	PP	DF GLS
Crr	-0.9542	-1.0222	-1.5881
ΔCrr	-3.2662**	-4.6444*	-2.7704*
Nim	-2.2985	-2.2135	-2.0444**
ΔNim	-8.8212*	-8.8212*	
Mpr	-2.9478**	--2.8515	-2.3147**
ΔMpr		-7.6817*	
Liqr	-3.6113**	-3.4177**	-3.6632*
Infla	-1.2673	-2.9552**	-1.2876
Δinfla	-5.5796*		-5.4707*
Tbr	-2.6785	-2.5709	-2.2346
ΔTbr	-5.7522*	-7.0146*	-5.8390*
Ms	-3.6294**	-3.1967**	-3.3361*
Npl/Tl	-1.1457	-1.1457	-1.0836
ΔNpl/Tl	-4.4177*	-4.2496*	-4.1864*
rgdp	-3.7906*	-39363*	-3.8446*

Note:*,** indicates Stationarity of Variables at 5 and 1 percent level of significance
*Δ*is the first difference operator

The lag selection criteria for monetary policy-commercial banks liquidity performance were mixed. While the SIC suggest no lag for the relationship, both the AIC and HQ (and other criteria not reported here) suggest lags of order three. When both suggestions were experimented, the AIC and HQ suggestions were more preferred. The similar situation was also noticed for the credit performance relationship and under statistical experiment, the suggestion by SIC was preferable and hence adopted for further investigation.

Table 3.VAR lag order selection criteria Included Variables: log(nim), mpr, M2, Crr, Tbr, rgdp, infl.

Lag	SIC	AIC	HQ
0	40.6815	40.3704	40.4778
1	40.2681*	37.7795*	38.6386*
2	42.4653	37.7992	39.4099

* indicates the lag order selected by the criterion

THE IMPULSE RESPONSE OF THE VARIABLES

An impulse response function in a VAR system traces all the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. The impulse response functions reported on Table 4 suggest that a one-time policy rate shock on commercial banks' profitability produces positive (albeit small in magnitude) but statistically insignificant effects which appear 1 period after the shock and grow marginally to the fifth period. However, beyond the fifth period, the positive effect grew at a declining rate until the tenth period and statistically insignificant. Similarly, a one-time shock on the growth of money supply produces marginally insignificant negative effect on commercial bank's profit margin that appears one period after the shock up until the ninth period. At the tenth period, the marginal insignificant effect was positive. A nearly similar negative effect was also produced by the cash reserve ratio of the apex bank. A one- time shock on the macro

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economy as proxied by the growth of GDP and inflation also produces positive but insignificant effect on the profit margin of commercial banks that appear one period after the shocks to the tenth period. A one-time shock to innovations in Treasury bill rate produces positive but insignificant response on the profit of commercial banks after 2 periods of shock until the tenth period.

Table 4.Accumulated Response of Log nim to Policy Variables

Period	Log nim	Mpr	M2	Crr	Tbr	rgdp	Infl
1	0.573269	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	(0.06756)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.930577	0.040048	-0.023472	-0.037691	0.094872	0.061188	0.013552
	(0.14009)	(0.06906)	(0.07841)	(0.06470)	(0.10471)	(0.08130)	(0.08554)
3	1.171900	0.097816	-0.062417	-0.093115	0.155371	0.110975	0.036651
	(0.22804)	(0.13802)	(0.16326)	(0.14955)	(0.19302)	(0.14775)	(0.16191)
4	1.331627	0.154611	-0.093003	-0.155471	0.181154	0.147559	0.070766
	(0.31839)	(0.20383)	(0.24036)	(0.25594)	(0.27059)	(0.20278)	(0.22180)
5	1.431107	0.209700	-0.106957	-0.225306	0.192835	0.170877	0.104650
	(0.40278)	(0.26645)	(0.30464)	(0.37516)	(0.34068)	(0.24760)	(0.26920)
6	1.488494	0.263564	-0.104824	-0.302206	0.200327	0.181206	0.131773
	(0.47602)	(0.32508)	(0.35736)	(0.49983)	(0.40301)	(0.28303)	(0.30640)
7	1.517647	0.315580	-0.089702	-0.384348	0.207692	0.180458	0.150627
	(0.53675)	(0.37984)	(0.40238)	(0.62530)	(0.45681)	(0.31144)	(0.33528)
8	1.528282	0.365060	-0.065002	-0.469696	0.216861	0.171181	0.161837
	(0.58598)	(0.43142)	(0.44368)	(0.74897)	(0.50248)	(0.33554)	(0.35788)
9	1.527001	0.411627	-0.033752	-0.556429	0.228583	0.155772	0.166693
	(0.62572)	(0.48054)	(0.48415)	(0.86954)	(0.54142)	(0.35757)	(0.37607)
10	1.518232	0.455164	0.001602	-0.643032	0.242847	0.136212	0.166596
	(0.65830)	(0.52776)	(0.52542)	(0.98647)	(0.57537)	(0.37903)	(0.39137)

Source: Authors' computation

However, a one-time shock on the profit margin of commercial banks by its own innovations produces positive and statistically significant impact on the profitability of the banks from the first period to the tenth period. While the strength of the effect will be stronger from one to the eighth period, it will however decline thereafter.

In the case of liquidity performance, a one-time shock on policy rate reinforces positive significant impact on the liquidity performance of commercial banks in Nigeria that appear one period after the shock up until the third period (Table: 5). Beyond this point, the effect of policy rate on liquidity performance of banks will be positive, but not significant.

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Table 5.Accumulated Response of Liquidity performance to Policy Variables

Period	Liqr	LogMpr	LogM2	LogCrr	LogTbr	Logrgdp	Log π
1	8.534036	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	(1.03490)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	11.58828	4.735761	0.984305	0.547572	-1.496329	-2.838989	0.450379
	(2.93410)	(2.30212)	(2.26104)	(2.14018)	(1.86563)	(1.86917)	(1.47618)
3	11.19614	5.441369	-1.305986	3.156698	-1.493276	-2.125008	0.131198
	(4.73258)	(3.77746)	(3.30164)	(3.19634)	(3.02013)	(3.03278)	(2.73136)
4	8.190213	4.205267	-2.410272	2.183620	-1.173689	-0.074028	-0.850796
	(5.77910)	(4.38006)	(3.74577)	(3.71735)	(3.53775)	(3.48965)	(3.59284)
5	5.406319	2.193846	-5.453108	3.593775	-0.436800	1.367884	-1.882544
	(5.81375)	(4.44357)	(4.15896)	(3.68491)	(3.76517)	(3.76634)	(3.71184)
6	6.467416	1.158212	-6.537668	6.560726	2.386521	3.861728	-2.011668
	(5.95954)	(4.79765)	(4.95398)	(4.15224)	(4.13526)	(4.14065)	(3.55574)
7	9.282526	0.242942	-8.292183	9.369314	3.806190	4.086911	-1.402820
	(6.75545)	(5.30874)	(5.74747)	(4.84913)	(4.63300)	(4.67808)	(3.56822)
8	10.09066	0.817950	-8.734936	9.438346	4.137725	4.696428	-1.477848
	(8.04898)	(6.04913)	(6.31530)	(5.67643)	(5.23268)	(5.38837)	(4.18472)
9	8.901964	0.784381	-8.473856	8.146564	3.981412	6.550845	-2.495883
	(9.03200)	(6.52419)	(6.70166)	(6.03336)	(5.52296)	(5.99561)	(4.81110)
10	8.123658	-0.663740	-6.888527	6.505414	3.481937	7.642092	-3.240234
	(9.65701)	(6.78292)	(6.94712)	(6.22669)	(5.86418)	(6.59018)	(5.15253)

Source: Authors' computation

Equally, a single shock on money supply produces insignificant positive impact on liquidity performance after one period only. From the third period onward, the impact of money supply on liquidity performance will be negative and insignificant. In sharp contrast to duo, a one-time shock on cash reserve ratio produce undulating insignificant positive impact on the liquidity performance of commercial banks that will transform to a positive significant effect after sixth period, even at a declining positive impact until the tenth period. Treasury bill rate had negative non-worthy statistical influence on liquidity performance of banks in Nigeria.

The response function of credit performance to monetary policy is presented in Table: 6.

Table 6.Accumulated Response of Credit performance to Policy Variables

Period	NPL_TL	Mpr	M2	Crr	Tbr	rgdp	π
1	5.200707	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	(0.61291)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	9.978434	-0.511879	-0.228072	0.035843	2.730333	0.035063	1.002354
	(1.32383)	(0.93061)	(0.82209)	(0.79531)	(1.01283)	(0.67451)	(0.78320)
3	14.37785	-1.310499	-0.321277	-0.478051	5.489047	-0.073329	2.343121
	(2.20546)	(2.17739)	(1.91779)	(1.89303)	(2.22307)	(1.45213)	(1.85735)
4	18.40976	-2.102261	-0.119161	-1.614802	7.719955	-0.374862	3.681260
	(3.21335)	(3.59207)	(3.13935)	(3.37473)	(3.52267)	(2.27522)	(3.03566)
5	22.10900	-2.777914	0.406578	-3.265474	9.399130	-0.825046	4.846341

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	(4.35352)	(5.03182)	(4.35871)	(5.22043)	(4.86195)	(3.06330)	(4.15920)
6	25.53610	-3.330860	1.194998	-5.314576	10.58394	-1.374967	5.774746
	(5.63208)	(6.41587)	(5.52031)	(7.37564)	(6.24246)	(3.79661)	(5.17207)
7	28.75457	-3.794881	2.164457	-7.665945	11.35259	-1.990936	6.476755
	(7.04989)	(7.72216)	(6.63558)	(9.78243)	(7.67564)	(4.48799)	(6.08742)
8	31.81680	-4.206700	3.249021	-10.24336	11.78804	-2.652970	6.996743
	(8.60521)	(8.96402)	(7.74685)	(12.3966)	(9.16704)	(5.16078)	(6.94398)
9	34.76074	-4.591409	4.406292	-12.98762	11.96654	-3.349207	7.383456
	(10.2962)	(10.1672)	(8.89549)	(15.1910)	(10.7149)	(5.83664)	(7.77833)
10	37.61235	-4.961813	5.611979	-15.85325	11.95132	-4.071594	7.676077
	(12.1223)	(11.3557)	(10.1080)	(18.1524)	(12.3132)	(6.53125)	(8.61388)

Source: Authors' computation

As the results show, monetary policy rate, money supply and the cash reserve ratio were very effective in improving the credit performance of commercial banks in Nigeria. These policies were effective in reducing loan losses in the system, even though their effects were non-significant statistically. However, a single shock on Treasury bill rate was shown to reduce the credit performance of the banking system and statistically significant from the third period onward to the seventh period and insignificant thereafter to the tenth period even though still positive.

VARIANCE DECOMPOSITION

The variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR. It shows the proportion of forecast error variance for each variable that is attributable to its own innovation and to innovations in the other endogenous variables. As reported on Table 7, past profits of commercial banks contributed the largest share to the profit margin of commercial banks in recent times, up to 84 % in the ten-point period. The monetary policy rate contributes slightly above 3 % to the innovations in commercial banks profit. The cash reserve ratio of the apex bank ensures that at least 7% of profit to the commercial banks is maintained in a decade pointer and Treasury bill rate only 2%. Elsewhere, the stability of the economy only ensures that less than 2% returns to the banking system as profit in the period.

Table 7.Variance Decomposition of Log nim

Period	S.E.	Log nim	Mpr	M2	Crr	Tbr	rgdp	Infl
1	0.573269	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.687612	96.50947	0.339207	0.116522	0.300460	1.903649	0.791851	0.038845
3	0.738678	94.29998	0.905534	0.378943	0.823325	2.320336	1.140432	0.131448
4	0.763134	92.73350	1.402298	0.515680	1.439057	2.288143	1.298328	0.322990
5	0.776019	91.32306	1.860069	0.531030	2.201511	2.235452	1.345863	0.503010
6	0.784357	89.92696	2.292339	0.520539	3.116174	2.197298	1.334739	0.611952
7	0.791302	88.49126	2.684381	0.547960	4.139303	2.167564	1.311505	0.658029
8	0.798066	87.01522	3.023462	0.634503	5.213114	2.144174	1.302877	0.666649
9	0.804971	85.52922	3.306469	0.774374	6.285009	2.128754	1.317268	0.658902
10	0.811964	84.07383	3.537263	0.950674	7.314819	2.123103	1.352704	0.647602

Source: Authors' computation

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The variance decomposition result for the liquidity performance of commercial banks is reported on Table 8. Our result shows that the monetary policy rate contributed to about 19% of the innovations in liquidity performance in the 2 period and its contribution will not be less than 13% at the tenth period; the contribution of money supply to innovations in commercial banks' liquidity performance is approximately 10% over the period; the cash reserve policy contributes cumulatively at least 12% to innovations in liquidity performance over the period, while slightly above 5% is attributed to innovations from treasury bill rate. Surprisingly, economic activities supported the liquidity behaviour of commercial banks by more than 10% in the entire period.

Table 8.Variance Decomposition of Liquidity Performance

Period	S.E.	LIQR	LogMpr	LogM2	LogCrr	LogTbr	Logrgdp	Log π
1	8.534036	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	10.78684	70.60932	19.27484	0.832666	0.257687	1.924267	6.926894	0.174328
3	11.38737	63.47691	17.67943	4.792303	5.481027	1.726668	6.608679	0.234991
4	12.15217	61.85710	16.55882	5.033845	5.454036	1.585335	8.651522	0.859339
5	13.20625	56.82039	16.34074	9.571162	5.758316	1.653708	8.517677	1.337997
6	14.17003	49.91470	14.72766	8.899293	9.385739	5.406301	10.49582	1.170482
7	14.93170	48.50671	13.63919	9.395228	11.99062	5.772788	9.475082	1.220379
8	14.98757	48.43648	13.68489	9.412582	11.90352	5.778762	9.569963	1.213804
9	15.24066	47.44943	13.23463	9.131898	12.22985	5.598943	10.73525	1.620012
10	15.56219	45.75915	13.55931	9.796220	12.84185	5.472990	10.78794	1.782541

Source: Authors' computation

The Variance Decomposition of Credit Performance to monetary policy reported on Table 9 shows that the ripple effect of bad loans will continue to weaken the credit performance capability of commercial banks in Nigeria. Own contributions to loan loss will not be less than 64% over a ten-point period. More than that, the cash reserve ratio contributed nearly 16% to the improved credit performance of commercial banks over the period. The combine contributions of monetary policy rate and money supply to credit performance by the banking system will be very marginal, only 3% in the entire time horizon. However, the contribution of treasury bill rate in growing loan loss will be greatly felt in the economy, more than 10% over the period.

Table 9.Variance Decomposition of Credit Performance

Period	**S.E.**	**NPL_TL**	**Mpr**	**M2**	**Crr**	**Tbr**	**Rgdp**	**π**
1	5.200707	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	7.658330	85.03669	0.446753	0.088690	0.002191	12.71052	0.002096	1.713067
3	9.398689	78.37054	1.018633	0.068720	0.300415	17.05458	0.014692	3.172422
4	10.64942	75.37707	1.346177	0.089546	1.373400	17.67230	0.091615	4.049890
5	11.61601	73.49607	1.469785	0.280110	3.173672	16.94323	0.227201	4.409932
6	12.42462	71.84932	1.482763	0.647506	5.493977	15.71899	0.394490	4.412960
7	13.14826	70.15004	1.448588	1.121846	8.104065	14.37809	0.571735	4.225639
8	13.82539	68.35278	1.398895	1.630047	10.80516	13.10340	0.746404	3.963318
9	14.47385	66.50223	1.347002	2.126553	13.45351	11.97077	0.912411	3.687524
10	15.10081	64.66074	1.297640	2.591120	15.96071	10.99750	1.067064	3.425232

Source: Authors' computation.

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MODEL STABILITY CHECK

An estimated VAR is said to be stable if and only if all the inverse roots of the autoregressive polynomial have modulus less than one and lie inside the unit circle. A non-stationary VAR produces results whose standard errors are not reliable and as such may lead to misleading inferences. As reported on Table 10, we cannot reject the hypothesis that all our VAR models were stable and the results reliable as no roots lies outside the unit circle.

Table 10.VAR Stability Test Endogenous Variables: nim, liqr, npl/tl, mpr, crr, m2, tbr, rgdp, π, Lag order: 1 1; 1 3; 1 1

Profitability Model		Liquidity Model		Credit Model	
Root	**Modulus**	**Root**	**Modulus**	**Root**	**Modulus**
0.9363	0.9363	0.8914	0.9776	0.9925	0.9925
0.7258	0.7258	0.8914	0.9776	0.7604	0.7604
0.5523	0.5552	0.8175	0.8732	0.4430	0.5636
0.5523	0.5552	0.8175	0.8732	0.4430	0.5636
0.2467	0.2468	0.3109	0.8712	0.5185	0.5185
0.0752	0.2441	0.3109	0.8712	0.0852	0.0876
0.0752	0.2441	0.8525	0.8525	0.0852	0.0876

Source: Authors' computation

Note: Only AR roots of lag 1 was reported for liquidity model even when other lags were also stable.

DISCUSSION AND CONCLUSION

The foregoing analysis showed that monetary policy can influence the workings of the commercial banking system variously. Evidence showed that the profitability of commercial banks improved in the review period mainly through the conduct of policy rate and the Treasury bill operation of the banking system. We also found that economic environment favoured the profit growth of commercial banks over the period. These findings suggest that a good mix of policy instruments can enhance a good return on investment to the banking system. The cash reserve ratio did not grow commercial banks profit even though not statistically significant.

The conduct of monetary policy was very successful in protecting the credit activities of the commercial banking system. As the results show, monetary policy rate, money supply and the cash reserve ratio were very effective in improving the credit performance of commercial banks in Nigeria. These policies were effective in reducing loan losses in the system, even when their effects were not statistical significant. In the credit risk test conducted by the CBN at end 2016, their result suggested that policy regulation was successful in mitigating credit risk in Nigeria as the banking system was shown to be able to withstand the prevailing NPLs rates (CBN, 2016). In the case of liquidity performance, we found that both policy rate and money supply movement produce positive impact on the liquidity performance of commercial banks at varied capacities. The positive impact will not be a once off event. Hence continuous checks and balances are needed to mitigate risk contagion in the system.

The outcome of our study gives a sound guide for monetary policy implementation for financial sector stability in Nigeria. We noted that throughout the study period, monetary policy rate (MPR) proves to be very effective in maintaining banking system stability by meeting its apriori expectations. This shows that effective monetary policy implementation in Nigeria should concentrate on manipulating

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interest rates policy variables (or more precisely the MPR) in managing banking system soundness. This means that the MPR should be the dominant policy tool in the monetary policy tool kit. Other policy tools may be effective at various levels and targets.

Evidence also showed that the use of one policy instrument can be effective for some commercial banks performance objective and detrimental to others. This was found in the case of Treasury bill rate and money supply growth. Hence, we recommend caution in the use of these policies as it could produce undesirable outcomes in other areas. Overall, we posit that monetary policy conduct was effective in enhancing commercial banks performance in Nigeria. The economic implication of our analysis is that monetary policy is still relevant in managing the financial system for higher service delivery to the general macroeconomy.

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APPENDIX

Table A1.Descriptive Properties of the Variables

Variables	NIM	LIQR	NPL_TL	MPR	M2__	CRR	TBR	RGDP	INFLATION
Mean	10.88649	46.25946	23.97838	12.73892	24.08486	7.624324	11.83838	3.915405	20.31919
Median	8.400000	45.00000	20.90000	12.70000	19.41000	7.500000	12.00000	5.000000	12.50000
Maximum	24.62000	65.10000	50.00000	26.00000	64.92000	24.00000	26.90000	11.00000	76.80000
Minimum	1.660000	29.10000	3.200000	6.000000	1.950000	1.000000	3.720000	-13.00000	3.600000
Std. Dev.	6.677885	9.605213	14.72485	4.174594	17.18474	5.403363	4.906989	4.730855	18.23881
Skewness	0.321707	0.336860	0.402783	0.701144	0.932498	1.200108	0.731463	-1.384471	1.671516
Kurtosis	1.774020	2.562538	1.742304	4.189142	2.949119	4.661120	3.828863	5.917664	4.715672
Jarque-Bera	2.955389	0.994794	3.439048	5.211557	5.366235	13.13556	4.358545	24.94387	21.76740
Probability	0.228163	0.608111	0.179151	0.073846	0.068350	0.001405	0.113124	0.000004	0.000019
Sum	402.8000	1711.600	887.2000	471.3400	891.1400	282.1000	438.0200	144.8700	751.8100
Sum Sq. Dev.	1605.389	3321.364	7805.563	627.3804	10631.34	1051.068	866.8273	805.7157	11975.56
Observations	37	37	37	37	37	37	37	37	37

Table A2.VAR lag order selection criteria
Included Variables: Liqr log (mpr) log (M2)
Log (Crr) log (Tbr) log (gdp) log (infl)

Lag	SIC	AIC	HQ
0	19.5544*	19.2401	19.3473
1	19.5843	17.0703	17.9276
2	20.9063	16.1925	17.8000
3	21.3822	14.4687*	16.8264*

* indicates the lag order selected by the criterion

Table A3.VAR lag order selection criteria
Included Variables: Npl/Tl, mpr, M2, Crr, Tbr, rgdp, infl.

Lag	SIC	AIC	HQ
0	45.8801	45.5658	45.5730
1	44.6129*	42.0989	42.9562
2	47.2728	42.5590	44.1666
3	45.4482	38.5347*	40.9824*

* indicates the lag order selected by the criterion

Table A4.Model selection test for profit performance
Dependent Variable: Nim

Variables	Linear	Double log	Semi log	Exponential
Mpr	0.7421	0.6077	0.0556*	8.1631*
Ms	0.0726*	0.2357*	0.0092*	1.8826*
Crr	0.0290	0.2197	0.0146	1.3889
Tbr	-0.4849	-0.5408	-0.0391*	-6.7090
Gdp	0.2317	0.0403*	0.0328	0.3115
Inf	-0.1264*	-0.2159	-0.0130*	-1.8814
C	6.8818*	1.2916	1.7173	2.5037
R^2	0.43	0.26	0.71	0.24
Adj R^2	0.36	0.11	0.62	0.19

Note: * indicate variable significance at 5 percent

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Table A5.Model selection test for liquidity performance

Dependent Variable:Liqr

Variables	Linear	Double log	Semi log	Exponential
Mpr	1.4723*	0.2210*	0.0328*	10.5742
Ms	0.0742	0.0614*	0.0017	2.6468*
Crr	0.2197	0.0735*	0.0061	2.8994
Tbr	-1.2126*	-0.1541	-0.0266*	-7.5933
Gdp	-0.1396	-0.0019	-0.0026	-0.1161
Inf	-0.1075	-0.0776*	-0.0023	-3.4967*
C	14.1287*	3.5410*	3.6783*	13.2038*
R^2	0.51	0.72	0.61	0.50
Adj R^2	0.42	067	0.40	0.39

Note: * indicate variable significance at 5 percent

Table A6.Model selection test for credit performance

Dependent Variable: Npl

Variables	**Linear**	**Double log**	**Semi log**	**Exponential**
Mpr	2.0808*	1.1974*	0.0993*	25.3338*
Ms	-0.0400*	0.1715	-0.0027	2.7946
Crr	-1.2134*	-0.4630*	-0.0759*	-8.1395*
Tbr	0.3184	0.1047	0.0075	5.0446
Gdp	-0.5363*	-0.0510*	-0.0357*	-0.8849*
Inf	0.1498*	0.1522	0.0053	2.9768
C	2.9728*	-0.1840	2.2710*	-49.5736*
R^2	0.70	0.60	0.62	0.67
Adj R^2	0.64	0.52	0.54	0.61

Note: * indicate variable significance at 5 percent

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