Monetary Policy and Bank Credit in Nigeria: A Toda-Yamamoto Approach

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Abstract: The importance of money in economic life has made policy makers and other relevant stakeholders to accord special recognition to the conduct of monetary policy. This study investigated the relationship that exists between monetary policy instruments and Deposit Money Banks Loans and Advances in Nigeria. An annual time series data covering a period of 36years from 1981-2016 were sourced from Central Bank of Nigeria and used for the study. The relationship between monetary policy and credit creation of Deposit Money Banks was captured by monetary policy variables and structural changes in monetary policy. The study employed Toda and Yamamoto granger non-causality model to examine the relationship existing between Deposit Money Banks loan and advances and monetary policy variables in Nigeria. The findings revealed that structural changes in monetary policy system exerted positive significant impact on loan and advances of Deposit Money Banks in Nigeria. Findings also revealed bidirectional relationship existing between MPR and loan and advances of Deposit Money Banks in Nigeria. Precisely, MPR proved to be a significant variable which causes Deposit Money Bank loans and advances in Nigeria. The other explanatory variables; broad money supply (LM2),liquidity ratio (LR), inflation rate (IFR) and cash reserve ratio (CRR) does not granger cause loan and advances of Deposit Money Banks in Nigeria within the study period. The study concluded that the structural change in monetary policy system and monetary policy rate have significant impact on loan and advances of deposit money banks in Nigeria .Hence, the study recommended that monetary authority should formulate policies that will stabilize interest rate so as to boost the investors' confidence.

Keywords: Bank Credit; Monetary Policy; TY Approach

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1. Introduction

Monetary policy is a deliberate action of the monetary authorities to influence the quantity, cost and availability of money and credit in order to achieve desired macroeconomic objectives of internal and external balances. This is a precise steps taken by the Central Bank (Monetary Authority) to control the value, supply and cost of money in the economy with a view to achieving targeted macroeconomic objectives (CBN), 2011; 2013). This action is implemented through the apex bank by varying money supply or interest rates with the aim of regulating as well as controlling the quantity of money in the economy. Money play an important role in any economy and this has made policy makers and other relevant stakeholders to accord special attention to the conduct of monetary policy.

The financial system of an economy is made of institutional arrangements designed to transform savings into investments through channeling of funds from surplus sectors to deficit sectors in the economy. These institutional arrangements are determined by legal framework which consists of rules and regulations which governed the bank's financial practices and hence, determine the flow of financial resources (Obadeyi, Okhiria & Afolabi, 2016). The banking industry is a subsystem of the financial system and has vital role in the transmission of monetary policy actions to the economy (Jegede, 2014).

Monetary policy is essential to the environment within which banks operations are carried out and it can either enhance the banking activities or constrain on the activities of the industry (Udeh, 2015). Monetary policy and deposit money banks are inextricably linked together and the assessment of the banking system (particularly in the area of loans and advances) can be evaluated through the performance of monetary policy tools (Jegede, 2014). The way at which banking industry credits react to changes brought by the monetary policy is of interest as the changes in monetary policy tools affect the effectiveness and efficiency of the industry (Jordi, David & Javier, 2002). There is no doubt that bank lending plays a special part in the monetary transmission mechanism and changes in the willingness and ability of banks to extend credit may have implications for aggregate economic activity (Ubi, Lionel & Eyo 2012). Banking institutions like other businesses operate for the paramount motive of making profit for all stakeholders. Hence, the more loans and advances they extend to borrowers, the more the profit they make (Solomon, 2012). Prior to the Structural Adjustment Programme of 1986, selective credit controls, administered interest and exchange rates, credit ceilings, cash reserve requirements and special deposits were used to regulate the banking system. The fixing of relatively low interest rates was done purposely to enhance investment and growth. Sometimes, special deposits were imposed on banks to reduce the amount of excess reserves and their credit creating capacity (Jegede, 2014).

Ajie and Nenbee (as cited in Jegede, 2014) observed that banks are influenced by the Central Bank of Nigeria through its various monetary policy tools. Some of these tools include; liquidity ratio, cash reserve requirement and open market operations. All these activities affect the banks in their operations and thus influence the cost and availability of funds for loans and advances. Thus, monetary policy instruments are critical to the supply of reserves held by financial institutions and consequently on availability of credit. Therefore through these instruments, Central Banks are expected to influence the rate of growth of the money supply, the level of interest rate, security prices, credit availability and liquidity creation from the banks. However, this assumption needs empirical investigation because, the credit of deposit money banks to private sectors rose from N10,660.07 billion in 2011 to N18,674.15 billion in 2015 in spite of the adjustment carried out on the monetary policy instrument during that period. It is in the light of this that this study raised the following research question: to what extent does various monetary policy instruments such as (Money Supply, Monetary Policy Rate, Liquidity and Cash Reserve Ratio) influence deposit money bank credit proxy using loans and advances?

The broad objective of this study therefore is to examine the relationship between monetary policy tools and deposit money banks credit in Nigeria. While specifically, the study seeks to assess the effect of various monetary policy tools which are money supply, interest rate, liquidity and cash reserve ratio on deposit money bank credit in Nigeria. This study is restricted to examine the relationship between monetary policy instruments and deposit money bank credit in Nigeria for the period of thirty six (36) years ranging from 1981-2016.The choice of this period was meant to reflect and capture many periods of direct and indirect monetary policy regulations.

Several empirical studies such as: Ubi, Lionel and Eyo (2012), Ajayi and Atanda, (2012), Agbonkhese and Asekome, (2013), Jegede (2014), Udeh (2015) and so on, have been carried out on either the impact of monetary policy on performance of the banking sector or sectoral loan and advance, both within and outside Nigeria. However, this study is different from other studies because it looked at the effect of the direct and the indirect period of monetary policy (structural changes) on the deposit money banks credit in Nigeria. Furthermore, this study examined the relationship between monetary policy instruments and loan/advances of deposit money banks with the use of Toda-Yamamoto (T- Y) procedure which appear non-existent in previous studies. This study will contribute to the existing literatures on monetary policy and further serve as a reference point for future studies in this area by other researchers. This study will assist the regulatory authorities in ways by which monetary policy tools can be used to attain the desired policy target. Researchers and students in the field of finance who may want to carry out further research in this area of study may find this work very useful. Finally, this study will also be of help to CBN as the chief superintendent of the financial system to ensure proper management of money supply and other macro-economic variables.

This study is divided into five sections: introduction, literature review, which consist of conceptual issues, theoretical framework and empirical evidence as section two, section three presented the methodology adopted in analyzing the relationship between the selected monetary policy instruments and bank credit and data analysis techniques employed in the study while last two sections constitute the result and discussion of findings and the conclusion and recommendations.

2. Literature Review

Conceptual Issues

monetary policy deals with the discretionary control of money supply by monetary authority (CBN) and fiscal authority in an attempt to attain the desired economic goals (Nuhu, 2015). Monetary policy is regarded as an effective "economic stabilizer" that is frequently applied to determine, regulate, control the quantity of money, cost availability, and influence the direction of money and lending within an economy purposely to achieve some specified macro-economic policy focus which include increased employment, balance of payment equilibrium and sustainable economic growth and development (Obadeyi, Okhiria Adebimpe & Afolabi, 2016). Therefore, monetary policy are those actions of monetary authority purposely designed to influence the behavior of the monetary sector (Jordi, David & Javier, 2002; Philip & Jonathan, 2010; Obiakor, Falaiye & Owolabi, 2011; Ajayi & Atanda, 2012). Monetary policy is mainly a series of actions taken by monetary authorities especially (CBN), to either increase or decrease the supply of money in the circulation and the flow of credit in order to achieve targeted macro-economic objectives (Dwivedi, 2005). Monetary policy as explained by Ogunjimi (1997) is a form of Government's efforts to manage the money in its economy so as to realize specific economic goals. He further came up with three basic kinds of monetary policy decisions, which are: the amount of money in circulation, the level of interest rate and the functions of credit markets and the banking system.

The formulation and implementation of monetary policy is the primary focus of the Central Bank of Nigeria (CBN), as spelt out in the Central Bank of Nigeria Act 1958. The act has gone through different amendment and the 2007 Act still retained the power for formulation and implementation to Central Bank of Nigeria. The monetary policy in Nigeria has gone through different facet since 1958 when the formulation started. From 1959-1973, Nigeria operated exchange rate target, the Nigerian Pound in use was pegged against the British pound in line with widespread world economic conditions and indicators at that time. Along with exchange rate policy, CBN embarked on direct monetary target policy which lasted till 1986 and used credit ceiling, selective credit, unchanged cash reserve ratio as instruments (CBN, 2011). Indirect control of monetary policy was introduced in 1986 along with the short term

monetary policy horizon and this led to deregulation of interest rate, rationalization of sectoral credit controls, and abolition of all mandatory credit allocation mechanisms and review of cash reserve ratio. The medium-term monetary policy horizon was introduced in 2002 and is in operation till–date (CBN, 2013).

There are basically two kinds of monetary policy, which are expansionary and contractionary. An expansionary monetary policy is used whenever the monetary authorities decides to increase the supply of money or reduce the cost of money in the economy so as to stimulate an increase in economic activities and also to overcome depression, recession and deflationary gap (Nuhu, 2015). This can be attained with the act of buying securities in the open market, interest and discount rates reduction, reduction in reserve requirements, and relaxing of credit controls, among others. The overall impact of expansionary monetary policy is to ensure more money is in the hands of the general public. This will lead to an increase in aggregate demand, investment, savings, employment, output and economic growth, while at the same time increasing the rate of inflation. Contractionary monetary policy is opposite of an expansionary policy. A monetary policy is said to be contractionary or tight when the monetary authorities embark on policies that will reduce the volume of money supply or increase the cost of money in economy, in other to generate a contraction in economic activities. The impact of contractionary policies is to reduce the general price level and curb inflation which will equally lead to a reduction in the level of investment, employment, output and economic growth (Adegbola, Fadipe & Olajide-Arise, 2015). The regulatory authorities may switches from contractionary to expansionary policies as the need arises depending on the economic objectives, which she is giving priority. The monetary policy adopted in Nigeria has been changing from one regime to another.

Selected Instruments of Monetary Policy

Cash Ratio: This is the proportion of total deposit liabilities which the deposit money banks and other financial institutions are expected to keep as cash with the Central Bank Nigeria (CBN) (Udeh, 2015). It is the statutory cash reserves that banks are to keep with the CBN and this cash ratio was designed to help rescue the liquidity of the banks and hence control the volume of banks credit that can be extended by the deposit money banks (Otalu, Aladesanmi & Mary, 2014).

Liquidity Ratio: The liquidity ratio is the proportion of total deposits to be kept in specified liquid assets mainly to safeguard the ability of the banks to meet depositors' cash withdrawals and ensure confidence in the banking system (Olweny & Chiluwe, 2012). It is generally accepted that liquidity ratio is used to increase or decrease cash availability of commercial banks, however, researchers have argued that the major use of the statutory reserve ratio of banks is to float government securities, it therefore intends to direct commercial bank credit towards the public sector (Otalu et al., 2014).

Monetary policy rates: The bank rate is the minimum lending rate of the Central Bank at which it rediscounts bill of exchange and government securities held by the deposit money bank (Morgan, 2002). The higher rates of interest as observed by Otalu *et al.* (2014) translate to a contractionary monetary policy which would definitely lower demand for loans and lead to decrease in output or production. When the CBN notice an inflationary pressure in the economy, it raises the bank rate. In this period, borrowing from the CBN becomes difficult and the deposit money banks borrow less from it. Also the deposit money banks borrowers such as the individual and industries borrow less from it due to an increase in its lending rate (Amidu, 2006). On the contrary in a depressed economy, the Central Bank lowers its bank rate making it cheaper to borrow from them. The deposit money banks also lower their lending rate making it easy for businessmen to borrow money (Jhingan, 2001).

Money supply: According to Otalu et. al. (2014), money supply is described as the total currency outside the banks, demand deposits at deposit money banks, domestic deposits at the Central Bank of Nigeria, less Federal and State governments deposits with the deposit money banks. This mainly involves buying government bonds "expanding the money supply" or selling them "contracting the money supply" (Adegbola, Fadipe & Olajide, 2015). When the Central Bank disburses or collects payment for these bonds, it alters the amount of money in the economy while simultaneously affecting the price of short-term government bonds. The change in the amount of money in the economy in turn affects interbank interest rates. **Bank Credit (dependent variable)**

Credit is the extension of money from the lender to the borrower (Ebi & Emmanuel, 2014)**.** Ajayi and Atanda (2012) noted that credit implies an arrangement by the debtor to pay the creditor for money lent or goods and services obtained on credit. Credit is a core business of financial institutions or banks because banks mobilized deposits from the surplus units of the economy and channeled it to the deficit units who need funds for productive uses. Therefore, the relationship between Banks and customers is that of debtors and creditors.

According to CBN (2009), the total loans and advances given by the banks to economic agents is termed bank credit. Bank credit is often secured with collateral so as to ensure that the loan is recovered in the event of default. This credit is channels into investment to promote economic activities. Thus, banks provide the role of intermediation where credit is channel to the deficit sectors to enhance economy growth. Anuolam (2010) defined bank credit as a process where a bank or financial house provides loan or advance to a single borrower or group of individual or client. It is believed that bank credit contributes significantly to banks' profitability, through their lending rates, lending policies and other services they provide.

Theoretical Framework

This study hinges on Keynesian Theory of 1936, John Maynard Keynes published his "General Theory of Employment, Interest and Money" and initiated the Keynesian Revolution. From the Keynesian mechanism, monetary policy works by influencing interest rate which influences investment decisions of financial institutions such as banks and the public and consequently, output and income via the multiplies process. Keynes posits that government had the responsibility to undertake actions to stabilize the economy and maintain full employment and economic growth, using fiscal policies. He therefore recommends a proper blend of monetary and fiscal policies as at some occasions, monetary policy could fail to achieve its objective (Onyemaechi, 2005). In simple terms, the monetary mechanism of Keynesians emphasizes the role of money, but involves an indirect linkage of money with aggregate demand via the interest rate. Analytically, if the economy is initially at equilibrium and there is open market purchase of government securities by the Central Bank of Nigeria (CBN), this open Market Operation (OMO) will increase the deposit money banks reserve (R) and raise the bank reserves. The bank then operates to restore their desired ratio by extending new loans or by expanding bank credit in other ways. Such new loans create new demand deposits, thus increasing the money supply (MS). A rising money supply causes the general level of interest rate (r) to fall. The falling interest rates affects deposit money banks performance and in turn stimulate investment given businessmen expected profit (Greg, Ndude & Hope, 2015). Fullwiler (2013) opined that modern Central Banks use interest rate targeting rather than targeting the money supply. In order to do so, in a corridor system, the Central Banks sets two rates: remuneration rate and lending rate. The remuneration rate is the interest the deposit money banks pay on bank reserves at the Central Bank, whereas lending rate is the interest rate the Central Bank charges on bank borrowings. When the rate is increased, ability of the bank to lend out money is affected. Charles and Gordon (1995) maintained that credit rationing and monetary policy tightening would cause decline in new loans advancing by banks. The Central Bank of Nigeria has made use of different instruments such as money supply, interest rate, liquidity and cash reserve ratio in order to control the level of money supply and control the ability to give out loans by the banks. It is on this note that this hypothesis is raised

H01: There is no significant relationship between various monetary policy instruments (money supply, interest rate, liquidity and cash reserve ratio) and deposit money bank credit in Nigeria.

Empirical Studies

Olweny and Chiluwe (2012) researched on the relationship between monetary policy and private sector investment in Kenya for the period between 1996 and 2009. The study employed vector error correction model to determine the dynamic of

relationship and level of cointegration among the variables. The study revealed that government domestic debt and Treasury bill rate have negative relationship with private sector investment; The results of the diagonistic test shows that contracting monetary policy by 1% has the effect of contracting investment by 2.63% and vice versa.

Ajayi and Atanda (2012) investigated the impact of monetary policy instruments on banks performance between 1980 and 2008. The study used Engle-granger two-step co-integration approach for it analysis. The result indicated that bank rate, inflation rate and exchange rate are credit enhancing variables, while liquidity ratio and cash reserves ratio exert negative impact on banks total credit. Although, it is only cash reserve ratio and exchange rate found to be significant at 5% critical value. The study found that monetary policy instruments are not significant to stimulate credit in the long-run, while banks total credit is more responsive to cash reserve ratio.

Agbonkhese and Asekome (2013) examined the effects of monetary policy on the deposit money banks' credit creation in Nigeria. The study covered the period between 1980 and 2010 and used Ordinary Least Square (OLS) method of data analysis. Their empirical results revealed that there was a positive and direct relationship between the total deposits and treasury bills rate. Whereas, the reserve requirement and interest rate had negative effects on the total credit creation. Therefore, the reserve requirements is not an effective monetary policy instrument to influence bank credit to achieve a desired monetary policy objective since money deposit banks could on their own easily raise and keep substantial deposits as reserve.

Andreas (2001) investigated the reaction of bank lending to monetary policy measures in Germany. Empirical evidence from dynamic panel estimations based on a data set that comprises individual balance sheet information on all German banks. It shows that the average bank reduces its lending more sharply in reaction to a restrictive monetary policy measure the lower its ratio of short-term interbank deposits to total assets. A dependence on its size can only be found if explicitly controlled for this dominating effect and/or if the very small banks are excluded.

Tsenkwo and Longdu'ut (2013) examined the Relationship between Monetary Policy Rate (MPR) and Banking Rates: Evidence from Regression and Multivariate Causality Analysis. The study used descriptive statistics and econometrics analysis to subject the raw data from secondary source to series of refining like Unit Root Test, Ordinary Least Square Test, Stability Test, and Granger causality test. These tests were conducted, using Granger causality test, to know the direction of their relationships and how they are caused. The finding revealed that almost all the variables, with the exception of bank savings rate, exhibit a strong sign of co-moving in the long run with the tendency of converging. The research revealed that there exist unidirectional causality between monetary policy rate and bank lending rate;

bank lending rate and bank savings rate. And there exist a bi-directional causality between monetary policy rate and bank savings rate.

Ayub and Seyed (2016) in their study the relationship existing between monetary policy and bank lending behavior and the influence of bank specific features on this relationship in the banks listed on the 8 Tehran Stock Exchange. The study used Iran's bank loan aggregated series and bank's size and capital structure data. The study used the growth rate of M2 as the indicators of Irans' monetary policy. Using Vector error correction model (VECM) and quarterly data for the period 2007:Q1 to 2014:Q4. The results showed a bidirectional causal link between M2 and banks lending behavior trading on the Tehran Stock Exchange. It was also observed that the banks' capital structure as one of the banks specific feature variables have a negative impact on bank lending behavior in accepted banks in Tehran Stock Exchange.

Otalu, Aladesanmi and Mary (2014) assessed the impact of monetary policy on the deposit money banks performance in Nigeria, and in their study, the interest rate and money supply, liquidity ratio and the cash reserve ratio were used as proxy for monetary policy. The study used regression analysis to examine the relationship between monetary policy and bank performance in Nigeria. The results of the diagonistic test showed that credit creation of commercial banks is significantly being influenced by the interest rate, money supply, liquidity ratio and the cash reserve. Precisely, money supply and cash reserve ratio appeared to have statistically influenced deposit money banks' credit creation.

Jegede (2014) empirically researched on the impact of monetary policy on commercial bank lending in Nigeria between 1998 and 2008. Vector Error Correction Mechanism of Ordinary Least Square was used as the tool for analysis. The findings of the study indicated that there exists a long run relationship among the variables in the model. Specifically, the findings also found that exchange rate and interest significantly influenced commercial bank lending, while liquidity ratio and money supply exert negative impact on commercial banks' loan and advance.

Udeh (2015) investigated the impact of monetary policy instruments on profitability of Zenith Bank Plc in Nigeria from 2005 to 2012. Pearson Product moment correlation technique was used to analyze the data collected while t-test statistic was employed in testing the hypotheses. The result shows that cash reserve ratio, liquidity ratio and interest rate did not have significant impact on the profit before tax of Zenith Bank Plc. However, minimum rediscount rate was found to have significant impact on the profit before tax of the bank. Uwazie and Aina (2015) examined the cause and effect of monetary policy on Commercial Banks credit in Nigeria for the period 1980-2013. They specified that there is linear relationship among bank credit, broad money supply (LM2), monetary policy rate (MPR), liquidity ratio (LR), inflation rate (IFR) and exchange rate (EXR). The result of the study showed that

there was a causal effect between monetary policy and commercial banks credit in Nigeria for the period of the study. Conclusively, there existed cause and effect relationship between bank credit and the monetary policy variables. Money supply proved to be a significant parameter which causes commercial bank credit. Also, causality runs from monetary policy rate to commercial bank loans and advances.

From the literatures reviews that are related to this study, the relationship between monetary policy and bank credit is mixed. The findings from this study will give more recent and reliable information on the contribution of monetary policy on the aggregate bank credit for the period of 36 years (1981 to 2016) while most of the literatures reviewed worked on lesser number of years. Also, this study focuses its attention on aggregate bank loan to private sectors. In addition to that, this study proxy monetary policy with five variables such as cash reserves ratio, liquidity ratio, monetary policy rate and money supply with one control variable (i.e inflation rate). Also, the study proxy structural change with dummy variable

3. Methodology

The scientific approach adopted in this research was descriptive design with a particular use of ex-post facto research design which is meant to afford the researcher the opportunity of systematic collection, presentation and analysis of data as well as information for the study. An annual time series data from 1981 to 2016 used in this study were obtained from Statistical Bulletin and Annual Report of the Central Bank of Nigeria (CBN).

In analyzing the data collected, the study made use of inferential statistics, preliminary analysis using Augmented Dickey Fuller (ADF), Kwaiatkowski Phillips–Schmidt-Shin (KPSS) and confirmatory test were conducted to determine variables' order of integration. Thereafter, an Augmented Vector Auto Regressive (VAR) model was estimated as proposed by Toda and Yamamoto (1995) in order to guarantee the asymptotic distribution of Wald statistic.

As part of the preliminary analysis, lag order selection criteria was determined using Akaike Information Criterion (AIC) and Final Predictor Error (FPE) as AIC and FPE suit small observations. In order to check for auto correlation, serial correlation Lagranger Multiplier (LM) test was used. Although, the principle of Toda and Yamamoto or Modified Wald model does not require pretesting for co-integrating property of the system, yet the researcher employed Johansen's test of co-integration to check whether series with 1(1) are co integrated or not so as to check the validity of Toda and Yamamoto at the very end of the analysis.

The central assumptions of Toda and Yamamoto (1995) test as highlighted by Dave (2011) are; first it does not necessarily depend on knowledge of the integration and cointegration properties of the system, secondly, the test is applicable in the absence

of integration or stability, and when rank system are not met provided the order of integration of the process does not exceed the true lag length of the model (Toda and Yamamoto, 1995), third, Toda and Yamamoto causality test requires estimation of an augmented VAR (k+dmax) model where k is the optimal lag length in the original VAR system, and dmax is the maximal order of integration of the variables in the VAR system, and lastly, the procedure uses a modified Wald (MWald) test for restrictions on the parameters of a VAR (k), where k is the lag length in the model.

The model for this study was developed from Toda-Yamamoto (T-Y, 1995) Granger non causality model:

$$Y = a_0 + \sum_{i=1}^{k} a_{1i} Y_{t-i} + \sum_{j=k+1}^{k+dmax} a_{2j} Y_{t-j} + \sum_{i=1}^{k} b_1 M_{t-i} + \sum_{j=k+1}^{k+dmax} b_2 M_{t-j} + e_{it}$$

$$M = c_0 + \sum_{i=1}^{k} c_{1i} Y_{t-i} + \sum_{j=k+1}^{k+dmax} c_{2j} Y_{t-j} + \sum_{i=1}^{k} b_1 M_{t-i} + \sum_{j=k+1}^{k+dmax} b_2 M_{t-j} + e_{it}$$

Then, testing H0: *b*1 = *b*2 = 0, against HA: 'Not H0', is a test that *M does not* Granger-cause *Y*. Similarly, testing H0: *C*1 = *C*2 = 0, against HA: 'Not H0', is a test that *Y does not* Granger causes *M*. If H_0 is *rejected, it* implies there is Granger causality. The modified model now becomes:

$$Y_t = a_0 + \text{dummy} + \sum_{i=1}^{n} a_1 y_{t-i} + \sum_{i=m+1}^{n+dmax} a_2 y_{t-i} + \sum_{i=1}^{m} b_1 x_{t-j} \ldots\ldots\ldots\ldots\ldots\ldots + \sum_{i=m+1}^{m+dmax} b_n x_{t-j} + u_t \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

$$X_t = c_0 + \text{dummy} + \sum_{i=1}^{m} c_1 x_{t-j} + \ldots\ldots\ldots\ldots\ldots\ldots + \sum_{i=m+1}^{m+dmax} c_2 x_{t-j} + \sum_{i=1}^{n} d_1 y_{t-i} + \sum_{i=m+1}^{n+dmax} d_n y_{t-i} + v_t \ldots\ldots \quad (4)$$

$$Bcr_t = a_o + \text{dummy} + \sum_{i=1}^{n} a_1 Bcr_{t-i} + \sum_{i=m+1}^{n+dmax} a_2 Bcr_{t-i} + \sum_{i=1}^{m} b_1 M2_{t-j} + \sum_{i=m+i}^{m+dmax} b_2 M2_{t-j} + \sum_{i=1}^{m} b_3 CRR_{t-j} + \sum_{i=m+1}^{m+dmax} b_4 CRR_{t-j} + \sum_{i=1}^{m} b_5 LR_{t-j} + \sum_{i=m+1}^{m+dmax} b_6 LR_{t-j} + \sum_{i=1}^{m} b_7 INF_{t-j} + \sum_{i=m+1}^{m+dmax} b_8 INF_{t-j} + \sum_{i=1}^{m} b_9 MPR_{t-j} + \sum_{i=m+1}^{m+dmax} b_{10} MPR_{t-j} + ut$$

Where yt – i = lag of dependent variable (bank credit)

Xt – j= lag of independent variable (M2, MPR, LR, CRR, INF, Structural changes (exogenous
variable))

Bcr=Bank credit to private sector

Dummy=Structural change

M2=Money supply

CRR= Cash reserve ratio

LR=Liquidity ratio

Inf=Inflation

MPR=Monetary policy rate

ao=intercept of the regression

ut = error term or stochastic variable to accommodate other variables not included in the model

By testing Ho:= bi=b2=…….bn = 0,against H1: not H0: is a test that bank credit does not granger cause monetary policy tools. In each case, the acceptance of the Ho indicates absence of granger causality. In this model, the following different case arises:

(1) The lagged x term in equation (1) may be statistically different from 0 as a group and the lagged y term in equation (11) is not statistically different from 0 so that x cause y and viceversa, it is unidirectional. (2) However ,if both set of x and y terms are statistically different from 0 in equation 1 and 2, it is bidirectional causality but if both set of x and y term are not statistically different from 0 in equation 1 and 2, x is independent of y and y is also independent of x

4. Result and Discussion of Findings

The Table 1 shows that average value of monetary policy rate was 12.88% with the maximum of 26% and the minimum of 6% while the average inflation rate stood at 19.34% with maximum of 57.28% and the minimum of 5.4%. The average money supply for the period under review was ₦3350.648 billion with the maximum value of ₦15158.62 billion and the minimum value of ₦14.47000 billion while the average cash reserve ratio is 11.58% with the maximum value of 50.8% and the minimum value of1.4%. The average CRP for the period under review was ₦3046.400 billion with the maximum value of ₦15778.31 billion and minimum value of ₦8.570000 billion.

Table 1. Descriptive Statistics

	DUMMY	MS	MPR	LIQ	InF	CRP	CRR
Mean	0.857143	3350.648	12.88400	46.39429	19.34857	3046.400	11.58
Median	1	488.1500	12.75000	45.00000	13.90000	351.9600	8.6
Maximum	1	15158.62	26.00000	65.10000	57.20000	15778.31	50.8
Minimum	0	14.47000	6.000000	29.10000	5.400000	8.570000	1.4
Std. Dev.	0.355036	4951.559	4.131395	9.783057	14.89152	4911.254	11.86651
Observations	36	36	36	36	36	36	36

Source: Author's computation, 2017

The essence of conducting unit root test for this study is to determine the extra lag to be added to the Vector Auto Regressive model for the Toda and Yamamoto test. Confirmatory test presented in Table 4 is drawn from the two unit root test shown in Table 2 and Table 3 and it shows that money supply and monetary policy rate are

stationary at 1st difference while bank credit and cash reserve ratio are stationary at 2nd difference (that is, highest order of integration). However, for inflation and liquidity the unit root test decision is inconclusive. Hence, VAR model will add only one extra lag (that is, dmax = 1) for the implementation of the granger non-causality test because of the model sensitivity to the number of observations. From the unit root test conducted, two series have 1(2) therefore; the use of Ordinary Least Square (OLS), Auto Regressive Distribution Lag (ARDL) and Vector Error Correction Model (VECM) estimate will break down and produce unreliable result because these methods cannot account for the highest order of the integration unlike Toda and Yamamoto.

Table 2. Augmented Dickey Fuller Unit Root Test

Variables	Constant with trend Level	Difference	Order of integration
Bank credit	_	-4.2845 (-11.4792)***	1(2)
Money supply (M2)	_	-4.2627 (-4.3178)***	1(1)
Monetary policy rate(MPR)	_	-4.2732 (-6.1773)***	1(1)
Inflation	-3.5484 (-3.6893)**	_	1(0)
Liquidity ratio (LR)	-3.5484 (-3.5726)**	_	1(0)
Cash reserve ratio (CRR)	_	-4.2627 (-8.9575)***	1(2)

Source: Author's computation, 2017

Note *** and ** denote rejection of the null hypothesis of unit root at 1% and5% level.

Table 3. Kwaiatkowski Phillips – Schmidt –shin (KPSS) unit root test

Variables	Constant with trend	Order of integration
Bank credit	0.2160 (0.2355)	1(2)
Money supply	0.1460 (0.0814)	1(1)
Monetary policy rate	0.21600 (0.0522)	1(1)
Inflation	0.4630 (0.2645)	1(1)
Liquidity ratio	0.21600 (0.3037)	1(1)
Cash reserve ratio	0.1460 (0.2740)	1(2)

Source: Author's computation, 2017

Table 4. Confirmatory Analysis

Variables	ADF	KPSS	Decision
Bank credit	1(2)	1(2)	Conclusive decision (both stationary at 2nd difference)
Money supply	1(1)	1(1)	Conclusive decision (both stationary at 1st difference)
Monetary policy rate	1(1)	1(1)	Conclusive decision (both stationary at 1st difference)
Inflation	1(0)	1(1)	Inconclusive decision (insufficient information)
Liquidity ratio	1(0)	1(1)	Inconclusive decision (insufficient information)
Cash reserve ratio	1(2)	1(2)	Conclusive decision (both stationary at 2nd difference)

Source: Author's computation, 2017

Based on AIC and FPE in Table 5, lag 2 is preferred which means the model has intercept and lag. The use of AIC and FPE information criterion for choosing lag length is contingent on the number of observation because AIC and FPE are appropriate when the observation is less than 60.

Table 5. VAR Lag selection

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-364.09	NA	6990.96	25.76	27.95	26.48
1	-294.10	78.74*	1078.86	23.63	27.48	24.91
2	-231.04	47.30	498.00*	21.94*	27.44*	23.76*

Source: Author's computation, 2017

- indicates lag order selected criterion

LR: Sequential modified LR test statistic (each test at 5% level)

FPE: Final predictor error

AIC: Akaike information criterion

SC: Schwaiz information criterion

HQ: Hannan-Quinn information criterion

From ADF and KPSS test both money supply and monetary policy rate have series with 1(1) and this necessitate using Johansen methodology to see if the two series are co integrated. From the Johansen test of co integration in Table 6, trace test and maximum Eigen value indicate no co integration at the 0.05 level. The purpose of this co integration test is to cross check the validity of Toda and Yamamoto model at the very end of the analysis. Overall, the Johansen methodology subject absence of a sustainable long run equilibrium relationship between money supply and monetary policy rate. However, in the case of low order VAR or small sample (n <100) this test is seriously biased towards spuriously or erroneously detecting co integration.

Table 6. Johansen co integration test

Hypothesized No of CE (S)	Engen value	Trace statistic	0.05 critical value	P-value	Eigen value	Max Eigen value	0.05 critical value	P-value
None	0.245678	10.80083	15.49471	0.2240	0.245678	9.621935	14.26460	0.2843
At most 1	0.054074	1.778900	3.841466	0.1823	0.054074	1.778900	3.841466	0.1823

Source: Author's computation, 2017

Trace test and Max Eigen value test indicate no co integration at the 0.05 level.

From Table7, the result of the VAR residual serial correlation LM test found that the VAR is well specified and there is no correlation at 0.05 level.

Table 7. VAR serial correlation LM test

Lag	Lm-statistic	Probability
1	56.78276	0.0151
2	60.01481	0.0072

Source: Author's computation, 2017

Table 8 revealed that, cash reserve ratio (CRR), inflation(INF), liquidity ratio(LR), money supply(MS) and monetary policy rate(MPR) have no long run significant impact on bank credit as confirmed by their p-values. However, structural change has positive long run significant impact on bank credit as the p-value is statistically significant at 5% level. It was discovered that the explanatory variables of monetary policy tools accounted for about 99 percent of changes in the dependent variable, as judged by the coefficient of determination (R–squared). F-statistic outcome shows the entire model is significant judging from its p-value (0.000452) being less than 5% significance level. Therefore, the result of this study cannot refute the Keynesian theory that says monetary policy tools have short run effect on the bank credit.

Table 8. System equation from VAR model

Dependent Variable: LBANK CREDIT

Variables	Coefficient	Std. Error	t-statistic	p-value
LCRP(-1)	0.15459	0.41116	0.375984	0.708
LCRP(-2)	-0.739811	0.491089	-1.506469	0.1363
CRR(-2)	0.002286	0.004797	0.47653	0.6351
CRR(-2)	0.007503	0.004878	1.538135	0.1284
IF (-2)	-0.001483	0.00294	-0.504375	0.6155
IF (-2)	-0.002527	0.002171	-1.163823	0.2483
LIQ(-1)	-0.003988	0.004031	-0.98914	0.3259
LIQ(-2)	-0.007276	0.005002	-1.45618	0.1501
LMS(-1)	0.818391	0.482196	1.697217	0.0940
LMS(-2)	1.138892	0.724808	1.571302	0.1205
MRR(-1)	-0.027053	0.015117	-1.789555	0.0777

MRR(-2)	0.005552	0.017156	0.323608	0.7472
CONS	0.326484	0.279565	1.167827	0.2467
DUMMY	0.045287	0.950218	1.424887	0.0476
LCRP(-3)	0.10983	0.42741	0.256966	0.7979
CRP(-3)	-0.000933	0.005673	-0.164475	0.8698
INF(-3)	-0.003282	0.002841	-1.155265	0.2518
LIQ(-3)	-0.001978	0.005181	-0.381725	0.7038
LMS(-3)	-0.489506	0.442V96	-1.105079	0.2728
MRR(-3)	0.002049	0.012106	0.169254	0.8661
R- squared 0.998914 Prob (f-statistic) 0.000452 Adjusted R-squared 0.99719 Durbin –watson 1.867667 F- statistic 580.9027				

Source: Author's computation, 2017

Table 9. Toda and Yamamoto model (modified Wald) test result

Null hypotheses	Chi –sq	Probability	Granger causality
CRR does not granger cause CRP	2.589959	0.2739	No causality
CRP does not granger cause CRR	0.321786	0.8514	No causality
Inf does not granger cause CRP	1.721110	0.4299	No causality
CRP does not granger cause inf	2.711396	0.4000	No causality
LR does not granger cause CRP	5.339975	0.0693	No causality
CRP does not granger cause LR	0.522890	0.7699	No causality
M2 does not granger cause CRP	1.553580	0.4599	No causality
CRP does not granger cause M2	0.858903	0.6509	No causality
MPR does not granger cause CRP	4.42883	0.0016	Bidirectional causality
CRP does not granger cause MPR	6.637550	0.0362	

Source: Author's computation, 2017

Discussion of Results

This test is meant to determine if monetary policy variables (CRR, LR, M2, Inf, MPR) provide significant empirical information about bank credit. Causality arises when index of monetary policy cause credit or vice versa. According to the results in table 8,at 0.05 significance level, there is no causal links between cash reserve ratio (CRR) and credit to private sector (CRP), the p-value of 0.2739 17 shows no significant relationship between the two variables. They do not cause each other and they are not related in short run. Likewise, the p-value of 0.8514 shows there is no significant causal relationship between CRP and CRR. Inflation rate with p-value of 0.4299 shows no significant causal relationship with CRP and 0.4000 p-values show no reverse causal relationship existing between the two variables, this aligns with the

findings of Uwazie and Aina(2015). At 0. 05 significance level, there is no causal links between liquidity ratio (LR) and credit to private sector (CRP), the p-value of 0.0693 shows no significant relationship between the two variables. They do not cause each other and they are not related in short run. The p-value of 0.7699 shows there is no significance causal relationship between CRP and LR. The p-value for money supply (M2) 0.4599 shows that there was no significant causal relationship between M2 and CRP this is contrary to the findings of Uwazie and Aina (2015) that found a significant causal relationship. Also, 0.6509 p-value shows that CRP does not granger cause M2. The causality that runs from monetary policy rate [MPR =>CRP] is statistically significant as confirmed by P-value [0.0016] and the p-value of 0.0362 implies that there is statistically significant causal relationship existing between CRP => MPR. This implies a bidirectional between the two variables and supports the finding of Uwazie andAina (2015). MPR proves to be significant variable which can cause bank credit in Nigeria and vice versa.

5. Conclusion and Recommendations

This study examined the relationship between monetary policy rate and credit creation of deposit money banks in Nigeria. Based on the result of this study, it was concluded that there is no long run relationship among the variables used for the study. The result obtained from the Toda and Yamamoto granger non casualty model shows that MPR and CRP is the only variable with bidirectional causal relationship and all other variables tested (M2, LR, INFR and CRR) in this study have no causal relationship with CRP within the period of study. The study revealed that structural changes in monetary policy system incorporated into the study shows statistically significant result affecting CRP in Nigeria.

In the light of the above, the following recommendations were made in line with the findings of the study:

i. Monetary authority should manage the monetary policy rate properly for it to be attractive and affordable for investors to borrow money from the bank;

ii. The government should employ other measures to support the monetary policy to control the credit creation of deposit money banks.

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