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CONTENTS

FINANCIAL INCLUSION AND MONETARY POLICY SHOCKS NEXUS IN NIGERIA: A NEW EMPIRICAL EVIDENCE

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Abstract

This paper empirically investigates the impact of monetary policy shocks on financial inclusion in Nigeria using the Vector Autoregression Model (VAR). Time series quarterly data were employed to conduct the analysis and the findings of the study reveal that shocks to minimum rediscount rate, interest rate, broad money supply and deposit rates of deposit banks all have significant impact on financial inclusion in Nigeria, however not at the same time and magnitude. Thus, the paper recommends the implementation of policies that will encourage innovations and competition in the banking industry. Also, there is need to adopt effective monetary policy measures that will increase financial inclusion in the country.

Contribution of the Study:
This is one of the pioneer papers that focused specifically on the impact of monetary policy shocks on financial inclusion in Nigeria using the Vector Autoregression Model (VAR). The paper makes some outstanding findings that can feed into monetary policy formulation in Nigeria. This is a major contribution to literature.

Keywords: Monetary Policy; Financial Inclusion; Shocks, Nigeria.
JEL Classification: E42, E51, E52, E58, G21, G23.

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1. BACKGROUND AND MOTIVATION

Recent discussions on monetary policy in Nigeria has been largely anchored on price stability and monetary targeting framework. This has also become the focus of monetary policy in recent times. This approach differs slightly from the earlier periods where the major focus of monetary policy was mainly on economic growth and employment. The special attention on price stability derives from new developments in monetary theories and empirical evidences which shows that sustainable growth can only be achieved when there is stability in the price level (CBN, 2017). Another issue that has also been a major concern to the monetary authorities is the relationship between monetary policy and financial inclusion.

The concept of financial inclusion has assumed greater level of importance in recent times due to its perceived usefulness in bridging the gap between the owners of investible funds and the users of such funds within the economy. Essentially, improving the mechanism through which access can be gained by hundreds of millions of men and women (all over the world) to relevant financial services and products would provide the possibilities for the creation of large depository of savings, investable funds, investment and therefore global wealth generation (CBN, 2014 and Anthony-Orji, Orji., Ogbuabor, and Nwosu 2019).

Mehrotra et al (2009), emphasized that access to financial services allows the poor to save money outside the house safely, and helps in mitigating the risks that the poor faces as a result of economic shocks. Hence, providing access to financial services is expected to have some far reaching social and economic implications. Again, the nexus between monetary policy and financial inclusion derives from the fact that to achieve economic prosperity in any nation, there is need for government to adopt monetary policy innovations and measures aimed at growing financial inclusion in such a country.

Prior to the recent effects to promote financial inclusion, the Nigerian economy was largely a cash-based economy with significant proportion of the narrow money stock in the form of currency outside the banking system. Although the average ratio of the currency outside the banking sector (COBs) to narrow money supply (M_1) tended downward from 61.1 percent in the 1960s to 44.3 percent in the 1970s and later to 40.9% in the 1980s, the value (in nominal terms) was still high considering the growth in the level of narrow money in the economy. This decline in the ratio was attributable to a combination of developments, including increased literacy rates and government policies directed towards encouraging financial sector growth. The CBN initiated the Rural Banking Programme directing banks to open branches in the rural areas, encouraging Nigerians to use financial institutions and their product more. In the 1990s the banking industry witnessed crisis which eroded the confidence of the populace in the industry. The problem was aggravated by the excessive spending of the political class leading to the increases in the level of currency outside the banking system. The ratio of the currency outside the bank system moved up to 47.7 percent by end of the 1990s. To forestall the damaging

effect of the banking industry distress in the 1990s, government implemented various policies which not only involved economic reforms to improve the general well-being of the populace in terms of employment and income earning capacity but also included measures (particularly the bank consolidation programme of 2004) that increased deepening of the financial sector. Thus the stimulated use of the financial service pushed down the ratio of currency outside the banking system to 38.2 percent by the end of 2005. However, between 2008 and 2010 the number of those completely excluded fell from 53 to 46%. The Nigerian government targeted an increase in financial inclusion of about 53% as at 2015 but this was unattainable.

The global financial inclusion average defined as the number of adults with access to financial services is less than 50 percent. The problem is more acute in the developing and African countries in particular, such that achieving a higher financial inclusion-level has become a global challenge (Ardic et al, 2011). The global target (with very minimal concentration on monetary policy innovations) so far has been to remove barriers like illiteracy, irregular income, regulations and geographical locations that have together contributed to the dearth of access to financial services by billions of adults all over the world.

Sanusi, (2011) attributed the rise in poverty level in Nigeria to the challenges of financial exclusion. According to him, achieving financial inclusion in Nigeria means empowering 70 per cent of the population living below poverty level, and this would boost growth and development, because multiple economic activities would be generated leading to growth in national output and eventually reduce poverty. According to the CBN only 1 out of every 5 adults are financially included.

Financial inclusion indicators such as Credit to private sectors by commercial banks, number of Automated Teller Machines (per 100,000 adults) and commercial bank branches (per 100,000 adults) in Nigeria have been at a very low ebb since 2011.The figure below represents the trends of the above mentioned indicators of financial inclusion in Nigeria between 2011 and 2013.

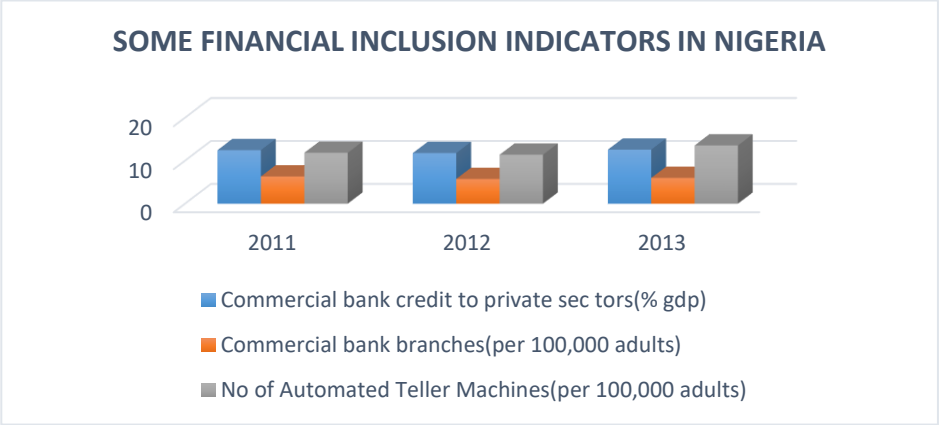


Figure 1. *Some financial inclusion indicators in Nigeria*

Source: World Bank (2014)

The chart above reveals that Commercial bank credit to private sectors (% GDP) only increased marginally from 12.46% to 12.58% between periods 2011 and 2013. Also, the Number of Commercial bank branches (per 100,000 adults) diminished marginally from an average of 6.35 to 6.00 branches between the periods 2011 and 2013. Consequently, the Number of Automated Teller Machines (per 100,000 adults) only increased marginally from 11.48 ATMs to 13.54 ATMs within these periods .From these figures it is clear that financial inclusion in Nigeria has been very low and needs to be improved.

Over the years, the government and monetary authorities of Nigeria have introduced varying polices aimed at deepening financial inclusion within the economy. The polices ranged from various institutional involvement such as the establishment of community and micro finance banks to specific policies and programmes designed to facilitate access of the financially excluded to formal financial services. The private banks, on the other hand, have also been engaged in innovations and activities aimed at getting more people involved in the financial inclusion process, though their level of involvement have always been moderated to the extent that profitability is enhanced.

Consequently, the figure below represents the trend of Monetary Policy and Financial inclusion in Nigeria between the year 2000 and 2014.

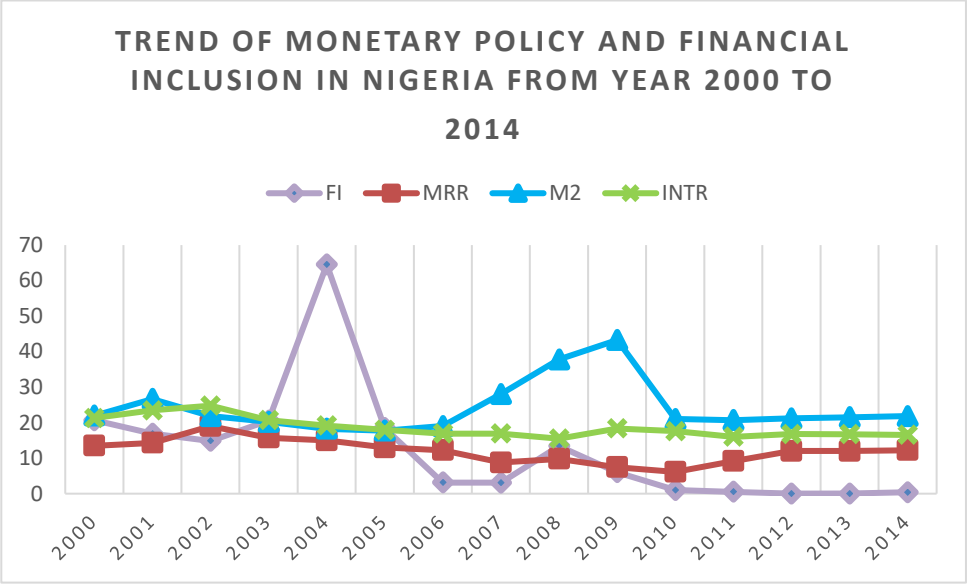


Figure 2. *Trend of monetary policy variables and financial inclusion variable in Nigeria*

Monetary policy was represented using some monetary policy instruments such as Broad money supply as a percentage of the Nigerian Gross Domestic Product (M2 %GDP), Lending interest rates of commercial banks (LE INTR), and Minimum rediscount rate (MRR). Also, financial inclusion was represented using rural deposits of commercial banks expressed in billions of naira

From figure 2, it was observed that as lending interest rate (LE INTR) rose from 21.4% to 24.9% between 2000 and 2002, financial inclusion (rural deposits of commercial banks) fell from 20 billion naira in year 2000 to about 15 billion naira in 2002. This is in line with J. Keynes (1936) General theory of employment, interest rates and money. As interest rates increases investments decreases and as such financial activities decreases. But as the lending interest rate decreased steadily for the other periods, financial inclusion increased steadily.

Consequently a sharp increase in broad money supply from 20% to 44% between 2006 and 2008 caused financial inclusion to decrease immensely during this periods. This is in line with the lrvin fisher's quantity theory of money (1907). Increase in money supply causes the nominal interest rate to rise which in turn is channelled back to financial activities and hence financial inclusion. However, as broad money supply increased marginally between periods 2010 and 2014, financial inclusion decreased marginally.

Amongst all the variables representing monetary policy in Nigeria in this graph, Minimum rediscount rate appears to be the most unsteady. Between the periods 2010 – 2014, as minimum rediscount rate (MRR) rose sharply from 6% to 14%, financial inclusion decreased steadily between this

periods. Meaning that the minimum rediscount rate had very little impact on financial inclusion but not so for period 2000 – 2002.

Also, it was observed that there was a sharp increase in financial inclusion (FI) from 2004 – 2005. This can be traced to the CBN Banking Consolidation Program which strengthened financial activities and stabilized the banking system. During these periods, all the monetary policy variables were at their low ebb and thus facilitated a spontaneous increase in financial inclusion because these variables, that is interest rate and minimum rediscount rate have negative relationship with financial inclusion (a priori, explained above).

Another notable trend from figure 2 is the collective decrease in monetary policy and financial inclusion in Nigeria between year 2007, 2008, 2009 and 2010. These can be traced to the events of the global financial crises whose impact was evidenced among various economies of the world, Nigeria not an exception. During these periods, broad money supply (M2 % of GDP), interest rate (LE INTR) and minimum rediscount rate (MRR) all declined. However, not exactly at the same time. The decline in interest rates, minimum rediscount rates were strategies employed by the Nigerian government to increase financial activities but the Global financial crises had impacts on virtually all the sectors of the Nigerian economy. Lowering interest rates and minimum rediscount rates alone could not resuscitate the falling financial activities in Nigeria and thus financial inclusion continued to decline and ever since has remained at its low ebb in Nigeria as can be seen in the graph from year 2010 to 2014.

The foregoing reveals that monetary policy instrument are very important in any nation and goes ahead to impact financial inclusion in such counties. Thus, there is need for government to make provision for shocks on these policy variables which determines the general economic prosperity of the nation. For the Nigerian government to improve financial inclusion, it is imperative that the government must come up with workable strategies and policies to accelerate its (financial inclusion) rate of reach and deepen the acceptability of such policies and strategies (Kahn 2011)

According to the financial strategy document for Nigeria (2010), the government of Nigeria has made targets towards improving financial inclusion indicators like Commercial bank credits to private sectors up to 53% in 2015 and 70% in 2020, Number of Automated Teller Machines(per 100,000 adults) up to 42.8% in 2015 and 59.6% by 2020, Commercial bank branches(per 100,000 adults) to 7.5 in 2015 and approximately 8 by 2020.However, the financial inclusion targets for 2015 was greatly unattainable because little or no concern have been placed on the impact of monetary policy shocks (innovation) on financial inclusion in Nigeria. Thus this study unveils the impact of monetary policy innovations on financial inclusion in Nigeria which has been grossly neglected by the government amongst other factors and proffers solutions on the right monetary innovative variables to apply so as to increase financial inclusion in Nigerian that will engender economic prosperity in the Nation. Specifically, this study aims at estimating the impact of monetary policy (minimum rediscount rate, interest rate, money supply, and bank

deposit rates) shocks on financial inclusion in Nigeria from 1982 to 2014. Data used for this paper were sourced from the Central Bank of Nigeria (CBN), publications of the international monetary fund (IMF) and the World Bank (IBRD). The rest of the paper is structured as follows; section 2 focuses on the review of empirical literature, while section 3 dwells on the methodology. The results are presented and discussed in section 4, while section 5 concludes the study and makes some vital policy recommendations.

2. BRIEF REVIEW OF EMPIRICAL LITERATURE

Although, series of research works have been conducted on monetary policy (Malaolu, Ogbuabor, and Orji, 2014**;** Ogbuabor, Orji, and Mba, 2014**),** financial inclusion (Anthony-Orji, et al 2019); and economic growth, we are not aware of any study that has quantitatively measured the transmission process of monetary policy shocks on financial inclusion in Nigeria. Thus this paper, therefore contributes to literature by filling this gap. For example, Onaloapo (2015), adopted the method of the ordinary least squares (OLS) to conduct an empirical study on the effects of financial inclusion on the economic growth of Nigeria. The overall results of the regression analysis showed that inclusive bank financial activities marginally impacted on national economic growth, while it greatly influenced poverty reduction. Also, Usman (2014), analysed the impact of monetary policy on industrial growth in Nigerian economy between the periods 1970 and 2010. The study concludes that deposits and rediscount rate have significant positive effect on industrial output, while treasury bills have a negative impact on industrial output.

In another study, Mbutor and Uba (2013) investigated the impact of financial inclusion on monetary policy in Nigeria between 1980 and 2012 using the econometric method of the ordinary least squares (OLS). The empirical findings show that improving the effectiveness of monetary policy requires a close monitoring of financial inclusion strategies. In an earlier study, Chain et al (2009) investigated the relationship between financial inclusion and financial access in developing countries. Their results found that between 2.1 billion and 2.7 billion adults, or 72 per cent of the adult population in developing countries do not even have a basic bank account. Ogunleye (2009) examines the impact of financial inclusion on financial stability in Nigeria. The study argues that financial inclusion is vital for ensuring economic inclusion. Again, the study shows that development of the financial sector contributes to economic growth when savings are mobilized and invested in productive sectors of the economy. Within the same year, Chuku (2009), carried out a study on the effects of monetary policy innovations (shocks) in Nigeria (1986 - 2008). The study used a structural vector autoregression (SVAR) model to trace the effects of monetary policy shocks on output and prices in Nigerian. The result showed that controlling the quantity of money (M2) in the economy is the most influential instrument for monetary policy implementation. Fansanyer, Onakoya and Agboluaje (2013), in another study also investigated the impact of monetary policy on economic growth using data covering the period of 1975- 2010. Adopting the Error correction model (ECM), the empirical analysis revealed a long run relationship among the variables and also shows that monetary policy

instruments are important in driving growth in Nigeria. Furthermore, Rafiq and Mallick (2008), adopted the new VAR approach to analyse the effect of monetary policy on output in Germany, France and Italy from 1981 – 2005.The empirical result shows that monetary policy innovations (shocks) are at their most potent only in Germany followed by the other countries.

Babatunde and Olufemi (2014) investigated the effects of monetary policy shocks on exchange rate volatility in Nigeria. This paper the OLS estimation technique, the error correction mechanism model and the Engle-Granger approach to analyse the short-run and long run monetary policy determinants of exchange rate volatility in Nigeria and their various interactions respectively. The empirical evidence shows that both real and nominal exchange rates in Nigeria have been unstable during the period under review. Furthermore, the variation in the monetary policy variable explains the movement/behaviour of exchange rate through a self-correcting mechanism process with little or no intervention from the monetary authority (CBN). Also, Abiola et al (2015) explored the impact of financial inclusion on economic growth in Nigeria. Ordinary least square regression model was used to analyze the data and the result shows that financial inclusion is a significant determinant of the total factor of production, as well as capital per worker, which invariably determines the final level of output in the economy. This study recommends that natural and economic resources should be adequately harnessed, as alternative means of revitalization and diversification of Nigeria's oil-dependent monocultural economy.

In another related study, Dipasha (2016) assessed the nexus between the vast dimensions of financial inclusion and economic development of the emerging Indian economy between 2004 and 2013. The study adopted the vector auto-regression (VAR) models and Granger causality test and the findings suggest that there is a positive association between economic growth and various dimensions of financial inclusion, specifically banking penetration, availability of banking services and usage of banking services in terms of deposits. Granger causality analysis reveals a bi-directional causality between geographic outreach and economic development and a unidirectional causality between the number of deposits/loan accounts and gross domestic product. The study concludes that the result obtained favor social banking experiments in India with a deepening of banking institutions.

Furthermore, in another recent paper, Adediran, *et al*. (2017) estimated the impact of monetary policy shocks and inclusive growth in Nigerian economy using the vector autoregressive model. The empirical evidence shows that an effective monetary policy will encourage inclusive growth; stabilize inflation and maintain macroeconomic stability in the economy.

From the papers reviewed above, it is clear that some studies have been carried out on the impact of monetary policy shocks on other issues in Nigeria, such as Babatunde and Olufemi (2012), Chuku (2009). However, to the best of our knowledge, no recent study has been carried out on the impact of monetary policy shocks on financial inclusion in Nigeria. This is important because the financial

sector is an important sector that contributes to the economic development of any nation.

Also, studies on financial inclusion such as Onaloapo (2015), Mbutor and Uba (2014) proxy financial inclusion with variables such as number of Automated Teller Machines for every 100,000 adults, Number of Bank Branches per 100,000 adults and so on. Available data on these variables in Nigeria are only visible within the early 2000s till date omitting the previous years. The study will proxy Financial Inclusion using rural deposits of commercial banks whose data is readily available for periods before and after the year 2000.

Furthermore, most studies conducted on monetary policy used the methodology of the Classical Linear Regression Model for example, Dele (2007), in his study on monetary policy and economic performance of West African Monetary Zone (1991-2004), Usman (2014), in his study on the Impact of monetary policy on industrial growth in Nigeria (1970-2010), and many others

Thus, this paper investigates the impact of monetary policy shocks on financial inclusion in Nigeria, using the Vector Autoregressive model, which we consider as a reliable methodology for analysis.

3. METHODOLOGY

In econometrics there is the possibility of delay on the part of endogenous variables (y) to respond to changes in exogenous variables (x). To take care of such delay in response to changes (Lag), it is necessary to use methodologies that involve lag in exogenous variable or endogenous variables, or both. Some of these methodologies include the Vector Autoregressive Model (VAR), the Vector Error Correction Model (VECM) and the likes.

However, our model of interest in this study is the unrestricted vector auto regressive Model (VAR) model because it is used to investigate external shocks or effects on the endogenous variables using the impulse response function. The impulse response function of any VAR model traces the effect of one standard deviation shock to one of the innovations on current and future values of the endogenous variables (Gujarati and Porter, 2009). Thus the VAR is a very good base line methodology to make stable future forecasts.

3.1. MODEL SPECIFICATION AND JUSTIFICATION

The methodology of interest for this study as stated above is the VAR model. VAR models (vector autoregressive models) are used for multivariate time series. The structure is that each variable is a linear function of past lags of itself and past lags of the other variables. The vector Autoregression Model is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. The VAR approach sidelines the need for structural modeling by treating every endogenous variable in the system as a function of the lagged values of all the endogenous variables in the system.

The mathematical representation of a VAR is given by

$$Y_t = A_1 Y_{t-1} + \ldots + A_p Y_{t-p} + BK_t + E_t$$

where Y_t is a K vector of endogenous variables, K_t is a α vector of exogenous variables and A_1, Ap and B are matrices of coefficients to be estimated and E_t is a vector innovations impulses or shocks in the language of VAR.

The models are stated on the basis of the available information which are related to the impact of monetary policy instruments innovations (shocks) on financial inclusion in Nigeria. However, as stated in the introductory part of this work, there is no study known that has captured the impact of monetary policy shocks on financial inclusion in Nigeria. Thus the variables would be on some major policy instruments that have key impacts on financial inclusion and satisfy the conditions of the VAR model.

In line with the objective of this paper, the variables of interest include Financial Inclusion (FI) Minimum Rediscount Rate (MRR), Money supply as a percentage of GDP (M2 % GDP) lending interest rate (INT) and Deposit rates of deposit banks.

Thus the model to be used in addressing the specific objectives is specified below.

$$LOGFI = \propto_{10} + \sum_{i=1}^{n} \beta_{11}\, LOGFI_{t-j} + + \sum_{i=1}^{n} \lambda_{12}\, MRR_{t-i} + \sum_{i=1}^{n} \theta_{13}\, M2_{t-i} + \sum_{i=1}^{n} \gamma_{14}\, INT_{t-j} + \sum_{i=1}^{n} \omega_{15}\, DBR_{t-j} + \mu_{1t} \quad (1)$$

$$MRR_t = \propto_{20} + \sum_{i=1}^{n} \beta_{21}\, LOGFI_{t-j} + \sum_{i=1}^{n} \lambda_{22}\, MRR_{t-i} + \sum_{i=1}^{n} \theta_{23}\, M2_{t-i} + \sum_{i=1}^{n} \gamma_{24}\, INT_{t-j} + \sum_{i=1}^{n} \omega_{25}\, DBR_{t-j} + \mu_{2t} \quad (2)$$

$$M2_t = \propto_{30} + \sum_{i=1}^{n} \beta_{31}\, LOGFI_{t-j} + \sum_{i=1}^{n} \lambda_{32}\, MRR_{t-i} + \sum_{i=1}^{n} \theta_{33}\, M2_{t-i} + \sum_{i=1}^{n} \gamma_{34}\, INT_{t-j} + \sum_{i=1}^{n} \omega_{35}\, DBR_{t-j} + \mu_{2t} \quad (3)$$

$$INT_t = \propto_{40} + \sum_{i=1}^{n} \beta_{41}\, LOGFI_{t-j} + \sum_{i=1}^{n} \lambda_{42}\, MRR_{t-i} + \sum_{i=1}^{n} \theta_{43}\, M2_{t-i} + \sum_{i=1}^{n} \gamma_{44}\, INT_{t-j} + \sum_{i=1}^{n} \omega_{45}\, DBR_{t-j} + \mu_{2t} \quad (4)$$

$$DBR_t = \propto_{50} + \sum_{i=1}^{n} \beta_{51}\, LOGFI_{t-j} + \sum_{i=1}^{n} \lambda_{52}\, MRR_{t-i} + \sum_{i=1}^{n} \theta_{53}\, M2_{t-i} + \sum_{i=1}^{n} \gamma_{54}\, INT_{t-j} + \sum_{i=1}^{n} \omega_{55}\, DBR_{t-j} + \mu_{2t} \quad (5)$$

Where α_o, β_1, λ_1, θ_i γ and ω are the parameters to be estimated in line with the objectives of the paper. Where:

FI= Financial Inclusion measured as rural deposits of commercial banks. This is because most of the people that are financially excluded are in the rural areas.
MRR = Minimum Rediscount Rate expressed in percentage
INT = Bank lending interest rate expressed in percentage
M2 = Broad money supply as a percentage of GDP.
DBR= Deposit rates of deposit banks.

3.2. VAR ESTIMATION

After going through the VAR pre estimation tests, we estimate the VAR model using the appropriate lag length we got from the presetimation tests. Then, the impulse response function is used to interprete the VAR model.

4. RESULTS AND DISCUSSION

4.1. STATIONARITY / UNIT ROOT TESTS

The results of the ADF unit root/stationarity test is given below.

Table 4.1.

VARIABLE	ADF TEST STATISTIC	MACKINNON CRITICAL VALUE AT 5%	ORDER OF INTEGRATION
LOGFI	-4.721700	-3.587527	I(1)
M_2	-4.464500	-3.603202	I(1)
INT	-6.204240	-2.960411	I(1)
MRR	-5.932466	-2.963972	I(1)
DBR	-6.232986	-2.960411	I(1)

From the stationarity table above, all the variables LOGFI, M_2, INT, MRR, DBR are all integrated of order I(1). That is at lag length one, because their absolute

values are greater than the critical values (all in absolute terms) at 5% level of significance. Thus, we conclude that all the variables are (LOGFI, M_2, INT, MRR, DBR) are stationary.

4.2. COINTEGRATION TEST

To determine the number of cointegrating vectors, the Trace test and the Maximum Eigen value test was applied using the more recent values of MacKinon-haug-Michelis (1999). In this paper, the number of cointegrating vectors was denoted by K_0; the trace test was calculated under the null hypothesis H0: K_0=K, and the alternative hypothesis, H_1: $K_0 \rangle K$. The test results are presented in Table 4.2.1 below. If the test statistic is greater than the critical value at a given level of significance (5%), the null hypothesis will be rejected and vice versa. The result is displayed below:-

Table 4.2.1. *Johansen Test for Cointegration*

RANK	EIGEN VALUE	TRACE STATISTIC	0.05 CRITICAL VALUE	PROBAILITY VALUE
0	0.589282	59.58521	69.81889	0.2483
1	0.409645	31.99995	47.85613	0.6122
2	0.190307	15.66198	29.79707	0.7358
3	0.175332	9.117884	15.49471	0.3546
4	0.096384	3.141869	3.841466	0.0763

The trace test indicates no cointegrating equation at 0.05 level of significance

Table 4.2.2. *Maximum Eigen value test for cointegration*

RANK	EIGEN VALUE	MAXIMUM EIGEN STATISTIC	0.05 CRITICAL VALUE	PROBABILITY VALUE
0	0.58982	27.58526	33.87687	0.2333
1	0.409645	16.33767	27.58434	0.6369
2	0.190307	6.544094	21.13162	0.9695
3	0.175332	5.976014	14.26460	0.6163
4	0.096384	3.141869	3.841466	0.0763

The Maximum Eigen-value test and the trace statistics have the same result. From the result above, using the trace statistics, we accept the null hypothesis (No cointegration among the variables). Since the |τcal|(the trace statistic) is less than the |τtab|(the critical value) at the 5% level of significance, the null hypothesis of no cointegration will be accepted.This is also affirmed by the probability values which are all greater than 0.05. Also, the Maximum Eigen statistics are all greater than their critical values at 5% level of significance.

Accordingly, LOGFI, INT, MRR, M_2 and DBR are said not to be cointegrating. As a result, there is no long run relationship between these variables for the time period of the study. Thus this satisfies the unrestricted VAR condition of no cointegration of variables and hence we can proceed with our analysis

4.3. VAR LAG ORDER SELECTION CRITERIA

It is very important to carry out a lag selection criteria to determine the lags at which the VAR would be estimated. This is because if the VAR is estimated at the wrong lag, then the problem of autocorrelation among the variables is imminent. The table below shows the lag order selection criteria by different information criteria.

Table 4.3.1. *Lag selection order criteria*

LAG	AIC	SC	HQ
0	25.89223	26.00252	25.93705
1	12.91337	13.57511	13.18226
2	11.13172*	12.34491*	11.62468*

The results above indicate the lag selection criteria by three different information criteria namely, the Akaike Information Criterion (AIC), Schwarz Information Criterion and the Hannan-Quinn information Criterion. The lag selected by these three different criteria is lag 2. Thus the VAR would be run at lag 2.

4.4. IMPULSE RESPONSE FUNCTION

Through the dynamic structure of the VAR model, shocks are transmitted to all of the endogenous variables (Lutkepohl, 2001). These transmitted shocks, make VAR models difficult to interpret. One remedy is to construct an impulse response function (IRF), which is useful in assessing how these shocks to economic variables reverberate through a system, and the effects of these shocks on the adjustment path of the variables. The IRF traces the response of the endogenous variables to one-standard deviation shock to one of the disturbance term in the system

Thus, we analyse the response of the financial inclusion to shocks in the monetary policy instruments in line with the objectives of the paper.

Figure 3 below represents impulse responses of financial inclusion to one standard deviation innovations/shocks in minimum rediscount rate over a three-year horizon (ten periods or quarters). The time scale measured on the primary horizontal axis is in months and the dashed lines are analytic confidence intervals obtained from variance-covariance matrices after the final iteration.

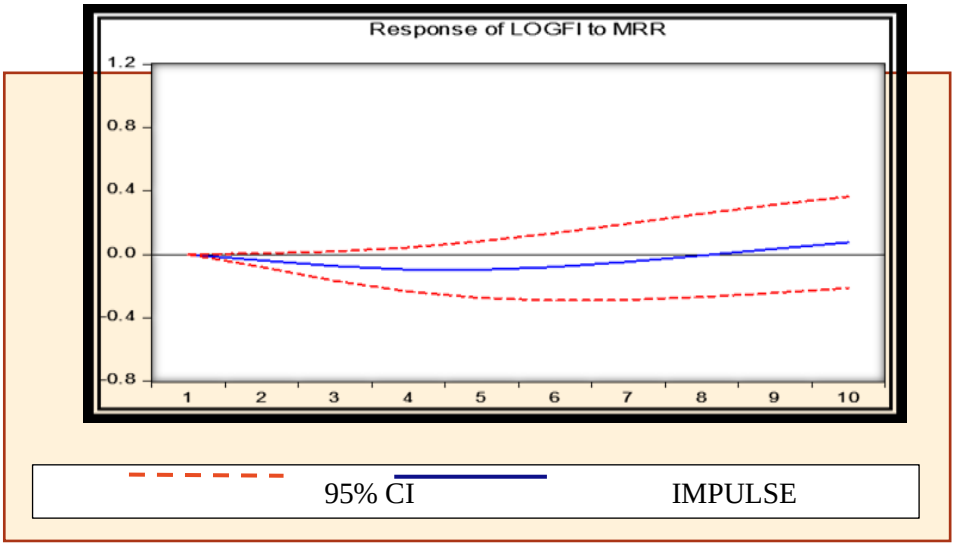


Figure 3. *Response of LOGFI to MRR*

From figure 3 above, a standard deviation shock on minimum rediscount rate corresponding to an unanticipated 1 percent increase in minimum rediscount rate trigger significant responses by financial inclusion. This lead to a decline in financial inclusion which bottoms at period 5.However, this trend changed from period 7 as the response of financial inclusion to a standard deviation shock on minimum rediscount rate became positive, peaking at period 10 above the zero base line.

The result conforms to theory as when the CBN raises MRR, the lending power of banks decreases lead to a fall in financial inclusion (rural loans and deposits). However, as time goes on, people and banks absorb this shock (increase) on MRR and financial inclusion rises again. One of the studies that have reported similar result is Hyytinen and Toivanen(2010). Their result found that that minimum rediscount rate has a significant impact on loans to small and medium enterprises and this covers also for the rural areas in Germany.

Next, we analyse the response of financial inclusion to shocks in the monetary policy variable, lending interest rates of commercial banks. The figure below represents impulse responses of financial inclusion to one standard deviation innovations in lending interest rates of commercial banks over a three-year horizon (ten quarters).

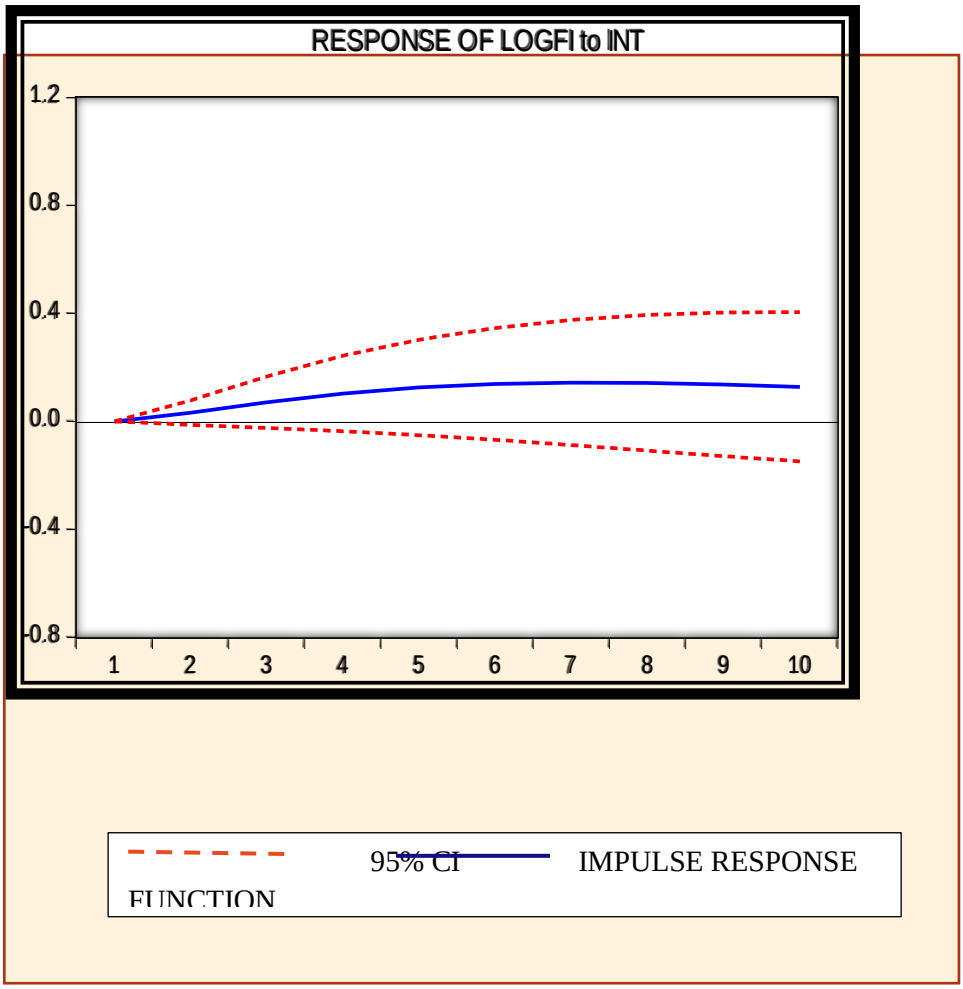


Figure 4. *Response f LOGFI to INT*

Figure 4 above indicates that a standard deviation shock on lending interest rates equivalent to an unexpected 0.62 percent rise in lending interest lead to only marginal increases in financial inclusion from periods 1 to 8.However, beyond period 8 the response of financial inclusion to the shock on interest rates becomes more evident as financial inclusion begins to decline beyond period 8. This also conforms to a priori expectation. (The Keynesian theory of interest rates and money). Thus, an increase in interest rates will cause financial activities to decline leading to an increase in financial exclusion. The work of Era, Yan and Unsal (2015) showed that lending interest rates affects financial inclusion in low income economies like Kenya, Uganda and Mozambique.

Also, to analyse how financial inclusion is affected by shocks to the monetary policy variable (broad money supply), we plot the impulse responses of financial inclusion to one standard deviation shocks in broad money supply.

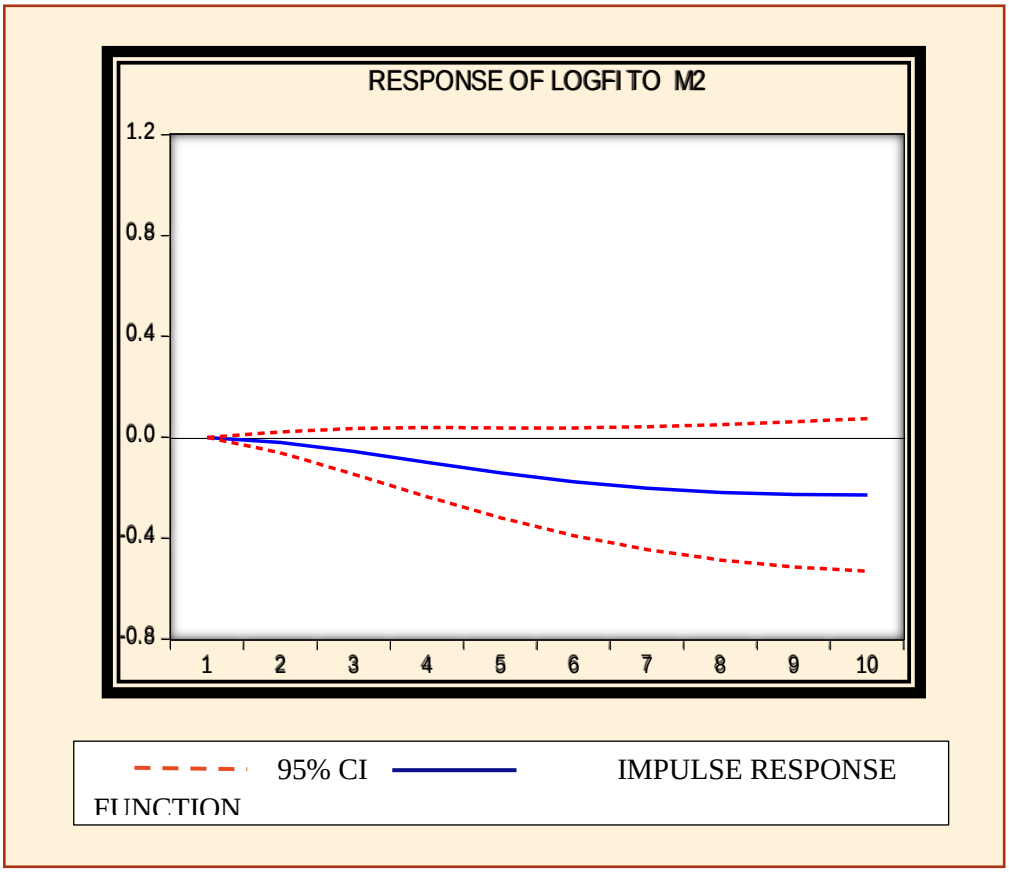


Figure 5. *Response of LOGFI to M2*

The figure above shows that a standard deviation shock on broad money supply equivalent to an unanticipated increase in broad money supply of about 1.5 percent causes financial inclusion to decline steadily, bottoming at 0.23 percent below baseline after 12 months. Thus, the response is significant for all the periods.

The result above also conforms to theory (Irvin Fishers quantity theory of money). An increase in money supply by the monetary authorities will cause the nominal interest rates to rise which in turn is channelled back to financial activities and hence financial inclusion. Studies like Chuku (2009), and Fasanya (2015) confirm that broad money supply is a very significant monetary policy variable and has a significant effects on commercial bank loans and advances in the Nigerian economy.

Similarly, to analyse how financial inclusion is affected by shocks to the monetary policy variable (deposit bank rates), we plot the impulse responses of financial inclusion to one standard deviation shocks in deposit bank rate.

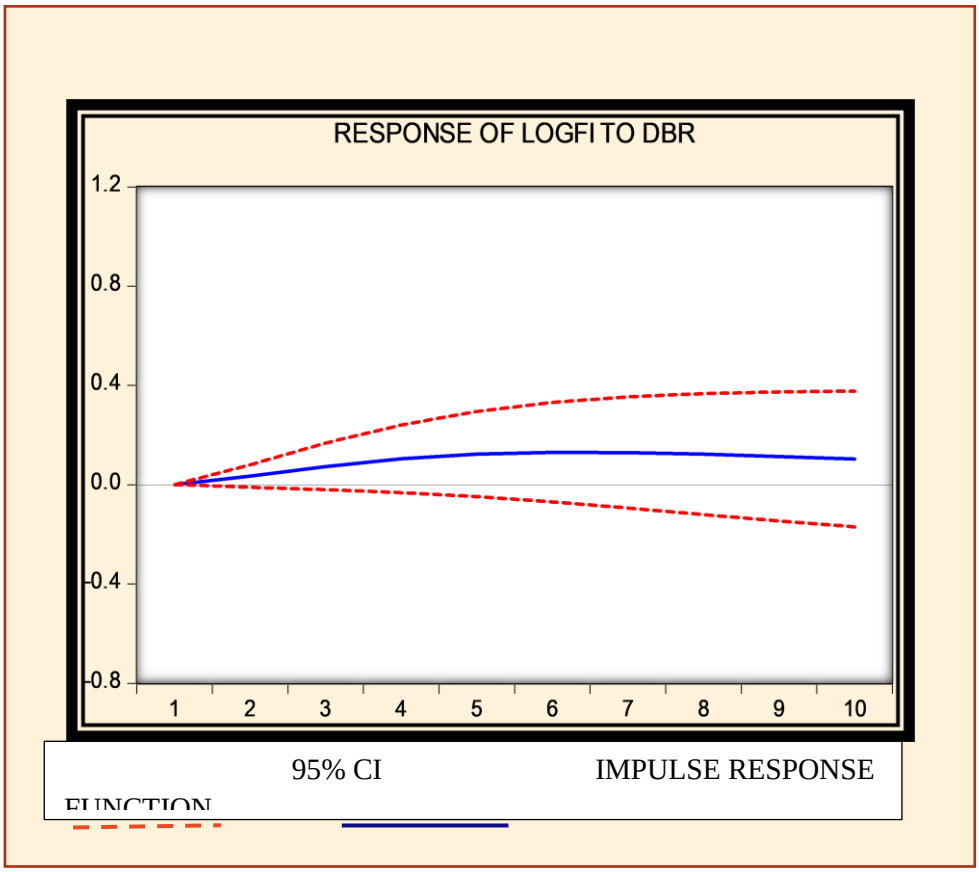


Figure 6. *Response of Logfi to DBR*

The result of the figure 6 shows that a standard deviation shock on deposit banks rates corresponding to an unanticipated 0.71 percent increase in deposit rates caused financial inclusion to increase only marginally from periods 1 to 6 peaking at only 0.13 percent above the zero base line at period 6. However, beyond period 6 the response of financial inclusion to the shock on interest rates becomes more significant as financial inclusion begins to decline beyond period 6. This also conforms to a priori as a higher deposit rates by deposit banks leads to financial exclusion of the citizenry especially in the rural areas. The study of Florence and Richards (2015) reveals that deposit rates of banks has a significant impact on customer patronage to banks in Rwanda.

4.5. VARIANCE DECOMPOSITION

In econometrics and other applications of multivariate time series analysis, a variance decomposition or Forecast Error Variance Decomposition (FEVD) is used to aid the interpretation of a VAR model. Once it has been fitted, the variance decomposition indicates the amount of information each variable contributes to the other variables in the autoregession. That is how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables.

To determine the relative importance of each structural innovation in explaining fluctuations of the variables in the generic model, Table 4.5.1 presents variance decompositions for each variable in the model over a three-year (ten periods) forecast horizon. However, the researchers concentrated on the variance decomposition as regarding the objectives of the paper.

Table 4.5.1

PERIOD	LOGFI	MRR	INT	M_2	DBR
1	100.0000	0.000000	0.000000	0.000000	0.000000
2	98.62165	0.465915	0.370459	0.133205	0.408767
3	96.18219	1.129733	1.017420	0.578511	1.092149
4	93.58417	1.603688	1.702863	1.343071	1.766207
5	91.25452	1.771648	2.317529	2.346825	2.309476
6	89.30477	1.685669	2.827542	3.484018	2.698003
7	87.67870	1.471391	3.234351	4.662470	2.953086
8	86.25746	1.263223	3.551766	5.817876	3.109677
9	84.92256	1.167731	3.795494	6.913016	3.201204
10	83.58791	1.247775	3.979488	7.930754	3.254070

The table above reveals that while shocks to minimum rediscount rate accounts for 1.24 percent fluctuations in financial inclusion, shocks to interest rates accounts for approximately 4 percent fluctuations in financial inclusion after period ten (three years).Similarly, while shocks to broad money supply accounts for about

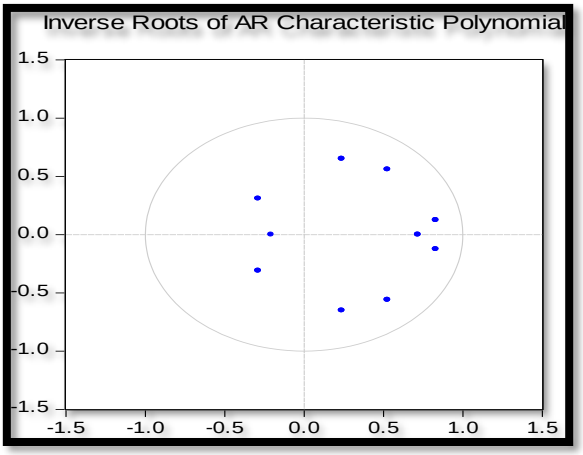
8 percent fluctuations in financial inclusion, shocks to deposit banks deposit rates accounts for about 3.3 percent fluctuations in financial inclusion.

4.6. VAR POST ESTIMATION TESTS

4.6.1. Stability Test

It is very important to carry out a stability test on a VAR model, especially when the model tested will be used for forecasting as if the model passes other tests and fails the stability test it is considered non reliable for prediction.

Stability test helps to ascertain that the variables are identified and hence predictable. It is worthy to note that unidentified (unstable) models or equation cannot be estimated. Essentially, the necessary and sufficient condition for stability is that all characteristic roots lie inside the unit circle. In other words, using the Eigen value stability condition, VAR satisfies stability condition if all the roots of the AR characteristic polynomials lie inside the unit circle. The result obtained is presented graphically below.



From the diagram, it is evident that all the roots of the AR characteristic polynomial lie inside the unit circle. This shows that the VAR model gives stable estimates. Based on this result, any form of forecasting done with the model is reliable since the VAR model used, satisfies the stability condition.

4.7. DISCUSSION OF THE FINDINGS

From the results, the paper found that a shock on minimum rediscount rate which caused an unexpected 1 percent increase in the rate had a negative impact on financial inclusion (caused financial inclusion to decline). This is traced to the fact that a higher minimum rediscount rate reduces the lending capacities of commercial banks and hence financial inclusion. Thus the Nigerian government should adopt policies that will cushion out the effects of an increase in minimum rediscount rate

as a result of shocks if financial inclusion is to be increased and sustained in the country. This will serve to raise the lending capacities of banks and motivate them to lend out to the citizenry.

It is also seen that a shock on lending interest rates of commercial banks which caused an unanticipated 0.62 percent increase in interest rates has no immediate significant impact of financial inclusion. This is because the increase in interest rates is very minute and thus people can still afford to do transactions with banks, however overtime, they respond to these little increases by reducing their financial activities with banks affecting financial inclusion. Therefore, policies should be adopted which would make the banking industry more competitive so as to curb unanticipated increases in lending interest rates of commercial banks and thus positive increases in financial inclusion.

Again, a negative significant relationship was found between financial inclusion and increases in the broad money supply. The result revealed that a shock on broad money supply which caused an unexpected 1.5 percent increase in the broad money supply of the Nigerian economy would cause financial inclusion to decline for all the periods. Meaning that increasing the broad money supply of the country is not a good strategy for increasing financial inclusion by the Nigerian government. This is traced to the negative effects of inflation on the Nigerian economy. Thus with the face of inflation on the economy, the government should rather pursue contractionary monetary policy measures which is a reverse of expansionary monetary policy measures which has a worse effect on financial inclusion by increasing the nominal interest rates and thus reducing financial inclusion in the country.

Consequently, the results revealed that a standard deviation shock on the deposit rates of deposit banks leading to an unanticipated 0.71 percent increase in the deposit rates of deposit banks has no immediate significant impact on financial inclusion. However, this is not the case for all periods as no sooner than later, these shocks translate to decreases in financial inclusion of the country. Thus policies that would expand the banking industry and make it more competitive would be very helpful.

4.8. POLICY IMPLICATION AND RECOMMENDATIONS

Myriads of policy lessons could be deduced from the results obtained from the paper. Among them, is the impact of a shock on broad money on financial inclusion in Nigeria. The results revealed that shocks to the monetary policy instrument, broad money, leading to an unexpected rise in broad money supply gives the quickest negative response of financial inclusion in Nigeria. Thus, expansionary monetary policies do more harm than good to financial inclusion in Nigeria.

Another lesson from the analysis is that a shock on minimum rediscount would at first trigger a fall in financial inclusion in Nigeria as theory suggests, but as time goes on financial institutions will source for other means to attract investors and depositors to their institutions leading to an increase in financial inclusion again.

This is possible if the shock leads to a very minimal increase in minimum rediscount rate. However, if the shock lead to a high increase in the rate, it becomes increasingly difficult to cushion the effects on financial inclusion.

Also, from the results, it was observed that a shocks on deposit banks deposit rates and shocks on lending interest rates have almost the same impact on financial inclusion in Nigeria. This is because shocks to the later (leading to an unexpected minimal rise in interest rates) would at first not affect financial inclusion but as investors begin to get enough plough back in terms of profits, they begin to channel this back to their investments because it is no longer profitable to borrow at high interest rates from commercial banks both at the rural areas and in the urban centres of the country thus affecting financial inclusion in the country. This also applies to if the deposit rates of deposit banks are high as investors after they have gotten enough profits from their investments will turn down their deposits in deposit banks.

The findings of this study have some implications for policy, which are summarized as policy recommendations herein. The Nigerian government can regulate the levels of financial inclusion in the country through the following measures.

1. The movement of the Nigerian government to create more banks at the rural areas during the early 1970s which has long been abandoned should be forestalled. The neglect of the rural areas in financial activities of the country leads to gross financial exclusion in the country. This is derived from the new urban and regional economics findings that more than 40 percent of the country's adult populations are concentrated in the rural areas and thus government policies that will lead to the creation of more banks in the rural areas will go a long way in trickling down the effects of financial exclusion in the country thus leading to increase in financial inclusion in the country. A way in which the government can do this is to institute policies that favors the establishment of community banks in the country.
2. As observed in the analysis, high lending interest rates and high deposit rates of financial institutions adversely affects financial inclusion in the country, it follows that the government should set up policies that will check the excess profiteering activities of financial institutions in the country. This measure will go a long way in curtailing high interest rates and the high deposit rates of individual financial institutions across the country thus attracting more individuals to deposit and borrow from financial institutions both in the rural and urban centers which in turn enhances financial inclusion in the country.
3. The government should also adopt policies that will lead to the expansion of the banking industry (across the rural and urban centers) and foster competition amongst the various commercial banks as this will lead to the inclusion of the citizenry in the financial activities of the country and also make the banking sector reduce lending interest rates in a bid to get more

customers thus enhancing financial inclusion in the country. This also serves to address future shocks leading to unanticipated rise in interest rates in the future.

4. As observed in the paper, an increase in minimum rediscount rate caused financial inclusion to decline. Thus, the government should cut down the minimum rediscount rate in the country as this will increase the lending capacity of commercial banks thus affecting financial inclusion positively. Also, low minimum rediscount rates help to cushion out the effects of very significant decline in the future in the situation of unanticipated shocks to minimum rediscount rates.
5. From the results, an unanticipated 1.5 percent increase in the broad money supply of the country will affect financial inclusion adversely. Thus, to improve financial inclusion in the country, the government should follow more after contractionary policies towards money supply or better still implement expansionary monetary policies that is low enough as not to trigger increases in the nominal interest rates which will in turn affect financial inclusion negatively.
6. Policies that will address the issue of inflation like tax policies could also serve to control unanticipated increases in the broad money supply of the country. This helps to cut down high nominal interest rates that will result from positive shocks to money supply.
7. The financial system strategy (FSS 2020) which was instituted to develop the Nigerian financial sector into a growth catalyst that will enable Nigeria to become one of the 20 largest economies in the world by 2020 should be reviewed and evaluated on yearly basis instead of the normal routine five year basis. This will enable the corrections for distortions in financial inclusion as a result of monetary policy shocks on yearly basis as enumerated above.
8. Policies that will give minimal and uniform deposit rates of various commercial banks and deposit banks across the country will tend to address the issue of arbitral high deposit rates in the country by various financial institutions thus increasing financial inclusion in the country.

5. CONCLUSION

Following the conclusions from literature that various monetary policy variables affect the financial activities of various countries differently, the paper subjected this consensus to empirical analysis using Nigerian data from 1982 to 2014. Thus, the research investigated the impact of monetary shocks on financial inclusion in Nigeria for the time span given above. The paper supports Keynesian conclusions that monetary policy innovations (shocks) has implications on financial activities in the country and hence financial inclusion.

The result from the study indicates that innovations which cause increase in monetary policy variables like minimum rediscount rate, broad money supply,

interest rates, and deposit rates of deposit banks adversely affects financial inclusion ceteris paribus. This is the case with the Nigerian economy. This paper therefore recommends that effective monetary policy measures should be put in place by the Nigerian government to guard against decreases in financial inclusion.

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