Journal of Advanced Research in Economics & Business Management
Volume 6, Issue 3&4 - 2019, Pg. No. 27-36
Peer Reviewed Journal

Research Article

Effects of Monetary Policy Shocks on the Nigerian Economy

Ifeoluwa I Ogunrinola

Department of Economics and Development Studies, Covenant University, Ota, Nigeria.

I N F O

E-mail Id:
ifeoluwaogunrinola@gmail.com
Orcid Id:
https://orcid.org/0000-0002-1165-2595
How to cite this article:
Ogunrinola II. Effects of Monetary Policy Shocks on the Nigerian Economy. *J Adv Res Eco Busi Mgmt* 2019; 6(3&4): 27-36.

Date of Submission: 2019-12-03
Date of Acceptance: 2019-12-26

A B S T R A C T

This study analyses the effects of monetary policy shocks on the economy of Nigeria during the period 1980:Q1-2018:Q4, using the Structural Vector Autoregression (SVAR) technique. Findings from the study reveals that monetary policy innovations carried on the quantity based nominal anchor, M_2, is the most significant source of variation in output and prices with a very fast speed of adjustment while other policy variables were insignificant. The study therefore, recommends emphasis on the manipulation of the quantity-based nominal anchor (M_2) for managing the economy.

Keywords: GDP, Monetary Policy Shocks, Money Supply, Nigeria, SVAR

Jel Classification: E52, E61 1.

Introduction

Innovations or shocks to monetary policy play a significant role in the achievement of set economy-wide objectives by monetary authorities. The ability of monetary authorities to ensure stability in the levels of prices and growth rests on the efficiency and effectiveness of monetary policy instruments. Hence, proper calibration and appropriate use of monetary policy options becomes an essential ingredient in the conduct of good policymaking. The occurrence of monetary policy shocks has over times, engaged the minds of monetary authorities and academicians who seek to identify their actual effects on the economy. Questions bordering on the actual effects of monetary policy shocks is argued to be highly puzzling amid varied opinions, depending on the structure of the economy investigated, the adopted approach, variable choice and the identifying restrictions imposed on the models so chosen (Chuku, 2009).

Over the years, various monetary policy regimes have emerged to create a platform for the attainment of monetary policy objectives of price stability and economic growth in Nigeria. The first era – the direct control regime (1974-1992) - is considered by various researchers as ineffective in ensuring stability and growth led objectives in the country (Chuku, 2009). The second era - the indirect control regime (1993-date) - has been characterized by debates surrounding the efficacy or otherwise of regime in attaining countrywide objectives. However, despite efforts in the past years to develop a monetary policy framework that would aid the achievement of macroeconomic and price stability in Nigeria, there have been constraints militating against the attainment of these objectives.

Prominent among the constraints is the issue of fiscal dominance and concerns about debt sustainability in Nigeria. According to Sanusi and Akinlo (2016), fiscal expansion and the concomitant large fiscal deficits averaging about 3.0 percent of GDP have discouraged the effectiveness of monetary policy in Nigeria. In 1999 for example, the level of fiscal deficit in Nigeria was 8.4 percent of the total GDP. Up to date, the inflationary financing of large budgetary deficits and the monetization of deficits have continued to pose serious challenges to monetary management in

the country. Despite the operational autonomy of the Central Bank of Nigeria (CBN), the bank's effort towards setting strict limits on the financing of government deficit has proved abortive.

Another constraint hindering the achievement of policy goals in the country is the inefficiency of the payment system and the existence of a large informal sector. The payment system is a vital link between the financial system and the real sector of the economy. Quite unfortunately, the payment instrument in Nigeria is predominantly cash. The prominence of cash for transaction purposes increases the volume of currency in circulation, which in turn, renders money control on aggregate level, difficult or impossible. With a large and unbanked informal setting, transactions are predominantly carried out outside the banking system, rendering monetary control difficult. Other militating factors include liquidity overhang, the oligopolistic structure of the banking system, which makes a few large banks control the preponderance of the liquidity in the banking sector. Poor data quality and fiscal shocks which affects the formulation of monetary policy in Nigeria; and the dualistic nature of the financial and products market, which features the existence of a large informal credit and exchange rate markets in Nigeria further inhibits successful achievement of policy efforts to drive growth in the country.

It is therefore not surprising that various literature have questioned the efficacy and effectiveness of monetary policy innovations in achieving the set goals of the monetary authorities because of the obvious challenges faced by monetary policy in Nigeria (see Chuku, 2009; Mishra and Montiel, 2012; Adeoye and Saibu, 2014; Adediran, Matthew, Olopade and Adegboye, 2017). Amidst the aforementioned challenges, this study investigates how policy induced shocks by monetary agents impact on the economy of Nigeria. Particularly, the study seeks to identify the actual effect of monetary policy changes, in the face of macroeconomic disturbances on real economic outcomes in Nigeria over the study period. This paper seeks to help academicians and policy analysts in this study area understand how effective monetary policy shocks are to steering the economy towards desired outcomes. The study presses on to reveal the nature of such 'shock responses' in the economy (i.e. whether the shocks explode or die out quickly). This study uses quarterly time series data from 1980:Q1 to 2018:Q4.

The remainder of this work progresses as follows: section two briefly addresses empirical literature relevant to the study under research. The third section discusses the theoretical framework and research method. Section four discusses data estimation and interpretation of results while the fifth section provides policy recommendation and then, concludes.

Brief Review of Literature

Review of Empirical Issues

What are the actual effects of monetary policy shocks on an economy? The empirical literature that follows contains a preponderance of studies of both developed and developing nations of the world that seek to measure the effects of monetary policy shocks on their economies.

Mishkin (2017) in his study made very important points on traditional discretionary and non-traditional monetary policy regimes vis-a-vis monetary policy effects on the economy. According to his study, an advantage of discretionary policy is that the monetary authority can use policy instruments to offset adverse shocks to output by pursuing expansionary policy when output is below its potential and contractionary policy when output is above its potential. For example, a policy-controlled interest rate can be set low to reduce commercial interest rates and stimulate aggregate spending in the below-potential situation. In addition, the liquidity of the banking system could be increased in an attempt to increase bank lending and again stimulate spending. Alternatively, a monetary expansion that lowers the real exchange rate may improve the competitiveness of the country's products in domestic and world markets and, thereby, boost demand for national output. In principle, countercyclical monetary policy can also be practiced with inflation targeting, although such a policy must be flexible rather than strict, as Ghironi and Rebucci (2000) and Mishkin (2002) argued. However, non-traditional policy regimes limit the ability of the monetary authorities to use policy to offset output fluctuations.

Mishkin (2002), Montes (2010) and Guney (2016), in separate works examined the role of output stabilization in the conduct of monetary policy. Results from their study showed that monetary authorities and central banker's focus on output fluctuations did not favour the realization of expected outcomes. Hence, activist monetary policy in which central bankers attempt to smoothen out output and inflation fluctuations were deemed inefficient policy strategies. This position is based on the premises that focus on output fluctuations could lead to suboptimal monetary policy outcomes, which could also complicate monetary authorities' communication strategy thereby, weakening the credibility of the central bank. Mishkin (2002) further noted that conducting monetary policy with a flexible inflation target rule is likely to produce better outcomes. This is because it allows monetary authorities to communicate effectively to the public that they really do care about output fluctuations, but makes it less likely that they will be encouraged to try to exploit the short run tradeoff between output and inflation.

For middle-income countries, a number of empirical

literature have claimed that the effect of monetary policy shocks are modest. Considering a number of Central and Eastern European (CEE) economies for instance, Ganev et al. (2002) found out some asymmetric effects of monetary policy shocks on ten countries. Evidences from the result of analysis showed output sensitivity to exchange rate fluctuations but not to interest rate changes. In the work of Starr (2005), using an SVAR model for five commonwealth of Independent States (CIS) countries, output and prices was found to be interest elastic only in Russia. However, in the remaining CIS countries, the real effect of monetary policy shocks was deemed weak. In the more developed countries such as the United States (US) and some other core European economies, the effect of monetary policy surprises on real economic factors was found to be assuring (Mishkin, 2002; Bernake et al., 2005; Rafiq and Mallick, 2008).

Chuku (2009) attempted to study the effects of monetary policy innovations/shocks in Nigeria. His analysis centered on the proposition that monetary authorities are unable to, within the same period, respond to output and price changes. The ability of central bankers, according to Chuku (2009), to achieve countercyclical objectives using monetary policy innovation as core strategy depend on a number of factors.

These factors include the credibility of monetary policy, policy transparency, choice of monetary instrument used for intervention, anticipation or non-anticipation by economic agents and the sticky and flexible nature of prices. Further, in his study, the effectiveness of monetary policy was found to be effective for developed countries while those for developing countries were found to be full of 'puzzles', which according to him are 'idiosyncratic evidences which are inconsistent with theoretical expectations'. These puzzles are identified as the liquidity, price and exchange rate puzzles respectively (also see Balogun, 2007; Mishkin, 2002; Rafiq and Mallick, 2008 and Bernake et al., 2005). Chuku (2009) concluded his research by submitting to the position that monetary policy innovations or shocks have mild effects on countercyclical outcomes in Nigeria. This conclusion originates from the result that the price based nominal anchor (Minimum Rediscount Rate, MRR and Real Effective Exchange Rate, REER) do not have a significant influence on real economic activity, whereas, innovations in the quantity based nominal anchor, M_2 (broad money) does.

Theoretical Framework and Research Method

The basic theoretical framework for explaining monetary policy effects on the economy is the popular Keynesian theory of monetary policy. The theory recognizes four main channels through which monetary policy actions of central bankers may affect an economy. The first, which is the interest rate channel, explains how changes in monetary policy affects investment, employment and aggregate demand through the rate of interest. The next, which is the asset price channel, explains how changes in monetary policy affects the value of financial asset, leading to changes in investment levels and net wealth holdings of households. The credit channel of Keynesian monetary policy describes how monetary changes affect credit availability through changes in reserves. The availability of credit to the private sector further drives investment, consumption and output in the economy. The exchange rate channel of monetary policy describes how monetary policy changes exerts upon the exchange rate through changes in the nominal interest rate, leading to a differential between domestic and foreign interest rates. The resulting effect is on the nominal exchange rate, the balance of payments and aggregate income.

Each of the transmission mechanisms explained above show how monetary policy changes (or shocks) might affect output and prices through the various channels. In the section that follows, we model a simple interaction in a VAR-type system and attempt to show how real output is affected by changes in monetary policy variables.

Research Method

To clarify the discussion of the effects of monetary policy shocks on the Nigerian economy, this study employs the use of the structural vector autoregressive (SVAR) approach. The use of this methodology follows majorly from the work of Tashrifov (2007) and Chuku (2009) in analyzing the effects of shocks on output and prices in the economy.

Model Specification

The empirical work applied in this study is in the form of a small and open-economy structural vector autoregression (SVAR). This SVAR model is composed of a system of five equations, depicting the relationship between the main macroeconomic indicators of Nigeria, the real GDP (RGDP), the inflation rate measured by the consumer price index (CPI), the broad money supply (M_2), the interest rate measured by bank's minimum rediscount rate (MRR), and the real exchange rate of the economy (RER).

The model in this study follows the works of Tashrifov (2007) and Chukwu (2009) in their analysis of monetary policy shocks on the macroeconomy, applying the SVAR econometric approach. However, this study makes slight adjustments to those of Chukwu (2009) and Tashrifov (2007) by adopting variables that are particular to the Nigerian economy in line with the core objective of this study. Following similar previous studies, we consider a system of simultaneous equations expressed in vector form below:

$$By_t = \gamma_0 + A(L)y_{t-1} + M\varepsilon_t \quad (1)$$

Where y_t is a vector of endogenous variables, γ_0 is the fixed constant, y_{t-1} is a vector of their lagged values, ε_t is a vector of random error of the disturbance terms for

every variable which captures any exogenous factors in the model. B is the square matrix of dimensions n x n, where n is a number of variables, and contains the structural parameters of the contemporaneous endogenous variables, $A(L)$ is a matrix polynomial in the lag operator L of lag length p, and M is the square n x n matrix, which contains the contemporaneous response of the variables to the innovations or disturbances. Equation (1) is a structural VAR model, given the assumption that the model will be determined by some underlying economic theory. However, the model for this study is presented in the following system of functional equations:

$$rgdp_t = f(rgdp_{t-1}, m_{2t-1}, cpi_{t-1}, mrr_{t-1}, rer_{t-1}) \quad (2)$$

$$m_{2t} = f(rgdp_{t-1}, m_{2t-1}, cpi_{t-1}, mrr_{t-1}, rer_{t-1}) \quad (3)$$

$$cpi_t = f(rgdp_{t-1}, m_{2t-1}, cpi_{t-1}, mrr_{t-1}, rer_{t-1}) \quad (4)$$

$$mrr_t = f(rgdp_{t-1}, m_{2t-1}, cpi_{t-1}, mrr_{t-1}, rer_{t-1}) \quad (5)$$

$$rer_t = f(rgdp_{t-1}, m_{2t-1}, cpi_{t-1}, mrr_{t-1}, rer_{t-1}) \quad (6)$$

Where $rgdp_t$ is the log of real gross domestic product (RGDP), m_{2t} is the log of broad money supply (M_2), cpi_t is the log of the consumer price index (CPI). mrr_t is the log of the minimum rediscount rate (MRR), and rer_t is the log of the real exchange rate (RER), all measured at time t, their lagged values are indicated by the 't-1' time period. The structural model of this study therefore, can be described by the following dynamic system of simultaneous equations with each variable taken as endogenous:

$$rgdp_t = a_{10} - b_{12}cpi_t - b_{13}m_{2t} - b_{14}mrr_t - b_{15}rer_t + \sum_{i=1}^{p} a_{11}^i rgdp_{t-1} + \sum_{i=1}^{p} a_{12}^i cpi_{t-1} + \sum_{i=1}^{p} a_{13}^i m_{2t-1} + \sum_{i=1}^{p} a_{14}^i mrr_{t-1} + \sum_{i=1}^{p} a_{15}^i rer_{t-1} + \varepsilon_t^{rgdp}$$

$$cpi_t = a_{20} - b_{21}rgdp_t - b_{23}m_{2t} - b_{24}mrr_t - b_{25}rer_t + \sum_{i=1}^{p} a_{21}^i rgdp_{t-1} + \sum_{i=1}^{p} a_{22}^i cpi_{t-1} + \sum_{i=1}^{p} a_{23}^i m_{2t-1} + \sum_{i=1}^{p} a_{24}^i mrr_{t-1} + \sum_{i=1}^{p} a_{25}^i rer_{t-1} + \varepsilon_t^{cpi}$$

$$m_{2t} = a_{30} - b_{31}rgdp_t - b_{32}cpi_t - b_{34}mrr_t - b_{35}rer_t + \sum_{i=1}^{p} a_{31}^i rgdp_{t-1} + \sum_{i=1}^{p} a_{32}^i cpi_{t-1} + \sum_{i=1}^{p} a_{33}^i m_{2t-1} + \sum_{i=1}^{p} a_{34}^i mrr_{t-1} + \sum_{i=1}^{p} a_{35}^i rer_{t-1} + \varepsilon_t^{m_2}$$

$$mrr_t = a_{40} - b_{41}rgdp_t - b_{42}cpi_t - b_{43}m_{2t} - b_{45}rer_t + \sum_{i=1}^{p} a_{41}^i rgdp_{t-1} + \sum_{i=1}^{p} a_{42}^i cpi_{t-1} + \sum_{i=1}^{p} a_{43}^i m_{2t-1} + \sum_{i=1}^{p} a_{44}^i mrr_{t-1} + \sum_{i=1}^{p} a_{45}^i rer_{t-1} + \varepsilon_t^{mrr}$$

$$rer_t = a_{50} - b_{51}rgdp_t - b_{52}cpi_t - b_{53}m_{2t} - b_{54}mrr_t + \sum_{i=1}^{p} a_{51}^i rgdp_{t-1} + \sum_{i=1}^{p} a_{52}^i cpi_{t-1} + \sum_{i=1}^{p} a_{53}^i m_{2t-1} + \sum_{i=1}^{p} a_{54}^i mrr_{t-1} + \sum_{i=1}^{p} a_{55}^i rer_{t-1} + \varepsilon_t^{rer}$$

The exogenous error terms ε_t^{rgdp}, ε_t^{cpi}, $\varepsilon_t^{m_2}$, ε_t^{mrr}, ε_t^{rer} are independent and are interpreted as structural innovations. The model is such that realizations of each structural innovation captures unexpected shocks to its respective dependent variables, which are uncorrelated with other unexpected shocks (ε_t). In the above system of simultaneous equations, the endogeneity of $rgdp_t$, m_{2t}, cpi_t, mrr_t and rer_t are determined by the values of the coefficients of b. However, the reduced form of the VAR model that is to be estimated does not have the instantaneous endogenous variables and the error terms e_t are linear combinations of the orthogonalized shocks (ε_t), such that each individual error term is serially uncorrelated with a zero mean and a constant variance.

Data Estimation and Interpretation

In line with the main objective of this study, empirical evidence of monetary policy shocks and their concomitant effects on the economy in Nigeria, over the timeframe 1980:1-2017:4, is tested.

Presentation of Results

As mentioned earlier, quarterly data of selected variables between 1980:Q1 and 2017:Q4 are used to estimate the structural VAR model of this study. All data are sourced from the Central Bank of Nigeria Statistical Bulletin and the World Development Indicators (WDI) for the various years. Further, in avoidance of any econometric problems in the estimation models, the natural logs of all variables are taken. In what follows, is the test for stationarity since time series data are believed to be inherently non-stationary (Gujarati, 2004). It is the results which follows that sets the stage for the estimation of the SVAR.

Test for Stationarity

Many macroeconomic time series are not stationary and hence, contain a unit root. As a result, it becomes necessary that they are subjected to unit root test in empirical works. A time series variable is stationary at level if it is integrated of order zero, i.e., I(0). The unit root test is necessary in order to ascertain that variables that are seemingly under random walk process end up being co-integrated (Alege, 2005).

Table 1 depicts the results of the unit root test. The analysis is restricted to the choice of Augmented Dickey-Fuller (ADF) statistic.

From the unit root test as summarized in table 1, we observe that all variables in the model (LGGDP, LGCPI, LGM_2, LGMRR and LGRER) are all non-stationary at level i.e. they all contain a unit root. Therefore, we accept the null hypothesis for all variables in this study. However, differencing each variable once makes all non-stationary variables stationary at 5% level of significance. This now implies that the variables no

Table 1.Augumented Dicky Fuller Test for Unit Root

Variables	Adf Test Statistic		Critical Values (5%)		Order of Integration	Remark
	at Level	at 1st Difference	at Level	at 1st Difference		
LGGDP	0.101363	-11.87314	-2.884291	-2.884291	I(1)	Stationary
LGCPI	-1.376685	-3.222033	-2.883753	-2.883753	I(1)	Stationary
LGM_2	0.632154	-12.60364	-2.883579	-2.883753	I(1)	Stationary
LGMRR	-2.168030	-2.901692	-2.885249	-2.885249	I(1)	Stationary
LGRER	-1.599544	-9.834454	-2.883579	-2.883753	I(1)	Stationary

Source: Author's computation using EViews 5.0 software package

longer contain a unit root or, we say they are integrated of order one i.e. they are I(1). This information now therefore sets the stage for the SVAR estimation analysis.

VARs with Incorporated I(1) Variables

In the SVAR analysis that follows, variables are incorporated in their first differences, following the unit root test result. This process however seems to be uncommon in econometric literature but suitable justifications for the same have been made by some scholars who believe in the appropriateness of incorporating variables in their first differences for a VAR analysis. Prominent among such literature is found in the works of Gali (1999) and Marcet (2004), for example. In support of this position, Hamilton (1994) also opines that an option for dealing with non-stationary series in a VAR model is to routinely difference any apparently non-stationary variables before estimating the VAR.

However, consensus in this argument holds that differencing already stationary series before incorporating into the VAR is what yields misspecification errors and inconsistent estimates. Many scholars support this view, for example Hamilton (1994), Hendry (1995) and Maravall (1999). This therefore set the stage for a comfortable use of variables in their first differences while estimating VARs and indeed, SVARS alike.

Choice of Maximum Lag Length

Choosing an optimal lag length in a VAR process is a very important aspect in the estimation procedure. According to the Akaike, Hanan-Quinn and the SB information criteria, the optimal lag length for this estimation process is set to one (see table 2, appendix II).

Estimation of the Reduced form VAR Model

Because of the parameter identification problem, ordinary least squares estimation of the structural VAR would yield inconsistent parameter estimates. Estimating the reduced form VAR model first, can solve this problem. In the five variable reduced form VAR model, DLGRGDP, DLGCPI, DLGM2, DLGMRR and DLGRER are estimated to see the effect of monetary policy innovations on the Nigerian economy. All variables are specified in their natural log form.

Overall findings from the reduced form VAR estimation shows that the relative power of predictability of broad money supply (M_2) is significant in explaining output variations in the economy. However, it is more likely to obtain better predictions by applying the short run restrictions of the structural VAR.

Test for Stability of the VAR Model

In order to determine if the VAR model satisfies the stability condition, we subject the model to a stability test. The test result shows that all the eigenvalues of the model lie inside the unit circle, which establishes that the VAR satisfies the stability condition (see table 3, appendix II).

The Lagrange Multiplier (LM) Test

The Lagrange Multiplier (LM) test is carried out to see that the disturbances are not autocorrelated in post analysis of VAR and SVAR models (Johansen, 1995). The obtained LM statistics for residual autocorrelation show that there is no autocorrelation at tested lag order 1 but reveal the presence of autocorrelation at lag order 2 (see table 4, appendix II). Hence, the SVAR model is estimated at lag 1.

Estimation of the Contemporaneous (Short Run) Variables of the Model

The estimation results from table 5, indicate that the sign and magnitude of the estimated coefficients of the contemporaneous variables differ during the analysed period except real output and money supply. Additional estimation show that only a change in money supply most significantly could contemporaneously change the level of output for the whole sample, while interest rate innovations affect changes in prices although, in a negative direction. However, the effect of interest rate innovations on prices is not as strong as the effect of money supply on output. Overall, we conclude that in the short run restriction model, broad money supply has more effect on output variations in the economy.

Table 5.The Estimated Coefficients of the Contemporaneous (Short Run) Variables

Variables	Non-Policy Variables		Policy Variables		
	LGRGDP	LGCPI	LGM2	LGMRR	LGRER
LGRGDP	1	0	0	0	0
LGCPI	-0.01602652(-1.91)	1	0	0	0
LGM2	0.0904359(2.93)**	-0.17555941(-0.55)	1	0	0
LGMRR	0.01528197(075)	-0.4846098(-2.37)**	0.00441764(0.08)	1	0
LGRER	-0.02751207(-0.37)	-0.19403901(-0.25)	-0.34123569(-1.65)	-0.50295339(-1.56)*	1

Source: Author's computation

Estimated Effects of Monetary Policy Shocks in Nigeria: Structural and Orthogonalized Impulse Response Analysis

At this point, we demonstrate the effects of monetary policy shocks on the Nigerian economy using the impulse-response analysis. The IRF describes how innovations or shocks to one variable affect another variable after a given period. Sims' (1980) Cholesky decomposition is one method to identify the impulse-response functions in a VAR model. Hence, the Cholesky decomposition identification method corresponds to structural VAR. However, the aim of the structural VAR is to apply economic theory (rather than Cholesky decomposition) to obtain the structural innovations from the residuals e_{it}. The IRFs are generated from the recursively orthogonalized SVAR estimated residuals and they show the path of output when there are innovations in the policy variables.

According to figure I (appendix I), panel A-H shows the responses of the various variables to its own shocks and shocks to other variables in the model. Figure 1 below shows that broad money supply shocks has its greatest effects on real output. Accordingly, a negative M_2 shock shows the most significant effects in the first and second periods as output rises quickly from the negative bounds towards its natural path. This effect slowly dissipates over time. Across the panels, money supply shocks to other variables do not show as much significant effect as it does to real output; the same goes for price shocks to real output and indeed, other variables in the model.

Analyzing the structural impulse response function for the above model of the Nigerian economy, we can conclude that the quantity based nominal anchor (broad money supply, M_2) shows the most significant effect on output fluctuations in Nigeria. This is evident from figure 1 where money supply shocks implied a negative output response and a significant effect between the first and second periods. This implies that a contractionary shock to broad money in the economy has the potency of reducing economic activity drastically. Further, output rises rapidly in response to money supply

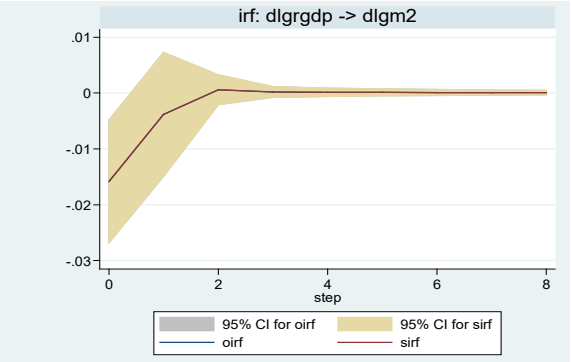

Figure 1.Structural and Orthogonalised Impulse Response Function (IRF) showing the response of rgdp (output) to a 1 standard deviation shock of M2 over an 8- year time horizon.

Source: Author's computation using Stata 11 software

shock, from the negative region towards its natural path. This result is consistent with those obtained from the reduced form VAR analysis where money supply shocks had significant influence on the level of economic activity. The mild response of output to adjustment to its natural path beyond the second period confirms the expectation that economic agents adjust their spending and investment habits moderately and gradually in response to increased supply of funds rather than immediately.

In summary, we find that money supply (M_2) innovations are more significant than interest rate (MRR) and exchange rate (RER) innovations in explaining output fluctuations in Nigeria (Figure I, appendix I). Furthermore, while money supply shocks have a negative effect on real GDP, its effect are more significant than the minimum rediscount rate (MRR) and exchange rate (RER) shocks. In addition, the IRF analysis of money supply shocks to prices (CPI) reveals a more significant effect than those of MRR and RER. Lastly, while the responses of output to money supply shocks are negative, we find a positive response of prices to shocks in money supply.

The result of initial quick response of output to money supply shocks here are similar to those found by Chukwu (2009)

for Nigeria, Gosh (1996) for Ukraine (both are developing economies) in that the real effects of monetary policy are quick. On the contrary, our results are unlike those found for the U.S (a developed economy) with monetary innovations having hump-shaped responses on real variables after a lag of about three quarters and petering out after about three years (Christiano et al., 2002). Therefore, this study affirms the effectiveness of money supply innovations on real output in developing countries, including Nigeria.

Policy Recommendation and Conclusion

Policy Recommendations

At this point, it becomes important to highlight policy relevant points that emanate from the result of analysis of this study. Of course, the study results from this work is expected to form a basis upon which good policy making and implementation for Nigeria and other developing nations who portray some sameness in economic characteristics. An important point to note, first of all, is that monetary policy shocks are not all neutral in the short run (except shocks of RGDP to CPI, RGDP to M_2, CPI to M_2, MRR to M_2, RGDP to MRR, CPI to MRR, M_2 to MRR, RGDP to RER, CPI to RER, M_2 to RER and MRR to RER). In addition, the result of the SVAR analysis shows that broad money supply, M_2, had the most potent effect on output and prices. Hence, monetary policy agents should place more emphasis on manipulating the quantity based nominal anchor (M_2) in their attempt to steer the economy towards pre-determined directions. Emphasis should be placed on the use of instruments such as the reserve ratio, liquidity ratio, repurchase order instruments or REPOs and Treasury Bills (TBs) in the conduct of monetary policy in order to maximize effectiveness of policy outcomes. Accordingly, this paper de-emphasizes the use of interest rates such as the Monetary Policy Rates (MPR) and exchange rates to manage the economy since their effect on output is observed to be less significant.

Further, money supply targets as against interest rate and exchange rate targets should be emphasized in the effort to control and regulate the volume of money in the economy. Since money supply has been found to be of most significant impact to the economy, it only seems natural to emphasize the use of money supply target control.

Conclusion

Various literature have established the relative impact of monetary policy shocks in achieving growth-led objectives in several economies of the world. As a re-iteration, we pointed out from literature search that the effectiveness of monetary policy shocks in developed economies are evident while in developing nations, we find only modest effects. For developing countries like Nigeria, various researchers on the actual effects of monetary policy innovations on the economy have encountered puzzling results. While most research works conclude that the effects of monetary policy shocks in Nigeria are not clear, this study departs from existing literature by taking a clear-cut position on the actual effects of monetary policy shocks in Nigeria.

Overall, this study finds that monetary policy innovations have significant effects on the Nigerian economy. Our results are of the view that the quantity based nominal anchor (M_2) has a more significant influence on output and prices in the economy than does the price based nominal anchors (MRR and RER), thus, implying that the quantity based nominal anchor is more effective than the price based nominal anchor in the conduct of monetary policy in Nigeria.

Finally, it is observed from the results that all variables (with the exception of CPI to MRR shocks and CPI to RER shocks) eventually adjust to their 'natural path' after initial shock effects. This shows that the Nigerian economy does show resilience to monetary policy shocks and that the economy moves towards pre-determined directions after a monetary policy shock. The importance of this finding is essential for efficient and effective monetary policy formulation and implementation in which monetary authorities can rest assure that a monetary policy action through the introduction of 'appropriate shocks' to the economy will steer the economy towards pre-determined directions that are consistent with set macro objectives. Hence, we conclude that monetary policy shocks in Nigeria have a significant effect on the economy, particularly shocks in broad money supply.

References

1. Adediran OS, Matthew O.A, Olopade B.C et al. Monetary Policy Shocks and Inclusive Growth in Nigeria: A VAR Approach. *The International Journal of Humanities and Social Studies* (ISSN 2321 - 9203), 2017.
2. Adeoye B.W, Saibu O.M. Monetary Policy Shocks and Exchange Rate Volatility in Nigeria. *Asian Economic and Financial Review* 2014; 4(4): 544-562.
3. Alege P.O. Trade Liberalization and Exports in the Nigerian Economy: An Assessment. *Journal of Social and Economic Development* 2005; 7; 2.
4. Architecture and the Monetary Transmission Mechanism in Tanzania. International Growth Centre, Mimeo.
5. Balogun E. Monetary Policy and Economic Performance of West African Monetary Zone Countries. *MPRA paper* 2007; 3408.
6. Bernanke B, Boivin J, Eliasz P.S. Measuring the Effects of Monetary Policy: A Factor-Augmented Vector Autoregressive (FVAR) Approach. *The Quarterly Journal of Economics* 2005; 120(1): 287 422.
7. Central Bank of Nigeria Statistical Bulletin (2008, 2010, 2012)

8. Christiano LJ, Eichenbaum M, Evans C. Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy 2002.
9. Chuku AC. Measuring the Effects of Monetary Policy Innovations in Nigeria: A Structural Vector Autoregressive (SVAR) Approach. *African Journal of Accounting, Economics, Finance and Banking Research* 2009; 5(5): 112-129.
10. Jordi G, Gertler M. Inflation Dynamics: A Structural Econometric Analysis. *Journal of Monetary Economics* 1999; 195-222.
11. Galí J. Technology, Employment and the Business Cycle; Do Technology Shocks Explain Aggregate Fluctuations? *American Economic Review* 1999; 89(1): 249-271.
12. Ganev G, Krisztina M, Krzysztof R et al. Transmission Mechanism of Monetary Policy in Central and Eastern Europe". Centre for Social and Economic Research (CASE) (Report No. 52), 2000.
13. Ghironi, Fabio, Rebucci et al. Monetary Rules for Emerging Market Economies. Working paper 476. Boston College Economics Department 2000.
14. Ghosh A. The Output-Inflation Nexus in Ukrain: Is There a Trade-off?" Working Paper WP/96/46 IMF Washington D.C 1996.
15. Guney PO. Does the Central Bank Respond to Output and Inflation Uncertainties in Turkey?" Central Bank Review 2016; 16(2): 53-57.
16. Hamilton JD. Time Series Analysis. Princeton University Press 1994.
17. Hendry DF. Dynamic Econometrics. Oxford University Press, 1995.
18. Kahn M, Shmuel K, Oded S. Real and Nominal Effects of Central Bank Monetary Policy. *Journal of Monetary Economics* 2002; 49: 1493-1519.
19. Maravall A. Unobserved Components in Economic Time Series. Handbook of Applied Econometrics, Chapter 1, ed. M. Hashem Pesaran and Michael R, Wickens, Blackwell Publishers, Oxford 1999.
20. Marcet A. Overidifferencing VARs is Ok. Institut d"Analisi Economica (CSIC), UPF, CREL and CEPR. Methodology and Philosophy of Science, Stanford University Press, Stanford, CA 2004; 232-239.
21. Mishkin FS. The Role of Output Stabilization in the Conduct of Monetary Policy. *Working Paper* No. 9291. NBER 2002.
22. Mishkin FS. Improving the Use of Discretion in Monetary Policy". A Paper Presented at the Federal Reserve Bank of Boston, Annual Conference: "Are Rules Made to Be Broken? Discretion and Monetary Policy. 2017
23. Mishra P. and Montiel P. How Effective Is Monetary Transmission in Low-Income Countries? A Survey of the Empirical Evidence". IMF Working Paper WP/12/143 2012.
24. Montes GC. Uncertainties, Monetary Policy and Output Stabilisation: Challenges on Inflation Targeting". Brazilian Journal of Political Economy. 2010; 301(117): 89-111.
25. Rafiq MS, Mallick SK. The Effect of Monetary Policy on Output in Emu: A sign restriction approach". Journal of Macroeconomics 2008; 30: 1756-1791.
26. Romer C, Romer D. Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz", in Olivier Blanchard and Stanley Fischer, eds., NBER Macroeconomics Annual (Cambridge MA: MIT Press), 1989; 9: 13-57
27. Sanusi KA, Akinlo AE. Investigating Fiscal Dominance in Nigeria. *Journal of Sustainable Development* 2016; 9(1). ISSN 1913-9063 E-ISSN 1913-9071.
28. Sims C A. Comparison of Interwar and Postwar Business Cycles: Monetarism Reconsidered. *American Economic Review* 1980b 70(2): 250-257.
29. Starr M. Does money matter in the CIS? Effects of monetary policy on output and prices. *Journal of Comparative Economics* 2005; 33: 441-461.
30. Tashrifov M. Monetary Policy Model of Tajikstan: A Structural Vector Autoregression Approach. Asia Pacific School of Economics and Government 2007. http://apseg.anu.edu.au.

Appendix I

List of Figures

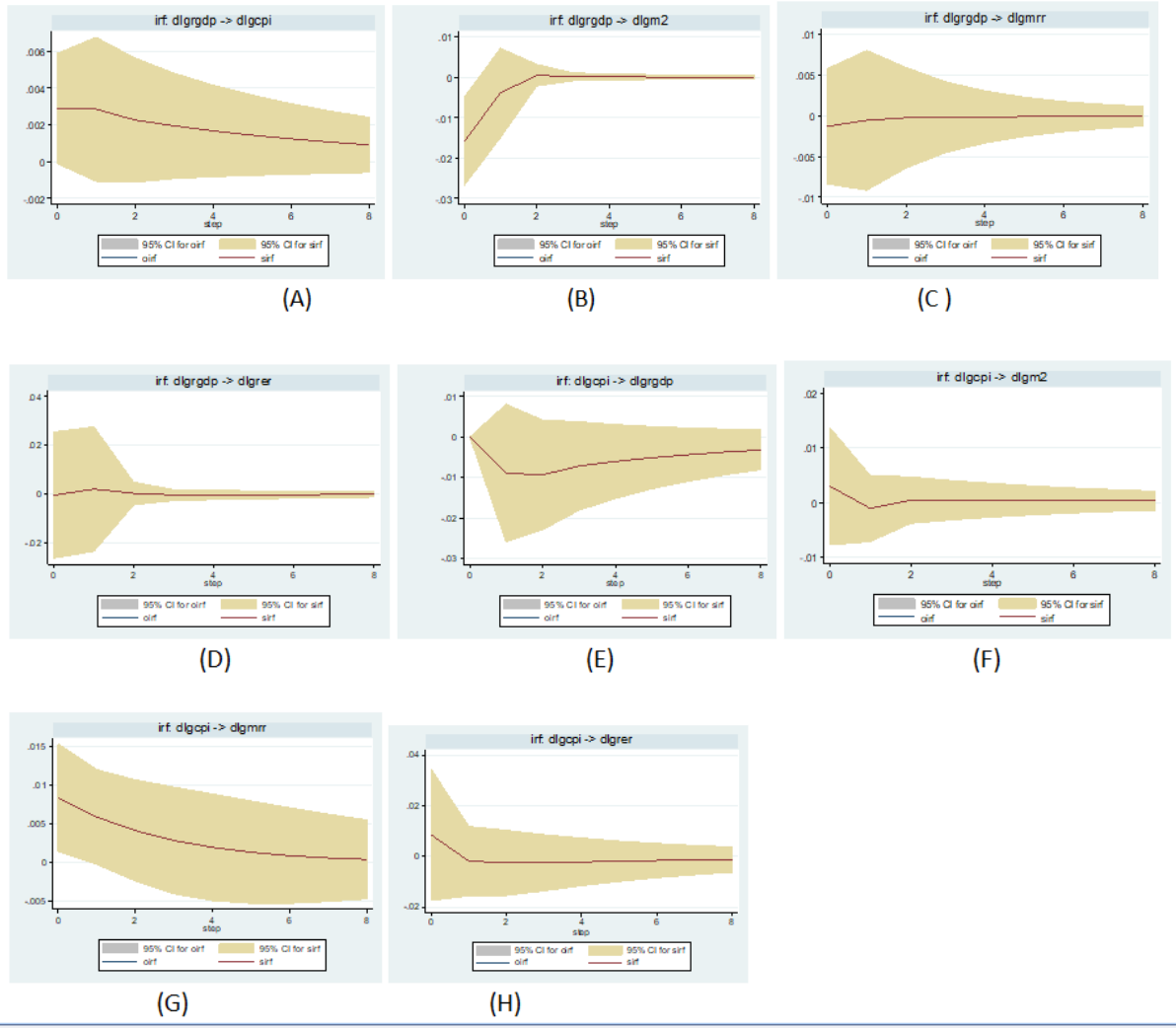

Figure I. (Panel A-H): Structural and Orthogonalised Impulse Response Function (IRF) showing the response of respective variables to a 1 standard deviation shock of another variable over an 8- year time horizon. Response to shocks are shown by the red line segment which hover about the horizontal time path. Positive shocks are shown by line segment above the zero value horizontal time line and negative shocks are below the zero value time line. The shaded area represents 95% confidence interval for the structural IRF

Source: Author's computation using Stata 11 software

Appendix II

List of Tables

Table 2.Optimal Lag Length Selection Criterion

sample:	1981q2 - 2018q4				Number of obs = 127			
lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	777.149				3.60E-12	-12.1598	-12.1143	-12.0478
1	**919.007**	**283.72**	**25**	**0.000**	**5.70E-13**	**-14.0001**	**-13.7271**	**-13.3283**
2	938.254	38.493	25	0.041	6.30E-13	-13.9095	-13.4091	-12.6778
3	947.138	17.769	25	0.852	8.10E-13	-13.6557	-12.9278	-11.8641
4	976.782	59.288*	25	0.000	7.60E-13	-13.7289	-12.7735	-11.3774

Note: The bold row shows the choice of optimal lag length
Source: Author's computation using Stata 11 software

Table 3.Var Stability Test. Source: Author's computation using Stata 11 software

Eigenvalue			Modulus
8612985			861299
0.04215342	+	.4922964 I	0.494098
0.04215342	-	.4922964 I	0.494098
0.4755899	+	.125129 i	0.491775
0.4755899	-	.125129 i	0.491775
-0.175813	+	.2266345 i	0.286833
-0.175813	-	.2266345 i	0.286833
0.01585447	+	.1846964 i	0.185376
0.01585447	-	.1846964 i	0.185376
0.07575019			0.07575

All the eigenvalues lie inside the unit circle.
VAR satisfies stability condition.

Table 4.Lagrange Multiplier (LM) Test

lag	chi2	df	prob > chi2
1	17.0555	25	0.87977
2	36.2257	25	0.06824

H_0: no autocorrelation at lag order
Source: Author's computation using Stata 11 software