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MONETARY POLICY RATE, INFLATION AND ECONOMIC GROWTH IN NIGERIA

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Abstract

The study used Taylor's rule and examined the relationship between the MPR, Inflation and economic growth in Nigeria spanning from 2007Q1 – 2017Q4 and employed the Structural VAR model technique. These structural parameters have shown that there is a positive statistically significant relationship between monetary policy rate and inflation in Nigeria in the short-run given the period of this study. Thus, monetary policy rate outcomes in Nigeria are ineffective in curtailing inflationary pressures. The estimated structural parameters also reveal a positive statistically significant relationship between monetary policy rate, interest rate and exchange rate in Nigeria in the short-run given the period of this study. It is also evident that estimated structural parameters are negative and significant relationship between interest rate and real Gross Domestic product (GDP) growth. Thus, the interest rate and credit channels are active in the monetary policy transmission in Nigeria. Finally, the impulse response results have indicated that increasing monetary policy rate (MPR) increases inflation, interest rate and depreciates the naira with negative consequences on the real Gross Domestic Product (GDP) output in the country. That is, inflationary pressures in the country via the exchange rate pass-through to domestic prices occasioned by changes in MPR exert negative impact on the real GDP growth on one hand, and the interest rate and credit channels are active in the monetary policy transmission in Nigeria. The interest rate and credit channels limit productive investments with spillover effects on real GDP growth and employment. The study recommends that the Monetary Policy Committee (MPC) should reduce the rate since the effect of monetary policy Rate transmission will affect the real sector of the economy positively through the Interest rate and credit channels.

Keywords: Inflation, Economic Growth, MPR, Interest Rate

1. Introduction

The major role of the Central Bank of Nigeria (CBN) as enshrined in section 2(a) of the CBN Act 2007, is the promotion of price stability. This function is a major monetary policy objective that enhances productivity of prices, which is a key requirement for sound consumer decisions. In fulfilling its major role, the Bank has over time used a number of monetary policy frameworks, from exchange rate targeting to the current monetary targeting framework, effectively comprising strategies for targeting growth in the monetary aggregates (CBN, 2017).

Monetary policy framework involves the measures through which the Central Bank manages the supply of money, in order to stabilize prices and achieve low and stable inflation with a view to promoting economic growth and employment in the economy. this can be achieved

through the transmission mechanism of monetary policy which involves a set of channels through which monetary policy influences the real economy, mostly output and inflation. Put differently, it is a process through which changes in monetary aggregates pass through some intermediate variables to affect prices (interest, exchange and inflation rates), output/employment and external balance (CBN,2017).

This transmission is captured under monetary policy reaction function which is a simple rule relating interest rates to inflation and the output gap. This function works via two major channels, which are; the interest rate channel and the credit channel (Opue and Bankong, 2014). The interest rate channel is a monetary policy transmission mechanism channel where by changes to the policy variable are propagated through the interest rates to

inflation; while the credit channel describes the transmission of changes in the nominal policy rate that affects the amount of credit made available to end users by banks and the subsequent impact on the economic growth (Opue and Bankong, 2014).

The Monetary Policy Rate (MPR) is the anchor rate that the CBN uses to implement or signal the stance of the monetary policy. It is the policy rate that provides an indication of the Bank's stance regarding current monetary conditions as well as its preferred path of action. It is to the market interest rate faced by banks and end-users of funds. Thus, changes to the policy rate by the CBN are expected to induce corresponding changes in the banking system and financial markets. An increase in the MPR indicates that the CBN considers that there is a buildup of inflationary pressures and seeks to pursue a contraction in liquidity conditions. On the other hand, a decrease in the policy rate indicates that the bank views current liquidity conditions to be non-inflationary and consider it appropriate to expand money supply to support economic growth. Decisions to alter the MPR are taken at meetings of the Monetary Policy Committee (MPC) (Nduati, 2013).

The MPC over time has been altering the MPR to achieve the desired monetary policy transmission in the country. Between 1999 and 2005 the Monetary Policy Committee (MPC) adjusted the Monetary Rediscount Rate (MRR) in line with the monetary conditions. The failure of the MRR to adequately signal the direction of monetary policy led to the introduction of the Monetary Policy Rate (MPR) in December, 2006. In line with market expectations, the CBN maintained its accommodative stance and kept its benchmark rate unchanged and the MPR was kept at 12%. In 2014, the MPR was raised to 13% to curb inflationary pressures and maintain tight monetary stance as a result of declining oil prices. In 2015, the MPR was reduced to 12% to ease credit to the real sector of the economy (CBN, 2015).

However, in 2016 July, the Central Bank of Nigeria increased its benchmark interest rate to 14% and CBN maintained a 200 basis points hike during its last meeting in the September 2016 aiming to control the inflation and support the naira after the Central Bank abandoned the

currency peg to the dollar in June. In November, 2016 the MPC reviewed the domestic macroeconomic developments and found that GDP figures showed that real income actually worsened in Q3 of 2016 as output contracted further by 2.24% related to its level in previous and corresponding quarter of 2015. Headline inflation rose to 18.35% in October 2016 from 17.9% and 17.7% in September and August 2016, respectively. The increase in headline inflation in October reflected increases in both the food and core components of inflation which rose to 18.1% and 17.1% in October from 17.7% and 16.6% in September, 2016 respectively. Thus, the MPC retained the MPR at 14%. With this high inflation level, the MPC has maintained the MPR at 14% for two years now. The empirical and theoretical puzzle is that: what is the relationship between the MPR, inflation and economic growth in Nigeria? This study seeks to verify the nature of the relationship between MPR, inflation and economic growth in Nigeria. The study is outlined into five (5) sections: Introduction, literature Review, , Methodology, Presentation and Discussion of Results as well as, Conclusion and Recommendations.

2. Literature Review

2.1 Conceptual Issues

Concepts of Monetary Policy Rate, Inflation and Economic Growth: The Monetary Policy Rate (MPR) is the anchor rate that the CBN uses to implement or signal the stance of the monetary policy (CBN, 2017). It is the policy rate that provides an indication of the Bank's stance regarding current monetary conditions as well as its preferred path of action. It is to the market interest rate faced by banks and end-users of funds. It is the rate at which the Central Bank lends to commercial banks and other clients. MPR is usually set at a level that is consistent with the goal of inflation target. It is expected to communicate the stance of monetary policy and act as a guide for all other banks rates. Monetary policy changes can affect the supply of credit. Because banks rely on demand deposits as an important source of funds, monetary policy tightening, by reducing the aggregate volume of bank reserves will also reduce the availability of bank loans. When a significant number of firms and households

rely on banks as a major source of financing, then a reduction in loan supply will depress aggregate spending and reduce total output and price. This is the bank lending channel (Nduati, 2013).

Thus, changes to the policy rate by the CBN are expected to induce corresponding changes in the banking system and financial markets. An increase in the MPR indicates that the CBN considers that there is a buildup of inflationary pressures and seeks to pursue a contraction in liquidity conditions. On the other hand, a decrease in the policy rate indicates that the bank views current liquidity conditions to be non-inflationary and consider it appropriate to expand money supply to support economic growth. Decisions to alter the MPR are taken at meetings of the Monetary Policy Committee (MPC) (Nduati, 2013).

Inflation is the persistent and continuous rising in the level of general prices of goods and services in an economy (Olofin & Salisu, 2014). The neo-classical economists see inflation as a galloping rise in prices as a result of excessive increase in the quantity of money. To Keynes, if the money supply increases beyond full-employment level, output ceases to rise and prices rise in proportion to money supply. This, according to Keynes, is true inflation. Brooman and Shapiro in a similar vein, simply defined inflation as a continuing increase in the general price level (Olofin & Salisu, 2014).

Todaro and Smith (2009) defined economic growth as a steady process by which the productive capacity of an economy is increased over time to bring about rising levels of national output and income. From Jhingan (2005), economic growth refers to the rise in real income or real output of an economy over period of time. Miller (1999), has defined economic growth as increases in per capital real Gross Domestic Product (GDP) measured by its rate of change per annum.

2.2 Theoretical Review:

The study is based on the Taylor rule which was introduced by John Taylor who was a professor of economics at Stanford University and is based on his empirical study on the FED's monetary policy between 1987 and 1992. It is a simple rule of monetary policy intended to suggest a

systematic way of determining the interest rates as the economic conditions and macroeconomic activities change over time. The Taylor rule is a monetary policy guideline that suggests how central banks should react to economic changes. Basically, it is a general rule of thumb to help predict how interest rates will be affected by changes in the economy. It suggests how central banks should adjust their policy rate in response to changes in macroeconomic conditions that impact on monetary variables. By design, adjustments to the policy rate are expected to produce short-term economic stability while maintaining growth in the longer-run (CBN, 2017).

The rule suggests a target for the level of central banks' nominal interest rates, which takes into account the current inflation, the real equilibrium interest rate, the inflation gap adjustment factor and the output gap adjustment factor. The inflation gap adjustment factor is the deviation from the target inflation and it suggests the increase or decrease in the interest rates if the inflation is higher or lower than the target inflation respectively. The output gap adjustment factor is the deviation from the target GDP and it suggests the increase or decrease in the interest rates if the actual GDP is higher or lower than the target GDP respectively.

Given all the above, an expansionary monetary policy is suggested by the rule when inflation is below the target or when production is less than the potential output. Put differently, when the inflation is above the target, the rule suggests that the central bank takes a contractionary monetary policy approach.

Empirically, Taylor's rule is stated as $I = r^* + \pi + 0.5(\pi - \pi^*) + 0.5(y - y^*)$ which essentially denotes that inflation is the difference between real and nominal interest rates; the real interest rates factors in inflation rate, the nominal does not. The rule therefore, recommends that the real interest rate should be 1.5 times the inflation rate in order to guarantee stability in financial markets (CBN, 2017).

2.3 Empirical Review

Inam (2017) used the VAR approach to forecast inflation in Nigeria for the period 1970 to 2012. Inflation was expressed as a function of growth rate of real GDP, broad money supply, fiscal deficits, exchange rate and changes in

the prices of imports. The study revealed that inflation rate at lag 1 is very significant in giving information about the current and future value of inflation level in Nigeria. The study recommended that the current inflation rate should be monitored, managed and reduced to the barest minimum since the current level of inflation will most likely determine the inflationary trend in the next year.

Mathew (2015) investigated the effectiveness of monetary policy in controlling inflation in the Nigerian economy. The study used the OLS technique and the Granger causality test on annual data spanning from 1986 to 2013. The Granger causality results indicated a uni-directional relationship exists between inflation and monetary policy rate and between economic growth and inflation running from inflation to economic growth. The OLS results showed that monetary policy rate is not significant but has a positive impact on inflation. The study concluded that monetary policy rate is not effective in controlling inflation in Nigeria.

Gbadebo and Mohammed (2015) examined the effectiveness of monetary policy as an anti-inflationary measure in Nigeria. The study used VAR on quarterly data spanning from 1980Q1 to 2012Q4. The study found that interest rate, exchange rate, money supply and oil-prices are the major causes of inflation in Nigeria. The estimated result showed that though in the short-run increase in income encourages inflation and proper utilization of economic growth reduces inflation in Nigeria. Money supply showed a significant positive impact on inflation both in the short and long-run, implying that the Nigerian inflationary situation is driven by monetary impulses.

Mushtaq and Siddiqui (2015) investigated the effects of interest rate on economic performance using the case of Islamic and non-Islamic economies. The study used Panel least square and fixed effect model separately for 57 non-Islamic and 17 Islamic countries from 2005 to 2013. Results suggested that in Islamic countries, people do not care about interest rate while saving; however, growth in GDP per capita income seems to effect positively to the saving decision. However, for non-Islamic countries GDP per capita growth as well as interest rate both has positive impact on saving. However, in the case of investment,

interest rate affects negatively while growth in GDP per capita affects positively for both Islamic and non-Islamic countries. Hence, there seems to be a need of different policies for Islamic countries in order to increase economic growth as religious factor has effect on financial decision.

Opue and Bankong (2014) analyzed monetary policy adjustments under alternative inflationary conditions in Nigeria. The study used the OLS technique and found that expansionary monetary policy under conditions of both demand-pull inflation and cost-push inflation leads to an increase in output. The study concluded that the problem of macroeconomic instability faced in the country is as a result of the applications of inappropriate adjustments in monetary policy under different inflationary conditions.

Emerenini and Eke (2014) investigated the impact of monetary policy on inflation in Nigeria using monthly data from January 2007 to August 2014. Using the OLS technique, the study found that expected inflation, exchange rate and money supply influenced inflation; while treasury bills and monetary policy rate thought rightly signed, did not influence inflation in Nigeria within the period under study.

Sulaiman, Ghulam, Saba and Mohammed (2013) examined the rate of interest and its impact on investment in Pakistan from 1964 to 2014 using Vector Error Correction Model. The findings confirmed to the economic theory and a number of other studies that investment has significant inverse association with real interest rate in Pakistan. Similarly, Larsen (2004) in a study on "the impact of loan rates on direct real estate investment holding period return" in the United States found that real estate investment is inversely related to interest rate. This means that changes in interest rates tend to affect investment decisions of investors.

Nduati (2013) investigated the effects of interest rate spread on financial performance of commercial banks in Kenya from 2000 to 2012 using a panel of 43 commercial banks in Kenya. The study found that there is a strong positive relationship between financial performance of commercial banks with interest rate spread. Study found variables significance to influencing financial performance

in Kenya banks. The study found that interest rate spread affect performanmce assets in banks as it increases the cost of loans charged on the borrowers, regulation on interest rates have far reaching effects on assets non-performance. The study recommends that there is need for government to regulate interest rates as this would help to safeguard borrowers from exploitation by commercial banks.

Enyioko (2012) investigated the impact of interest rate policy on the performance of deposit money banks in Nigeria. The study used descriptive statistics to analyze the published audited accounts of twenty (20) out of twenty-five (25) banks that imerged from the consolidation exercise and the data from the CentralBank of Nigeria (CBN) were used in this regard. The year 2004 was denoted as the pre-consolidation and 2005 and 2006 as post-consolidation periods for the analysis. It was found that the interest rate policies have not improved the overall performance of banks significantly and also have contributed marginally to the growth of the economy for sustainable development.

Udonsah (2012) investigated the impact of interest rate on investment decision in Nigeria between 1981 and 2010. Using the OLS technique, the study found that interest rate has negative impact on investment decision in Nigeria. Joshua and Delano (1990) in a study on “determinants of private investment in Less Developing Countries (LDCs)” o 23 less developing countries for the period of 1975 to 1985 using multiple regression analysis found that, interest rate is inversely related to investment in the countries investigated.

Obamuyi (2009) investigated the relationship between interest rates and economic growth in Nigeria, using time series analysis and annual data from 1970 to 2006. The cointegration and error correction model were used to capture both the long-run and short-run dynamics of the variables in the model. The empirical results indicate that real lending rates have significant effect on economic growth. Thetre also exists a unique long-run relationship between economic growth and its determinants, including interest rate. The results imply that the behavior of interest rate is important for economic growth in view of the relationships between interest rates and investment and

investment and growth. Thus, the formulation and implementation of financial policies that enhance investment-friendly rate of interest is necessary for promoting economic growth in Nigeria.

3. Methodology

The study used quarterly time series data spanning from 2007Q1 to 2017Q4 and the data for the study were sourced from the annual statistical bulletinsof the Central Bank of Nigeria (CBN), CBN annual reports and the statistical bulletins of the National Bureau of Statistics (NBS). The date were collected on quarterly data on inflation rate, monetary policy rate, real GDP growth rate, money supply (M_2), Exchange rate and interest rate.

Using the Taylor’s rule and following the model specification of Inam (2017) with modifications, the model for this study is specified as follows:

$$\text{Infl} = f(\text{mpr}, \text{intr}, \text{rgdp}, \text{ms}, \text{exch}) \dots\dots\dots 1$$

Where “infl” is the inflation rate, “mpr” is money policy rate, ”intr” is lending rate, ”rgdp” is the growth rate of realGDP, ”ms” is money supply and “exch” is the exchange rate.

The stochastic form of equation 1 isv expressed as follows:

$$\text{Infl} = \alpha_0 + \alpha_1 \text{mpr} + \alpha_2 \text{itr} + \alpha_3 \text{rgdp} + \alpha_4 \text{ms} + \alpha_5 \text{exch} + \mu \dots\dots 2$$

α_0 is the intercept of the model and $\alpha_1 - \alpha_5$ are the parameters to be estimated.

The structural VAR methodology was used to estimate equation 2. The SVAR is the most suitable technique for the analysis of monetary policy effects because it has produced relatively better and robust results (CBN, 2014). SVAR is theoretically suitable and offers the benefit of identifying monetary policy transmission as well as offer shocks. Thus, the structural form of the model is given as:

$$A x_t = \alpha_0 + C(L) x_{t-1} + B \varepsilon_t \dots\dots\dots 3$$

Where x_t = vector of endogenous macroeconomic variables; X_{t-1} = vector of lagged values of endogenous macroeconomic variables; ε_t = vector of random error of

disturbance terms for every variable that captures exogenous factors in the model.

$C(L)$ = matrix polynomial in the lag operator L of length P ;
 A = a matrix of $n \times n$ dimension;

B = a column vector of dimension $n \times 1$, which contains the contemporaneous responses of the variable to the innovations or disturbances; n = number of variables.

To transform equation 3 into reduced form, both sides of the equation is multiplied by the inverse of matrix A translating it into a standard VAR representation of:

$$x_t = A^{-1}\alpha_0 + A^{-1}C(L)x_{t-1} + A^{-1}B\varepsilon_t \dots\dots\dots 4$$

further transformation of equation 1 gives:

$$x_t = Y_0 + D(L)x_{t-1} + e_t \dots\dots\dots 5$$

$$\text{where } Y_0 = A^{-1}\alpha_0 \dots\dots\dots 6$$

$$D = A^{-1}C(L) \dots\dots\dots 7$$

$$e_t = A^{-1}B\varepsilon_t \dots\dots\dots 8$$

The main concern here is to recover the underlying structural disturbances from the estimated VAR by imposing restrictions on the structural model. By doing so, the study utilized the non-recursive method of imposing restrictions in SVAR for monetary policy rate

(MPR), inflation (INFL), economic growth (RGDP) using economic theory as the basic foundations. If there are n variables, equation 2 requires the imposition of $n(n-1)/2$ restrictions on the $2n^2$ unknown elements n matrix

A and B . In this model at least 15 restrictions are required and accordingly, 16 restrictions were imposed. The SVAR analysis is to use innovation accounting to trace the pass-through of foreign portfolio investment to domestic investment via the stock market growth. It uses the forecast error e from the estimated reduced form VAR to obtain the Impulse Response Functions (IRF) and forecast error variance decomposition (FEVD).

In order to examine the quarterly effects of the monetary policy rate on inflation and economic growth in Nigeria, the IRF and FEVD were used. The IRF show the response of each variable in the system to shocks from the system variables; while the FEVD provides information about the proportion of movements in a sequence due to its own shocks and the shocks due to other variables in the system (Enders, 2010).

4. Presentation and Discussion of Results

4.1 Unit Root Test

First, the unit root properties of the series used for the analysis was tested using the Augmented Dickey-Fuller (ADF) test, the results are shown in the following table;

Table 1: Unit Root Results at Level and 1st Difference of the Variables.

Variables	Level value	1 st Difference value	ADF Critical value@5%	Order of Integration
INFL	-2.296958	-4.93537	-2.933158	I(1)
MPR	-0.722588	-5.41855	-2.933158	I(1)
INTR	-1.781852	-5.42410	-2.933158	I(1)
RGDP	-0.488350	-8.32526	-2.936942	I(1)
MS	-2.14472	-6.77901	-2.936942	I(1)
EXCH	-0.03190	-4.56131	-2.933158	I(1)

Source: Author's Computation Using E-views 9

The ADF results in Table 1 revealed that all the series were not stationary at level and but are stationary at first difference. That is, when the computed values of the ADF statistics are compared with the critical values, it showed that the absolute ADF values of the computed statistics at first difference are higher than the critical values. This leads to

the rejection of the null hypotheses of unit root and the acceptance of the alternative hypotheses of no unit roots among the series. This implies that all the variables are integrated of order one i.e. I(1), meaning that the series have the mean reverting ability in the long-run. The implication is

that any shock to series will fade away with the passage of time, suggesting long-run equilibrium among the variables.

Optimal Lag Length Determination

In order to find the ideal lags for the Johansen co-integration given the uniform order of integration among the series, the lag structure was estimated and the results are presented in Table 2.

Table 2: Optimal Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-805.5225	NA	2.44e+09	38.64393	38.89217	38.73492
1	-640.3545	297.2799	5307566	32.49307	34.23074	33.13000
2	-583.0207	79.17529*	2139007*	31.47718*	34.01428*	32.66004*

Indicates lag order selected by the criterion (Opue and Bankong, 2014).

LR: sequential modified LR test statistic (each test at 5% level) FPE: Final Prediction error

SC: Schwarz information criterion AIC: Akaike Information criterion HQ: Hannan-Quinn information criterion

The results of the lag selection reveal that the different selection criteria, namely; the sequential modified LR test statistic, Final prediction error (FPE), Akaike (AIC), Schwarz (SC), LR and Hannan-Quinn information criterion (HQ) have suggested lag two to be optimal for assessing the effect of monetary policy rate on inflation and economic growth in Nigeria. This means that the policy lag for monetary policy outcomes is two quarters.

Having ascertained that lag two is optimal for the monetary policy outcomes in Nigeria, lag two was used for the estimation of the Johansen co-integration test with view to determine the existence of long-run relationship among the variables. The results of the Trace and Max-Eigen value tests are presented as follows:

Table 3: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. Of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.847809	179.4142	95.75366	0.0000
At most 1*	0.619658	100.3441	69.81889	0.0000
At most 2*	0.529125	59.74334	47.85613	0.0026
At most 3	0.428621	28.11053	29.79707	0.0773
At most 4	0.099827	4.603046	15.49471	0.8494
At most 5	0.004418	0.185960	3.841466	0.6663

Trace test indicates 3 cointegrating equation(s) at the 0.05 level

*Denotes rejection of the hypothesis at the 0.05 level ** MacKinnon-Haug (1999) p-value (Opue and Bankong, 2014).

Table 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. Of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.847809	79.07011	40.07757	0.0000

At most 1*	0.619658	40.60075	33.87687	0.0068
At most 2*	0.529125	31.63281	27.58434	0.0142
At most 3*	0.428621	23.50748	21.13162	0.0227
At most 4	0.099827	4.417086	14.26460	0.8129
At most 5	0.004418	0.185960	3.841466	0.6663

Max-eigenvalue test indicates 4 cointegrating equation(s) at the 0.05 level. *Denotes rejection of the hypothesis at the 0.05 level ** MacKinnon-Haug-Michelis (1999)p-values (Opue and Bankong, 2014).

The results of the Trace statistic showed that there are three co-integrating equations at 5% level of significance and that of the Maximum-Eigen value indicates that there are four co-integrating equations at 5% level of significance as shown in Tables 3 and 4 respectively. Given the results of the Trace statistic and the Maximum-Eigen statistic, the null hypothesis of no co-integration among the series is rejected leading to the acceptance of the alternative hypothesis of co-integration. The implication is that there is long-run equilibrium among monetary policy rate, inflation, interest rate, real GDP growth rate, money supply and exchange rate in Nigeria.

To trace the effects of monetary policy transmission to real sector growth in Nigeria, the structural VAR (SVAR) was estimated. The SVAR parameters are used to obtain non-recursive orthogonalization of the error terms for impulse response analysis. This alternative to the recursive Cholesky orthogonalization requires the user to impose enough restrictions to identify the orthogonal (structural) components of the error terms.

The result of the SVAR model shows the chi-square (6) value of 73.4324 with the probability value of (0.000) which is statistically different from zero leading to the rejection of the hypothesis that the SVAR is over identified, meaning that the SVAR is exactly identified. The estimated structural parameters have shown that there is a positive statistically significant relationship between monetary policy rate and inflation in Nigeria in the short-run given the period of this study. This suggests that monetary policy rate outcomes in Nigeria are inefficient in curtailing inflationary pressures. Also, the estimated structural parameters reveal a positive statistically significant relationship between monetary policy rate, interest rate and exchange rate in Nigeria in the short-run

given the period of this study. This suggests that the price rate has not been able to achieve stable domestic prices (inflation, interest rate and exchange rate).

Furthermore, it is evident in the estimated structural parameters that there is a negative and significant relationship between interest rate and real GDP growth. This suggests that the interest rate and credit channels are active in the monetary policy transmission in Nigeria. The interest rate channel is a monetary policy transmission mechanism channel whereby changes to the policy are propagated through interest rates to inflation. It is a direct link of impact for monetary policy in bank-based economies like Nigeria. The interest rate channel is adduced to produce quick changes on commercial rates but poses lags on such changes to expenditure and savings decision of consumers and ultimately on overall output. The credit channel describes the transmission of changes in the policy rate that affects the amount of credit made available to end users by banks and the subsequent impact on the economy. That is, GDP growth. The credit channel is based on the premise that bank loans are the primary source of funding for productive economic activities and that there is no perfect substitute for this kind of credit.

Diagnostic Tests

Before the impulse response and variance decomposition were analyzed to trace the monetary policy transmission, the VAR residual normality tests and the inverse roots AR characteristic polynomial were estimated and the results revealed that the successive errors are not interrelated and variances of the errors are equal. For the normality tests, the orthogonalized Cholesky (Lutkepohl) estimates showed that the residuals are multivariate normal, however the joint results proved otherwise; but this is common with quarterly

data. The inverse roots AR characteristic polynomial showed that the SVAR estimates are stable over the long-run period. All these results are shown in the Appendices.

Monetary Policy Transmission

In order to examine the monetary policy rate transmission, impulse responses inflation, interest rate, exchange rate, money supply, to shock 2 (structural innovations in MPR) were first examined and secondly, the impulse response of real GDP growth to shock 3 (structural innovations in interest rate) and the impulse response of real GDP growth to shock 2 (structural innovations in MPR) as well as the impulse response of real GDP growth to shock 1 (structural innovations in inflation).

Variance Decomposition Analysis

The variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR. The variance decomposition analysis provides a means of determining the relative importance of shocks in explaining variations in the variable of interest. It gives the proportion of the forecast error variance of a variable that can be attributed to its own innovations and to that of other variables. The variance decomposition results presented in the appendix also corroborates the outcome of the structural VAR estimates and the impulse response results that increasing MPR increases inflation, interest rate and depreciates the naira with negative consequences to the real GDP output in the country.

5. Conclusion and Recommendations

The structural parameters have shown that there is a positive statistically significant relationship between

monetary policy rate and inflation in Nigeria in the short-run given the period of this study. This suggests that monetary policy rate outcomes in Nigeria are ineffective in curtailing inflationary pressures. Also, the estimated structural parameters reveal a positive statistically significant relationship between monetary policy rate, interest rate and exchange rate in Nigeria in the short-run given the period of this study. This suggests that the price rate has not been able to achieve stable domestic prices (inflation, interest rate and exchange rate).

Furthermore, it is evident in the estimated structural parameters that there is a negative and significant relationship between interest rate and real GDP growth. This suggests that the interest rate and credit channels are active in the monetary policy transmission in Nigeria. The interest rate channel is a monetary policy transmission mechanism channel whereby changes to the policy are propagated.

Finally, the impulse response results have indicated that increasing MPR increases inflation, interest rate and depreciates the naira with negative consequences on the real GDP output in the country. That is, inflationary pressures in the country via the exchange rate pass-through to domestic prices occasioned by changes in MPR exert negative impact on the real GDP growth on one hand and the interest rate and credit channels are active in the monetary policy transmission in Nigeria. The interest rate and credit channels limit productive investments with spillover effects on real GDP growth and employment.

Based on the findings of this study, it is recommended that since monetary policy rate is not effective in controlling inflationary pressures, the MPC should rather reduce the rate so that the effect of monetary policy rate transmission will affect the real sector of the economy positively through the interest rate and credit channels.

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Appendix:

YEAR	INF(%)	MPR(%)	RGDP(%)	M2(%)	INTR(%)	EXCH(N=\$)
2007Q1	5.2	10	4.63	19.13	6.85	128.15
2007Q2	6.4	8	5.14	6.63	6.59	127.41
2007Q3	6.6	8	21.33	10.88	7.1	125.88

2007Q4	7.8	9.5	5.49	2.42	7.75	118.21
2008Q1	12	9.5	-21.46	37.67	8.5	117.92
2008Q2	13	10.25	6.16	-0.062	8.24	117.81
2008Q3	15.1	9.75	21.87	12.73	9.08	117.73
2008Q4	14.4	9.75	6.96	2.3	5.61	126.48
2009Q1	11.2	8	-23	-1.84	2.53	147.72
2009Q2	10.4	6	8.67	0.88	3.32	148.2
2009Q3	13.9	6	8.25	4.2	4.8	152.3
2009Q4	14.8	6	19.99	13.98	4	149.69
2010Q1	14.1	6	-13.83	2.25	1.04	149.83
2010Q2	13.6	6	2.79	-1.61	2.29	150.19
2010Q3	11.8	6.25	10.59	3.5	6.6	151.03
2010Q4	12.8	6.25	3.39	2.68	7.47	150.48
2011Q1	10.2	7.5	-9.05	1.11	8.27	152.51
2011Q2	10.3	8	2.28	4.45	8.2	154.5
2011Q3	10.3	9.5	7.72	3.66	8.92	155.26
2011Q4	12.1	12	4.48	5.43	14.27	158.21
2012Q1	12.9	12	-10.12	-0.24	14.49	157.59
2012Q2	11.3	12	2.93	1.6	14.08	157.44
2012Q3	12	12	9.23	4.32	12.75157.34	
2012Q4	8.6	12	2.56	10.09	11.77	157.32
2013Q1	8.4	12	-9.41	1.3210.17		157.31
2013Q2	8	12	3.86	-0.68	11.6	157.31
2013Q3	8	12	8.99	-7.89	10.91	157.32
2013Q4	7.8	12	4.12	9.24	10.97	157.27
2014Q1	8.2	12	-9.88	13.03	11.92	157.3

2014Q2	8.3	12	4.18	-0.88	9.98	157.29
2014Q3		13	8.67	3.55	9.75	157.3
2014Q4	8.1	13	3.84	3.92	10.8	169.68
2015Q1	8.5	13	-11.57	1.16	10.77	197.07
2015Q2	9.2	13	2.67	-1.68	9.95	196.92
2015Q3	9.4	11	9.19	-0.5	10.36	197
2015Q4	9.6	12	3.1	7.01	4.57	196.99
2016Q1	12.8	14	-13.97	2.2	5.53	197
2016Q2	16.5	14	1.72	7.85	8.32	231.76
2016Q3	17.9	14	8.24	-0.29	14	305.23
2016Q4	18.6	14	3.75	6.24	13.96	305.22
2017Q1	17.3	14	-13.26	-4.63	13.6	305.2
2017Q2	16.1	14	3.23	-1.45	13.5	305.62
2017Q3	15.9	14	3.13	-0.12	13.2	305.9
2017Q4	15.4	14	3.03	9.33	12.95	306.31

Structural VAR Estimates. Date: 07/27/18 Time: 13:12 Sample (adjusted): 2007Q3 2017Q4 Included
observations: 42 after adjustments
Estimation method: method of scoring (analytic derivatives) Convergence achieved after 59 iterations