IMPACT OF MONETARY POLICY CONDITIONS ON SELECTED MACROECONOMIC INDICATORS IN NIGERIA ($1999Q_1$-$2024Q_4$)

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Abstract

This study analyzes the influence of monetary policy conditions on a set of macroeconomic variables: price level, money supply, exchange rate, and real output in Nigeria using quarterly data for the period of 1999 to 2024. A Monetary Policy Condition (MPC) Index was developed in order to come up with a composite index that reflects the overall stance of the monetary policy in Nigeria, as opposed to using the interest rate alone. The study used the structural vector autoregression model where five variables including the MPC Index were included based on the Financial Conditions Theory. The Augmented Dickey-Fuller unit root test found all variables to be integrated of order one, whereas the Johansen cointegration test found no cointegration between the variables. For this reason, estimation of the SVAR model in first difference was undertaken. From the results, a one standard deviation shock in MPC Index leads to an increase in the price level, a decrease in money supply by about 11% over a period of ten quarters, depreciation of the naira relative to the US dollar, and persistent decreases in real output over the forecast horizon. Of the variables, the exchange rate proved to have the strongest effect, with the MPC Index shocks accounting for about 38% of the forecast error variance of the exchange rate over a period of ten quarters. The study concludes that despite the fact that tightening of monetary policy results in reduction of the money supply and economic growth, there is no reduction in the inflation rate, which instead causes depreciation of the exchange rate. The study recommends that in order to achieve stability of the economy, the Central Bank of Nigeria should complement monetary policy with other policies such as exchange rate policy and supply-side policy.

Keywords: Monetary policy, Central Bank, exchange rate, inflation, money supply
JEL Classification: E52, E58, E31, F31

Introduction

Monetary policy is among the main macroeconomic policy tools utilized by central banks to ensure economic stability. Central banks try to stabilize prices, achieve sustainable growth, ensure stable exchange rates, and attain an appropriate level of money supply within the economy through the use of interest rates and money supply. The performance of monetary policy is determined by how much the policy measures influence the macroeconomic variables such as GDP, exchange rate, money supply, and the inflation rate. These macroeconomic variables react differently to monetary policy in most developing countries due to inefficiencies within the financial system and external shocks (Sadeghi et al., 2023; El-Khodary, 2024).

There is significant research regarding the relationship between monetary policy conditions and macroeconomic performance in both advanced and emerging markets. The concept of monetary policy conditions refers to the state of monetary policy through the integration of impacts of changes in interest rates and exchange rates into one measure. Contrary to the approach of using a monetary policy tool in isolation, monetary policy conditions give a more comprehensive view on the nature of the monetary policy as either expansionary or contractionary. Monetary policy conditions have an effect on borrowing costs, investments, consumption, production, and international competition leading to economic growth, inflation, money supply, and exchange rates (Falconio & Manganelli, 2024; Chang, 2025).

The execution of monetary policy in Nigeria has been increasingly difficult due to the challenges faced by inflationary pressures, an unstable exchange rate, recurrent foreign exchange scarcity, and variations in the price of crude oil, which happens to be the main foreign exchange earner for the nation. Over the years, the Central Bank of Nigeria has utilized different policy tools such as the Monetary Policy Rate (MPR), Open Market Operations (OMO), Cash Reserve Ratio (CRR), and liquidity management in order to affect macroeconomic outcomes. Notwithstanding these efforts, the level of inflation has exceeded the target while the exchange rate remains volatile, and economic growth has varied widely (Bilalli et al., 2024; Sadeghi et al., 2023).

Though there have been numerous empirical researches exploring the impact of monetary policy on the economy, most of them have been concentrated on single policy variables like interest rates, money supply, or exchange rates. However, this method cannot accurately represent the total monetary policy stance since policies may vary concurrently, resulting in various impacts. Therefore, the use of one variable might not sufficiently

evaluate the effectiveness of the monetary policy (Astuti & Udjianto, 2022; Judijanto et al., 2025).

The issue with this is that although there have been monetary policy actions implemented consistently by the Central Bank of Nigeria, there still remains a situation whereby the Nigerian economy is suffering from the problem of high inflation, fluctuating exchange rates, uneven economic growth, and monetary aggregates. This brings out the issue of whether the monetary policy condition as opposed to the policy instrument provides a more comprehensive approach to analyzing the macroeconomic performance of Nigeria. There is also lack of research into how the Monetary Policy Condition Index (MPCI) can be used to analyze the effect of monetary policy transmission in Nigeria, especially amidst economic shocks that have occurred in the past. In view of this scenario, this research looks into the effects of monetary policy conditions on some macroeconomic variables in Nigeria from $1999Q_1$ to $2024Q_4$. This is in relation to the effect of Monetary Policy Condition Index on real GDP growth, broad money supply, inflation, and exchange rate fluctuations through the Structural Vector Autoregression model.

Monetary Policy Conditions, Inflation and Economic Growth in Nigeria

This section critically discusses the previous research on monetary policy environment and macroeconomic performance in relation to four variables that are being studied in this paper, namely economic growth, inflation, money supply and exchange rate. The classification of the literature helps to identify those aspects of each variable that have been explored before and those areas that need further research. There are various scholarly researches that relate interest rate policy with economic performance in emerging nations, but depending on the nation the effects may differ in terms of strength and direction. According to Wauk and Adjorlolo (2019), interest rates negatively affect the economy of Ghana through causing macroeconomic instability and inadequate central bank independence. Similarly, in ASEAN-4 nations, Astuti and Udjianto (2022) have shown that while interest rate increases reduce growth in the short run, the same effect is reversed in the long run. Also, in the case of Morocco, El-Khodary (2024) showed that interest rates adversely affected the economy, although money supply growth has been identified as a supportive factor for growth.

Moreover, the transmission of these effects also takes place through the institutional environment within which policies operate. According to Sadeghi, Tayebi, and Roudari (2023), comparing Iran and Argentina, interest rate repression undermines the transmission of monetary policy into output in Iran, while interest rate was highly related to the financial market

in the case of Argentina. In connection with this, along with the results found by researchers regarding Ghana, ASEAN-4 and Morocco, there can be seen a common trend among all developing countries: interest rate increases undermine growth, yet the extent to which these effects take place relies on the degree of independence and credibility of the central bank, and also on the development of financial systems. Still, none of these works considers combining the interest rate with other monetary variables in order to assess the stance of monetary policy.

Evidence on inflation is inconsistent to evidence of economic growth. According to Judijanto et al. (2025), the impact of interest rates was found to be negative on inflation while the impacts of money supply and growth in bank credits were found to be positive on inflation, which is in line with normal monetary economics. The findings of Astuti & Udjianto (2022) revealed, however, that there exists a price puzzle in ASEAN-4 countries due to the lack of reduction of inflation despite interest rate rises. These contradictory evidences indicate that the impact of interest rates on inflation is not always consistent since it varies from country to country depending on several determinants.

The connection between monetary policy and inflation is not confined to the interest rate alone. In their study of 38 OECD countries from 2002 to 2021, Bilalli, Sadiku and Sadiku (2024) observed a steady negative connection between inflation and the performance of the financial sector, indicating that times of high inflation often correspond with poor performance of the financial sector. The results from the two studies together suggest that inflation targeting by monetary policy is achieved via two channels – through the interest rate channel and through the performance of the financial sector.

Changes in exchange rates are among the key ways in which monetary policy operates on developing countries, as it affects the cost of imports, competitiveness of the nation abroad, and inflation. Nevertheless, the studies reviewed above do not pay much attention to exchange rates, as it tends to be seen only as a background variable for explaining the price puzzle or transmission problem that exists, and not a variable to be included in the model together with other variables such as interest rates, money supply, and inflation. This, in fact, is a major flaw of the existing literature on this topic, as the monetary policy condition index without exchange rate is incomplete for economies where exchange rates change frequently, as it happens in Nigeria.

Since interest rates alone cannot fully account for the impact of monetary policy on the economy, various studies have developed financial conditions indices that can shed light on this issue. In particular, Chang (2025) analyzed the performance of financial conditions indices in China

and found some drawbacks related to the implementation of policies in the transmission stage. Falconio and Manganelli (2024) discovered that stricter financial conditions increase the likelihood of poor economic results but do not have much impact on boosting economic growth beyond its regular levels, implying that financial conditions are essential not only for the protection from recessions but also for expansions. Aikman et al. (2020) discovered that in the case of the US, the transmission of monetary policy becomes less effective when the growth of credit goes beyond its long-term trend. The above findings, along with Sadeghi et al. (2023) regarding interest rate and the relationship with financial market indices, further strengthen the argument for developing a monetary policy condition index as opposed to depending on interest rates alone. The majority of the indices examined here have been developed for advanced or middle-income countries. However, none have been developed for Nigeria using factors that capture the characteristics of its own financial market.

In terms of methodologies, vector autoregression (VAR) models prevail in reviewed literature (Astuti & Udjianto, 2022; El-Khodary, 2024); the models of autoregressive distributed lag are more favorable to apply to small data sets (Wauk & Adjorlolo, 2019; Zia et al., 2025); and panel data techniques are applied to overcome endogeneity problem in cross-country research (Xu & Wubishet, 2024). Three key research gaps arise as a direct consequence of the literature review outlined above. Firstly, there is no previous study among those discussed above which has created a unified index of the monetary policy condition that takes into account interest rates, money supply, and exchange rates for any sub-Saharan African country, although the review proves the significance of each channel individually in influencing the impact of monetary policy on economic growth and inflation. Secondly, none of the studies reviewed above has applied SVAR approach to analyzing the impact of a monetary policy condition index on real GDP, inflation, money supply, and exchange rate in Nigeria. The third point is that none of the literature that has been discussed thus far deals with the period after 1990 using quarterly data that captures all the changes in the foreign exchange policy regime, financial system reform, and periods of inflation in one dataset. This study, however, seeks to fill these three gaps by developing a monetary policy conditions index for Nigeria through principal component analysis and then estimating the SVAR model using quarterly data from $1990Q_1$ to $2024Q_4$ on its effect on real GDP, money supply, exchange rate, and inflation.

Theoretical Framework

The Financial Conditions Theory forms the basis for this research since the theory helps to understand the relationship between the aggregate

monetary policy position and the economic performance via various transmission mechanisms that work simultaneously. Instead of relying on a particular policy tool, the theory holds that the combined influence of interest rates, exchange rates, and the state of financial markets determines the effects of monetary policy on the real economy. The theory is more appropriate than those considering either interest rates or money supply in the discussion of monetary policy (Sadeghi et al., 2023).

The model is then put into operation using the Monetary Conditions Index (MCI), which integrates the impact of interest rates and exchange rates on monetary conditions into one single measure. The model can be stated as:

$$MCI_t = \alpha(r_t - r^*) + \beta(e_t - e^*) \quad \ldots\ldots (2.2)$$

where:

- **MCI** = Monetary Conditions Index;
- $\mathbf{r_t}$ = current interest rate;
- **r*** = benchmark or equilibrium interest rate;
- $\mathbf{e_t}$ = current exchange rate;
- **e*** = benchmark or equilibrium exchange rate;
- α and β = weights representing the relative effects of interest rates and exchange rates on economic activity (Ericsson et al., 2009).

This implies that monetary policy must not be gauged by just one single variable such as the policy interest rate or money supply. Rather, the state of monetary policy is judged based on the joint change in the interest rate and exchange rate because both affect decisions regarding investments, consumption, production, and foreign trade. Tightening of monetary policy means a reduction in the level of liquidity and aggregate demand, whereas loosening of monetary policy increases economic activity.

The theory is relevant to the variables being used in this research. The MPCI is the independent variable that depicts the monetary policy conditions. Real GDP is the dependent variable that is used to capture the impact of monetary conditions on the growth of the economy. The broad money supply is the dependent variable that shows the change in liquidity due to monetary policy conditions, inflation is the variable used to show the effect of monetary conditions on price stability, and the exchange rate is the component of the monetary conditions index.

The application of FCT in Nigeria can be justified based on the monetary policy framework existing in the country. Nigeria is a small open economy characterized by constant fluctuations in the exchange rate, inflation risks, reliance on oil export revenues, and weak transmission of monetary policy. In such an environment, interest rates alone cannot indicate the monetary policy stance since exchange rate fluctuations affect inflation, imports, exports, and economic performance. Previous research findings suggest that

low financial market development results in inefficiency of the traditional interest rate channel, which implies the need to use the monetary conditions index in developing countries like Nigeria (Astuti & Udjianto, 2022; Sadeghi et al., 2023).

In addition to this, Financial Conditions Theory is compatible with the research method applied in this paper. Through the application of the SVAR model, the monetary policy conditions shock can be identified, along with its dynamic impact on output, money supply, and exchange rate. Therefore, it can be said that this theory offers an appropriate approach to analyse the monetary policy conditions' impact on macroeconomic performance in Nigeria (Falconio & Manganelli, 2024).

Research Methodology

This study examines the impact of monetary policy conditions on the performance of the Nigerian economy based on real GDP, broad money supply (M2), consumer price index (CPI), exchange rate, and MPC (monetary policy condition indicator) based on principal component analysis. Quarterly data for the period of 1990Q1-2024Q4 obtained from the Central Bank of Nigeria will be used in the study under the structural vector autoregressive model (SVAR).

Model Specifications

The mathematical expression for the model will be;

To achieve the objectives of the research, we will use a Simple Structural Vector Autoregression Model (SVAR). This is appropriate because the SVAR Model can be used to identify shocks that affect the short run dynamics of the variables. In this model, there are five endogenous variables which are: GDP, Broad Money Supply (LOGM2), Consumer Price Index (CPI), Official Exchange Rate (LOGOEX), and Monetary Policy Condition (MPC). All these variables are determined simultaneously in the model. The Structural Vector Autoregressive Model can thus be written as:

$A_0Y_t = A_1Y_{t-1} + A_2Y_{t-2} + \dots + A_pY_{t-p} + \varepsilon_t$ ………………………….…… (3.1)

Where

Y_t = [$LOGRGDP_t$ $LOGM2_t$, CPI_t, $LOGOEX_t$, MPC_t]′ is a vector of endogenous variables,

A_0 is the contemporaneous coefficient matrix that captures short-run restrictions,

$A_1 \dots A_p$ are matrices of lagged coefficients,

p is the optimal lag length selected using information criteria, and

ε_t is a vector of structural shocks assumed to be uncorrelated with unit variance.

Pre-Estimation Test

Prior to the estimation of the SVAR model, some initial testing was undertaken to make sure that the data was suitable for analysis and reliable. The descriptive statistics were used to examine the basic features of the variables along with the nature of the distributions. Stationarity of the series was then checked using the ADF unit root test in order to avoid spurious regression because of non-stationary data. For the SVAR model, an appropriate lag length was selected based on the AIC and SBIC.

Estimations of the SVAR

Let the vector of endogenous variables be defined as:

$$y_t = \begin{bmatrix} logRGDP_t \\ logM2_t \\ CPI_t \\ LOGOEX_t \\ MPC_t \end{bmatrix}$$

Where:

- $logRGDP_t$ = GDP (constant 2015 US$)
- $logM2_t$ = Broad money (current LCU, billions of naira, [M2])
- $logCPI_t$ = Consumer price index (2010 = 100)
- $logOEX_t$ = Official exchange rate (LCU per US$, period average)
- MPC_t = Monetary policy condition indicator (Monetary Policy Rates computed using PCA-based index)

Reduced-Form VAR Model

The reduced-form VAR(p) is specified as:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + \mu_t$$

Where:

- A_i are coefficient matrices
- μ_t is a vector of reduced-form residuals with covariance matrix Σ_μ

Structural VAR (SVAR) Model

The structural form of the VAR is given as:

$$By_t = C_1 y_{t-1} + C_2 y_{t-2} + \cdots + C_p y_{t-p} + \varepsilon_t$$

Where:

- B is the contemporaneous coefficient matrix
- ε_t represents mutually uncorrelated **structural shocks**, such that:

$$E(\varepsilon_t \varepsilon_t') = I$$

Identification Strategy and Contemporaneous Restrictions

A recursive (short-run) identification scheme is adopted, consistent with monetary transmission mechanisms in developing economies.

Variable Ordering**:**

($logRGDP_t$, $logM2_t$ CPI_t, $logOEX_t$, MPC_t)
This ordering assumes that:

- Output does not respond contemporaneously to monetary policy shocks.
- Inflation responds sluggishly to policy changes.
- Exchange rate responds faster to macroeconomic shocks.
- Money supply adjusts before policy rate decisions.
- Monetary policy reacts contemporaneously to all macroeconomic conditions.

Structural Matrix B

$$B = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 \end{bmatrix}$$

Interpretation of Structural Shocks

$$\varepsilon_t = \begin{bmatrix} \varepsilon_t^{logRGDP} \\ \varepsilon_t^{logM2} \\ \varepsilon_t^{CPI} \\ \varepsilon_t^{logOEX} \\ \varepsilon_t^{MPC} \end{bmatrix}$$

Where:

- ε_t^{MPC} represents monetary policy shocks
- Other shocks capture output, price, exchange rate, and liquidity innovations

Justification for Nigeria

The methodology used here is consistent with the Central Bank of Nigeria approach to monetary policy, which involves a contemporaneous reaction to inflation pressure, foreign exchange rates, and liquidity, whereas the real output and price levels adjust gradually.

Post estimations Tests

The residual diagnostic checks are performed in order to find out how reliable and valid the estimates are. In particular, the analysis of the residual properties of serial correlation, normality, heteroskedasticity, and model stability is carried out because of these properties' crucial role for the validation of empirical findings. The Breusch-Godfrey LM test is applied in order to check for serial correlation in the residuals as the autocorrelation of the residuals can result in the bias in the standard errors. In addition, the Jarque-Bera test is applied in order to check for normality in the residuals as

it is an important condition for making valid inferences. To check whether the residuals are homoscedastic or not, the Breusch-Pagan-Godfrey test is used. Lastly, the SVAR model stability is checked using the roots of the AR characteristic polynomial, and if all roots are within the unit circle, the model is called stable, and impulse response functions are considered to be reliable.

Table 1 Description, Measurement, and Data Transformation of Variables

Variable	Measure	Source of Data	Data Transformation
RGDP	Gross Domestic Product measured in constant 2015 US dollars, representing real economic output	World Development Indicators (WDI)	Converted from annual to quarterly series using EViews
M2	Broad money supply measured in current local currency units (billions of naira)	World Development Indicators (WDI)	Converted from annual to quarterly series using EViews
CPI	Consumer Price Index (2010 = 100), used as a proxy for inflation	World Development Indicators (WDI)	Converted from annual to quarterly series using EViews
OEX	Official exchange rate measured as local currency units per US dollar (period average)	World Development Indicators (WDI)	Converted from annual to quarterly series using EViews
MPC	Monetary policy condition index constructed using PCA from monetary policy rate, treasury bill rate, maximum lending rate, prime lending rate, and credit to private sector	Central Bank of Nigeria (CBN)	Constructed and transformed to quarterly series using EViews

Source: Author compilation 2026

Results and Discussions

Results of the empirical analysis based on the quarterly data for the period 1999-2024 are discussed in this chapter. This includes the discussion on preliminary tests, SVAR estimation (cointegration, identification, impulse response, and variance decomposition), diagnostics, Granger causality test, and an analysis of the findings in light of existing literature.

Descriptive Statistics

Table 4.1 presents the descriptive statistics of the raw values of the five variables used in the study, namely the Monetary Policy Condition index (MPC), the Consumer Price Index (CPI), broad money supply (M2), the official exchange rate (OEX), and real Gross Domestic Product (RGDP).

Table 2: Descriptive Statistics of the Study Variables

Statistic	MPC	CPI	M2	OEX	RGDP
Mean	0.3422	176.0261	2.01E+12	261.2880	3.83E+11
Median	0.1786	117.6203	12586.19	154.7628	4.14E+11
Maximum	1.0053	780.2843	8.32E+13	1926.064	5.50E+11
Minimum	-0.0304	27.5556	-8.15E+12	88.8666	1.68E+11
Std. Dev.	0.3445	165.7624	1.11E+13	285.2697	1.20E+11
Skewness	0.7795	1.6667	3.7620	5.7625	-0.4226
Kurtosis	2.1045	5.4431	18.9287	37.5336	1.7004

Source: Authors computation using Eviews 12 (2026)

The MPC index has a mean value of 0.34 and ranges from -0.03 to 1.01 over the review period, and the standard deviation of 0.34 is almost as large as the mean, which shows that the stance of monetary policy in Nigeria has swung by a wide margin from one quarter to another instead of staying steady. The CPI has a mean of 176.03 and a maximum of 780.28, showing that the price level moved up several times its starting value at the peak of the sample, a sign of episodes of high inflation within the period. The M2 series shows a wide gap between the mean and the median, together with a negative minimum value, and this points to strong swings and extreme values in money supply figures across the quarters. The exchange rate (OEX) carries the highest skewness (5.76) and kurtosis (37.53) among the five variables, which tells us that a few quarters of sharp naira depreciation pull the distribution of the exchange rate far away from what a normal distribution would look like. Real GDP is the most even variable in the group, with the smallest skewness value and a kurtosis value close to 3, the value expected under a normal distribution. On the whole, most of the variables depart from normality at their raw levels, which is common with macroeconomic series of this kind, and this is part of the reason the price level, money supply, exchange rate, and output were converted to their log form before entering the SVAR model, while the MPC index, which already carries positive and negative values, was left in its raw form.

Correlation Analysis

Table 3 presents the pairwise correlation among the MPC index and the log form of the other four variables.

Table 3: Correlation Matrix

Variable	MPC	LOGCPI	LOGM2	LOGOEX	LOGRGDP
MPC	1.0000				

LOGCPI	0.8842	1.0000			
LOGM2	0.6043	0.6833	1.0000		
LOGOEX	0.8878	0.9206	0.8391	1.0000	
LOGRGDP	0.6954	0.9270	0.4986	0.7323	1.0000

Source: Authors computation using Eviews 12 (2026)

The MPC index has a high correlation with exchange rates (0.89) and price level (0.88); moderate correlation with output (0.70) and low correlation with the money supply (0.60). All the coefficients of correlations are positive, but none is near 1. This means that there is no relationship between any of the two variables that makes them behave similarly, therefore, multicollinearity is not an issue and all five variables can be included in the SVAR model..

Unit Root Test

The Augmented Dickey-Fuller (ADF) test was used to check the order of integration of each variable, both at level and after first differencing. Table 4 presents a summary of the results.

Table 4Summary of Augmented Dickey-Fuller Unit Root Test Results

Variable	ADF at Level	Prob.	ADF at 1st Diff.	Prob.	Order of Integration
MPC	-0.4637	0.8924	-6.2396	0.0000	I(1)
LOGCPI	1.4859	0.9992	-4.9291	0.0179	I(1)
LOGM2	-1.7903	0.3831	-6.4678	0.0000	I(1)
LOGOEX	2.5840	1.0000	-4.4468	0.0209	I(1)
LOGRGDP	-2.8700	0.0526	-5.4019	0.0001	I(1)

Source: Authors computation using Eviews 12 (2026)

All five of these variables are not stationary in level form because the p-value associated with each of their ADF statistics is greater than 5%, even LOGRGDP's p-value of 0.0526, which is only slightly less than the 5% threshold. After taking the first difference of each variable, however, the ADF statistic turns out to be large and negative enough that all of the variables can reject the null hypothesis of a unit root at the 5% level of significance or better. As a result, all five variables are integrated of order one, I(1), which is the typical order of integration in macroeconomic variables.

Lag Length Selection Criteria

Prior to the SVAR model being estimated, the optimum lag order was selected on the basis of standard lag order selection methods that include

Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criteria (AIC), Schwarz Information Criteria (SC), and Hannan-Quinn (HQ).

Table 5VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	501.46	NA	8.66e-12	-11.2832	-11.1425	-11.2265
1	1476.47	1817.06	3.64e-21	-32.8743	-32.0298	-32.5341
2	1563.07	151.55	9.02e-22	-34.2744	-32.7260*	-33.6506*
3	1570.48	12.13	1.36e-21	-33.8746	-31.6225	-32.9673
4	1576.07	8.52	2.18e-21	-33.4335	-30.4776	-32.2427
5	1665.62	126.18	5.25e-22	-34.9005	-31.2408	-33.4261
6	1695.09	38.18*	5.07e-22*	-35.0021*	-30.6386	-33.2442
7	1703.87	10.37	8.07e-22	-34.6335	-29.5662	-32.5920
8	1717.40	14.45	1.20e-21	-34.3727	-28.6017	-32.0477

*Note. * indicates the lag order selected by that criterion.*
Source: Authors computation using Eviews 12 (2026)

The criteria SC and HQ choose lag 2 as the optimal lag, whereas the criteria LR, FPE and AIC opt for lag 6. Because SC and HQ penalize the problem of overparameterization more strongly compared to the AIC and considering that the sample used in this analysis is a small quarterly sample, lag 2 was chosen as the lag order for the SVAR model. As seen from Figure 4.1, the graphs SC and HQ show a rapid decrease followed by an increase right after lag 2, whereas the graph AIC continues to decrease until lag 6.

Structural Vector Autoregression (SVAR) Analysis
Johansen Cointegration Test

Since all five variables are integrated of order one, the Johansen cointegration test was carried out to check whether they share a long run relationship. Table 6 present the trace test and the maximum eigenvalue test results.

Table 6: Johansen Cointegration Test

Johansen Cointegration Test (Trace Statistic)				
Hypothesised No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.**
None	0.2296	63.5457	69.8189	0.1429
At most 1	0.1982	38.5014	47.8561	0.2806
At most 2	0.0979	17.2907	29.7971	0.6185
At most 3	0.0564	7.3980	15.4947	0.5318
At most 4	0.0188	1.8246	3.8415	0.1768
Johansen Cointegration Test (Maximum Eigenvalue Statistic)				

Hypothesised No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	0.2296	25.0443	33.8769	0.3820
At most 1	0.1982	21.2108	27.5843	0.2637
At most 2	0.0979	9.8926	21.1316	0.7547
At most 3	0.0564	5.5734	14.2646	0.6683
At most 4	0.0188	1.8246	3.8415	0.1768

Source: Authors computation using Eviews 12 (2026)

Neither the trace statistic nor the maximum eigenvalue fails to reject the null hypothesis of non-cointegration at the 5 percent level for all hypothesized ranks since the test statistics are less than their respective critical values. Therefore, there exists no long run relationship between the price level, the money supply, the exchange rate, output, and the MPC index between the years 1999 and 2024. Under this case, the econometric model is specified as a Structural VAR in first difference specification and not a Vector Error Correction Model since an error correction term cannot be constructed due to lack of cointegration.

SVAR Identification Scheme

Identification of the SVAR model is done via a recursive, Choleski short-run restriction where the order of the five variables is: Log of CPI (Shock 1), Log of M2 (Shock 2), Log of OEX (Shock 3), Log of RGDP (Shock 4) and MPC (Shock 5), the target variable for the research. This ordering is based on the Financial Conditions Theory where financial and monetary conditions affect the economy in a specified order starting from prices to money to exchange rates then to output and finally to the policy position.

Table 7: Structural VAR Estimates (Contemporaneous Restriction Matrix A)

Coefficient	Estimate	Std. Error	z-Statistic	Prob.
C(1)	-1.7136	0.4117	-4.1618	0.0000
C(2)	-1.0180	0.3340	-3.0482	0.0023
C(3)	0.1646	0.1065	1.5458	0.1221
C(4)	-2.3919	0.8594	-2.7832	0.0054
C(5)	0.2559	0.0755	3.3885	0.0007
C(6)	0.0675	0.0243	2.7749	0.0055
C(7)	-0.3106	0.2015	-1.5420	0.1231
C(8)	0.1108	0.0308	3.6001	0.0003
C(9)	0.7233	0.2612	2.7694	0.0056
C(10)	3.9788	0.8057	4.9386	0.0000

Source: Authors computation using Eviews 12 (2026)

Price level has been considered first, since prices are the slowest variable among the five to change in one quarter; hence log CPI is considered to be responding to nothing else in the same quarter (sticky price hypothesis). Second on the ordering is the money supply because money is controlled by the banking system which can react to price shock but cannot react to shocks from exchange rate, output, and policy stance during the same quarter. Exchange rate follows price and money and has been ranked third, as Nigeria is an open and import-dependent economy; hence, exchange rate reacts to price and money shock in the same quarter but will need another quarter to respond to output and policy stance shock. Output has been considered next in ordering because the production decisions respond to price, money, and exchange rate shock during the same quarter but the reaction of output to monetary policy stance of the current quarter will show its effect with lag. The MPC indicator comes at the end of the list, thereby allowing it to react to price, money, exchange rate, and output shocks within the quarter in accordance with the notion that the central bank chooses its stance of monetary policy for the quarter after evaluating the current state of prices, money, exchange rate, and output.

The model is just-identified and converges after eight iterations of maximum likelihood estimation using the Newton-Raphson algorithm with a value of log likelihood of 1714.67. The first eight out of ten contemporaneous coefficients are significant at the 5 percent level, thus validating the identification scheme used, and C(3) and C(7), both of which are from the exchange rate row, fail to reach the level of significance.

Impulse Response Analysis (Tabular)

Tables 8 present the impulse response of each of the five variables to a one standard deviation structural shock in log CPI (Shock 1), log M2 (Shock 2), log OEX (Shock 3), log RGDP (Shock 4), and MPC (Shock 5), read at three points, Period 1 for the short run, Period 5 for the medium run, and Period 10 for the long run.

Table 8: Impulse Response Structural Shocks (Short, Medium, and Long Run)

Impulse Response of LOGCPI to Structural Shocks					
Horizon	**Shock 1 (CPI)**	**Shock 2 (M2)**	**Shock 3 (OEX)**	**Shock 4 (RGDP)**	**Shock 5 (MPC)**
Period 1 (Short run)	0.003004	0.000000	0.000000	0.000000	0.000000
Period 5 (Medium run)	0.007759	-0.000614	0.001635	0.001025	0.001229
Period 10 (Long run)	0.009899	-0.000390	0.002907	0.000516	0.003563
Impulse Response of LOGM2 to Structural Shocks					

Horizon	Shock 1 (CPI)	Shock 2 (M2)	Shock 3 (OEX)	Shock 4 (RGDP)	Shock 5 (MPC)
Period 1 (Short run)	0.005148	0.012245	0.000000	0.000000	0.000000
Period 5 (Medium run)	0.005890	0.018568	0.000244	-0.005361	-0.005933
Period 10 (Long run)	0.005079	0.020040	0.000518	-0.008887	-0.011265
Impulse Response of LOGOEX to Structural Shocks					
Horizon	**Shock 1 (CPI)**	**Shock 2 (M2)**	**Shock 3 (OEX)**	**Shock 4 (RGDP)**	**Shock 5 (MPC)**
Period 1 (Short run)	0.001741	-0.003134	0.009155	0.000000	0.000000
Period 5 (Medium run)	0.007464	-0.002399	0.012890	-0.000170	0.008760
Period 10 (Long run)	0.008710	0.002406	0.009099	-0.004681	0.016692
Impulse Response of LOGRGDP to Structural Shocks					
Horizon	**Shock 1 (CPI)**	**Shock 2 (M2)**	**Shock 3 (OEX)**	**Shock 4 (RGDP)**	**Shock 5 (MPC)**
Period 1 (Short run)	-0.001035	-0.000479	-0.001014	0.002789	0.000000
Period 5 (Medium run)	-0.000066	-0.001226	-0.002486	0.005525	-0.002102
Period 10 (Long run)	0.001109	-0.001205	-0.003394	0.005243	-0.004330
Impulse Response of MPC to Structural Shocks					
Horizon	**Shock 1 (CPI)**	**Shock 2 (M2)**	**Shock 3 (OEX)**	**Shock 4 (RGDP)**	**Shock 5 (MPC)**
Period 1 (Short run)	0.011642	0.007977	-0.002586	-0.011098	0.022247
Period 5 (Medium run)	0.011459	0.009985	0.006773	-0.018913	0.037813
Period 10 (Long run)	0.009282	0.002558	0.011290	-0.011179	0.022620

Source: Authors computation using Eviews 12 (2026)

Figure 1 shows how each variable reacts to a one standard deviation change in every other variable over ten quarters. The following description uses the conventional way of analyzing an impulse response graph. However, special attention has been paid to the reactions of all the variables to a one standard deviation change in the MPC index (Shock 5) because MPC is the main variable under study alongside the immediate relationships between the other four variables.

A tightening shock to MPC of one standard deviation (Shock 5) leads to a slight positive reaction in log CPI that increases steadily from 0.0000 in Period 1 to 0.0012 in Period 5 and 0.0036 in Period 10. In other words, in spite of a tightening shock, the price level increases rather than decreases, and the increase is greater the longer the time horizon considered – a

situation that is known in the literature as a price puzzle associated with monetary policy and consistent with an economy that is exposed to costs and supply factors as well as demand pressures

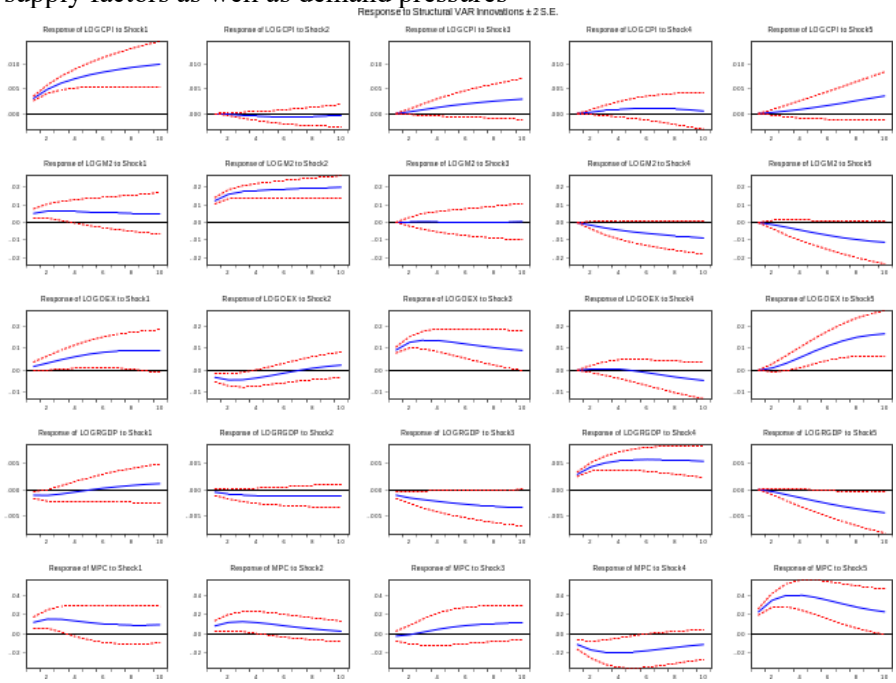

Figure 1: Response of the Study Variables to Structural VAR Innovations (± 2 S.E.)
Source Auhtor's generation using Eviews version 12(2026)

As shown in the Log M2 series, the negative effect of the MPC shock rises over time, beginning from 0.0000 at time 0, to -0.0059 at Period 5 and -0.0113 at Period 10. This is due to the fact that an increase in the supply of money is becoming more and more difficult as the monetary policy becomes tighter in line with the usual effects of tightening the policy stance on money supply growth.

In regard to the Log OEX series, there is a rising reaction of the series to MPC shock at all points of the horizon, ranging from 0.0000 during the impact period, through 0.0088 in Period 5 and 0.0167 in Period 10 before starting to fade off towards the end of the horizon. Since the Log OEX variable represents the rate of naira/US$, the positive rising reaction indicates that naira depreciates as time goes by under the influence of the tightening shock. The log RGDP shows the reaction of the shock that was caused by MPC in a way that becomes more negative as time progresses; the impact starts at 0.0000 in the impact, -0.0021 in Period 5, and -0.0043 in

Period 10. Real GDP continues to fall progressively due to the tightening of monetary policy, and the amount of fall continues to increase instead of decreasing in the ten-quarters period under consideration..

On the other hand, MPC responds to shocks in all other variables for the same period. The first shock is price level shock (Shock 1). On impact, it causes an increase in MPC by 0.0116, increasing to 0.0148 in Period 3 and then reducing to 0.0093 in Period 10, signifying that the policy condition becomes tighter due to the effects of price levels, but the magnitude becomes smaller over time. The second shock is the money supply shock (Shock 2), causing an increase in MPC on impact by 0.0080, increasing to 0.0124 in Period 3 and then decreasing to 0.0026 in Period 10. The third shock is exchange rate shock (Shock 3). In this scenario, MPC declines very little at period 1 by -0.0026 and gradually becomes positive from Period 4 and reaches 0.0113 at Period 10, showing that the policy condition becomes increasingly tighter as a result of continued exchange rate shock. Lastly, there is an output shock (Shock 4). This leads to a reduction in MPC at -0.0111 on impact, declining to -0.0193 at Period 3, remaining in the negative for all periods up to Period 10 at -0.0112.

Variance Decomposition Analysis

Tables 9 present the forecast error variance decomposition of each variable, again read at Period 1, Period 5, and Period 10, using a linear (non-cumulative) decomposition of the variance shares attributed to each structural shock.

Table 9: Variance Decomposition (Percentage of Forecast Error Variance)

Variance Decomposition of LOGCPI (Percentage of Forecast Error Variance)					
Horizon	**Shock 1 (CPI)**	**Shock 2 (M2)**	**Shock 3 (OEX)**	**Shock 4 (RGDP)**	**Shock 5 (MPC)**
Period 1 (Short run)	100.00	0.00	0.00	0.00	0.00
Period 5 (Medium run)	94.49	0.41	2.60	1.18	1.32
Period 10 (Long run)	87.89	0.34	5.23	0.89	5.64
Variance Decomposition of LOGM2 (Percentage of Forecast Error Variance)					
Horizon	**Shock 1 (CPI)**	**Shock 2 (M2)**	**Shock 3 (OEX)**	**Shock 4 (RGDP)**	**Shock 5 (MPC)**
Period 1 (Short run)	15.02	84.98	0.00	0.00	0.00
Period 5 (Medium run)	10.87	81.86	0.04	3.53	3.70

Period 10 (Long run)	7.21	73.18	0.02	7.87	11.72

Variance Decomposition of LOGOEX (Percentage of Forecast Error Variance)

Horizon	**Shock 1 (CPI)**	**Shock 2 (M2)**	**Shock 3 (OEX)**	**Shock 4 (RGDP)**	**Shock 5 (MPC)**
Period 1 (Short run)	3.13	10.16	86.71	0.00	0.00
Period 5 (Medium run)	11.92	5.92	71.00	0.12	11.04
Period 10 (Long run)	16.04	2.43	42.13	1.70	37.71

Variance Decomposition of LOGRGDP (Percentage of Forecast Error Variance)

Horizon	**Shock 1 (CPI)**	**Shock 2 (M2)**	**Shock 3 (OEX)**	**Shock 4 (RGDP)**	**Shock 5 (MPC)**
Period 1 (Short run)	10.59	2.27	10.18	76.96	0.00
Period 5 (Medium run)	2.20	3.39	12.65	76.32	5.44
Period 10 (Long run)	1.50	3.00	16.05	62.08	17.37

Variance Decomposition of MPC (Percentage of Forecast Error Variance)

Horizon	**Shock 1 (CPI)**	**Shock 2 (M2)**	**Shock 3 (OEX)**	**Shock 4 (RGDP)**	**Shock 5 (MPC)**
Period 1 (Short run)	16.45	7.72	0.81	14.95	60.07
Period 5 (Medium run)	9.49	6.25	0.82	16.24	67.21
Period 10 (Long run)	8.52	4.74	3.85	16.50	66.39

Source: Authors computation using Eviews 12 (2026)

The findings from the variance decompositions indicate that in the short term, every variable is largely driven by its own shock, but the proportion of its own shock diminishes with an increase in the horizon length. The log CPI is largely self-driven throughout the horizon, with its own shock accounting for 87.89 percent of its variance in Period 10, while the MPC contributes only 5.64 percent of the log CPI in the same period. The log M2 is also largely driven by its own shock (accounting for 73.18 percent of its variance in Period 10).

The log OEX variable experiences the most dramatic adjustment: the impact of its own shock declines from 86.71 percent in the short run to 42.13 percent in the long run, whereas the MPC shock increases from 0.00 percent to 37.71 percent in Period 10, which indicates that the MPC index becomes

almost as important for the variance of the exchange rate as its own shock, confirming the fact that the exchange rate channel is the most effective way to transmit monetary policy conditions through the economy in the current setting. The log RGDP index is mainly determined by its own shock (although this share decreases from 76.96 percent to 62.08 percent in the short and the long run), but the share of the MPC shock increases to 17.37 percent in Period 10. The MPC index is mainly affected by its own shock in the entire horizon of consideration (66.39 percent in Period 10).

Diagnostic and Residual Analysis

Table 10 presents, in one table, the three main diagnostic checks carried out on the estimated model, namely the residual serial correlation LM test, the residual normality test, and the residual heteroskedasticity test.

Table 10 VAR Residual Diagnostic Tests

Test	Statistic	df	Prob.	Decision
Serial Correlation LM (Lag 1)	18.7555	25	0.8087	No serial correlation
Serial Correlation LM (Lag 2)	8.9877	25	0.9986	No serial correlation
Serial Correlation LM (Lag 3)	15.0554	25	0.9401	No serial correlation
Normality (Jarque-Bera, Joint)	759.1371	10	0.0000	Residuals not normal
Heteroskedasticity (Joint White test)	292.8523	300	0.6052	No heteroskedasticity

Source: Authors computation using Eviews 12 (2026)

The LM test finds no evidence of serial correlation in the residuals at lag 1, 2, or 3, since all the probability values are well above 5 percent. The joint White test for heteroskedasticity likewise fails to reject the null of no heteroskedasticity, with a probability value of 0.6052, so the residual variance can be treated as steady across the sample. The one test the residuals fail is the Jarque-Bera normality test, which rejects the null of multivariate normal residuals at every conventional level, a common result in macroeconomic SVAR models built on series with the kind of skewness and kurtosis already reported in Table 4.1, and one that mainly affects the size of confidence bands rather than the direction of the impulse response results already discussed.

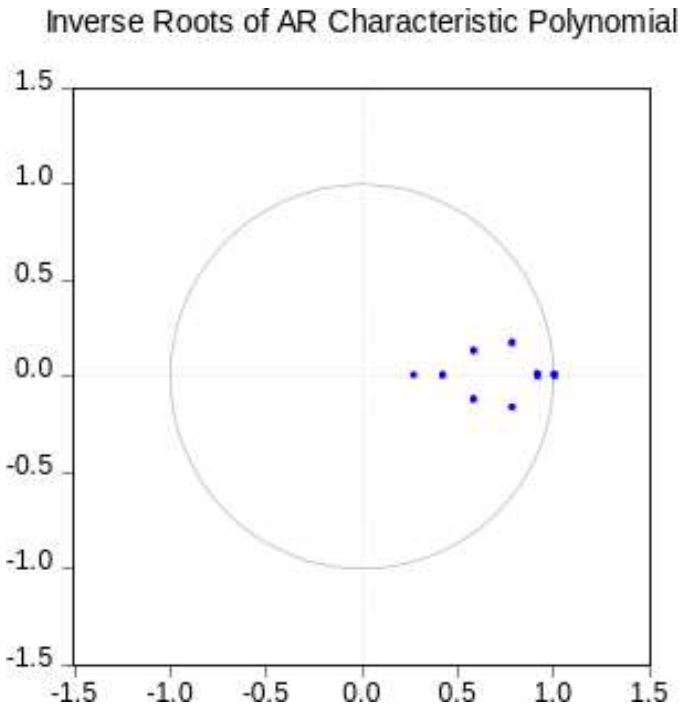

Figure 2: *Inverse Roots of the AR Characteristic Polynomial*

Figure 2 shows that every inverse root of the estimated system falls inside the unit circle, which confirms that the SVAR model satisfies the stability condition, so the impulse response and variance decomposition results reported above can be read with confidence.

Granger Causality Analysis

The VAR Granger Causality/Block Exogeneity Wald test was used to check the direction of the short run predictive link among the five variables..

Table 11: VAR Granger Causality/Block Exogeneity Wald Test

Dependent Variable	Excluded Variable	Chi-sq	df	Prob.
LOGCPI	LOGM2	0.1781	2	0.9148
LOGCPI	LOGOEX	3.8385	2	0.1467
LOGCPI	LOGRGDP	1.9854	2	0.3706
LOGCPI	MPC	0.7786	2	0.6775
LOGCPI	All	16.9519	8	0.0306
LOGM2	LOGCPI	3.9018	2	0.1421
LOGM2	LOGOEX	1.3257	2	0.5154
LOGM2	LOGRGDP	8.9522	2	0.0114
LOGM2	MPC	4.0234	2	0.1338
LOGM2	All	48.1121	8	0.0000

LOGOEX	LOGCPI	1.8786	2	0.3909
LOGOEX	LOGM2	16.8026	2	0.0002
LOGOEX	LOGRGDP	2.1202	2	0.3464
LOGOEX	MPC	12.8533	2	0.0016
LOGOEX	All	27.1683	8	0.0007
LOGRGDP	LOGCPI	10.0666	2	0.0065
LOGRGDP	LOGM2	0.3427	2	0.8425
LOGRGDP	LOGOEX	4.9838	2	0.0828
LOGRGDP	MPC	4.9745	2	0.0831
LOGRGDP	All	11.8687	8	0.1572
MPC	LOGCPI	2.9798	2	0.2254
MPC	LOGM2	4.1911	2	0.1230
MPC	LOGOEX	2.1035	2	0.3493
MPC	LOGRGDP	0.3158	2	0.8539
MPC	All	11.7225	8	0.1640

Source: Authors computation using Eviews 12 (2026)

The same model that passed the diagnostic checks reported in Table 11 was used for this test. Real output granger causes money supply (p = 0.0114). The variables money supply and MPC index both granger causes the exchange rate (p = 0.0002 and p = 0.0016 respectively) whereas the price level granger causes real output (p = 0.0065). When combining with the block test results, the price level equation, the money supply equation and the exchange rate equation have each proven to have a statistically significant joint causality effect coming from the other variables in the system (p = 0.0306, 0.0000 and 0.0007 respectively), while the joint causality effect to the real output equation (p = 0.1572) and the MPC equation (p = 0.1640) fall short of the 5 percent benchmark. This indicates that the exchange rate is the most Granger-caused variable by the remaining variables, consistent with the variance decomposition result showing that the exchange rate is the variable with the largest proportion of the effect transmitted by the MPC shock out of the four macroeconomic variables.

The results of this study are analyzed below against the previous empirical research and Financial Conditions Theory on which this study is based. With regard to economic growth, the results that an increase in monetary condition tightness will reduce economic growth gradually through the period of ten quarters analyzed are consistent with the findings of Wauk and Adjorlolo (2019), who reported the similar impact of increasing interest rate on growth of the Ghanaian economy, Astuti and Udjianto (2022), who reported that for the ASEAN-4 countries, and El-Khodary (2024) on Morocco. Whereas previous studies focused on one specific instrument of monetary policy, the current study considers an index which also includes money supply and exchange rates, in line with the view of El-

Khodary (2024) that the growth impact of monetary policy is influenced by the choice of instrument.

Regarding inflation, the price puzzle that has been established in this study in which tightening shocks lead to increases in the price level, is consistent with the price puzzle noted by Astuti & Udjianto (2022) for the ASEAN-4 countries, but contrary to the conventional finding established by Judijanto et al. (2025) where interest rates reduce inflation. The plausible reason, based on the review of literature, can be the presence of significant supply-side and exchange rate transmission effects in the Nigerian inflation dynamics. Regarding the exchange rate, the result where the shock from the MPC turns into the major source of exchange rate variability in the long run (37.71 percent) addresses the deficiency noted in the literature review done for this research, where previous studies done on the conditions of monetary policy ignore the exchange rate and consider it to be an exogenous variable influencing other outcomes. The importance of this route of monetary policy influence on the exchange rate is so crucial that its omission while building the index will definitely be a serious mistake.

Concerning the financial sector, the fact that money supply and output continue declining after an MPC tightening shock indicates the relevance of the Financial Conditions Theory that states that tight financial conditions suppress growth while causing a long-term decline in monetary aggregates. This conclusion is consistent with Falconio and Manganelli (2024) who state that tight financial conditions make the probability of poor growth outcomes higher and with Aikman et al. (2020) who prove that the condition of the credit market determines the strength of monetary policy transmission to other sectors of the economy. The continuous decline in money supply and output in the paper adds more weight to the argument presented in literature concerning the development of the single monetary policy condition index for Nigeria.

Conclusion and Recommendations

Tightening of monetary policy condition increases the overall price level in Nigeria instead of reducing it, and this increase is accumulated progressively through the quarters under consideration. Monetary policy condition on its own has failed to serve as an effective check on inflation. The tightening process of monetary policy leads to a gradual slowing down of money supply growth over time. This reveals that indeed the policy measures have an impact on the banking sector and curb the growth of money supply in the economy although the magnitude is relatively small. Condition tightening in monetary policy causes devaluation of the naira with respect to the dollar, and this transmission mechanism is more potent when the effect persists for longer periods of time. Exchange rate remains the most

effective transmission mechanism of monetary policy condition in Nigeria. Condition tightening in monetary policy reduces real GDP growth rate in Nigeria during the period under review. Reduction in output level takes place cumulatively over time and remains negative during the ten-quarter period under study.

The Central Bank of Nigeria ought to consider supply-side factors, which include production and distribution costs, instead of considering interest rate tightening only when trying to control inflation because interest rate tightening does not reduce but increases prices in this case study. The CBN needs to consider joint committees that can help solve this issue much faster than using monetary policy alone.

The Central Bank of Nigeria needs to continue with the practice of using the policy tightening measure as one of the ways to control growth in money supply when there is a buildup of inflation pressure. The bank must collaborate with deposit money banks in imposing credit growth restrictions in phases, a strategy that might reduce sudden movements in the money supply.

Foreign reserve cushions should be increased by the Central Bank of Nigeria, in cooperation with the Debt Management Office, before implementing any monetary tightening measures because these measures cause further devaluation of the naira over time due to this research. This will be done by implementing a policy of dollar inflows, such as diaspora bond initiatives.

There should be a combination of monetary tightening with economic growth measures such as access to credit for small businesses. The two ministries must conduct meetings on monetary and fiscal policies in order to achieve this. It is expected that the output decline resulting from the monetary tightening will be minimized, as evidenced in this study.

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