Monetary Policy and Economic Growth in Nigeria: An Autoregressive Distributed Lag Approach

Monday A. Gbanador
Department Of Banking and Finance
School of Financial Studies
Port Harcourt Polytechnic, Rumuola Port Harcourt
Rivers State, Nigeria.
Email: monday.gbanador@portharcourtpoly.edu.ng

Baribefe I. Giami
Department Of Accountancy
School of Financial Studies
Port Harcourt Polytechnic, Rumuola Port Harcourt
Rivers State, Nigeria.
Email: baribefe.giami@portharcourtpoly.edu.ng

Abstract

This study examines the effect of monetary policy on economic growth in Nigeria. The study employed annual time series data spanning from 1988 to 2022 while the ex-post facto research design was used for the study. A stationarity test was conducted on the variables using the Augmented Dickey Fuller (ADF) and Phillips-Perron test. The Auto-Regressive Distributed Lag (ARDL) was used for the data analysis while diagnostic test like Histogram Normality Test, Heteroskedasticity Test, Ramsey RESET Test and CUSUM Test of Stability were also conducted for the study. The findings from the long-run analysis reveals that Treasury bill rate, Exchange rate and Money supply has a positive and significant effect on the Gross Domestic Product while Inflation rate has a negative and significant influence on the Gross Domestic Product. On the other hand, Interest rate has a negative and insignificant effect on the Gross Domestic Product. Based on the findings, the study concludes that monetary policy has significant influence on economic growth in Nigeria. Therefore, the study suggests that the Central Bank of Nigeria should use the relevant monetary policy to control the money supply. If properly implemented, it will have a multiplier effect on inflation rate.

Key words: Treasury Bill Rate, Interest Rate, Inflation Rate, Monetary Policy, Economic Growth

1. Introduction

Monetary policy deals with the measures in which the government regulates and controls the volume of money supply in order to accomplish some predetermine macroeconomic objectives. The Central Bank of Nigeria as the highest monetary authority is given the responsibility of making monetary policies. Some of the basic objectives of monetary policy are; exchange rate stability, maintenance of balance of payments equilibrium, attainment of high level of employment, promotion of high and accelerated economic growth and maintenance of domestic price stability (Gbanador, 2021a; Gbanador, 2021b).

The announcement of monetary policy directly influences every aspects of the economy. The Central Bank of Nigeria (CBN) conducts monetary policy meeting after every two months (8weeks) for proper implementation, monitoring and control of the volume of money supply. The monetary policy decision of the CBN revolves around pronouncements concerning monetary policy rate, liquidity ratio, and cash reserve requirement for private and public sector deposits amongst others. The CBN uses monetary policy to realize stability in exchange rate, maintenance of balance of payment equilibrium, attainment of increased level of employment, promotion of high and accelerated economic growth and maintenance of domestic price stability (Gbanador, 2021a). As in Ndugbu & Okere (2015), Central bank determines certain targets on monetary variables. Although, some objectives are consistent with each other, others are not. For instance, the objectives of price stability often conflict with the objectives of interest rate stability and high short-run employment.

Monetary policy is amongst the macroeconomic environment that is very critical in enhancing corporate financial performance. The financial development of any economy largely relies on the short run stabilization of the monetary policy of any economy. Financial performance therefore performs a very substantial function in implementation of monetary policy (Amassoma, Nwosa, & Olaiya, 2011).

As in Onyeiwu (2012) monetary policy has been used since the Central bank of Nigeria was given the responsibility of formulating and implementing monetary policy by Central bank Act of 1958. This role has influenced the emergence of active money market where treasury bills, a financial instrument utilized for open market operations and raising debt for government has grown in volume and value becoming a prominent earning asset for investors and source of balancing liquidity in the market. There have been various regimes of monetary policy in Nigeria some times, monetary policy is tight and at other times it is loose mostly used to stabilize prices. The economy has also witnessed times of expansion and contraction but evidently, the reported growth has not been a sustainable one as there is evidence of growing poverty among the populace.

Similarly, Aliu (2022) is of the opinion that despite the increased focus on monetary policy manipulation in Nigeria, the country's economic growth constitutes issues like high unemployment, low investment, high inflation, and an unstable foreign exchange rate are examples of such issues. The resultant effect of these alleged issues are said to have necessitated Nigeria's

rapid drop in economic growth. The implication of this assertion is that the Central Bank of Nigeria is getting its monetary policies wrong.

Divergent views exist regarding the outcome of the influence of monetary policy on economic growth in Nigeria. Some Researchers asserts that monetary policy enhances economic growth in Nigeria (see Salami & Toriola, 2021; Ufoeze, Odimgbe, Eeabakisi & Alajekwu, 2018; Oseni & Oyelade, 2023; Onyeiwu, 2012). Conversely, the outcome of some study indicates that monetary policy does not significantly enhance economic growth (Olaife, 2017, Ajibola & Adeyemi, 2018). Also, the Researcher's literature search revealed that none of these studies employed key monetary policy variables like interest rate, inflation rate, exchange rate, money supply and treasury bills rate as a set of proxies for the independent variables. This created a gap which this study tries to bridge by utilizing all these variables as the independent variables. This is geared towards examining the influence of monetary policy on economic growth in Nigeria.

2. LITERATURE REVIEW
The theory upon which this work hinges is the General equilibrium theory of interest. The General equilibrium theory of interest was propounded by John R. Hicks in 1937. The Hick's general equilibrium theory is a synchronization of the Classical and Keynesian theories of interest rate. The Hick's theory of interest opined that the determination of interest rate depends on the equilibrium in both the real sector variables and the monetary sector variables. Thus, the equilibrium between investment and savings (I=S) which are real sector variables and the equilibrium between demand and supply of money (MD = MS) which are monetary sector variables are what determine interest rate. The implication of this assertion is that the equilibrium interest rate is a condition whereby there exists a general equilibrium between the variables in both the real sector and the monetary sector of the economy (Gbanador, 2021a).

Ogundipe and Akinbobola (2020) assessed effect of monetary policy on economic growth in Nigeria. Money supply, interest rate, and exchange rate were used as proxies for monetary policy while the Gross Domestic Product was used as proxy for economic growth. The Autoregressive Distributed Lag (ARDL) Bounds Testing approach was used to analyze the data. The outcome shows that in the short-run there is a significant positive relationship between money supply and economic growth while the long-run result indicates that both money supply and exchange rate have positive and significant influence on economic growth. On the other hand, the study revealed that interest rate has a negative effect on economic growth both in the short-and long-run. The study concludes that monetary policy is a veritable tool to promote economic growth in Nigeria.

Salami & Toriola (2021) investigated the influence of monetary policy shocks on economic growth in Nigeria using time series data spanning through the period of 1986 to 2018. This study employed the ex-post facto research design while regression model and Vector auto-regression (VAR) techniques were used for the data analysis. Money supply, inflation and interest rate were used as proxies for the independent variables while the Gross Domestic Product was used as proxy for the Dependent variable. The outcome of the vector auto-regression estimation indicates that money supply has a significant positive effect on economic growth in Nigeria while inflation and interest rate has an insignificant positive effect on economic growth in Nigeria. Thus, the study concludes that monetary policy shocks has significant influence on economic growth in Nigeria. Therefore,

the study recommended that the CBN should ensure the downward review of the Monetary Policy Rate of 12% to 9 percent so as to enhance more financial accessibility.

Similarly, Aliu (2022), assessed the effectiveness of monetary policy in stimulating economic growth in Nigeria using time series secondary data spanning through the period of 1990 and 2019. Ordinary least squares multiple regression, Augmented Dickey Fuller Unit Root Test, ARDL Bounds Test and Error Correction Mechanism (ECM) were utilized for the study. The ARDL Bounds Test result indicated evidence of long run relationship amongst the variables. The result of the error correction mechanism (ECM) test reveals an 88% adjustment back to equilibrium. Based on the findings, the study recommended that since economic growth in Nigeria is greatly influenced in the long-run by interest rate and reserve requirement making monetary policy an effective tool in stimulating economic growth.

Ufoeze, Odimgba, Ezeabalisi & Alajekwu (2018) examined the influence of monetary policy on economic growth in Nigeria using time series data is the market controlled period covering 1986 to 2016. The Gross Domestic Product was adopted as the dependent variable while monetary policy rate, money supply, exchange rate, lending rate and investment were used as proxy for monetary policy. The Ordinary least square multiple regression, unit root and co-integration tests were used for the data analysis. The findings indicated that a long-run relationship exists amongst the variables. Thus, the study concluded that monetary policy can be effectively used to control Nigerian economy since it is a veritable tool for price stability and improve output.

Oseni & Oyelade (2023) conducted a study to examine the effect of monetary and fiscal policies on economic growth in Nigeria using time series data from 1981 to 2020. The Johansen Co-integration test and error correction model (ECM) were used for the data analysis. The outcome of the analysis reveals that gross capital formation, total number of employees, broad money supply, and lending interest rate are significant factors in determining economic growth in Nigeria. Based on the findings, the study concludes that monetary policy is more effective than fiscal policy in influencing economic growth in Nigeria. Therefore, the study recommends that monetary authority could use an expansionary monetary policy to reduce interest rates and encourage more investment, which would stimulate economic growth in Nigeria.

Andabai, Ikeora & Anah (2019) investigated the effect of monetary policy on economic growth in Nigeria using time series secondary data spanning through the period of 1990-2017. The Gross Domestic Product was used as proxy for economic growth while monetary policy rate, liquidity rate and Treasury Bills were used as proxy for monetary policy. The Ordinary Least Square (OLS) multiple regression was used for the data analysis. The outcome indicates that Treasury Bills has significant effect on Gross Domestic Product in Nigeria while Liquidity ratio had a significant influence on Gross Domestic Product in Nigeria. Furthermore, monetary policy rate had a significant effect on Gross Domestic Product in Nigeria. The study therefore, concludes that monetary policy has significant effect on economic growth in Nigeria. Thus, the study recommends that policy makers should make strong economic policies that will maintain and stabilize the economy.

Nwoko, Ihemeje & Anumadu (2016) researched on the effect of Monetary Policy on the Economic Growth of Nigeria using time series data covering the period of 1990-2011. The Gross Domestic

Product was used as proxy for economic growth while money supply, average price, interest rate and labour force were used as proxies for monetary policies. The data were analyzed using multiple regression models. The findings indicate that average price and labour force have significant influence on Gross Domestic Product while money supply was not significant. The influence of Interest rate was negatively significant. The study therefore, recommends that monetary policy measures should be well coordinated so that the desired behavioural changes in the real sector will be achieved.

3.0 Methodology

The research designs adopted for this study was the ex-post facto research design. The ex-post facto design was used to establish the cause and effect relationship amongst the variables. An annual time series data spanning through the period of 1988 to 2022 were gathered from the CBN Statistical Bulletin. The Gross Domestic Product was used as proxy for economic growth while Interest rate, inflation rate, exchange rate, money supply and Treasury bill rate were used as proxies for monetary policy variables.

3.1 Model Specification

The functional specification of the model is given as;

$$GDP = f(TBR_t, IR_t, IFR_t, EXR_t, MS_t) \tag{1}$$

Where;

GDP = Gross Domestic Product

IR = Interest rate

IFR = Inflation rate

EXR = Exchange rate

MS = Money Supply

TBR = Treasury bill rate

GDP = Gross Domestic product

$$GDP = \beta_0 + \beta_1 TBR + \beta_2 IR + B_3 IFR + \beta_4 EXR + \beta_5 MS + U_t \tag{2}$$

GDP, IR, IFR, EXR, MS and IB are as defined in equation (1) while;

$\beta 1$ = Regression Constant

$\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 = Regression coefficient.

U_t =Stochastic Error Term

4.0 RESULTS AND DATA ANALYSIS

The results and analysis of the various tests conducted in this study are discussed in this subsection of the work.

Table 1: Unit Root (Stationarity) Test

Variables	Augmented Dickey-Fuller (ADF)Test Statistic	Phillips-Perron (PP)Test Statistic	Mackinnon's Critical Values at 1%, 5% and 10% respectively			Order of Integration	Prob.
GDP	-3.613111	-3.544385	-3.646342	-2.954021	-2.615817	I(1)	0.0109
TBR	-3.167492	-3.226177	-3.639407	-2.951125	-2.614300	I(0)	0.0309
IR	-3.398430	-3.688046	-3.639407	-2.951125	-2.614300	I(0)	0.0180
IFR	-3.046218	-3.169186	-3.639407	-2.951125	-2.614300	I(0)	0.0406
EXR	-3.972021	-3.892077	-3.646342	-2.954021	-2.615817	I(1)	0.0044
MS	-3.478421	-3.478421	-3.639407	-2.951125	-2.614300	I(0)	0.0149

Source: Researcher's computation using Eviews 12

The study used both the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) to test for unit root as shown in Table 1 and the result indicates that all the variables are stationary at order (1) except GDP and EXR which are stationary at level. This results satisfies the condition for employing the Autoregressive Distributed lag approach for the data analysis.

Table 2: ARDL Bounds Test for Cointegration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	13.95635	10%	1.81	2.93
k	5	5%	2.14	3.34
		2.5%	2.44	3.71
		1%	2.82	4.21

Source: Researcher's computation using Eviews 12

The ARDL bound cointegration test was utilized to check a possible long run equilibrium relationship between the dependent and independent variables using the F-statistic as a measure of comparison between the lower and upper bound of cointegration result. From Table 2, the F-statistic of 13.95635 is higher than the lower bound of 2.14 and higher

bound of 3.34 at 5% level of significance. Thus, revealing that there exist a long run equilibrium relationship between the variables.

Table 3: ARDL Short run Error Correction Model

ARDL Error Correction Regression
Dependent Variable: D(GDP)
Selected Model: ARDL(3, 3, 3, 2, 2, 3)
Case 1: No Constant and No Trend
Date: 12/19/23   Time: 16:34
Sample: 1988 2022
Included observations: 32

ECM Regression
Case 1: No Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-0.010316	0.079022	-0.130542	0.8985
D(GDP(-2))	0.696674	0.063065	11.04686	0.0000
D(TBR)	0.003885	0.000503	7.720922	0.0000
D(TBR(-1))	-0.006829	0.000671	-10.18036	0.0000
D(TBR(-2))	-0.004040	0.000455	-8.873738	0.0000
D(IR)	-0.002410	0.000762	-3.162550	0.0090
D(IR(-1))	0.002358	0.000661	3.569334	0.0044
D(IR(-2))	-0.000802	0.000540	-1.485550	0.1655
D(IFR)	-0.001638	0.000204	-8.028692	0.0000
D(IFR(-1))	-0.000463	0.000139	-3.332130	0.0067
D(EXR)	-0.000485	7.47E-05	-6.499418	0.0000
D(EXR(-1))	0.000144	8.41E-05	1.705873	0.1161
D(MS)	4.16E-05	0.000133	0.313902	0.7595
D(MS(-1))	-0.003423	0.000340	-10.07824	0.0000
D(MS(-2))	-0.001430	0.000247	-5.779155	0.0001
CointEq(-1)*	-0.005598	0.000507	-11.03634	0.0000

R-squared	0.978774	Mean dependent var	0.038948	
Adjusted R-squared	0.958875	S.D. dependent var	0.036339	
S.E. of regression	0.007369	Akaike info criterion	-6.676150	
Sum squared resid	0.000869	Schwarz criterion	-5.943282	
Log likelihood	122.8184	Hannan-Quinn criter.	-6.433225	
Durbin-Watson stat	2.018060			

* p-value incompatible with t-Bounds distribution.

Table 3 shows the ARDL Short run Error Correction Model result. The outcome of the analysis indicates that Treasury bill rate (TBR) at current level with a prob. value of 0.0000 and a coefficient of 0.003885 has a positive and significant impact on the GDP. The coefficient value indicates that a 1% rise in the value of TBR will necessitate a 0.39% increase in the value of GDP. TBR lagged 1 period has a negative and significant influence on the GDP. The coefficient of -0.006829 shows that a 1% increase in the value of TBR will decreased GDP by 0.68%. Secondly, interest rate (IR) at current level with a prob. value of 0.0090 and a coefficient of -0.002410 has a negative and significant effect on the GDP. Thus, the coefficient indicates that a 1% rise in the value of IR will necessitate a 0.24% fall in the GDP. IR lagged 1 period has a positive and significant influence on the GDP. The coefficient of 0.002358 shows that a 1% increase in the value of IR will necessitate a 0.24% increase in the GDP. IR lagged 2 periods indicates a negative and insignificant effect on the GDP. Thirdly, inflation rate (IFR) at current level is has a negative and significant effect of the GDP based on its prob. value of 0.0000. The coefficient of -0.001638 indicates that a 1% increase in the value of inflation rate will cause a 0.16% decrease in the value of the GDP. Similarly, IFR lagged 1 period has negative and significant effect on the GDP. The coefficient of -0.000463 indicates that a 1% rise in IFR necessitates a 0.05% fall in the value of GDP. Fourthly, exchange rate (EXR) at current level has a prob. value of 0.0000 and coefficient of -0.000485 is negatively significant with the GDP. Thus, a 1% increase in the EXR will lead to a 0.05% decrease in the GDP. EXR lagged 1 period with a prob. value of 0.1161 and a coefficient of 0.000144 has a positive and insignificant influence on the GDP. The coefficient suggest that a 1% increase in EXR will increase GDP by 0.01%. Finally, the current level of Money supply (MS) is positively insignificant with the GDP. Its coefficient value of 4.160005 indicates that a 1% rise in MS will lead to a 416.00%% rise in the value of GDP. MS lagged 1 period is negatively significant. Its coefficient of -0.003423 shows that a 1% increase in MS will decreased GDP by 0.34%. MS lagged 2 period also indicates a negative and significant impact on the GDP.

The ARDL-ECM result as indicated in Table 4 reveals an error correction term or the speed of adjustment coefficient of -0.005598 and a p-value of 0.0000. This means that there is 0.56% speed of adjustment if there is any disequilibrium in this model from the short run back to the long run annually. The R^2 result of 97.88% represent the combined correlation of the independent variables while the adj. R^2 indicates that 95.89% of the variations in the Gross Domestic Product can be explained by the variation the independent variables (TBR, IR, IFR, EXR and MS). This leaves 4.11% unexplained.

Table 4: ARDL Long run Results

Levels Equation Case 1: No Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TBR	2.452109	1.093013	2.243440	0.0464
IR	-1.755151	1.021372	-1.718424	0.1137
IFR	-0.566532	0.225480	-2.512560	0.0289

EXR	0.014169	0.004514	3.138988	0.0094
MS	0.840987	0.353284	2.380481	0.0365

EC = GDP - (2.4521*TBR -1.7552*IR -0.5665*IFR + 0.0142*EXR + 0.8410*MS)

Source: Researcher's computation using Eviews 12

Table 4 captured the long run result of the ARDL Model. Reckoning with the result, Treasury bill rate TBR) with a P-value of 0.0464 and coefficient of 2.452109 is positively significant to the Gross Domestic Product at 5% level of significance. Thus, every 1 unit increase in the value of TBR will lead to a 245.21% rise in the value of the GDP. The Interest rate (IR) with a P-value of 0.1137 has an inverse and insignificant impact on the GDP while its coefficient of -1.755151 indicates that every 1 unit increase in the value of the IR will lead to a 1.76% decrease in the performance of the GDP. IFR with a P-value of 0.0289 and a coefficient of -0.566532 is negatively significant to the GDP. Thus, indicating that a rise in IFR will decrease GDP by 56.65%.
EXR has a positive and significant influence on GDP. The coefficient of 0.014169 indicates that a 1% increase in EXR will increase the GDP by 1.14%. Finally, MS with a prob. value of 0.0365 and a coefficient of 0.840987 has a positive and significant relationship with GDP. Its coefficient indicates that a 1% increase in MS will decreased GDP by 84.10%.
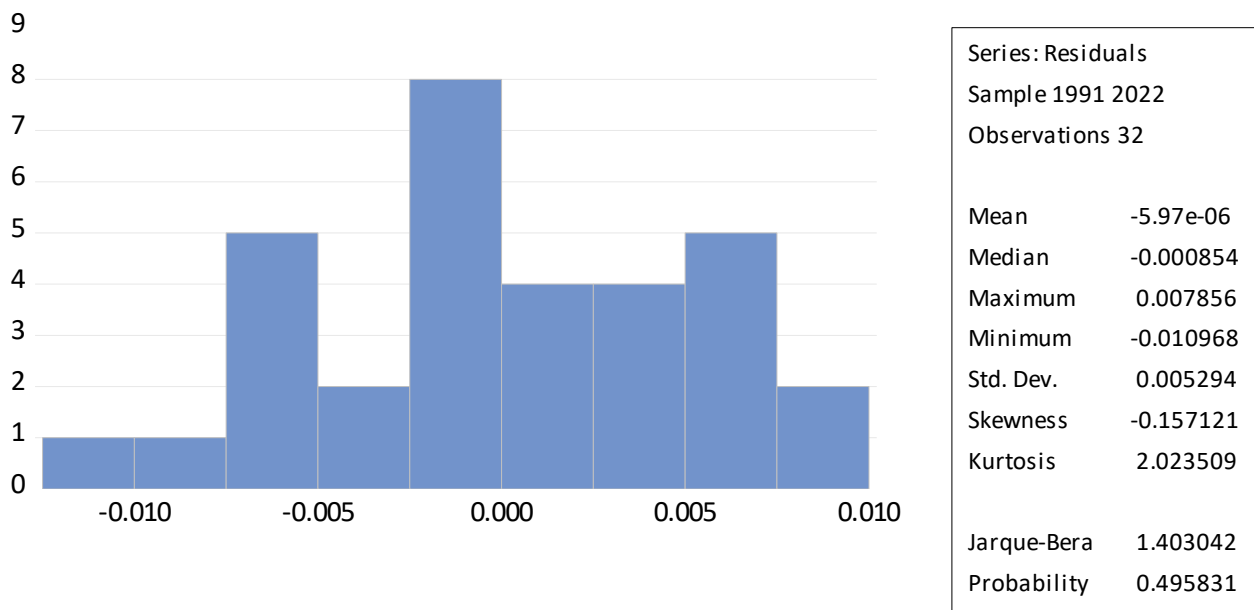

Series: Residuals	
Sample 1991 2022	
Observations 32	
Mean	-5.97e-06
Median	-0.000854
Maximum	0.007856
Minimum	-0.010968
Std. Dev.	0.005294
Skewness	-0.157121
Kurtosis	2.023509
Jarque-Bera	1.403042
Probability	0.495831

Figure 1. Histogram Normality Test
Source: Researcher's computation using Eviews 12

The Histogram normality test was conducted to check whether the residuals are normally distributed or not. The outcome of the analysis reveals that the residuals are normally distributed as Jarque-Bera Prob. > 0.05 as shown in Figure 1.

Table 5 Heteroskedasticity Test

Heteroskedasticity Test: ARCH

F-statistic	0.069479	Prob. F(1,29)	0.7940
Obs*R-squared	0.074093	Prob. Chi-Square(1)	0.7855

Source: Researcher's computation from Eviews 12
The ARCH test was conducted to examine the presence of Heteroskedasticity using it F-statistic and the Observed R-Squared. The outcome of the test indicates that this model is Homoskedastic as their values are both higher than the P-value of 0.05. Thus, there is no problem of heteroskedasticity in the outcome.

Table 6: Ramsey RESET Test
Ramsey RESET Test
Equation: UNTITLED
Omitted Variables: Squares of fitted values
Specification: GDP GDP(-1) GDP(-2) GDP(-3) TBR TBR(-1) TBR(-2) TBR(
    -3) IR IR(-1) IR(-2) IR(-3) IFR IFR(-1) IFR(-2) EXR EXR(-
1) EXR(-2) MS
    MS(-1) MS(-2) MS(-3)

	Value	df	Probability
t-statistic	0.403984	10	0.6947
F-statistic	0.163203	(1, 10)	0.6947
Likelihood ratio	0.518034	1	0.4717

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	1.40E-05	1	1.40E-05
Restricted SSR	0.000869	11	7.90E-05
Unrestricted SSR	0.000855	10	8.55E-05

LR test summary:

	Value
Restricted LogL	122.8184
Unrestricted LogL	123.0774

Source: Researcher's computation using Eviews 12
The outcome of the Ramsey Reset Test indicates that the model is stable and well specified.
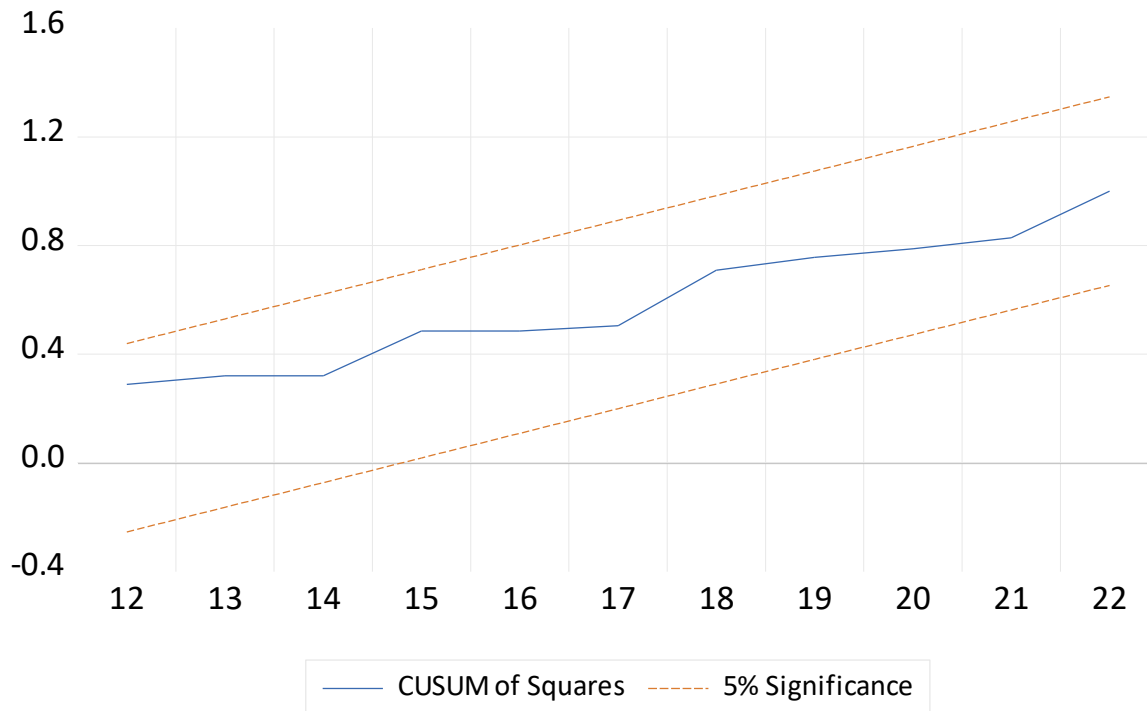
Figure 2. CUSUM Test of Stability
Source: Researcher's computation from Eviews 12
The CUSUM test was conducted to check the stability of the model. The outcome of the CUSUM test indicates that the model is well specified.

5. Discussion of the Findings

This study investigates the influence of monetary policy on the Gross Domestic Product in Nigeria. The outcome of the ARDL-ECM regression indicates an error correction term or the speed of adjustment coefficient of -0.005598 and a p-value of 0.0000. Thus, implying that there is 0.56% speed of adjustment if there is any disequilibrium in this model from the short run back to the long run annually. In addition, the outcome of the adj. R^2 indicates that 95.89% of the variations in the Gross Domestic Product can be explained by the variation the independent variables. Furthermore, the result from the long-run analysis revealed that the TBR, EXR and MS has a positive and significant effect on the GDP while IFR has a negative and significant influence on the GDP. On the other hand, IR has a negative and insignificant effect on the GDP. These results tallied with the findings from the works of Ogundipe & Akinbobola (2020) and Aliu (2022) who discovered a link between monetary policy and economic growth.

6. Conclusion and Recommendation

Based on the findings, the study concludes that monetary policy has significant influence on the Gross Domestic Product in Nigeria. Therefore, the study suggest the following policy recommendations.

1) The Central Bank of Nigeria should use the relevant monetary policy to control to money supply. If this is properly implemented, it will have a multiplier effect on inflation rate.
2) To enhance operations in the real sector, interest rate should be adjusted to single digit. This is expected to encourage borrowing for investment purposes.
3) The study therefore suggest that the government through its relevant agencies should formulate good macroeconomic policies in order to enhance stock market performance.

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