Nigerian Economic Growth and Monetary Policy Nexus

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Abstract
Due to the unresolved argument on the efficacy of monetary policy in the growth of an economy, this study is conceived examine whether monetary policy variables have predicted economic growth in Nigeria. To achieve this, data were obtained from Central Bank of Nigerian Statistical bulletin of 2022. The relationship between monetary policy variables and economic growth was estimated with Autoregressive Distributive Lags (ARDL). After the analysis, the outputs revealed that the entire monetary policy variables employed were found to have negative and significant relationship with economic growth in Nigeria within the scope of the study. On this note, the researchers are of the opinion that a flexible monetary policy by the monetary authority will help sustain price stability and economic growth in the country. Policy instruments should be well-coordinated and as well have an optimal mix to significantly influence economic growth and stability.

Keywords: *Economic Growth, Monetary Policy, Nigeria, ARDL*

1.1 INTRODUCTION

Monetary policies are programs that try to increase or decrease the nation's level of business by regulating the supply of money and credit (control over bank lending and the rate of interest). Monetary policy measures involve deliberate changes in government policy instruments in response to changes in macroeconomic condition to stabilize the economy. It relates to financial markets and supply of credit, money, and other financial assets. Monetary policy, which includes credit and financial policy, is the use of changes in money supply or interest rates to influence the level of income, employment, the aggregate price level, and the balance of payments. Evidence has also shown support for both monetary and fiscal policy in promoting economic growth in Nigeria (Ajisafe & Folorunso, 2002; Adefeso & Mobolaji, 2010).

Monetary policy is known to be a vital instrument that a country can deploy for the maintenance of domestic price and exchange rate viability, as a critical condition for the achievement of sustainable economic growth and external viability. One of the major objectives of monetary policy in Nigeria is stabilization of economic growth (Anyanwu, 2003; Ayodeji & Oluwole, 2018). Nigerian government has adopted various monetary policies through Central Bank of Nigeria (CBN) over the years to achieve economic growth. Despite the increasing emphasis on manipulation of monetary policy in Nigeria, the problem surrounding its economic growth persists. Such problems include high unemployment rate, low investment, high rate of inflation and unstable foreign exchange rate. No economy is protected from economic instability such as high unemployment rate, balance of payment disequilibrium, inflation, unsustainable growth rate,

increase in printing of fake currency, etc. like we experience here in Nigeria. The Economic fluctuations in Nigeria with its attendant growth problems can be attributed to some domestic and external factors. These perceived problems are being claimed to have caused a fast decline in the economic growth of Nigeria. It, therefore, becomes necessary to highlight the monetary policy instruments in Nigeria and examine the extent to which it has contributed to the growth in the economy.

The subsequent sections of this study are organized as follows; section two will take care of review of conceptual, theoretical, and empirical literature; section three addresses the materials and methods of analysis adopted; section four analyses the data, results, and interpretation while section five handles conclusion and recommendations for policy making.

2.Review of Related Literature

2.1 Conceptual review

Monetary policy concept is seen as any policy measure designed by the federal government through the CBN to control cost availability and supply of credit. It's a combination of measures designed to regulate the value, supply, and cost of money on an economy in consonance with the expected levels of economic activities. It can also be seen as the regulation of money supply and interest rate by the CBN to control inflation and to stabilize the currency flow in an economy. (CBN, 2011, 2021), Likewise, monetary policy is one of the macro-economic instruments with which monetary authority of a country employed in the management of their economy to and attain desired objectives. Monetary policy entails those actions initiated by the central bank which aim at influencing the cost availability of credits. Monetary policy consists of a formal government effort to manage the money in its economy to realize specific economic goals. It refers to that measure or action undertaken by the government to achieve her economic objectives using monetary instruments of control over bank lending and the rate of interest. It is a government deliberate attempt to influence aggregate demand in an economy by regulating cost and availability of credit. The government can influence both cost and availability of credit by following measures designed to affect the economy's supply of money, these include open market operation, special deposit, direct control over lending by bank and other financial institution and various forms of request (Nwankwo 1991, Wrightsman, 1976; Okwo et al.,2012; Udo, 2017). To Ogunjimi (1997) three basic kinds of monetary policy decisions can be made: the amount of money in circulation; the level of interest rate; and the functions of credit markets and the banking system. The combination of these measures is designed to regulate the value, supply, and cost of money in an economy, in line with the level of economic activity. Abeng (2006) explained that monetary policy is valid only for a highly monetized economy. If the economy is not monetized, the efficacy of monetary policy is restricted. For instance, in an underdeveloped economy where a large proportion of output is produced in a subsistence sector, supply of money would be independent. Monetary policy, therefore, would not be a better tool to manage the economy. A close observation of these definitions shows that monetary policy boils down to adjusting the supply of money in the economy to achieve some combination of inflation and output stabilization. Most economists agree that in the long run output usually measured by gross domestic product (GDP) is fixed, so any changes in the money supply only cause prices to change. But in the short run, because prices and

wages usually do not adjust immediately, changes in the money supply can affect the actual production of goods and services.

Economic growth is viewed as a steady increase in the output monetary value of goods, services, and job opportunities with the express purpose of improving citizens' economic and financial well-being over a period usually one year (Elakhe, 2016, Amaedeo, 2018). Economic growth creates more profit for businesses, as a result, stock prices rise, hence gives the company's capital to invest and hire more employees. As more jobs are created, incomes rise, consumers have more money to buy additional products and services. Purchases drive higher economic growth. For this reason, all countries want positive economic growth. This makes economic growth the most watched economic indicator. The gross domestic product (GDP) is the indicator that measures the rate of economic growth in an economy. It can be distinguished between nominal and real. The nominal GDP measures the increases in goods and services without taking changes in prices into consideration, while the real GDP measures changes in goods and services after making provision for adjustment in prices. To be accurate, the measurement must remove the effects of inflation.

2.2 Theoretical Literature

The following theories are reviewed for the study.

2.2. 1: The Keynesian Theory: Keynesian Economists see the monetary policy efficacy basically lies on interest rate. In Keynesian monetary theory assertions, an increase or decrease in money supply is caused by open market purchase or sale of government debt instruments by the central bank of any nation. Excess demand for government securities, mostly when government is also involved in the repurchase of such securities, pushes up the prices of those securities, as well raises the capital gain and reduces the annual interest yield of those securities. The moment the government resorts to entering the market it normally buys or sells securities on a large scale. If the aim is to stimulate a sluggish economy, the government repurchases securities on a large scale and injects cash into the economy to increase aggregate demand for goods and services and encourage more output. If the intention is to lower the high inflationary rate and create a favourable environment for business, mostly financial institution to thrive, government sells securities on a large scale. A large volume of money is withdrawn from circulation and the level of money supply falls, dragging transactions balances of the community to a lower level. As a result, general prices are falling, bringing down the rate of inflation (Onoh, 2007; Ekpung et al 2015).

2.2.2 The Classical Monetary Theory: The classical theory was expanded by the Quantity theory of money supply by Irving Fisher, supported by Say's law, Walras' law, and others. In elucidating the Quantity Theory of Money, Fisher used equations to explain *the cause and effect in relationship between the quantity of money and the general price level.*

Stating, MV = PT; where M = Quantity (Stock) of money supplied V = Velocity of money in circulation P = Price levels T = Volume of transactions ***Or*** M V = PQ; where 'Q' is replaced with 'T' meaning Quantity of goods involved.

The above equation states that the level of prices in any economy is directly proportional to the quantity of money in circulation such that a given percentage changes in the stock of money will exert an equal percentage change in the price level, normally in the same direction. In addition, Sir

Fisher assumed that for every transaction, there is both a buyer and a seller and that sale equates receipts. Fisher further opined that sale is the product of the number of transactions and average number of times it changes hands over the same period (Dare & Okeya 2017; Ejem et al, 2020).

2.2.3: The Monetarists' Theory: The monetarists' school of thought argued that that money is demanded as a set of wealth of an economic agent. They see money as any other commodity. Friedman's argument to monetary theory is commendable because it does not dissipate energy trying to explain the motives for holding money; instead, he analyzed the factors that determine how much money people will want to hold under various circumstances. Succinctly the fundamental difference between the Keynesian and Monetarists lies in the notion of money being a close substitute for financial assets, while the Keynesian are of the opinion that that money is a close substitute for financial assets because of its liquid form, the monetarists argue that money is not a particularly close substitute for any specific range of assets. However, based on their belief, the Keynesians would expect that there was a close relationship between the demand for money and the yield (that is rate of interest) on money substitutes. On the other hand, monetarists would expect no significant relationship because of their belief that money is a substitute for all assets alike (Udude, 2014; Ekpung et'al, 2015; Ejem et al, 2020).

2.3 Empirical Review

The impact of monetary policy on economic growth has generated a large volume of empirical studies with mixed findings using cross sectional, time series and panel data. Some of these studies are. For instance, Hameed, Khalid, and Sabit, (2012) in presenting a review on how the decisions of monetary authorities influence macro variables like GDP, money supply, interest rates, exchange rates and inflation using the method of ordinary lease square OLS found that tight monetary policy (in term of increase interest rate) had significantly negative impact on output, therefore asserting that increase in money supply has strong positive impact on inflation but affects output negatively. In addition to this the exchange rate was found to be negatively related to output.

Onyeiwu (2012) examines the impact of monetary policy on the Nigerian economy using the Ordinary Least Square Method (OLS) to analyze data between 1981 and 2008. The result of the analysis shows that monetary policy represented by money supply exerts a positive impact on GDP growth and Balance of Payment but negative impact on rate of inflation. Furthermore, the findings of the study support the money-prices-output hypothesis for Nigerian economy.

Okwo, Eze, and Nwoha, (2012) examined the effect of monetary policy outcomes on macroeconomic stability in Nigeria. The study analyzed gross domestic products, credit to the private sector, net credit to the government and inflation using OLS technique. None of the variables were significant, which suggested that monetary policy as a policy option may have been inactive in influencing price stability.

Okoro (2013) examined the impact of monetary policy on Nigeria economic growth by testing the influence of interest rate, inflation, exchange rate, money supply and credit on GDP. Augmented Dickey Fuller (DF) test, Philips - Perron Unit Test, Co-integration test and Error Correction Model

(ECM) techniques were employed. The results show the existence of long-run equilibrium relationship between monetary policy instruments and economic growth.

Owalabi and Adegbite (2014) examined the impact of monetary policy on industrial growth in Nigerian economy using multiple regression analysis. They analyzed the relationship between manufacturing output, treasury bills, deposit and lending, and rediscount rate and industrial growth, and found that the variables had significant effects on the industrial growth.

Nwoko et al (2016) examined the extent to which the Central Bank of Nigeria monetary policies could effectively be used to promote economic growth, covering the period of 1990-2011. The influence of money supply, average price, interest rate and labour force were tested on Gross Domestic Product using the multiple regression models as the main statistical tool of analysis. Studies show that CBN monetary policy measures are effective in regulating both the monetary and real sector aggregates such as employment, prices, level of output and the rate of economic growth. Empirical findings from this study indicate that average price and labour force have significant influence on Gross Domestic Product while money supply was not significant. The interest rate was negative and statistically significant. It was therefore, recommended that Central Bank Monetary Policy could be an effective tool to encourage investment, reduce unemployment, reduce lending rate and stabilize the economy of Nigeria.

Udude, (2014) examined the impact of monetary policy on the growth of Nigeria economy between the period of 1981 and 2012 with the objective of finding out the impact of various monetary policy instruments (money supply, interest rate, exchange rate and liquidity ratio) in enhancing economic growth of the country within the period considered. To identify the stationarity characteristics of the data employed in the empirical investigation, various advanced econometric techniques like Augmented Dickey Fuller Unit Root Test, Johansen Cointegration Test and Vector Error Correction Mechanism (VECM) were employed and the following information surfaced: None of the variables was stationary at level meaning they all have unit roots. But all the variables became stationary after the first difference with the exclusion of money supply. However, all the variables became stationary after the second difference. Hence, they were integrated into order two. The cointegration result indicated that there was a long-term relationship among the variable with two cointegrating vectors. The result of the vector error correction mechanism (VECM) test indicates that only exchange rate exerted significant impact on economic growth in Nigeria while other variables did not. Equally, only money supply though statistically insignificant possessed the expected sign while others contradicted expectation. The study concluded that monetary policy did not impact significantly on economic growth of Nigeria within the period under review and that the inability of monetary policies to effectively maximize its policy objective most times is because of the shortcomings of the policy instruments used in Nigeria as such limits its contribution to growth.

Ayodeji, and Oluwele, (2018) analyzed the impact of monetary policy on economic growth in Nigeria by developing a model that can investigate how monetary policy of the government has affected economic growth using multi-variable regression analysis. They proxied the variables of monetary policy instruments to include Money Supply (MS), Exchange Rate (ER), Interest Rate

(IR), and Liquidity Ratio (LR). Economic growth was represented by Gross Domestic Product (income) at constant prices. Unit root test was conducted, and all their estimating variables were stationary at first difference except the component of interest rate. Error Correction Model was introduced in their estimation to have parsimonious model. From their result, two variables (money supply and exchange rate) had a positive but insignificant impact on economic growth. Measures of interest rate and liquidity ratio, on the other hand, had a negative but highly significant impact on economic growth. In addition, Engle-Granger co-integration test was done and showed the existence of a long run relationship between monetary policy and economic growth in Nigeria. Granger causality test was done on their variables and the results showed the existence of a uni-directional causality between money supply and economic growth, economic growth granger causing liquidity ratio and exchange rates while a bi-directional causality exists between interest and economic growth.

Ufoeze, Odimgbe, Ezeabalisi and Alajekwu (2018), used Ordinary Least Square technique and the unit root and co-integration tests to investigate the effect of monetary policy on economic growth in Nigeria. The natural log of the GDP was used as the dependent variables against the explanatory monetary policy variables: monetary policy rate, money supply, exchange rate, lending rate and investment. The time series data is the market-controlled period covering 1986 to 2016. The study showed that long run relationship exists among variables. In addition, the core finding of this study showed that monetary policy rate, interest rate, and investment have insignificant positive effect on economic growth in Nigeria. Money supply however has significant positive effect on growth in Nigeria. Exchange rate has significant negative effect on GDP in Nigeria. Money supply and investment granger cause economic growth, while economic growth causes interest rate in Nigeria. On the overall, monetary policy explains 98% of the changes in economic growth in Nigeria.

Iheanacho, (2019) investigated the dynamic relationship between monetary policy on economic growth in Nigeria, for the period 1986 to 2017. The variables include real GDP, Broad money supply (BMS), Cash reserves ratio (CRR), Monetary policy rate (MPR), Liquidity ratio (LQR). Data was analyzed using descriptive statistics and ordinary least square regression, Johansen cointegration, VECM and granger causality approach. Findings revealed that CRR and BMS have inverse long run relationship with GDP MPR and LQR exert positive long run relationship with GDP. In the short run CRR and MPR had an inverse relationship with GDP at lag while LQR exerts positive relationship with GDP. Using granger causality, RGDP and BMS, MPR, and CRR has no causal relationship between GDP while and LQR exerts significant cause on Real GDP. From the findings, the study recommends that the policy instrument should be a well-coordinated optimal mix of instruments to significantly influence economic stability.

Abdullahi, Shehu, Shuaibu, Saleh, Usman, (2021) studied Monetary Variables, Economic Growth and Monetary Policy in Nigeria. The paper measured the influence of monetary variables on economic growth in Nigeria, it tests money demand function in Nigeria. It employed Generalized Method of Moments (GMM) and Autoregressive Distributed Lag Model (ARDL) for the analysis, using annual data from 1989 to 2019. The result of the analysis shows money supply (M2) as important in explaining economic growth in Nigeria. The result also shows negative effects of Nigerian foreign exchange policy on economic growth in Nigeria. The result of the money demand

analysis shows that income is the most important variable that explains money demand in Nigeria, even more important than interest rate which shows insignificant result.

Oluwaseun (2021) examined the effect of monetary policy on economic growth in Nigeria. Data collected covering the period 1971 to 2018 were analyzed using Ordinary Least Square method. The study also conducted the unit root and cointegration test to ascertain the fitness of the model. The result shows that Long-run relationship exists among the variables and that some explanatory variables (Monetary policy rate, Interest rate, Investment to productive sector) have a positive but non-significant effect on economic growth while real exchange rate has a negative impact on economic growth in Nigeria. However, monetary supply, which is another explanatory variable, has a positive significant effect on economic growth. On the overall, monetary policy is found to explain about 89% of the changes in economic growth in Nigeria.

Muhammed, Babawulle, and Tahir (2021) Used annual data over the period 1981 to 2016, to examine the impact of monetary policy on the Nigerian economy. In doing this, Augmented Dickey-Fuller unit root test, Vector error correction mechanism (VECM) and the ordinary least squares (OLS) method, were employed to analyze the time series data for the period. The results of the analysis show that monetary policy represented by money supply exerts a positive impact on GDP growth with negative impact on rate of inflation.

Timothy, (2022) in his study examined effectiveness of monetary policy in stimulating economic growth in Nigeria between 1990 and 2019. Advanced econometric techniques like augmented dickey fuller unit root test, ARDL bounds test and error correction mechanism (ECM) employed and the result revealed that all the variables were stationary at first difference except, the result of the ECM indicates an 88% adjustment back to equilibrium which means that economic growth in Nigeria is greatly influenced in the long run by interest rate and reserve requirement,

3. Materials and Methods

Secondary data was used for the analysis of this study, and it's sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin-2022 edition, within the period of 1988-2021. The study employed various econometric tools such as the correlation matrix to examine presence of multicollinearity, and Ordinary Least Square (OLS) technique to examine and determine the global utility of the specified model. To determine the stationarity of the data obtained, the Augmented Dickey Fuller (ADF) unit root test is employed. To estimate the model, the Autoregressive Distributive Lags (ARDL) is engaged.

3.1 Specification of Model

This study is based on monetary policy variables and its effect on the Gross Domestic Product (GDP) and how it affects the economy of Nigeria at large. To examine the relationship between monetary policy and economic growth in Nigeria; Real Gross Domestic Product (RGDP) is used as endogenous variable while Cash Reserve Ratio (CRR), Monetary Policy Rate (MPR), and Liquidity Ratio (LQR) are used as the exogenous variables.

Having highlighted these variables, our complete macroeconomic model for the determination of long-run impact of monetary policy on economic growth are stated first; in its implicit non stochastic form as shown below:
Starting with the functional specification as seen below.

Economic Growth = f (Monetary Policy Variables) (1)

Gross Domestic Product = f (Monetary Policy Rates, Cash Reserve Ratio, Liquidity Ratio) (2)

GDP = f (MPR, CRR, LQR) (3)

Next is the explicit form.

$$GDP = \alpha_0 + \alpha_1 GDP_{t-1} + \alpha_2 MPR + \alpha_3 MPR_{t-1} + \alpha_4 CRR + \alpha_5 CRR_{t-1} + \alpha_6 LDR + \alpha_7 LQR_{t-1} + e_{t-1} \quad (4)$$

Where et_{-1} are stochastic terms

3.5 Operational form (Apriori Expectation)

α_1, α_2, and α_3 are coefficient of MPR, CRR, and LQR respectively. It is expected that monetary variables influence capital market returns both ways.

4. Analysis and Discussion

Data for empirical tests were sourced mainly from the Central Bank of Nigeria Statistical Bulletin. These data covered the period 1988 - 2021. The study used two groups of variables. The leading economic indicator as dependent variables measured by:
GDP = Growth rate of the Real Gross Domestic Product, expressed in billions of Naira as a measurement of internal stability. Monetary policy proxies as independent variables measured by: CRR = Cash Reserve Ratio, expressed in percentage as a measurement of quantity based nominal anchor (monetary aggregates). LQR = Liquidity Ratio, expressed in percentage as a measurement of quantity based nominal anchor (monetary aggregates). MPR = Monetary Policy Rate, expressed in percentage as measurement of cost of lending to deposit money banks. It is a penalty rate and often the anchor of bank lending rate.

This estimation of the model specified in this study started with trend analysis of data. The time series plot of the data is shown in figure I below. The figures below indicate that all the variables recorded period of peaks and troughs suggesting non-stationarity of the variables as expected.

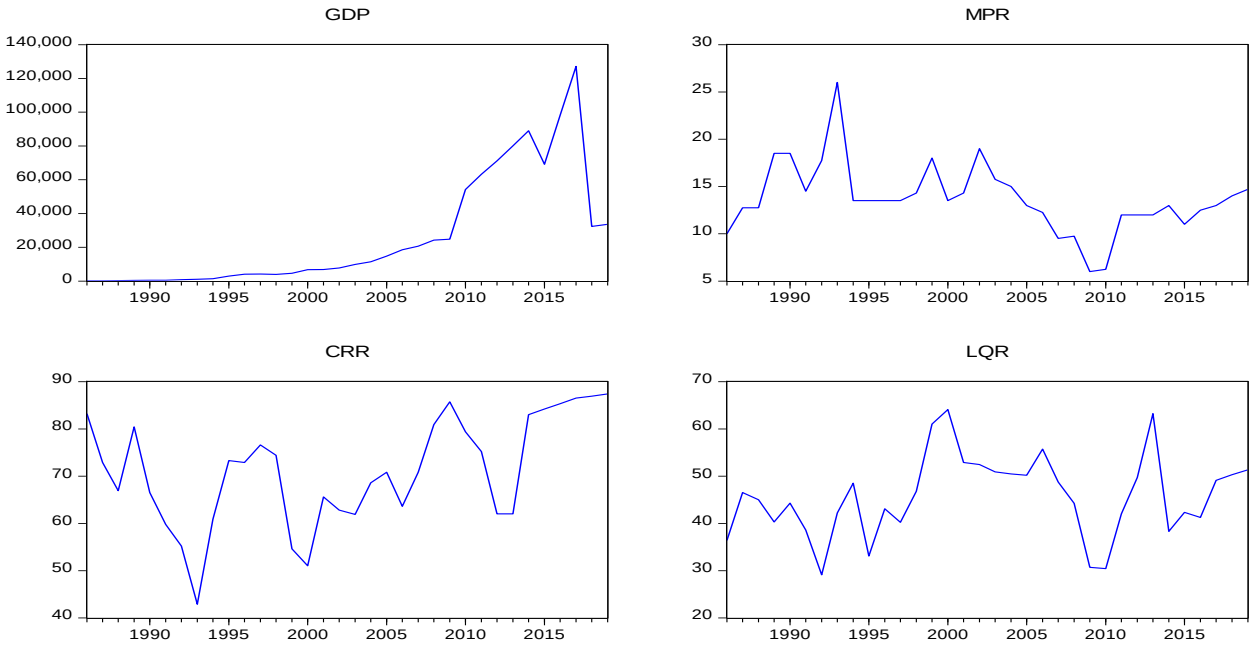


Figure 1: Trend Analysis of GDP, MPR, CRR and LQR

4.2 Presentation of Result

Description of Variables

Table 4.2 below is a summary of statistics that describe the distributional features of all the data. The GDP has standard deviation of 34156.42, with 3.706751, 11.48676, and 8.629448 of MPR, CRR, and LQR respectively. CRR, and LQR exhibited Kurtosis lower than 3 indicating platykurtic distributions while GDP and MPR showed Kurtosis greater than 3, suggesting a leptokurtic distribution. At a 5% significant level Jarque-Bera P-value for CRR and LDR are 0.549483, and 0.954688 respectively; evidence of normal distribution, whereas GDP and MPR recorded 0.002133 and 0.002659 indicating abnormal distribution.

Table 4.2: Descriptive Statistics for GDP, MPR, CRR, and LQR

	GDP	MPR	CRR	LQR
Mean	26153.08	13.69324	71.00294	45.69101
Median	8854.640	13.50000	71.85000	45.75000
Maximum	127087.0	26.00000	87.40000	64.10000
Minimum	134.6030	6.000000	42.90000	29.10000
Std. Dev.	34156.42	3.706751	11.48676	8.629448
Skewness	1.401647	0.785409	-0.359392	0.098046
Kurtosis	3.907765	5.429768	2.426690	2.835644
Jarque-Bera	12.30019	11.85926	1.197556	0.092742
Probability	0.002133	0.002659	0.549483	0.954688
Sum	889204.6	465.5700	2414.100	1553.494
Sum Sq. Dev.	3.85E+10	453.4201	4354.210	2457.423
Observations	34	34	34	34

Authors' computation output using E-view 10.

In finametric analysis, determination of global utility or usefulness of the specified models gives a research confidence to making inference that can be referred for policy making. To achieve this, the researchers used correlation matrix and Ordinary Least Square (OLS) as shown below.

Multicollinearity Test

Table 4.3 below depicts the correlation matrix of the variables employed. The correlations between GDP, MPR, CRR, and LQR are from -0.367105 to 0.447818, suggesting no linear correlation. Hence, multicollinearity is not a concern in this model.

Table 4.3: Correlation Matrix

	GDP	MPR	CRR	LQR
GDP	1.000000	-0.350841	0.447818	0.031093
MPR	-0.350841	1.000000	-0.570502	0.196623
CRR	0.447818	-0.570502	1.000000	-0.367105
LQR	0.031093	0.196623	-0.367105	1.0000000

Authors' computation output using E-view 10.

Ordinary Least Square (OLS) Method

Table 4.4 is an output of the Ordinary Least Square (OLS) estimate for the relationship between monetary policy and capital market return. Though other indexes are satisfied both Durbin-Watson statistics is 0.599348, suggesting autocorrelation is found. This is an uncomfortable posture for further analysis and policy formulation, therefore ignored and subjected to stationarity test to choose an appropriate method for model estimation.

Table 4.4: Ordinary Least Square (OLS) method

Dependent Variable: GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPR	-1263.520	1765.469	-0.715685	0.4797
CRR	1343.417	600.5201	2.237089	0.0329
LQR	886.2615	669.5816	1.323605	0.1956
C	-92425.99	73100.53	-1.264368	0.2158
R-squared	0.257390	Mean dependent var		26153.08
Adjusted R-squared	0.183129	S.D. dependent var		34156.42
F-statistic	3.466016	Durbin-Watson stat		0.599348
Prob(F-statistic)	0.028367			

Authors' computation output using E-view 10.

Stationarity/Unit Root Test

Here, the researchers employed Augmented Dickey Fuller (ADF) unit root test as depicted below. Table 4.5 below shows the stationary test for GDP, MPR, CRR, and LQR variables. The results show GDP and CRR are differenced once to be stationary or integrated at order one, while MPR and LQR are stationary at level. The variables have different orders of integration, justifying the adoption of ARDL technique.

Table 4.5: ADF Unit Test

Variables	Lag SCI	ADF Statistic	CRITICAL VALUES		Remarks
		With Prob. Value	5%	10%	Stationarity
GDP	7	-4.828555 (0.0007)	-2.986225	-2.632604	@1(1)
MPR	8	-3.221813 (0.0276)	-2.954021	-2.615817	@1(0)
CRR	7	-3.767497 (0.0083)	-2.971853	-2.625121	@1(1)
LQR	8	-3.432355 (0.0168)	-2.954021	-2.615817	@1(0)

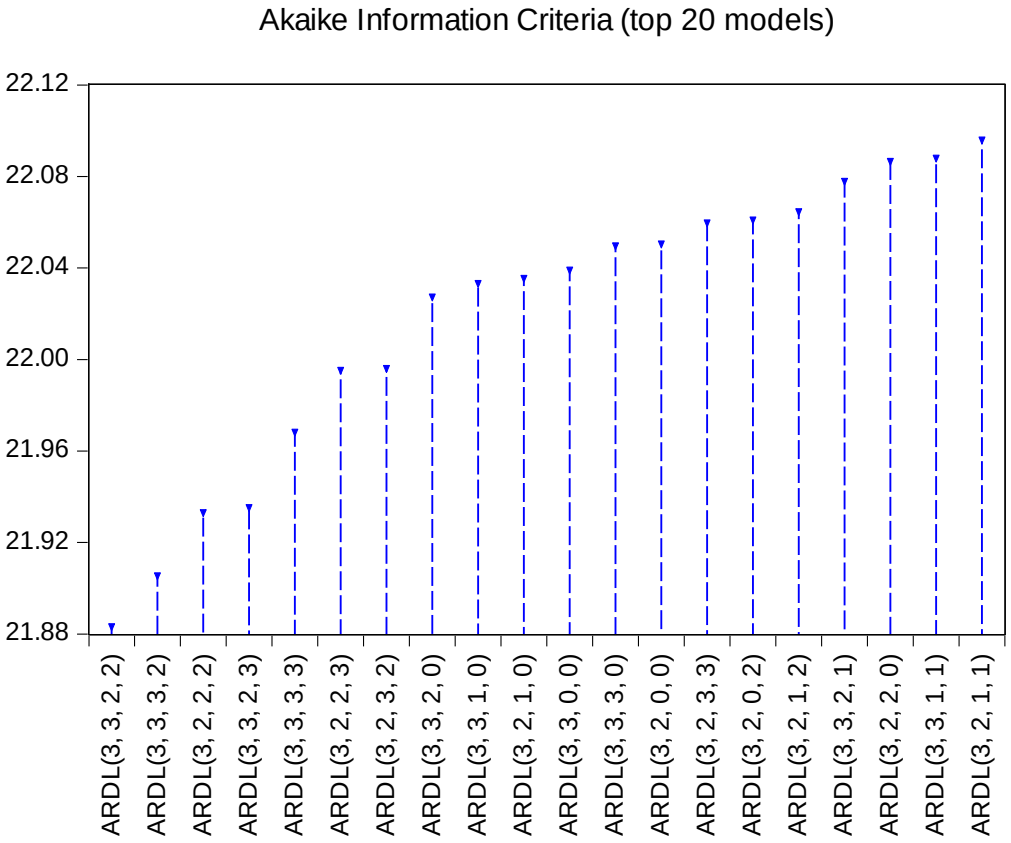
Authors' computation output using E-view 10.

The researchers certified adoption Autoregressive Distributive Lag (ARDL) for estimation of the specified model then moved to model selection using Akaike Information Criterion (AIC) as shown below in Figure 2 below.

Model Selection

Figure 2 below depicts ARDL model selection based on Akaike Information Criterion (AIC). Information criteria select models that minimize their values. From figure 1 below, the best model, according to AIC, is an ARDL (3,3,2,2). This implies that a model that includes lagged value of the dependent variables as an additional regressor is the best description of researchers' data.

Figure 2: Model Selection based on AIC.



Authors' computation output using E-view 10.

The researchers now commenced estimation of the models with ARDL, aimed at proffering dynamic solutions to the static problem of time series. This is shown in table 4.6 below.

Model Estimation and Results

Having confirmed the preliminary finametric statistical test, the researchers confidently proceeded to estimating the relationship between Economic growth GDP) and monetary policy variables (MPR, CRR, and LQR) in Nigeria with ARDL framework.

Table 4.6 below found that GDP reinforces itself or is autoregressive. It is statistically confirmed evidence showing that GDP in the past can predict future growth in Nigerian economy. It was found that all the variables (MPR, CRR, and LQR) at different lags have negative and significant relationship with GDP. The adjusted R-square is 0.895, revealing that the estimated ARDL (3,3,2,2) model is moderately fitted, with the explanatory variable jointly accounting for 89.5% of total variation of GDP. The probability of F-Statistic is 0.000000, evidence that the estimated model is highly significant. Durbin-Watson Statistics (Dw) is 1.985 suggesting absence of autocorrelation.

Table 4.6: ARDL Estimation Results

Dependent Variable: GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDP(-1)	0.211794	0.133617	1.585082	0.1314
GDP(-2)	-1.238006	0.266024	-4.653741	0.0002
GDP(-3)	2.226195	0.337071	6.604538	0.0000
MPR	-1517.628	765.5722	-1.982345	0.0638
MPR(-1)	-1983.763	863.2301	-2.298070	0.0345
MPR(-2)	-2125.923	917.2523	-2.317708	0.0332
MPR(-3)	-1178.044	820.6900	-1.435431	0.1693
CRR	-1004.286	404.0098	-2.485795	0.0236
CRR(-1)	143.0098	456.2950	0.313415	0.7578
CRR(-2)	-973.8372	414.2452	-2.350871	0.0311
LQR	-293.9308	377.9610	-0.777675	0.4474
LQR(-1)	333.7026	465.2542	0.717248	0.4830
LQR(-2)	-895.4228	399.2609	-2.242701	0.0385
C	267378.5	52194.18	5.122765	0.0001
R-squared	0.935333	Mean dependent var		28664.95
Adjusted R-squared	0.885882	S.D. dependent var		34776.93
F-statistic	18.91431	Durbin-Watson stat		1.985175
Prob(F-statistic)	0.000000			

Authors' computation output using E-view 10.

Test of long run Relationships and cointegration between Monetary Policy Variables and Economic Growth

To examine if there is a long run relationship in the model, table 4.7 summarizes the output for long run effect and cointegration of the dependent and independent variables. The result here confirms that MPR, CRR and LQR negatively and significantly relate with GDP both in the short run and long run. Table 4.7 also shows the ARDL Bound cointegration. From the bound test, the

F-Statistics is 8.905834, which is greater than all the critical values at 1(0) and 1(1) bounds at 1%, 5% and 10%. These reject the null hypothesis of no levels of relationship. With this result the researcher has sufficient evidence to declare a cointegration between economic growth proxied by Gross Domestic Product (GDP) and Monetary Policy variables (Monetary Policy Rates (MPR), Cash Reserve Ratio (CRR), and Liquidity Ratio (LQR) in Nigeria within the scope of this study.

Table 4.7: ARDL Long Run Form and Bounds Test

ARDL Long Run Form and Bounds Test				
Dependent Variable: D(GDP)				
Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	267378.5	52194.18	5.122765	0.0001
GDP(-1)*	0.199983	0.114245	1.750464	0.0981
MPR(-1)	-6805.359	1228.230	-5.540786	0.0000
CRR(-1)	-1835.113	467.6553	-3.924072	0.0011
LQR(-1)	-855.6510	363.4033	-2.354549	0.0308
D(GDP(-1))	-0.988189	0.170491	-5.796139	0.0000
D(GDP(-2))	-2.226195	0.337071	-6.604538	0.0000
D(MPR)	-1517.628	765.5722	-1.982345	0.0638
D(MPR(-1))	3303.967	1066.586	3.097702	0.0065
D(MPR(-2))	1178.044	820.6900	1.435431	0.1693
D(CRR)	-1004.286	404.0098	-2.485795	0.0236
D(CRR(-1))	973.8372	414.2452	2.350871	0.0311
D(LQR)	-293.9308	377.9610	-0.777675	0.4474
D(LQR(-1))	895.4228	399.2609	2.242701	0.0385
Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPR	34029.75	19832.13	1.715890	0.1043
CRR	9176.361	4280.012	2.144004	0.0468
LQR	4278.626	2609.517	1.639624	0.1195
C	-1337009.	686769.8	-1.946808	0.0683
EC = GDP - (34029.7453*MPR + 9176.3614*CRR + 4278.6261*LQR				
-1337008.5802)				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	8.905834	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Correction Short Run Error Test

Table 4.8 below revealed that error correction equation, CointEq(-1) has expected negative sign of -0.199983 and p-value of 0.0000 suggesting the model is statistically significant. It can also be adduced that 19.9% of errors from the equilibrium can be corrected in the next period, and speed of adjustment is 19.9%.

Table 4.8: ARDL Error Correction Regression

Dependent Variable: D(GDP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-0.988189	0.132560	-7.454673	0.0000
D(GDP(-2))	-2.226195	0.266026	-8.368352	0.0000
D(MPR)	-1517.628	674.1735	-2.251095	0.0379
D(MPR(-1))	3303.967	892.3487	3.702551	0.0018
D(MPR(-2))	1178.044	704.4369	1.672320	0.1128
D(CRR)	-1004.286	308.8188	-3.252023	0.0047
D(CRR(-1))	973.8372	334.8405	2.908361	0.0098
D(LQR)	-293.9308	314.2081	-0.935465	0.3626
D(LQR(-1))	895.4228	338.9867	2.641468	0.0171
CointEq(-1)*	-0.199983	0.026964	7.416645	0.0000
R-squared	0.808206	Mean dependent var		1077.255
Adjusted R-squared	0.726009	S.D. dependent var		20193.63
S.E. of regression	10570.19	Akaike info criterion		21.62516
Sum squared resid	2.35E+09	Schwarz criterion		22.08774
Log likelihood	-325.1900	Hannan-Quinn criter.		21.77595
Durbin-Watson stat	1.985175			

Authors' computation output using E-view 10.

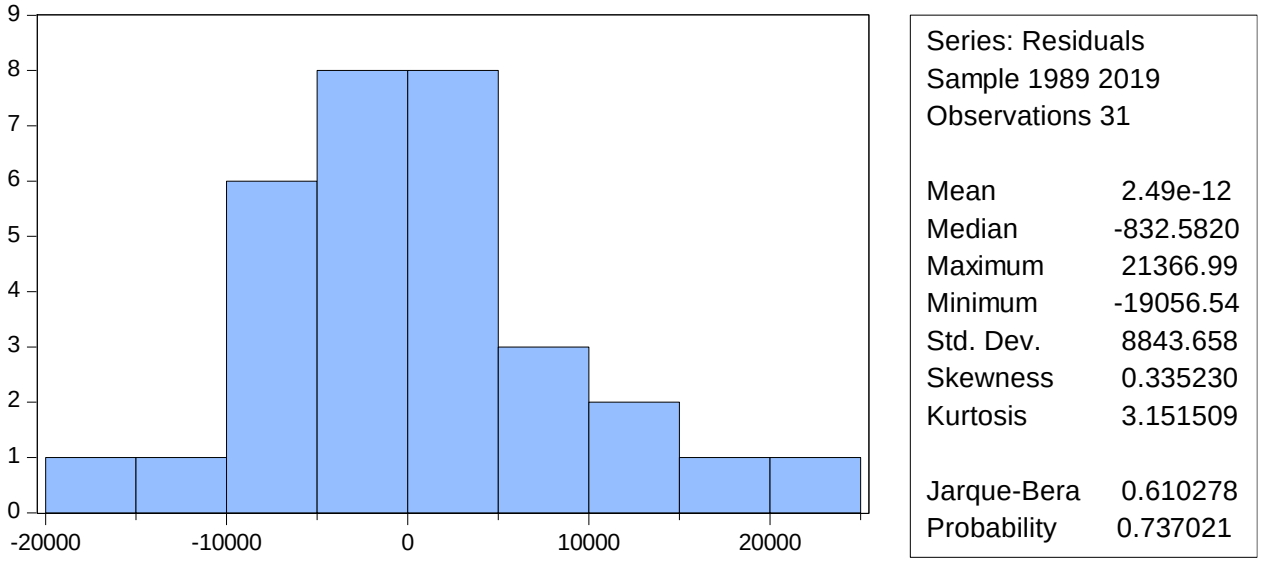
Next is to run some residual diagnostic test; Normality Test, Serial Correlation Test as seen tables below.

Residual Diagnostic Test

Normality Test

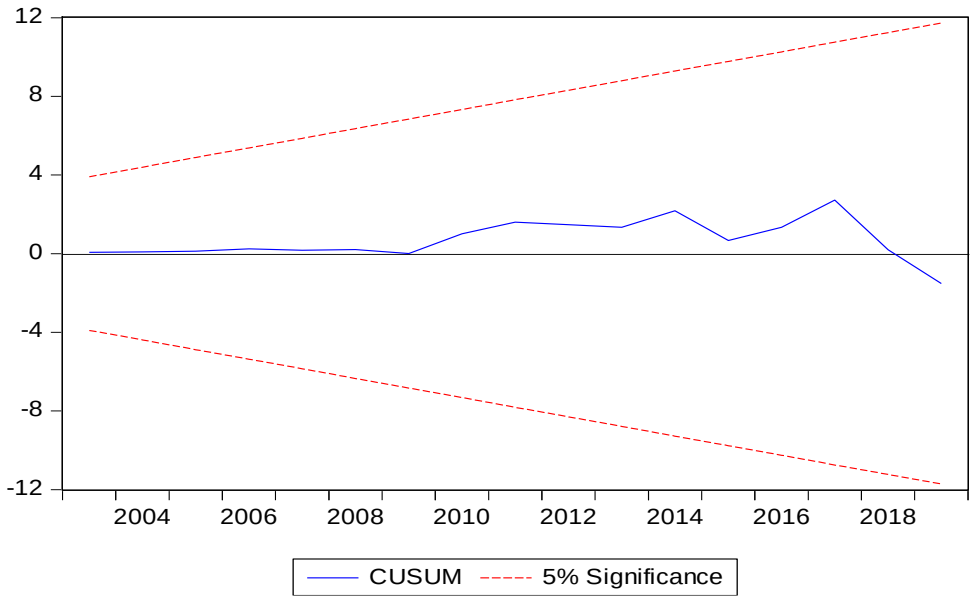
From Table 4.9 below, it is seen that Jarque-Bera Statistic is 0.610278 with P- value of 0.737021 clear evidence of normal distribution.

Table 4.9: Normality Distribution



Authors' computation output using E-view 10.

Figure 3: Recursive Estimates of the CUSUM (Cumulative Sum Control) Test



Recursive Estimates of the CUSUM in figure 3 above showed that the blue line falls between the two red lines showing the 5% significance level boundaries. This confirmed that the model is stable.

Serial Correlation Test

The table 4.10 below shows that Breusch-Godfrey Serial Correlation LM Tests with F-Statistic P-value of 0.8027, which shows non-rejection of the null hypothesis, an indication of absence of serial correlation.

Table 4.10: **Serial Correlation Tests**

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.223010	Prob. F(2,15)	0.8027
Obs*R-squared	0.895159	Prob. Chi-Square(2)	0.6392

Authors' computation output using E-view 10.

Causality Relationship

From table 4.11 below, there is no traceable causal relationship between GDP and MPR, CRR, LQR since their p-values are greater than the significant levels of 5%.

Table 4.11: Pairwise Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
MPR does not Granger Cause GDP	32	1.81712	0.1818
GDP does not Granger Cause MPR		0.24950	0.7810
CRR does not Granger Cause GDP	32	0.14403	0.8665
GDP does not Granger Cause CRR		3.33187	0.0509
LQR does not Granger Cause GDP	32	0.35769	0.7026
GDP does not Granger Cause LQR		0.09392	0.9106

Authors' computation output using E-view 10.

5. Conclusion and Recommendation

This study on the relationship between monetary policy and economic growth found that GDP in the past can predict future growth in Nigerian economy. It was majorly found that all the monetary policy variables have a negative and significant relationship with GDP. The result of this study corroborates with the findings of Nwoko et al (2016) and Ayodeji and Oluwele (2018) and contradicts the finding of Okwo et al (2010), Udude (2014) and Ufoeze et al (2018) that found that there exists an insignificant relationship between monetary policy, gross domestic product, credit to private sector and inflation in Nigeria. The results confirm the weakness of all the monetary policy variables, especially monetary policy rate in driving economic activities in Nigeria. The use of monetary policy instruments for economic stability may be important but should be properly formulated and transmitted to produce positive results on the economy. For instance, the redesigning of the Nigerian Naira with its inherent potentials of mopping excess liquidity or idle hoards but was wrongly targeted. There are several reasons for being cautious in assigning such a role to monetary policy. These range from time-lags (uncertainty regarding the timing and magnitude of its effects) to the length of transmissions and poor policy implementation. With the Nigerian government working hand in hand with Central Bank of Nigeria (CBN), monetary policy can be adjusted accordingly when the impact of money supply on economic growth is not apparent. Considering the above findings, the researchers are of the opinion that a flexible monetary policy by the monetary authority will help sustain price stability and economic growth in the country and policy instruments should be well-coordinated and as well an optimal mix to significantly influence economic growth and stability.

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