IMPACT OF MONETARY POLICY ON ECONOMIC PERFORMANCE: A NON-LINEAR ARDL APPROACH

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Abstract

Monetary policy plays a significant role in driving the economy of any nation. This study aimed to examine the impact of monetary policy on economic performance in Nigeria from 2006Q1 to 2023Q4. The study utilized both Autoregressive Distributive Lag (ARDL) and Non-Linear ARDL (NARDL) models to investigate the asymmetric impact of monetary policy on economic performance in the short and long term. The study used real GDP as a proxy for economic performance and considered exchange rate and money supply as independent variables representing monetary policy. The findings showed an insignificant negative relationship between monetary policy variables (money supply and exchange rate) and economic performance in the short run using the ARDL technique. The NARDL results also demonstrated that money supply and exchange rate had a negative insignificant effect on economic performance in the long run. From these results, it was concluded that there is no relationship between economic performance and monetary policy in both short-run and long-run periods. Based on these findings, it is recommended to manage monetary policy to attract domestic and foreign investment by maintaining an appropriate quantity of money supply and the central bank should use other instruments aside from exchange rate to motivate the economic performance of the nation.

Keywords: Economic Performance, Monetary Policy, Non-Linearity.

Jel Classification Code: E52, O47, C32

1. Introduction

Nigeria's economy is grappling with slow growth and unstable economic policies, leading to rising unemployment, inflation, low productivity, and balance of payment disequilibrium. The government, through different ways, regulates and controls the economy to maximize the welfare of the citizens through efficient resource allocation. Nigerian Economy has passed through lots of structural shifts over the years which hitherto have not brought significant and persistent economic performance and development. This is proven by rising government expenditure, unstable foreign

exchange rates, unfavorable balance of payment and high unemployment rates (Sha'aibu & Enofe, 2021). To this end, there is no conclusive scientific attempt at explaining Nigeria's unstable economic performance.

One of the major objectives of monetary policy in Nigeria is the stabilization of economic performance. The Nigerian government has adopted various monetary policies through the Central Bank of Nigeria over the years to achieve economic performance. Despite the increasing emphasis on the manipulation of monetary policy in Nigeria, the problem surrounding its economic performance persists. Thus, the objective study is to evaluate the impact of monetary policy on economic performance and specifically determines the asymmetric relationship between economic growth proxied by real GDP and monetary policy (M2), exchange rate and crude oil price. Other sections of this paper were organized in the following manner: section two includes review of Relevant Literature, Methodology, Research Findings, Discussion of Results and Implication of Findings, finally Conclusion and Recommendations.

2.0 Review of Relevant Literature

2.1 Conceptual Review

According to Sule et al. (2019), monetary policy refers to the use of instruments and measures of the monetary authority to regulate the value supply and cost of money in an economy. It is seen as the combination of measures designed to regulate the values, supply and cost of money in the economy in consonance with the expected level of economic activity. It refers to the combination of measures designed to regulate the value, supply and cost of money in an economy in tandem with the anticipated level of economic activity (Ukwonga et al., 2023).

Economic growth can be defined as a process through which the productive capacity of a state is increased in due course of time consequently increasing national outcome and income (Anu et al., 2022). In another view, Economic growth as the process whereby the real per capita income of a country increases over time usually annually at current prices (Ukangwa et al., 2023).

2.2 Theoretical Review

The Theories of Economic Growth refer to the theories propagated by renowned economists that define possible ways to boost development in an economy based on the resources available and the dynamic observed between multiple economic variables. The primary purpose of these theories is to enable countries to withstand economic crises and facilitate overall progress. Several classical, neoclassical, and modern economists have supported the theories of economic growth. However, for this study, three theories (models) of economic growth shall be reviewed which include; classical theories of economic growth, Neoclassical economic theory (exogenous growth model) and Exogenous growth model.

2.2.1 Classical Theories of Economic Growth

The classical theory was presented by Adam Smith in 1776. Also, David Ricardo, Robert Malthus, and others contributed in later years. According to their view, deliberate efforts to increase Gross Domestic Product (GDP) can lead to overutilization or exploitation of resources, leading to slow economic growth. It means economic growth can be achieved only when markets operate freely based on changing circumstances. Smith stated that growth is possible when certain factors receive attention from government authorities. These include labour productivity, increased revenue, and the role of trade and market forces. Smith also explained how labour specialization can tremendously increase growth. For the classical economists, too much population is generally miserable, it only makes the landowner to be better off by receiving high rents and an increase in land scarcity. Technological changes or innovations may cause a shift in the productivity curve. However, there were certain limitations to this model. This theory did not consider important factors such as technology, economies of scale, and improper wage determination in an economy.

2.2.3 Neoclassical Theory (Solow-Swan or Exogenous Model)

As the name suggests, this theory was proposed by neoclassical economists. However, the most popular model was presented by Solow-Swan (Robert Solow and Trevor Swan) Growth Model. The theory suggests that increase in productive inputs like labour or capital could lead to diminishing returns in the long run. It explains the relationship between factors like capital, labour, and output to steady growth can be realized through their interactions. An increase in GDP and technological investment is what influence the economic growth rate. Although this theory solved a few limitations of the classical model, it failed to prove effective in the long run.

2.3 Empirical Review

The literature investigating the link between monetary policy and economic growth has included macroeconomic determinants of growth in the relationship between monetary policy and growth. Bolarinwa and Anochirionye (2024) investigated the relationship between exchange rates and economic growth using annual time series data from 1981 to 2019. ARDL and bound test techniques were used. The ARDL model revealed the short-run relationship between exchange rate and economic growth. Positive correlations were observed between the exchange rate, GDP per capita growth, interest rate, and total exports. While negative relationships were noted with inflation and imports.

Nyeche (2024) examined the effect of exchange rate dynamics on economic growth in Nigeria using annual data from 1985-2021. Real gross domestic product was used as a dependent variable while independent variables were exchange rate, trade openness, and external reserves. The econometric techniques employed in the study included unit roots, cointegration, autoregressive distributed lag, and bound techniques. The study revealed a long-term relationship between economic growth, exchange rate, trade openness, and external reserves. Specifically exchange rate was found to exhibit a positive and statistically significant effect on real GDP in Nigeria. Trade openness had a positive and

not statistically significant effect on real GDP in Nigeria while external reserves had a positive and statistically significant impact on real GDP.

Ugwu and Njeze (2023) evaluated monetary policy transmission mechanisms on economic growth in Nigeria. They examined the impact of money supply, credit supply on the private sector, and interest rate on gross domestic product in Nigeria. The data obtained was from the CBN statistical bulletin. OLS of multiple regressions was used to test the research hypotheses. The result revealed that the broad money supply had a positive and significant effect on the gross domestic product in Nigeria. Credit supply to the private sector had a positive and non-significant effect on GDP. Oseni and Oyelade (2023) investigated the effects of monetary and fiscal policies on economic growth in Nigeria using various economic variables. It was found that a broad money supply has a positive and significant effect on gross domestic product while lending interest rate has a negative and significant effect on GDP.

Dauda and Abdulkareem (2023) examined the impact of monetary policy on economic growth in Nigeria. In doing this, they employed a time series of data sourced from CBN between the periods of 1990-2020. The methodology used involved examining the stationary nature of the data using the Augmented Dickey-Fuller test and an ARDL bound test for examining the presence of long-run relationships among the variables of the study. The short-run regression conducted using the ARDL regression method showed that monetary policy is an important determinant of economic growth in Nigeria. The indicators of monetary policy used (Monetary Policy Rate, MPR and Money Growth Rate, M2) exert a significant impact on economic growth in Nigeria.

Ikechukwu et al. (2023) examined the impact of exchange rates on economic growth in Nigeria using time series data. The econometric technique utilized was the Autoregressive Distributed Lag (ARDL), Error Correction Model (ECM). They found that there is a positive relationship between exchange rates, trade openness, and economic growth in the long run. Foreign direct investment net inflows have a positive relationship with economic growth.

Ogouche and Elizabeth (2022) studied the impact of monetary policy on economic growth in Nigeria from 1990 to 2022 using time series data. ARDL model was used to find the short-run and long-run relationship of the monetary variables. The findings showed the existence of a long-run relationship among the variables.

In another research by Aliyu (2022) in a bid to reinvestigate the nexus between monetary policy and economic growth in Nigeria from 1970 to 2020. His major findings indicate that broad money supply, real interest rate, and monetary policy rate are all positively significant, except for the monetary policy rate, which is negative. Inflation rate and exchange rate were negatively significant with economic growth. Therefore, the study concluded that monetary policy has positively impacted the Nigerian economy over the years.

Aliu (2022) examined the effectiveness of monetary policy in stimulating economic growth in Nigeria between 1990 and 2019. Secondary data were sourced mainly from CBN publications. The theoretical framework was based on the Keynesian transmission mechanism. ARDL bound tests and Error Correction Test was used. In the empirical investigation, the ARDL Bounds Test showed that there is a long-run relationship among the variables, with both the lower and upper bounds being less than the calculated 5% level of significance. Additionally, the error correction mechanism (ECM) test indicated an 88% adjustment back to equilibrium. Godfrey (2021) found that for each year's increase in GDP, there is a 3.889, 323.074, 0.287 increase in Money supply, Interest rate and Credit to the private sector respectively, while there is a decrease of 467.638 decreases in monetary policy Rate. This confirms that there is a relationship between monetary policy and economic growth and those monetary policies (money supply, interest rate, credit to private sector and monetary policy rate) individually and collectively impact economic growth in Nigeria.

In another investigation by Abdulahi et al. (2021), the influence of monetary variables on economic growth in Nigeria was measured. Subsequently, it tests the money demand function in Nigeria and uses the Generalized Method of Moments (GMM) and Autoregressive Distributed Lag Model (ARDL) for the analysis, using annual data from 1989 to 2019 sourced from CBN. The results of the analysis showed that money supply (M2) has a positive impact on economic growth while interest rate showed an insignificant impact. The result also shows the 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 results.

In the same vein, Gisaor (2021) assessed the impact of monetary policy on economic growth in Nigeria between 1980 – 2014. The study employed the Vector Error Correction Model, pairwise Granger causality test and variance decomposition was used to test the long-run relationship among the monetary variables. The VECM showed a positive short and long-run relationship between narrow money supply and broad money supply and economic growth in Nigeria. There was also bidirectional causality between broad money supply and economic growth in Nigeria at a 5% level of significance.

Shaiabu and Enofe (2021) examined the relationship between monetary policy instruments and economic growth in Nigeria using annual time series data from 1986 – 2018 sourced from CBN and the World Bank. ARDL and OLS were used as estimation techniques. They found that interest rates had a positive and significant impact on economic growth in Nigeria in the short run while previous gross domestic product and broad money had a negative significant impact on the economy.

Kelechi and Chigozie (2021) investigated the effect of monetary policy on economic growth during post structural adjustment programme in Nigeria. Time series data was used from 1985 – 2015 sourced from CBN and the National Bureau of Statistics. OLS and linear regression were used to estimate the parameters. The findings showed that broad money supply and inflation had a positive impact on economic growth, while interest rates had a negative significant effect on the economy.

|In a similar capacity, Okoh et al. (2020) examined the impact of monetary policy on economic growth in Nigeria. The Vector Auto-regression Technique (VAR) was used to analyse data between 1980 - 2017. The result showed that monetary policy represented by money supply (M2) has a positive impact on economic growth proxy with RGDP. Monetary policy variables-interest rate, money supply, exchange rate and liquidity ratio all had a negative and non-significant relationship with inflation.

In the same year, Henry and Hamisu (2020) investigated the asymmetric impact of monetary policy shocks on output and price levels in Nigeria using annual data from 1981-2018. They employed the linear Autoregressive Distributed Lag (NARDL) Model and the Wald Test. Hey found evidence of the asymmetric impact of monetary policy shocks on output in the short and long runs. Positive monetary policy shock was found to have a positive impact on output while negative monetary policy shocks were found to have a positive impact on prices.

Sule et al. (2019) empirically assessed the impact of monetary policy instruments on economic growth in Nigeria between 1981 and 2016 using quarterly time series data from the National Bureau of Statistics. Autoregressive Distributed Lag Model and Vector Error Correction Models were employed as methodology. The independent variables used in the study were the monetary policy rate, cash reserve ratio, and exchange rate. The findings indicated that in Nigeria, economic growth is more responsive to the exchange rate than to the monetary policy rate or cash reserve ratio.

Ufoeze et al. (2018) investigated 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. Employing the co-integration tests, the study showed that a long-run relationship exists among the variables. In addition, the core finding of the study showed that monetary policy rate, interest rate, and investment have insignificant positive effects on economic growth in Nigeria. Money supply however has a significant positive effect on growth in Nigeria. The exchange rate has a significant negative effect on GDP in Nigeria. Money supply and investment granger cause economic growth, while economic growth causes interest rates in Nigeria. The overall, monetary policy explains 98% of the changes in economic growth in Nigeria.

Based on the above empirical reviews, researchers are yet to arrive at a harmonious conclusion on what should be the exact effect of monetary policy (variables) on economic performance yet only a few literature tested the asymmetric relationship between monetary policy variables with economic performance. Using monthly time series data (previously reviewed studies used annual data) that range from 2006 to 2023, this study will test the asymmetric influence of the monetary policy variables using Non-Linear Autoregressive Distributive Lag (NARDL) to analyse the data.

3.0 Methodology

This study will adopt the neo-classical growth model of Solow-Swan (1956) as the theoretical framework. The economic growth is the dependent variable in this study.

3.1 Model Specifications

For this study the following variables will be used, Money Supply (M2), Government Expenditure (GEXP), and Exchange Rate (EXCH) Thus, equation 4 yields:

$RGDP = f(M2, EXCH, COP)$…… (5)

RGDP represents the Real Gross Domestic Product which is defined as nominal GDP adjusted for inflation. It is used to measure the actual growth of production without any distorting effect from inflation. EXCH represent exchange rate fluctuations, while COP crude oil price.

To find long-run cointegration between the variables, since the order of stationarity of the variables differs, the ARDL method, not Johansen cointegration, is used to carry out the multivariable cointegration. The ARDL model will be:

$\Delta RGDPt = \beta o + \sum_{i=1}^{p} \beta 1 \Delta RGDPt - i + \sum_{i=1}^{p} \beta 2 \Delta lnM21t - i + \sum_{i=1}^{p} \beta 3 \Delta lnEXCHt - i + \sum_{i=1}^{p} \beta 4 \Delta lnCOP2t - i + \lambda 1 lnRGDPt\text{-}i + \lambda 2 lnM21t\text{-}i + \lambda 3 lnEXCH2t\text{-}i + \lambda 4 lnCOP2t - i + Ut$… …….(6)

$\Delta RGDPt = \beta o + \sum_{i=1}^{p} \beta 1 \Delta RGDPt - i + \sum_{i=1}^{p} \beta 2 \Delta lnM21t - i + \sum_{i=1}^{p} \beta 3 \Delta lnEXCHt - i + \sum_{i=1}^{p} \beta 4 \Delta lnCOP2t - i + \lambda ECM_{t-1} + Ut$… …….(7)

Equation 7 represents an Unrestricted Error Correction Model (UECM) and corresponds to the ARDL bound test, where ΔlnRGDP, ΔlnM21, ΔlnEXCH, and ΔlnCOP represent their respective different values. While $\beta 1 - \beta 4$, represents short-run parameters of the dynamic relationship, λ is the parameter which indicates the speed of adjustment and ECM is the lagged error correction term obtained from estimating equation 6. According to Peseran et al. (2001), the bound test uses Wald F statistics for a joint significance test to test cointegration. The null hypothesis i.e. is represented by $\lambda 1 = \lambda 2 = \lambda 3 = \lambda 4 = 0$

The rule of thumb is that if F-statistics is less than the lower bound, the null hypotheses are accepted. Otherwise, we reject the null hypotheses. if the computed value is in between the lower and upper bound of the boundary value, the result is inconclusive. The long-run and short-run model is represented below.

$\Delta LnRGDPt = \beta o + \sum_{i=1}^{p} \beta 1 \Delta lnRGDPt - i + \sum_{i=1}^{p} \beta 2 \Delta lnM212t - i + \sum_{i=1}^{p} \beta 2 \Delta lnGEXCHt - i + \sum_{i=1}^{p} \beta 2 \Delta lnCOP2t - i + \theta i$……..(8)

3.4 Non-Linear Autoregressive Distributed Lag (Non-Linear ARDL) Model

NARDL accommodates the asymmetric relationship between the variables of the study. it does not require the variables to be equally integrated. Thus, the model will be

$LnRGDPt = \beta o + \beta 1 \Delta lnM21^{-}\ t\text{-}i + \beta 2 \Delta lnM21^{+}\ t\text{-}i + \sum_{i=1}^{p} \beta 3 \Delta lnEXCH - t - i + \beta 4 \Delta lnEXCH + t - i + \beta 5 \Delta lnEXCH - t - i + \beta 6 \Delta lnEXCH^{+}\ t\text{-}i + Ut$……...(9)

$lnM21^{-}$, $lnM21^{+}$, $lnEXCH^{-}$, $lnEXCH^{+}$,$lnCOP^{-}$, and $lnCOP^{+}$ represent positive and negative partial sum process variations derived from the ARDL model. The NARDL effect also provides asymmetric multipliers. These constructs are similar to impulse-

response curves in the VAR literature and trace asymmetric paths of adjustment of each non-linear distributed lag regressor to its long-run co-integrating state.

Thus, our econometric model for this work will be;

$$\Delta lnRGDP = \beta RGDPln(RGDP)t-1 + \theta + lm2ln(m2)t-1 + \theta\_EXCHln(EXCH)t-1 + \alpha + COPln(COP)t-1$$

$\sum_{j=1}^{p-1} \text{lnRGDPj}, \Delta \ln RGDP_{\text{t-j}} + \sum_{k=1}^{qi-1}(\Upsilon \text{M2}+, \text{k1}, \Delta(\text{M2}) + \text{t} - \text{k1} + \square - \text{M2ln}(\text{M2}) - \text{t} - \text{k} - 1) + \sum_{k=2}^{q2-1}(\Upsilon \text{EXCH} + \text{k2}, \Delta(\text{EXCH}) + \text{t} - \text{k2} + \square - \text{EXCHln}(\text{EXCH}) - \text{t} - \text{k} - 2) + \sum_{k=3}^{q3-1}(\Upsilon \text{COP}+, \text{k3}, \Delta(\text{COP}) + \text{t} - \text{k3} + \square - \text{COP}(\text{COP}) - \text{t} - \text{k} - 3) + €_0 + €_1 t + \mu_i$ .....(10)

This describes a NARDL (p,q1,q2,q3) model where a change in RGDP enters an autoregressive process of order p and M2, EXCH, and COP enter as asymmetrically distributed lag variables with orders q,q,q respectively. Variables with + and negative superscripts denote respectively the positive and negative partial sum decompositions underlying distributed lag variables. The positive and negative partial sums here explicitly model how asymmetries in Nigeria's RGDP both in the long run and short run reflect on its economic development. The deterministic dynamics $€_0$, and $€_1$ respectively capture the effect of the constant and linear trend, while μ_i is the stochastic disturbance term.

3.4 Measurement of Variables and Sources of Data

This study used aggregate monthly time series data including real GDP, Money Supply (M2), Exchange Rate (EXCH) and Crude Oil Prices. Data for these variables were all sourced from statistical bulletins of the Central Bank of Nigeria (CBN, 2023). However, the variables are specifically defined as follows;

Real Gross Domestic Product (GDP): Real Gross Domestic Product is a macroeconomic statistic that measures the value of the goods and services produced by an economy in a specific period, adjusted for price change. In this study, it is the proxy for economic growth and the dependent variable.

Broad Money Supply (M2): Broad Money Supply measures the total volume of money supply in the economy in the economy. It is defined as narrow money plus savings and time deposits with banks including foreign-denominated deposits.

Exchange Rate: The exchange rate is the price of one currency expressed in terms of another currency. This study used Naira to Dollar monthly average exchange rate at the CBN official rate.

Crude Oil Price: This is the average price of crude oil in dollars at the international market.

3.5 Estimation Techniques

The analysis started with pre-estimation tests, which included the descriptive statistics, variance inflation factor, unit root test, estimation tests using linear ARDL and Non-linear ARDL, and post-estimation tests for autocorrelation and heteroscedasticity.

4.0 Research Findings/Results

4.1.1 Descriptive Statistics

Table 1 shows the statistical attributes of the variables of the study. RGDP has a mean of 10.31 with corresponding minimum and maximum values of 11.23 and 9.69 respectively. M2 has a mean value of 0.01 with corresponding minimum and maximum values of -0.28 and 0.39. EXCH is averaged at 3.17 and ranges from -9.67 to 316.17, while COP is averaged at 0.07 with minimum and maximum values of -28.51 and 23.30 respectively.

Table 1: Results of Descriptive Statistics

	LRGDP	LM21	EXCH1	COP1
Mean	10.3197	0.015254	3.1756	0.0710
Median	10.0889	0.0107	0.0000	0.8300
Maximum	11.2354	0.3953	316.1700	23.3000
Minimum	9.6934	-0.2867	-9.6700	-28.5100
Std. Dev.	0.4894	0.0481	22.5278	7.4129
Skewness	0.7012	1.4774	12.6915	-0.6636
Kurtosis	2.0166	27.2302	175.2265	4.7903
Jarque-Bera	26.2857	5337.709	271493.7	44.4968
Probability	0.0000	0.0000	0.0000	0.0000
Sum	2218.736	3.2797	682.7700	15.2700
Sum Sq. Dev.	51.2679	0.4965	108605.9	11759.77

Source: Authors Computation, 2024

EXCH is the variable with the highest standard deviation. The Kurtosis shows that all the variables are leptokurtic except RGDP which has a value of 2.01, platykurtic. The distribution is flat relative to normal distribution.

4.1.2 Variance Inflation Factor

Table 2 shows the result of the variance inflation factor which is determined to show whether there is Multicollinearity in the model.

Table 2: Results of the Variance Inflation Factor

Variable	Coefficient Variance	Uncentered VIF	Centred VIF
C	0.0107	10.5250	NA
LM21	0.4445	1.1014	1.0006
EXCH	2.03E-06	1.0219	1.0019
COP	1.56E-06	10.4115	1.0020

Source: Author's Computation, 2024.

These variables can be considered highly correlated, i.e., multicollinear if the Variance Inflation Factor (VIF) exceeds 5. Since the individual Variance Inflation Factors (VIF) are less than 10, there is no multicollinearity present.

4.1.3 Stationary Tests

In this study, we used the Augmented Dickey-Fuller and Phillips-Perron to check for unit roots at a 5% significance level in Table 3 and Table 4 respectively. The results from the ADF and PP unit root tests show that the real gross domestic product (RGDP) change is stationary at the level. Additionally, money supply (M2), exchange rate (EXR), and crude oil price (COP) are all stationary at their first differences.

Table 3a: Results of Units Roots Tests (ADF)

Variable	ADF (at Level)		ADF(at 1st Diff)	
	t-stat	Probability	t-stat	Probability
LRGDP	-3.3598	0.0135**	-	-
LM21	-0.1822	0.9372**	-19.3257	0.0000**
EXCH1	2.2588	1.0000**	-14.5952	0.0000**
COP1	-2.9204	0.0547**	-10.9094	0.0000**

Source: Author's Computation, 2024.

Note: **denotes significance levels at 5 %.

The results from the ADF unit root tests in Table 3a showed that the real gross domestic product (RGDP) change is stationary at the level. It has a t-statistical value of -3.3598 and a prob value of 0.0135 which rejects the null hypothesis of stationarity at a 5% level of significance. While money supply (M2), exchange rate (EXR), and crude oil price (COP) are all stationary at their first differences.

Table 3b: Results of Units Roots Tests (PP)

Variable	PP (at Level)		PP (at 1st Diff)	
	t-stat	Probability	t-stat	Probability
LRGDP	-3.5117	0.0086**	-	-
LM21	-1.3509	0.0057**	-18.5824	0.0000**
EXCH1	2.9675	1.0000**	-14.5952	0.0000**
COP1	-2.6468	0.0853**	-10.9297	0.0000**

Note: **denotes significance levels at 5 %.

Source: Author's Computation, 2024.

The results from the Phillip-Perron unit root tests in Table 3b showed that the real gross domestic product (RGDP) change is stationary at the level. It has a t-statistical value of -3.5117 and a prob value of 0.0086 which rejects the null hypothesis of stationarity at a 5% level of significance. While money supply (M2), exchange rate (EXR), and crude oil price (COP) are all stationary at their first differences at a 5% level of significance.

4.1.5 The ARDL Bound Test

The ARDL Bound testing approach is a cointegrating method developed by Peseran et al. (2001) to test the presence of the long-run relationships between variables. This approach is normally used irrespective of the order of integration of the variables i.e. I(0) or I(1). The ARDL Bound test rule of thumb is that if the value of F-statistics is above the upper bound at a 5% level of significance then a long-run relationship exists among the variables, otherwise short-run relationship exists among the variables.

Table 4: Results of the ARDL Bound Test

Test Statistic	**Value**	**K**
F-statistic	3.3464	3
Critical Value Bounds		
Significance	**Lower Bound**	**Upper Bound**
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Source: Authors Computation, 2024.

From the ARDL bound test the F-statistics is 3.3464 lower than the upper bound of 4.35 at a 5% level of significance this means that only a short-run relationship exists among the variables. Thus, we accept the null hypothesis.

4.1.6 ARDL Analysis

The ARDL result indicates vital information such as R-squared, adjusted R-squared, t-statistics and probability values of the variables which help in the interpretation of the variables.

Table 5: Results of the ARDL Analysis

Variable	Coefficient	Std. Error	t-Stat	Prob.*
LRGDP(-1)	0.9712	0.0699	13.8894	0.0000
LRGDP(-2)	-0.0771	0.0696	-1.1085	0.2690
LM21	-0.1418	0.4120	-0.3443	0.7310
LM21(-1)	0.3947	0.3440	1.1473	0.2526
LM21(-2)	0.2046	0.3069	0.6665	0.5058
EXCH1	-0.0001	0.0006	-0.2004	0.8413
EXCH1(-1)	4.87E-05	0.0006	0.0761	0.9394
EXCH1(-2)	-8.25E-05	0.0006	-0.1313	0.8956
COP1	-0.0006	0.0019	-0.3264	0.7444
COP1(-1)	-0.0012	0.0021	-0.5961	0.5518
COP1(-2)	0.0022	0.0020	1.1389	0.2561
C	1.0822	0.3097	3.4935	0.0006
R-squared	0.8300	Mean dependent var		10.3117
Adjusted R-squared	0.8207	S.D. dependent var		0.4846
S.E. of regression	0.2051	Akaike info criterion		-0.2752
Sum squared resid	8.4613	Schwarz criterion		-0.0858
Log-likelihood	41.3121	Hannan-Quinn criteria.		-0.1987
F-statistic	89.2548	Durbin-Watson stat		2.0055
Prob(F-statistic)	0.0000			

Source: Authors Computation, 2024.

From Table 5 above, the R-squared and the adjusted R-squared are 83% and 82% respectively. These suggest that the model is a very good fit. The F statistics is 89.25 less than the prob value of 0.000 at a 5% level of significance which signifies a short-run relationship among the variables. Akaike Information Criteria was used to select the optimal lag having the lowest value of -0.2752 compared to Shwarz and Hannan-Quinn Criterion with values of -0.0858 and -0.1987 respectively. The coefficients of the independent variables and their associated p-values are used to determine their effects on the dependent variables at a significance level of 5%. A decrease in LM21 by 1% decreases Rgdp by -0.14% and a decrease in EXCH by 1% decreases RGDP by -0.0001. Also, a decrease in COP by 1% decreases RGDP by -0.0006% in the short run. All the effects of the independent variables on RGDP are statistically insignificant at a 5% level of significance.

4.1.7 Non-Linear ARDL Bound Test

From Table 6, the F statistics is 2.19 less than the probability value of 3.61 of the upper bound at a 5% level of significance. Thus, the bound test of the NARDL also suggests a long-run relationship among the variables.

Table 6: Results of NARDL BOUND TEST

Test Statistic	**Value**	**K**
F-statistic	2.1939	6
Critical Value Bounds		
Significance	**Lower Bound**	**Upper Bound**
10%	2.12	3.23
5%	2.45	3.612
2.5%	2.75	3.99
1%	3.15	4.43

Source: author's computation, 2024.

4.1.9 Non-Linear ARDL Analysis

The non-linear ARDL model shows the asymmetric effects of independent variables on the dependent variable in the long run.

Table 8: Results of Non-Linear ARDL Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LRGDP(-1)	0.9758	0.0720	13.550	0.0000
LRGDP(-2)	-0.1039	0.0722	-1.4394	0.1517
LM21_POS	-0.4123	0.6365	-0.6477	0.5179
LM21_POS(-1)	1.4424	1.0037	1.4371	0.1523
LM21_POS(-2)	-0.6530	0.8093	-0.8068	0.4207
LM21_NEG	0.4385	0.7611	0.5762	0.5651
LM21_NEG(-1)	-0.7040	0.9303	-0.7567	0.4501
LM21_NEG(-2)	0.5750	0.4718	1.2186	0.2245
EXCH1_POS	-2.99E-05	0.0007	-0.0412	0.9671
EXCH1_POS(-1)	-0.0002	0.0045	-0.0584	0.9535
EXCH1_POS(-2)	-0.0015	0.0044	-0.3530	0.7245
EXCH1_NEG	-0.0004	0.0043	-0.1014	0.9193
EXCH1_NEG(-1)	-0.0014	0.0043	-0.3414	0.7331
EXCH1_NEG(-2)	-0.0001	0.0007	-0.2273	0.8204
COP1_POS	0.0012	0.0033	0.3568	0.7216
COP1_POS(-1)	-0.0075	0.0043	-1.7244	0.0863
COP1_POS(-2)	0.0050	0.0030	1.6620	0.0981
COP1_NEG	-0.0023	0.0031	-0.7452	0.4571
COP1_NEG(-1)	0.0043	0.0047	0.9335	0.3517
COP1_NEG(-2)	-0.0027	0.0036	-0.74933	0.4546
C	1.1983	0.4597	2.6066	0.0099
R-squared	0.8336			
Adjusted R-quared	0.8162			
S.E. of regression	0.2066		Akaike info criter	-0.2213
Sum squared resid	8.1599		Schwarz criter	0.1111
Log-likelihood	44.464		Hannan-Quinn crit	-0.0869
F-statistic	47.86236		D. W. stat	1.9956
Prob(F-statistic)	0.0000			

Source: author's computation, 2024.

From Table 8 above the R-squared and the adjusted R-squared are 83% and 81% respectively. This suggests that the model has a very good fit. The F-statistics is 47.86 with a very low p-value of 0.000, meaning that at a 1% level of significance, the result has a good fit, the overall explanatory variables (R-squared) have significant power in explaining the changes in the dependent variable (economic performance). Akaike Information Criteria was used to select the optimal lag having the lowest value of -0.2213 compared to Shwarz and Hannan-Quinn Criterion with values of 0.1111 and -0.0869 respectively. The value of the coefficients of the independent variables as well as the p values helps in determining their effects on the dependent variables at a 5% level of

significance. The F-statistics is higher than the prob. value at a 5% level of significance. A percent increase in LM21 will decrease RGDP by -0.4123.While a unit decrease in LM21 will increase RGDP by 0.4385 in the long run. A unit increase in exchange will insignificantly decrease RGDP by -0.00002 percent while a unit decrease in EXCH will increase RGDP by 0.0004in the long run. A percentage increase in COP will increase RGDP by 0.0012 while a percentage decrease in COP will increase RGDP by 0.0023 in the long run. All the effects of the independent variables on RGDP are statistically insignificant at a 5% level of significance.

4.3.0 Post-estimation

To ensure the validity of the findings, various diagnostic tests were employed. These include the Wald test, Heteroskedasticity test and Serial Correlation.

4.3.1 Residual Tests

Table 9 presents the diagnostic test result of the residual in the model. Using the p-values of the three statistics, the null hypothesis is accepted that there is no presence of heteroskedasticity in the model since the p-values is 0.1988. However, the null hypothesis is rejected for the serial correlation whose p-value is 0.0000.

Table 9: Results of Residual Tests

Diagnosis	Statistics	Probability
Serial Correlation	435.5284	0.0000
Heteroskedasticity	1.5656	0.1988
Wald Test	1.0335	0.3787

Source: Author's Computation, 2024.

The Wald test suggests a long-run asymmetry since the F statistics 1.03 is greater than the p-value 0.37. Therefore, we reject the null hypothesis.

5. Discussion of Results and Implication of Findings

The section showcases a discussion of the empirical findings on the impact analysis of money supply on economic performance in Nigeria using monthly time series data (2006 -2023). The discussion will conform to the set objectives of the study and its hypotheses will be tested respectively. The study has three specific objectives and hypotheses.

The first objective is to evaluate the impact of money supply on economic performance. The ARDL co-integration test showed the existence of a short-run relationship between economic performance and Money supply. A decrease in money supply by 1% decreases Real GDP by -0.14%. The Non-Linear ARDL results, on the other hand, showed that an increase of 1% in LM2 will decrease LRGDP by -0.10% in the long run. This result correlates with the findings made by Dauda and Abdulkareem (2023) who found that money supply is an important determinant of economic performance. However, Ngwu and Njeze (2023) and Anu et al. (2022) findings established a positive relationship between the variables. Also, Ogouche. (2022) found that a long-run relationship exists

between money supply and economic performance. The findings of the result reject the null hypothesis that there is no significant relationship between monetary policy and economic performance.

Similarly, the second objective is to determine the effect of the exchange rate on economic performance. The ARDL Bound test showed the existence of a short-run relationship among the variables. The ARDL result showed that exchange rate and economic performance have a negative relationship with RGDP in the short run, a decrease in exchange rate by one per cent will decrease RGDP by -0.0001. The NARDL result, on the other hand, indicated that an increase in exchange rate by one per cent will decrease economic performance by -0.0002 while a percentage decrease in EXCH will increase RGDP by 0.0004 in the long run. The results refute the null hypothesis that exchange rates do not significantly impact economic performance in Nigeria. However, the findings were inconsistent with the works of Ikechukwu et al. (2023) and Bolarinwa and Anochirionye (2024). They found that the exchange rate has a positive relationship with economic growth.

The third objective is to examine the asymmetric relationship between monetary policy variables and economic performance in Nigeria. This is tested using the Non-Linear Autoregressive Lag Model after the NARDL bound test established the existence of a long-run relationship among the dependent and independent variables. The result showed that a per cent increase in LM21 will decrease RGDP by -0.4123. While a unit decrease in LM21 will increase RGDP by 0.4385 in the long run. A unit increase in exchange will insignificantly decrease RGDP by -0.00002 percent while a unit decrease in EXCH will increase RGDP by 0.0004 in the long run. A percentage increase in COP will increase RGDP by 0.0012 while a percentage decrease in COP will increase RGDP by 0.0023 in the long run. However, this research rejects the null hypothesis that there is no asymmetric relationship between the monetary policy variables and economic performance in Nigeria. The findings of Henry and Hamisu (2020) contradict the result, suggesting a negative impact of positive monetary policy shocks on economic growth.

6. Conclusion and Recommendations

Monetary policy will remain an indispensable tool for managing economies in a bid to achieve stable and sustainable economic growth. It is believed to influence price stability, aggregate output, and favourable exchange rates, among others. This study aimed to examine the impact of monetary policy on economic growth using both ARDL and Non-Linear ARDL approaches. The study tried to establish a connection of both short-run and long-run relationships between economic performance and monetary policy. From the findings, it was established that the ARDL results showed an insignificant negative relationship between monetary policy variables (money supply, exchange rate, and crude oil price) and economic performance in the short run at a 5% level of significance. While NARDL results showed that money supply and exchange rate had a negative insignificant relationship with economic performance in the long run. The crude oil price has a positive insignificant impact on economic performance. Based on the findings, it is recommended that monetary policy should be managed to create a favourable environment for attracting domestic and foreign investment. This can be achieved by maintaining appropriate interest rates. The exchange rate should be fixed by the central

bank to reduce the fluctuation of prices of goods and services. Additionally, the government should encourage the establishment of more private refineries to reduce the prices of crude oil in the domestic market.

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