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# IMPACT OF SELECTED MONETARY POLICY INSTRUMENTS ON EXCHANGE RATE DYNAMICS IN NIGERIA: EVIDENCE FROM THE AUTOREGRESSIVE DISTRIBUTED LAG (ARDL) APPROACH

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**Abstract**

Exchange rate stability is fundamental to macroeconomic performance because it influences inflation, international trade, investment decisions, and overall economic growth. Despite the adoption of various monetary policy measures by the Central Bank of Nigeria, exchange rate volatility has remained a persistent challenge, particularly in the aftermath of oil price shocks, external financial disturbances, and structural imbalances. This study investigates the impact of selected monetary policy instruments on exchange rate dynamics in Nigeria using annual time-series data covering the period 1985–2025. Specifically, the study evaluates the effects of the Monetary Policy Rate, Money Supply, and Liquidity Ratio on the exchange rate while controlling for inflation and international crude oil prices. The Autoregressive Distributed Lag modelling framework was employed because of its suitability for estimating both short-run and long-run relationships among variables with mixed orders of integration. The results reveal the existence of a stable long-run relationship among the variables. Money supply emerged as the most influential monetary policy instrument affecting exchange rate movements in both the short and long run, while liquidity ratio exerted mainly transitory effects. Conversely, the monetary policy rate demonstrated limited long-run influence on exchange rate dynamics, suggesting that structural characteristics of the Nigerian economy weaken the interest-rate transmission mechanism. The findings underscore the importance of coordinated monetary, fiscal, and exchange rate policies in achieving exchange rate stability. The study contributes to the literature by providing one of the most comprehensive assessments of the monetary policy–exchange rate nexus in Nigeria over four decades of economic reforms and policy regime changes.

**Keywords:** Exchange Rate, Monetary Policy, Monetary Policy Rate, Money Supply, Liquidity Ratio, ARDL, Nigeria.

## 1. INTRODUCTION

The exchange rate is one of the most important macroeconomic variables in an open economy because it determines the relative price of domestic and foreign currencies and influences international competitiveness, inflation, investment decisions, and external sector performance. For developing economies such as Nigeria, where production activities depend substantially on imported raw materials, machinery, and intermediate goods, exchange rate movements have far-reaching implications for domestic prices, industrial productivity, fiscal sustainability, and economic growth.

Over the past four decades, Nigeria has experienced persistent exchange rate volatility arising from a combination of structural, institutional, and external factors. Heavy dependence on crude oil exports has exposed the economy to fluctuations in international oil prices, while recurrent foreign exchange shortages, rising import demand, capital flow reversals, and speculative activities have intensified pressure on the value of the naira. These challenges have

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prompted successive governments and the Central Bank of Nigeria (CBN) to implement a wide range of monetary and exchange rate policies aimed at stabilizing the foreign exchange market and safeguarding macroeconomic stability.

Since the introduction of the Structural Adjustment Programme (SAP) in 1986, Nigeria has witnessed significant transformations in its exchange rate management framework. The country has transitioned through fixed exchange rate systems, managed floating arrangements, multiple exchange rate windows, and, more recently, market-oriented reforms characterized by exchange rate unification and enhanced price discovery mechanisms. These policy transitions have been accompanied by corresponding changes in monetary policy implementation, including adjustments in the Monetary Policy Rate (MPR), Cash Reserve Ratio (CRR), Liquidity Ratio (LR), Open Market Operations (OMO), and broad money supply management.

Monetary policy plays a central role in influencing exchange rate movements through several transmission channels. Conventional macroeconomic theory suggests that increases in policy interest rates raise domestic financial returns, attract capital inflows, strengthen the domestic currency, and moderate inflationary pressures. Similarly, controlling the growth of money supply reduces excess liquidity within the financial system and limits speculative demand for foreign currencies. Conversely, excessive monetary expansion often fuels inflation, weakens domestic purchasing power, and contributes to exchange rate depreciation. However, the effectiveness of these transmission mechanisms depends largely on the structure of the economy, the depth of financial markets, institutional quality, and the credibility of monetary authorities.

The Nigerian economy presents a particularly interesting case because monetary policy frequently operates within an environment characterized by fiscal dominance, limited export diversification, shallow financial markets, high import dependence, and periodic external shocks. Consequently, changes in monetary policy instruments do not always produce the expected responses in exchange rate behaviour. Episodes of exchange rate depreciation have occurred even during periods of aggressive monetary tightening, suggesting that structural factors may weaken the effectiveness of conventional monetary policy.

Recent macroeconomic developments have further heightened interest in understanding the relationship between monetary policy and exchange rate dynamics. Exchange rate liberalization reforms, the removal of multiple foreign exchange windows, sustained inflationary pressures, and successive adjustments in the Monetary Policy Rate have generated renewed debate regarding the effectiveness of monetary policy in stabilizing the naira. Understanding the relative importance of various monetary policy instruments is therefore essential for designing appropriate policy responses capable of promoting exchange rate stability while supporting sustainable economic growth.

Although numerous empirical studies have investigated the determinants of exchange rate behaviour in Nigeria, existing evidence remains inconclusive. While some studies report that monetary policy instruments exert significant influence on exchange rate movements, others argue that structural factors such as oil price fluctuations, external reserves, political

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uncertainty, and capital flows dominate monetary policy effects. Moreover, many previous studies relied on relatively short sample periods or focused exclusively on individual monetary policy instruments without considering their combined effects within a comprehensive econometric framework.

This study addresses these limitations by examining the impact of selected monetary policy instruments on exchange rate dynamics in Nigeria using annual data spanning 1985–2025. The period captures major episodes of macroeconomic reforms, exchange rate regime changes, global financial crises, oil price fluctuations, and recent monetary policy adjustments. The study adopts the Autoregressive Distributed Lag (ARDL) modelling framework because it permits simultaneous estimation of short-run dynamics and long-run equilibrium relationships among variables integrated of different orders. Specifically, the study seeks to:

- Examine the effect of the Monetary Policy Rate on exchange rate movements in Nigeria;
- Evaluate the influence of Money Supply on exchange rate behaviour;
- Determine the contribution of the Liquidity Ratio to exchange rate stability; and

The findings provide valuable insights for policymakers, monetary authorities, financial market participants, researchers, and development institutions seeking to strengthen monetary policy effectiveness and improve exchange rate management in Nigeria. The study also enriches the growing body of empirical literature by providing evidence from one of the longest time series available on Nigeria's monetary policy–exchange rate relationship.

The remainder of the paper is organized as follows. Section Two reviews the theoretical and empirical literature underpinning the study. Section Three presents the research methodology. Section Four discusses the empirical findings, while the final section concludes the study and outlines policy recommendations.

## 2. LITERATURE REVIEW

### 2.1 Conceptual Review

Monetary policy refers to the deliberate actions undertaken by a country's central bank to regulate the availability, cost, and allocation of money and credit within the economy in pursuit of macroeconomic objectives such as price stability, sustainable economic growth, full employment, and financial system stability. In Nigeria, the Central Bank of Nigeria implements monetary policy using a combination of conventional instruments, including the Monetary Policy Rate (MPR), Open Market Operations, Cash Reserve Ratio, Liquidity Ratio, and money supply management.

The exchange rate represents the price of one currency expressed in terms of another currency.

It serves as a critical macroeconomic variable influencing international trade, foreign investment, inflation, capital flows, and external sector competitiveness. Exchange rate stability is particularly important for import-dependent economies because fluctuations in currency values directly affect domestic production costs and consumer prices.

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Money supply constitutes the total stock of money circulating within an economy. Changes in money supply influence aggregate demand, inflation, interest rates, and exchange rate movements through the monetary transmission mechanism. Excessive monetary expansion often increases demand for foreign currencies, leading to exchange rate depreciation, while prudent liquidity management supports macroeconomic stability.

The Monetary Policy Rate is the benchmark interest rate used by the Central Bank to signal the direction of monetary policy. Changes in the policy rate influence lending rates, savings decisions, investment expenditure, and capital flows. Under conventional macroeconomic theory, higher policy interest rates encourage foreign capital inflows and strengthen the domestic currency, although this relationship may be weakened by structural and institutional factors.

The Liquidity Ratio represents the proportion of liquid assets that deposit money banks are required to maintain relative to their deposit liabilities. By influencing the volume of funds available for lending, liquidity ratio adjustments affect credit creation, money supply growth, and broader macroeconomic conditions. Although primarily designed to ensure banking sector stability, liquidity regulation also indirectly affects exchange rate dynamics through its influence on domestic liquidity conditions.

### 2.2 Theoretical Framework

This study is anchored primarily on the Mundell–Fleming Model, which extends the traditional IS–LM framework to an open economy. The model predicts that monetary policy influences exchange rates through interest rate differentials and international capital mobility. Contractionary monetary policy raises domestic interest rates, attracts foreign capital, and results in currency appreciation, while expansionary monetary policy increases liquidity and contributes to currency depreciation.

The analysis is further supported by the Quantity Theory of Money, which explains the relationship between monetary expansion, inflation, and exchange rate depreciation, and the Purchasing Power Parity (PPP) theory, which posits that exchange rates adjust over time to reflect differences in national price levels. The International Fisher Effect also provides additional theoretical justification by linking expected exchange rate changes to interest rate differentials across countries.

Collectively, these theoretical perspectives provide a comprehensive framework for analyzing how monetary policy instruments influence exchange rate dynamics in an oil-dependent developing economy such as Nigeria.

### 2.3 Empirical Review

The relationship between monetary policy and exchange rate dynamics has attracted considerable empirical attention in both developed and developing economies because exchange rate stability remains a fundamental objective of macroeconomic management. Exchange rate fluctuations influence inflation, international trade, capital flows, foreign direct investment, and overall economic growth, thereby making the effectiveness of monetary policy

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a subject of continuing academic and policy debate. Despite the extensive body of literature, empirical findings remain inconclusive owing to differences in monetary policy frameworks, exchange rate regimes, sample periods, econometric methodologies, and structural characteristics of individual economies.

Evidence from advanced and emerging economies generally suggests that monetary policy influences exchange rate movements through changes in interest rate differentials, inflation expectations, money supply, and capital mobility. The International Monetary Fund (2023) reported that monetary tightening generally contributes to exchange rate appreciation by reducing inflation expectations and attracting foreign capital inflows. Nevertheless, the report observed that the effectiveness of monetary policy depends largely on fiscal discipline, institutional credibility, financial market development, and the degree of exchange rate flexibility. Countries characterized by persistent fiscal imbalances and weak macroeconomic institutions experienced relatively limited exchange rate stabilization despite substantial increases in policy interest rates. Similar findings have been reported in cross-country studies, which conclude that monetary policy transmission is stronger in economies with credible central banks, well-developed financial markets, and flexible exchange rate systems.

Although the theoretical relationship between monetary policy and exchange rates appears well established, empirical evidence from developing economies presents a more complex picture. Commodity-exporting countries, particularly those dependent on crude oil exports, often experience exchange rate fluctuations driven more by external shocks than by domestic monetary policy actions. Consequently, several studies argue that monetary policy alone may be insufficient to achieve exchange rate stability in economies characterized by weak productive capacity, shallow financial markets, and persistent external sector vulnerabilities.

Empirical studies conducted in Nigeria equally reveal mixed findings. Aliyu (2011), using a Vector Error Correction Model to examine the determinants of exchange rate behaviour between 1986 and 2009, found that monetary expansion significantly contributed to exchange rate depreciation, while improvements in international crude oil prices enhanced exchange rate stability through increased foreign exchange earnings. The study concluded that although monetary policy plays an important role in exchange rate management, external sector developments exert substantial influence on the value of the naira.

Ndubuisi, Uma, and Obidike (2017) utilized data from 1981 to 2014 to investigate the effectiveness of monetary policy in ensuring exchange rate stability in Nigeria. The multiple regression approach, the Johansen co-integration test, and the ECM were used in the analysis. The findings divulged that the variables had a long-run connection, as well as the presence of one co-integrating vector in the model. The results also demonstrated that monetary policy had a considerable influence on exchange rates, whereas the ECM demonstrated the amount to which deviations from a steady path reverted to stability. It was suggested that earnest efforts be made to narrow the discrepancy between the official and parallel market currency rates.

Subsequent studies have produced varying conclusions regarding the relative importance of individual monetary policy instruments. Imoagwu et al. (2022) investigated the effectiveness

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of monetary policy in promoting price and exchange rate stability using Johansen cointegration and the Error Correction Model. Their findings indicated that monetary policy instruments exert significant long-run effects on exchange rate behaviour, although the magnitude of these effects differed across policy instruments. The authors recommended improved coordination between monetary and fiscal authorities to strengthen macroeconomic stability.

Recent Nigerian studies have increasingly adopted the Autoregressive Distributed Lag (ARDL) framework because of its ability to estimate both short-run dynamics and long-run equilibrium relationships among variables integrated of mixed orders. A study published in the Journal of Economic Studies employing annual data from 1986 to 2023 found that the Monetary Policy Rate exerted a statistically significant influence on exchange rate movements, whereas money supply demonstrated a positive but statistically insignificant relationship with exchange rate depreciation. The study further established that real output growth and private sector credit significantly influenced exchange rate behaviour, suggesting that broader macroeconomic conditions determine the effectiveness of monetary policy interventions.

Effiong U.E et al (2022) investigates the impact of monetary on exchange rate movements in Nigeria from 1985 to 2020, using data from the Central Bank of Nigeria. The researchers employed econometric techniques including Ordinary Least Squares (OLS), threshold regression, impulse response functions, and variance decomposition. The findings show that among monetary policy variables, broad money supply had a positive and statistically significant effect on exchange rate movements.

Similarly, Maccido and Lawali (2026) examined the effects of monetary policy on exchange rate dynamics in Nigeria using monthly data covering the period 2012–2025. Applying the ARDL Bounds Testing approach alongside impulse response analysis and variance decomposition techniques, the authors found that neither the Monetary Policy Rate nor inflation exerted statistically significant long-run effects on exchange rate movements. Their results further indicated the absence of a stable cointegrating relationship among the variables, implying that exchange rate dynamics during the study period were influenced more by structural and external factors than by conventional monetary policy instruments alone.

In another recent contribution, Obode and Gini (2026) analyzed the effectiveness of monetary policy under Nigeria's official and parallel foreign exchange markets using ARDL and threshold regression models. Their findings demonstrated that monetary policy effects differed substantially across exchange rate regimes. Specifically, monetary tightening generated stronger exchange rate responses only after policy interest rates exceeded certain threshold levels, suggesting the existence of asymmetric monetary policy transmission within the Nigerian economy. The study concluded that exchange rate management should account for nonlinear responses arising from structural distortions in the foreign exchange market.

Recent evidence has also highlighted the importance of external sector variables in explaining exchange rate movements. A study examining the interaction among monetary policy, foreign reserves, foreign direct investment, and exchange rate stability found that while money supply influenced exchange rate behaviour primarily in the short run, foreign reserve accumulation

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significantly strengthened exchange rate stability over the long run. The authors argued that exchange rate management requires a combination of prudent monetary policy, adequate reserve accumulation, and sustained investor confidence rather than reliance on policy interest rates alone.

The growing literature following Nigeria's recent exchange rate liberalization reforms similarly suggests that monetary tightening has contributed to improving investor confidence and reducing speculative pressures within the foreign exchange market. Nevertheless, these studies consistently observe that exchange rate stabilization remains constrained by persistent inflationary pressures, inadequate foreign exchange supply, fiscal imbalances, and the economy's heavy dependence on crude oil exports. Consequently, recent policy assessments argue that monetary policy should operate alongside complementary fiscal, structural, and external sector reforms to achieve durable exchange rate stability.

A careful review of empirical literature reveals several important observations. First, although most studies acknowledge that monetary policy influences exchange rate dynamics, there is little consensus regarding which monetary policy instrument exerts the greatest effect. While some researchers identify the Monetary Policy Rate as the principal transmission mechanism, others conclude that money supply, liquidity conditions, inflation, foreign reserves, or international crude oil prices provide stronger explanations for exchange rate movements. Second, methodological differences have contributed significantly to the divergent empirical findings reported in the literature. Previous studies have employed Ordinary Least Squares (OLS), Vector Autoregression (VAR), Vector Error Correction Models (VECM), Structural VAR, Johansen cointegration techniques, Generalized Method of Moments (GMM), and Autoregressive Distributed Lag (ARDL) models, each possessing different assumptions and estimation properties. Third, many earlier Nigerian studies relied on relatively short sample periods that excluded recent macroeconomic reforms, including exchange rate liberalization, foreign exchange market unification, and the post-COVID-19 monetary policy framework. Consequently, their findings may not adequately reflect the evolving relationship between monetary policy and exchange rate dynamics under the current policy environment.

Furthermore, many existing studies concentrate on individual monetary policy instruments without simultaneously examining the combined effects of the Monetary Policy Rate, Money Supply, Liquidity Ratio, inflation, and international crude oil prices within a unified empirical framework. Relatively few studies have employed sufficiently long time-series data capable of capturing multiple exchange rate regimes, major monetary policy reforms, episodes of oil price volatility, and structural changes spanning several decades. This limitation restricts the ability to draw comprehensive policy conclusions regarding the effectiveness of monetary policy across different macroeconomic environments.

Against this background, the present study contributes to the literature by employing the Autoregressive Distributed Lag (ARDL) approach to examine both the short-run and long-run effects of selected monetary policy instruments on exchange rate dynamics in Nigeria over the period 1985–2025. Unlike many previous studies, the analysis simultaneously incorporates the Monetary Policy Rate, Money Supply, Liquidity Ratio, inflation, and international crude oil

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prices within a single empirical framework while extending the sample period to include recent monetary policy and exchange rate reforms. By addressing these methodological and empirical limitations, the study provides more comprehensive and policy-relevant evidence on the effectiveness of conventional monetary policy instruments in promoting exchange rate stability in Nigeria.

## 3. METHODOLOGY

### 3.1 Theoretical Foundation of the Empirical Model

The empirical model is anchored primarily on the Mundell–Fleming Open Economy Model, which extends the traditional IS–LM framework by incorporating the external sector. The model postulates that monetary policy influences exchange rates through changes in domestic interest rates, capital mobility, and aggregate demand. Under a flexible exchange rate regime, contractionary monetary policy increases domestic interest rates, attracts foreign capital inflows, and strengthens the domestic currency, whereas expansionary monetary policy increases liquidity and exerts depreciation pressure on the exchange rate.

The empirical specification is further supported by the Quantity Theory of Money (QTM), which explains how changes in money supply affect inflation and exchange rate movements, and the Purchasing Power Parity (PPP) theory, which suggests that exchange rates adjust over time to reflect differences in domestic and foreign price levels. The International Fisher Effect also provides theoretical justification by linking interest rate differentials to expected exchange rate movements.

Collectively, these theories provide a robust conceptual foundation for modelling the relationship between monetary policy instruments and exchange rate dynamics in Nigeria.

### 3.2 Model Specification

The study specifies exchange rates as a function of selected monetary policy instruments and relevant macroeconomic control variables. The exchange rate determination can be expressed as:

$$EXR_t = f(MPR_t, LR_t, MS_t, INF_t, OILP_t)$$

More explicitly:

$$EXR_t = \alpha_0 + \alpha_1 MPR_t + \alpha_2 LR_t + \alpha_3 MS_t + \alpha_4 INF_t + \alpha_5 OILP_t + u_t$$

Where:

$EXR_t$= Exchange rate

$MPR_t$= Monetary Policy Rate

$LR_t$= Liquidity Ratio

$MS_t$= Money Supply

$INF_t$= Inflation rate

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$OILP_t$= Oil price

$u_t$= stochastic error term

To improve the statistical properties of the data and minimize heteroscedasticity, variables measured in monetary values are transformed into their natural logarithmic forms where appropriate. The estimated log-linear model is therefore expressed as:

$$\text{Ln}\,(EXR_t) = \alpha_0 + \alpha_1 MPR_t + \alpha_2 LR_t + \alpha_3 \ln(MS_t) + \alpha_4 INF_t + \alpha_5 Ln(OILP_t) + u_t$$

The expected apriori signs of the explanatory variables are presented in Table 1.

**Table 1: Variables, A priori Expectations and Sources**

| Variables | Expectation | Source |
|---|---|---|
| Exchange Rate (EXR) | Dependent variable | CBN Statistical Bulletin (2023) |
| Monetary Policy Rate(MPR) | Negative | CBN Statistical Bulletin (2023) |
| Liquidity Ratio (LR) | Negative | Central Bank of Nigeria |
| Money Supply | Positive | Central Bank of Nigeria |
| Inflation | Positive | National Bureau of Statistics(NBS) |
| Oil Price | Negative | National Bureau of Statistics(NBS) |

Higher policy interest rates and tighter liquidity conditions are expected to strengthen the domestic currency, whereas increases in money supply and inflation are expected to exert depreciation pressure on the exchange rate. Rising international crude oil prices are expected to improve foreign exchange earnings and support exchange rate appreciation in an oil-exporting economy such as Nigeria.

### 3.3 Measurement of Variables

The dependent variable is the official annual average exchange rate of the Nigerian Naira against the United States Dollar.

The explanatory variables include:

- **Monetary Policy Rate (MPR):** the benchmark interest rate determined by the Central Bank of Nigeria.
- **Broad Money Supply (M2):** representing overall liquidity within the economy.
- **Liquidity Ratio (LR):** the statutory minimum liquidity ratio prescribed for deposit money banks.
- **Inflation Rate (INF):** annual percentage change in the Consumer Price Index.
- **International Crude Oil Price (COP):** annual average Brent crude oil price measured in US dollars per barrel.

These variables were selected because they represent the principal channels through which monetary policy influences exchange rate behaviour while accounting for important external shocks affecting the Nigerian economy.

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### 3.4 Sources of Data

The study relies exclusively on secondary data obtained from credible national and international institutions. Exchange rate, money supply, monetary policy rate, liquidity ratio, and inflation data were obtained primarily from publications of the Central Bank of Nigeria (CBN), including the Statistical Bulletin and Annual Reports. International crude oil price data were sourced from internationally recognized energy and financial databases.

The use of official macroeconomic data enhances the reliability, consistency, and comparability of empirical analysis.

### 3.5 Estimation Technique

The study adopted the Autoregressive Distributed Lag (ARDL) framework, as popularized by Pesaran et al. (2001), to examine the impact of selected monetary policy instruments on exchange rates in Nigeria. This model is selected for its ability to simultaneously estimate both long-run and short-run dynamics regardless of whether the underlying variables are integrated of order I(0), I(1), or a mixture of both. The functional relationship is expressed as follows:

$$EXR_t = f(MPR_t, LR_t, MS_t, INF_t, OILP_t)$$

Following the Unrestricted Error Correction Model (UECM) representation, the ARDL model for this study is specified as:

$$\begin{aligned}\Delta EXR_t = \alpha_1 + \lambda_1 EXR_{t-1} + \lambda_2 MPR_{t-1} + \lambda_3 LR_{t-1} + \lambda_4 MS_{t-1} + \lambda_5 INF_{t-1} + \lambda_6 OILP_{t-1} \\ + \sum_{i=1}^{n} \beta_t \Delta EXR_{t-1} + \sum_{i=0}^{n} \beta_t \Delta MPR_t + \sum_{i=1}^{n} \beta_t \Delta LR_{t-1} + \sum_{i=1}^{n} \beta_t \Delta MS_{t-1} \\ + \sum_{i=1}^{n} \beta_t \Delta INF_{t-1} + \sum_{i=0}^{n} \beta_t \Delta OILP_t + \epsilon_{1t}\end{aligned}$$

The equation expresses the change in the exchange rate ($\Delta EXR_t$) as a function of its own history and several macroeconomic drivers, where EXR, MPR, LR, MS, INF, OILP and their lags represent exchange rate, monetary policy rate, liquidity ratio, money supply, inflation, oil price and their lags respectively, while λ's and β's are the long-run, and short run coefficient parameters, respectively. The $\epsilon_{1t}$ is the error term (white noise or residual), representing factors not captured by the model. The coefficients $\lambda_1$ through $\lambda_6$ represent the long-run coefficients, which are associated with the lagged levels (not difference) of the variables, the coefficients β represent the immediate, short-term impact of changes in the variables.

The theoretical justification for using contemporaneous effect - events happening in the same time period ($i = 0$), for MPR and OILP is because under the Mundell-Fleming framework, interest rate changes trigger immediate capital flows and market expectations. In Nigeria, a change in the MPR is a high-profile "signaling device". Investors and speculators in the forex market react instantly to the announcement of a rate hike or cut, making the current period's change ($i = 0$) crucial for capturing this immediate shock. In addition, Nigeria is an oil-dependent economy where crude oil exports account for over 85% of foreign exchange

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earnings. Global oil price shocks impact the country's foreign reserves and the perceived value of the Naira almost immediately. Because oil prices are determined in global markets, they are exogenous to the Nigerian economy, meaning there is little risk of "feedback bias" if the current period's price is included in the model. However, contemporaneous effects are excluded for LR, MS and INF. The LR, and MS are quantity-based instruments that are associated with significant transmission lags. Studies in Nigeria suggest that changes in the broad money supply liquidity ratio can take months to fully filter through the banking system (time-lagged transmission) before affecting the exchange rate. As such, including contemporaneous effects for money supply and liquidity ratio may lead to simultaneity bias. For instance, a sudden depreciation in the exchange rate might force the Central Bank of Nigeria to inject liquidity or adjust bank reserves in the same month to stabilize the market. If you use contemporaneous effect ($i = 0$), the model won't know if MS is driving EXR or if EXR is driving MS. Moreover, according to the Purchasing Power Parity (PPP) theory, inflation affects exchange rates over the long run, but in the short run, there is a "pass-through" lag. High inflation today doesn't always change the exchange rate this afternoon; the effect is usually observed in subsequent periods as price levels adjust. Hence, excluding contemporaneous effect avoids simultaneity and captures delayed price effects.

Moreover, going by the error correction framework specified above, we therefore specify the error correction method model as follows:

$$ECT_{t-1} = rEXR_{t-1} - (\lambda_0 + \lambda_1 MPR_{t-1} + \lambda_2 LR_{t-1} + \lambda_3 MS_{t-1} + \lambda_4 INF_{t-1} + \lambda_5 OILP_{t-1})$$

Where ECT = error correlation term, and other variables are as defined above.

### 3.6 Diagnostic and Stability Tests

To ensure the reliability and robustness of the estimated model, several post-estimation diagnostic tests are conducted.

Serial correlation is examined using the Breusch–Godfrey LM test, while heteroscedasticity is assessed using the Breusch–Pagan–Godfrey test. Residual normality is evaluated through the Jarque–Bera test, and model specification is verified using the Ramsey RESET test.

The stability of the estimated coefficients is examined using the **CUSUM** and **CUSUM of Squares (CUSUMSQ)** tests. These tests determine whether the estimated parameters remain stable throughout the sample period despite major macroeconomic reforms and structural changes. Collectively, these diagnostic procedures ensure that the estimated ARDL model satisfies the assumptions of classical regression analysis and that the reported empirical findings are statistically reliable, economically meaningful, and suitable for policy inference.

## 4. DATA ANALYSSIS AND EMPIRICAL RESULTS

### 4.1 Test of Stationarity of the Variables

Following the descriptive analysis, this study proceeds to examine the time-series properties of the variables using the Augmented Dickey–Fuller (ADF) unit root test. The purpose of the stationarity test is to determine the order of integration of each variable and to avoid spurious

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regression results. The ADF test is conducted under three alternative specifications: (i) with constant, (ii) with constant and trend, and (iii) without constant and trend. The null hypothesis of the ADF test states that the series has a unit root (i.e., is non-stationary), while the alternative hypothesis suggests stationarity. The decision rule is based on the MacKinnon (1996) one-sided p-values, where a probability value is less than the chosen level of significance leads to the rejection of the null hypothesis.

**Table 2: ADF Result**

| Variable | Decision Level | ADF t-Statistic | p-value | Order of Integration | Decision |
|---|---|---|---|---|---|
| EXR | First Difference (With Constant) | -6.0781 | 0.0031 | I(1) | Stationary at first difference |
| MPR | First Difference (With Constant) | -7.1892 | 0 | I(1) | Stationary at first difference |
| LR | Level (With Constant) | -3.7179 | 0.0075 | I(0) | Stationary at level |
| MS | First Difference (With Constant) | -3.5866 | 0.0056 | I(1) | Stationary at first difference |
| OILP | First Difference (With Constant) | -3.8414 | 0.0036 | I(1) | Stationary at first difference |
| INF | First Difference (With Constant) | -3.9525 | 0.0047 | I(1) | Stationary at first difference |

The results indicate that the lending rate (LR) is stationary at level, implying that it is integrated of order zero, I (0). However, EXR, MPR, MS, OILP and INF become stationary after first differencing, indicating that they are integrated of order one, I (1).

Lag selection is crucial and essential when estimating an equation with the ARDL model, be for a panel or time series. According to (Bahmani-Oskooee and Nasir, 2004) and (Baek, 2014), the lag selection is very sensitive because the result of the F-statistic could be affected in case of time series which could also affect the outcome of the error correction term (in both time series and panel application). In order to choose the lags for each variable, the lags that occur the most frequently will be picked and used in all subsequent estimation. Indicated by the most prevalent lag, all variables' lag selection is (4,4,2,4,4,4)

**Table 3: Result of Bound Test**

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| F-statistic | 4.024134 | 10% | 2.33 | 3.42 |
| k | 6 | 5% | 2.80 | 4.01 |
| | | 1% | 3.90 | 5.42 |

Source: Author's computation using EVIEWS 10.0 software

### 4.2 Stability Test of the Model

A very important property in the estimation of a model is the constancy or stability of parameters used in that model. This ensures that the estimates remain valid (Dinardo and Johnston, 1999). We thus applied the CUSUM and CUSUMSQ tests developed by Brown et al (1975). The statistics are within the crucial 5% critical boundaries according to the plots of the

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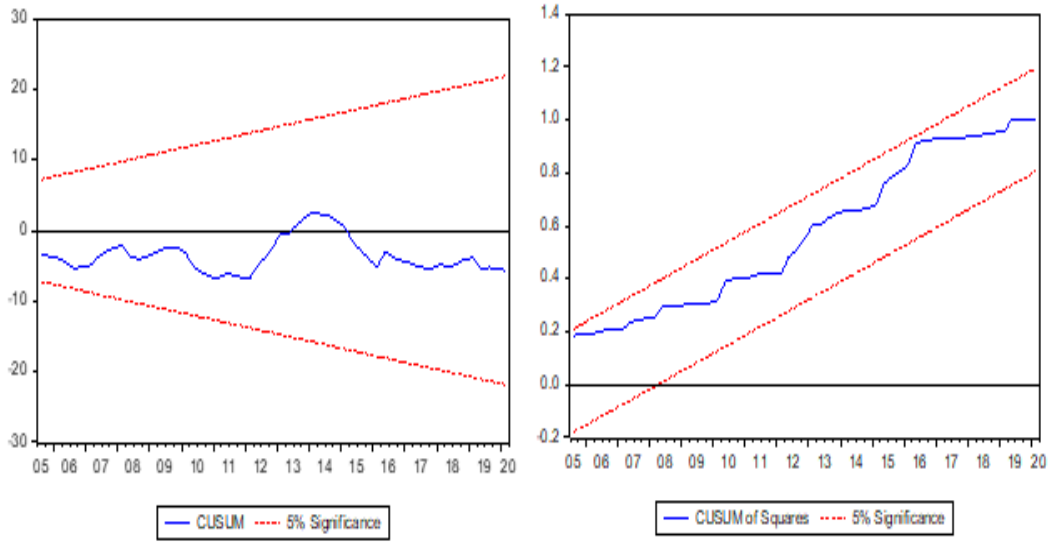
CUSUM and CUSUMSQ, indicating that the model's coefficient is stable as shown below.




### 4.3 Estimation Procedure:

#### 4.3.1 Short-Run Dynamics of Exchange Rate Determination

The short-run ARDL error correction model (ECM) reveals a significant long-run equilibrium relationship between exchange rate and the selected monetary policy and macroeconomic variables. The error correction term (ECT = -0.3846, $p < 0.01$) is negative and significant, indicating that approximately 38.5% of short-run disequilibrium is corrected within one period, reflecting a moderate speed of adjustment toward long-run equilibrium.

Lagged exchange rate changes significantly influence current exchange rate movements, demonstrating short-run persistence and corrective adjustments. The monetary policy rate (MPR) has no immediate effect but exerts a significant positive impact through its lagged values, suggesting delayed transmission of monetary policy.

The **liquidity ratio (LR)** is insignificant contemporaneously but becomes significant after one lag, indicating that liquidity management affects exchange rate movements indirectly through the banking system.

**Table 4: Short-Run Estimates**

| |
|---|
| Dependent Variable: D(EXR) |
| Method: ARDL |
| Date: 01/05/26 Time: 16:00 |
| Sample: 1985 2025 |
| Included observations: 37 |
| Dependent lags: 4 (Automatic) |
| Automatic-lag linear regressors (4 max. lags): MPR LR MS OILP INF |
| Deterministics: Restricted constant and no trend (Case 2) |
| Model selection method: Akaike info criterion (AIC) |

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| Number of models evaluated: 12500 | | | | |
|---|---|---|---|---|
| Selected model: ARDL(4,4,2,4,4,4) | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| COINTEQ* | -0.3846 | 0.0415 | 9.2726 | 0.0000 |
| D(EXR(-1)) | -0.9212 | 0.1677 | -5.4923 | 0.0001 |
| D(EXR(-2)) | 0.6022 | 0.1558 | 3.8648 | 0.0015 |
| D(EXR(-3)) | 1.3320 | 0.2191 | 6.0800 | 0.0000 |
| D(MPR) | 0.9485 | 0.7359 | 1.2889 | 0.2170 |
| D(MPR(-1)) | 6.7326 | 0.9603 | 7.0110 | 0.0000 |
| D(MPR(-2)) | 7.3663 | 0.9194 | 8.0125 | 0.0000 |
| D(MPR(-3)) | 4.7306 | 1.0887 | 4.3451 | 0.0006 |
| D(LR) | -0.3840 | 0.2304 | -1.6669 | 0.1163 |
| D(LR(-1)) | 1.1478 | 0.2275 | 5.0448 | 0.0001 |
| D(MS) | 0.0000 | 0.0000 | 23.4095 | 0.0000 |
| D(MS(-1)) | 0.0000 | 0.0000 | 6.1685 | 0.0000 |
| D(MS(-2)) | 0.0000 | 0.0000 | -6.2531 | 0.0000 |
| D(MS(-3)) | 0.0000 | 0.0000 | -5.9477 | 0.0000 |
| D(OILP) | 0.0002 | 0.0006 | 0.3296 | 0.7463 |
| D(OILP(-1)) | -0.0043 | 0.0008 | -5.2929 | 0.0001 |
| D(OILP(-2)) | -0.0131 | 0.0012 | -10.4944 | 0.0000 |
| D(OILP(-3)) | -0.0081 | 0.0014 | -5.7108 | 0.0000 |
| D(INF) | -0.2637 | 0.2462 | -1.0711 | 0.3011 |
| D(INF(-1)) | -1.2366 | 0.2866 | -4.3149 | 0.0006 |
| D(INF(-2)) | -1.4562 | 0.2276 | -6.3991 | 0.0000 |
| D(INF(-3)) | -0.8407 | 0.2645 | -3.1789 | 0.0062 |

Source: Authors' computation using Eviews 13

Money supply (MS) has a strong and significant short-run influence, with current and first-lag increases causing exchange rate depreciation, while later lags indicate corrective adjustments. Oil prices (OILP) have no immediate impact but significantly appreciate the exchange rate after a lag, reflecting improved foreign exchange inflows from oil exports.

Inflation (INF) is insignificant contemporaneously but its lagged values significantly influence exchange rate movements, indicating that inflation affects the exchange rate indirectly over time.

### 4.4 Long-run ARDL Estimates

Table 5 reports the estimated ARDL (4, 4, 2, 4, 4, 4) level equation for the exchange rate and selected monetary policy variables in Nigeria from 1989–2025. The model, selected using the Akaike Information Criterion (AIC), indicates that exchange rate movements are highly persistent, with significant lagged exchange rate terms reflecting both inertia and long-run correction.

Among the monetary policy variables, the monetary policy rate (MPR) has no significant long-run effect on the exchange rate. In contrast, the liquidity ratio (LR) has a significant negative effect, suggesting that tighter banking system liquidity contributes to exchange rate stability.

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**Table 5: Long-Run Estimates**

| Dependent Variable: EXR | | | | |
|---|---|---|---|---|
| Method: ARDL | | | | |
| Date: 01/05/26 Time: 16:00 | | | | |
| Sample: 1985 2025 | | | | |
| Included observations: 37 | | | | |
| Dependent lags: 4 (Automatic) | | | | |
| Automatic-lag linear regressors (4 max. lags): MPR LR MS OILP INF | | | | |
| Deterministics: Restricted constant and no trend (Case 2) | | | | |
| Model selection method: Akaike info criterion (AIC) | | | | |
| Number of models evaluated: 12500 | | | | |
| Selected model: ARDL(4,4,2,4,4,4) | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.*** |
| EXR(1) | 0.4635 | 0.2079 | 2.2290 | 0.0528 |
| EXR(2) | 1.5234 | 0.4544 | 3.3522 | 0.0085 |
| EXR(3) | 0.7298 | 0.4007 | 1.8214 | 0.1019 |
| EXR(4) | -1.3320 | 0.3369 | -3.9535 | 0.0033 |
| MPR | 0.9485 | 1.4255 | 0.6654 | 0.5225 |
| MPR(1) | 0.9882 | 1.3196 | 0.7488 | 0.4731 |
| MPR(2) | 0.6338 | 2.1229 | 0.2985 | 0.7721 |
| MPR(3) | -2.6357 | 1.6436 | -1.6036 | 0.1433 |
| MPR(4) | -4.7306 | 2.9759 | -1.5897 | 0.1464 |
| LR | -0.3840 | 0.4080 | -0.9412 | 0.3712 |
| LR(-1) | -0.7380 | 0.3354 | -2.2003 | 0.0553 |
| LR(-2) | -1.1478 | 0.3727 | -3.0797 | 0.0131 |
| MS | 0.0000 | 0.0000 | 11.7750 | 0.0000 |
| MS(-1) | 0.0000 | 0.0000 | -1.5854 | 0.1473 |
| MS(-2) | 0.0000 | 0.0000 | -5.0305 | 0.0007 |
| MS(-3) | 0.0000 | 0.0000 | -0.6646 | 0.5229 |
| MS(-4) | 0.0000 | 0.0000 | 3.1141 | 0.0124 |
| OILP | 0.0002 | 0.0015 | 0.1339 | 0.8964 |
| OILP(1) | -0.0014 | 0.0013 | -1.0572 | 0.3180 |
| OILP(2) | -0.0088 | 0.0019 | -4.6755 | 0.0012 |
| OILP(3) | 0.0050 | 0.0020 | 2.4941 | 0.0342 |
| OILP(4) | 0.0081 | 0.0029 | 2.7837 | 0.0213 |
| INF | -0.2637 | 0.6209 | -0.4247 | 0.6810 |
| INF(-1) | 0.5467 | 0.6406 | 0.8534 | 0.4156 |
| INF(-2) | -0.2197 | 0.8803 | -0.2496 | 0.8085 |
| INF(-3) | 0.6155 | 0.5078 | 1.2121 | 0.2563 |
| INF(-4) | 0.8407 | 0.5692 | 1.4770 | 0.1738 |
| C | 117.2544 | 37.0635 | 3.1636 | 0.0115 |

Money supply (MS) is positive and highly significant, implying that monetary expansion leads to exchange rate depreciation, although some lagged effects indicate subsequent corrections. Oil prices (OILP) significantly influence exchange rate dynamics, with higher oil prices initially supporting exchange rate appreciation through increased foreign exchange inflows, while later lags capture delayed adjustment effects. Inflation (INF) is statistically insignificant, indicating that it does not independently affect the exchange rate after controlling for other macroeconomic variables.

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### 4.5 Discussion of Findings

This section discusses the empirical findings of the study in line with the specific objectives, drawing insights from the ARDL estimation results, bounds test, and Granger causality analysis. The discussion emphasizes both the short-run and long-run dynamics of monetary policy instruments and their implications for exchange rate behavior in Nigeria.

#### 4.5.1 Impact of Monetary Policy Rate on Exchange Rate in Nigeria

The findings of the study reveal that the monetary policy rate (MPR) does not exert a statistically significant contemporaneous effect on the exchange rate in Nigeria. Both the short-run ARDL estimates, and the long-run coefficients indicate that changes in the policy rate are weakly transmitted to exchange rate movements. While some lagged values of MPR appear statistically significant in the short run, the direction and magnitude of these effects are inconsistent, suggesting instability in the interest rate–exchange rate transmission mechanism.

This result implies that monetary tightening or easing through adjustments in the policy rate does not immediately translate into exchange rate appreciation or depreciation. In theory, an increase in interest rates is expected to attract foreign capital inflows, leading to exchange rate appreciation through the interest rate parity condition. However, the Nigerian case deviates from this theoretical expectation due to structural rigidities in the financial system, shallow capital markets, and persistent foreign exchange supply constraints.

Furthermore, the dominance of oil revenue in Nigeria's foreign exchange earnings weakens the effectiveness of the interest rate channel. Exchange rate movements are largely driven by exogenous shocks such as oil price volatility rather than domestic interest rate adjustments. This explains why MPR changes fail to exert a predictable influence on the exchange rate, reinforcing the view that monetary policy rate is a weak exchange rate management tool in Nigeria.

#### 4.5.2 Impact of Liquidity Ratio on Exchange Rate in Nigeria

The results indicate that the liquidity ratio (LR) has a statistically significant impact on exchange rate movements, particularly in the short run. Lagged values of the liquidity ratio exert notable effects on the exchange rate, suggesting that banking sector liquidity conditions play a role in shaping foreign exchange dynamics.

An increase in liquidity ratio, which reflects a higher proportion of liquid assets held by banks, tends to influence the availability of credit and money circulation within the economy. Higher liquidity may fuel demand for foreign exchange through increased imports and capital outflows, thereby exerting depreciation pressure on the domestic currency. Conversely, tighter liquidity conditions may constrain foreign exchange demand, supporting exchange rate stability. The significance of liquidity ratio underscores the importance of macroprudential policy tools in exchange rate management. Unlike the monetary policy rate, which operates through interest rate signaling, liquidity regulations directly affect the volume of funds available in the banking system. This makes the liquidity ratio a more effective indirect instrument for influencing exchange rate dynamics in Nigeria.

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### 4.5.3 Impact of Money Supply on Exchange Rate in Nigeria

The empirical findings show that money supply (MS) has a strong and statistically significant effect on the exchange rate in both the short run and the long run. Changes in money supply exert immediate and persistent impacts on exchange rate movements, confirming the relevance of the monetary expansion channel in Nigeria.

Increases in money supply are associated with exchange rate depreciation, reflecting excess liquidity in the economy and heightened demand for foreign currency. This aligns with the monetary approach to exchange rate determination, which posits that excessive growth in domestic money supply relative to output leads to currency depreciation.

The bi-directional causality observed between money supply and exchange rate further reinforces the central role of monetary aggregates in Nigeria's exchange rate dynamics. Exchange rate depreciation often prompts monetary expansion through increased domestic currency valuation of foreign earnings, while expansionary monetary policy fuels exchange rate pressures. This feedback loop highlights the sensitivity of Nigeria's exchange rate to liquidity conditions rather than interest rate adjustments.

## 5. RECOMMENDATIONS AND CONCLUSION

Based on the findings of this study, several policy recommendations are proposed to enhance the effectiveness of monetary policy in stabilizing the exchange rate in Nigeria.

There is a need for the Central Bank of Nigeria to strengthen the monetary policy transmission mechanism by deepening the financial system, improving policy credibility, and enhancing communication with market participants. A transparent and predictable policy environment will help anchor expectations and improve the responsiveness of exchange rate movements to monetary policy actions.

Maintaining strict monetary discipline is also essential, particularly with respect to controlling money supply. Given the strong relationship between money supply and exchange rate depreciation, the Central Bank should intensify liquidity management efforts through effective use of open market operations and other monetary tools to ensure that monetary expansion is consistent with real economic growth.

In addition, effective coordination between monetary and fiscal authorities is crucial. Expansionary fiscal policies, especially when financed through monetary means, tend to undermine the effectiveness of monetary policy. Therefore, the government should pursue prudent fiscal management by reducing budget deficits and limiting reliance on central bank financing.

Furthermore, the Nigerian economy must be diversified to reduce its heavy dependence on crude oil exports. Promoting non-oil sectors such as agriculture, manufacturing, and services will enhance foreign exchange earnings and reduce vulnerability to external shocks, thereby supporting exchange rate stability.

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Structural reforms aimed at improving infrastructure, increasing domestic production, and reducing import dependency should also be prioritized. Strengthening the productive capacity of the economy will reduce demand for foreign goods and ease pressure on the exchange rate.

The Central Bank should also prioritize the accumulation and effective management of external reserves. Adequate reserve buffers will enable the monetary authority to intervene in the foreign exchange market during periods of volatility and external shocks.

Finally, efforts should be made to improve the overall investment climate in Nigeria in order to attract foreign direct investment and portfolio inflows. Policies that promote political stability, regulatory consistency, and ease of doing business will enhance investor confidence and increase capital inflows, thereby supporting exchange rate stability.

This study therefore concludes that monetary policy instruments have significant but limited effectiveness in influencing exchange rate movements in Nigeria. Although tools such as the Monetary Policy Rate, Liquidity Ratio, and Money Supply play important roles, their impact is often weakened by structural and institutional challenges within the economy.

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