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Website: <https://www.ecofunai.ng>

ISSN (Print): 2536-6793 | ISSN (Electronic): 2536-6742

Volume 3 (2) August, 2026 (pp 21 - 39)

Submitted April 2026; Published August 2026.

EXAMINING THE DYNAMICS OF EXCHANGE RATE ON INFLATION IN NIGERIA

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ABSTRACT

This study re-examined the dynamics of the exchange rate on inflation in Nigeria using quarterly time series data spanning from 2010Q1 to 2024Q4. The study employed ARDL techniques and the Granger causality test. The result of the ARDL bound test indicates the existence of a long-run relationship among the variables employed in the model. This result suggests that inflation and the explanatory variables move together in the long run. The result of the long-run coefficients of the exchange rate shows a positive and significant relationship with inflation. Similarly, the short-run coefficients of the exchange rate show a positive and significant relationship with inflation. The Granger causality test indicates the existence of a bidirectional causal relationship between the exchange rate and inflation. Based on these findings, the study concludes that the exchange rate has both short-run and long-run effects on inflation in Nigeria over the study period. Based on these findings, it is recommended that the government should focus on exchange rate stabilization policies to achieve price stability and coordinate monetary, fiscal, and exchange rate policies to break the inflation-depreciation cycle.

Keywords: Exchange Rate, Inflation, ARDL, Granger Causality, Quarterly time series, Nigeria

JEL Classification E31, F31, E52, F41

1. Introduction

The escalating inflationary pressures in recent times, particularly in the aftermath of global economic shocks such as the COVID-19 pandemic and fluctuating global oil prices, have resulted in critical and persistent challenges globally, especially for emerging and developing economies. The issue of inflation stands out due to its profound effects on economic stability and social welfare. It arises from a complex interplay of factors, including external shocks, excessive expansion of the money supply, structural imbalances within the economy, and often a combination of these elements (Idisi et al., 2023). The consequences of inflation are far-reaching, leading to diminished purchasing power, increased cost of living, and heightened social unrest (Idisi et al., 2023).

The exchange rate remains a crucial price variable in any economy, serving both to maintain international competitiveness and to act as a nominal anchor for domestic prices (CBN, 2021). Promoting price stability is recognized as a key objective of exchange rate policy in nearly every country (Mordi, 2006; CBN, 2021). The importance of exchange rate changes for price stability largely depends on their influence on domestic prices and the speed of transmission. When this influence is significant, exchange rate movements alter the relative prices of commodities, leading to rapid adjustments in trade balances.

One of the key challenges in economic policy management globally, especially in emerging and developing economies, is the impact of exchange rate changes on inflation. Exchange rate movements are believed to cause domestic economic distortions and influence a country's economic competitiveness. The detrimental effects of exchange rate misalignment are well documented in the literature, and policy-makers are often reluctant to adjust exchange rates due to perceived negative consequences for the economy, primarily related to price stability. This issue is particularly relevant for analyzing inflation behavior in countries with high import dependence, such as Nigeria.

For instance, Nigeria's annual inflation rate fluctuated significantly between 2010 and 2024, with a notable peak of around 33% in 2023 and early 2024 (CBN, 2024). The rate was 11.8% in 2010 and has experienced periods of both increase and decrease, affected by economic policies and shifts in the consumer price index (CPI) methodology. Inflation surged to over 28% in 2023 and continued to rise to 34.19% in June of 2024 (CBN, 2024), exchange rate moving from N151/\$1 in 2010 to N1,544/\$1 in February of 2024 (CBN, 2024), it is vital to investigate the impact of exchange rate fluctuations on inflation as the period saw aggressive monetary policy measures such as rate hikes by the Central Bank of Nigeria to control inflation and stabilize the naira.

These fluctuations have both macroeconomic implications and policy hurdles. Fluctuations in the exchange rate can translate into the domestic economy, where there tend to be high levels of importation, whether as final consumer goods or intermediate products. This often results in so-called 'imported inflation, where a depreciation of the Nigerian Naira has a direct bearing on prices of imported goods that lead to inflation pressures which undermine the consumers' purchasing power and can destabilize the economy (Bello & Sanusi, 2019). Moreover, inflation serves as a barometer for assessing the efficacy of government policies and the overall health of the economy. Its responsiveness to monetary and fiscal policies, exchange rate fluctuations, and supply-side constraints makes it a crucial indicator for policymakers.

Despite the measures adopted to stabilize the exchange rate and control the increase in prices of goods and services, the two macroeconomic challenges persist in Nigeria. It is imperative to investigate and identify the nature of the relationship and the consequences of the exchange rate on the inflation rate in Nigeria. Though empirical literature has found evidence of significant positive link between exchange rate and inflation (Bala et al, 2025; Anachedo et al, 2025; Ozoji & Ekperechukwu, 2025; Tasan, et al, 2024; Tiamiyu, 2022; Nuhu, 2021; Njuko & Nwaimo, 2019), as well as considerable evidence of insignificant or negative relationship within Nigeria and across countries (Yusuf et al, 2022; Ighoroje & Orife, 2022; Eneh & Amakor, 2021; Okoli, et al., 2016); Lowe, 2019), leading naturally to the question of what the impact of exchange rate on inflation.

Given the escalating inflationary pressures that have hit their worst level in Nigeria, which is predominantly an import-dependent nation, a heavy shock in global oil prices following crises in the Middle East, and the aftermath of the COVID-19 pandemic, it is imperative to revisit and analyze the nexus between exchange rate and inflation within the Nigerian context. Against this background, this study aimed to re-examine the dynamics of the exchange rate on inflation in Nigeria. To achieve this, the study is divided into five sections. Following this introduction, section two reviews the literature, while section three focuses on the data and methods used to achieve the objectives of this study. Section four presents the analysis of the empirical results, while section five concludes the paper and proposes some policy recommendations.

Research Questions

- a. What is the long-run and short-run impact of exchange rate dynamics on inflation in Nigeria?
- b. What is the causal relationship between exchange rate dynamics and inflation in Nigeria?

Objectives of the Study

The broad objective of this study is to re-examine the dynamics of exchange rate on inflation in Nigeria. To achieve that, the following specific objectives were pursued:

- a) To examine the long-run and short-run impact of exchange rate dynamics on inflation in Nigeria.
- b) To investigate the causal relationship between exchange rate dynamics and inflation in Nigeria.

2. Literature Review

2.1 Conceptual Literature

Exchange Rate:

The exchange rate is the price of one currency in terms of another currency; simply put, it is the current market price at which one domestic currency can be exchanged for a foreign one (CBN, 2017; Saheed & Ayodeji, 2012). It is usually expressed as some units of a domestic currency that will buy one unit of a foreign currency and vice versa (CBN, 2017). For example, the Nigerian naira per the United States (US) dollar (N/US\$) or vice versa (Adeyemi, 2024).

The role of the exchange rate in an economy cannot be ignored, as it is a vital price indicator that connects the domestic economy to international markets in economic literature. It quantifies the relative value of one currency to another, shaping trade, investment flows, and macroeconomic stability. In Nigeria, the exchange rate is a benchmark for assessing the naira's strength in the global market (Opuala-Charles, 2023). The exchange rate functions as a policy tool, enabling access to credit and export financing in key sectors such as agriculture and manufacturing, and has remained a major policy focus because the nation relies on crude oil exports and its exposure to external economic shocks (Mamman & Sabo, 2024).

Inflation:

Inflation is defined as the rate of increase in prices of goods and services over a given period of time (Okoye-Ozaji et al 2023). Inflation depicts an economic situation where there is a general and continuous rise in the prices of goods and services. It is simply seen as a term that explains changes in the price of goods and services (Ighoroje, 2022). Inflation could be defined as a continuing rise in prices as measured by an index such as the implicit price deflator for Gross National Product (GNP) or by the consumer price index (CPI). Inflation is usually described as a state where “too much money is chasing too few goods (CBN, 2017). When inflation is present in a country, the money loses purchasing power.

Inflation is a critical economic indicator monitored by central banks to support sustainable growth (Mankiw, 2016). While moderate inflation can signal a growing economy, excessive inflation leads to instability, often driven by demand-pull, cost-push, and built-in factors, especially in developing countries with weaker economic policies (Mankiw, 2016). Its impact spans all sectors: consumers face reduced purchasing power, especially those on fixed incomes; businesses experience planning uncertainties; and governments contend with increased debt servicing costs and diminished real tax revenues (Friedman, 1968). In countries like Nigeria, inflation is often tied to volatile oil prices and expansionary fiscal policies, requiring coordinated monetary, fiscal, and exchange rate measures to maintain economic stability (Adebayo et al., 2017).

2.2 Theoretical Literature

This study is anchored on two theories - the Cost-Push theory and the Law of One Price and Purchasing Power Parity (PPP).

The Cost-Push Theory:

This theory provides a basic perspective to comprehend inflationary forces in Nigeria. Occasioned by a persistent rise in the cost of production due to an increase in the cost of raw materials, energy prices, and wages, thus forcing businesses to transfer these high costs of inputs to consumers in the form of higher prices. Considering the fact that Nigeria heavily depends on imported intermediate goods and services, any variation in the exchange rate leads to an increase in the prices of imports and, in turn, results in an increase in the general price level through cost-push-inflation. Cost-push inflation is well correlated for Nigeria as an import-dependent country; hence, any depreciation of the Naira translates to a higher cost of imported goods. The country's high import base coupled with constant depreciation of the currency triggers high import costs, hence placing strong inflationary pressure on businesses that pass the cost on to consumers. Similarly, currency depreciation is another cost-push inflation factor in Nigeria. Considering Nigeria's structure of operating under the Import List system, devaluation of the Naira influences the prices of goods and services within Nigeria, especially fuel, food and raw materials. In this situation, the exchange rate fluctuations cause inflation since they increase the price of these imported goods and services. Other cost-

push factors include unemployment-modelled wage-price inflation spiral, and supply shocks like the global prices of oil, as this influences revenue collected, thereby contributing to currency fluctuations. As several enterprises in Nigeria rely on imported energy products, oscillating oil prices will no doubt have an impact on production and, consequently, prices for end consumers.

Law of One Price and Purchasing Power Parity (PPP):

The doctrine of the law of one price and purchasing power parity (PPP), an offshoot of the law of one price (LOOP). The PPP Theory explains the relationship between prices and exchange rates, while assuming that barriers to trade and transport costs are nonexistent. However, in real-world situations, trade barriers do exist, which distort the underlying assumptions of PPP to their very core. Notwithstanding these developments, the law of one price remains useful for understanding the relationship between prices and exchange rates. This relationship, linking the domestic price to the exchange rate, follows from the LOOP; accordingly, the LOOP states that in the absence of trade frictions and under conditions of free competition and price flexibility, identical goods sold in different locations must sell for the same price when prices are expressed in a common currency. In other words, if there are no trade barriers and in a market with free competition and flexible prices, identical goods sold in different locations should be priced the same when expressed in the same currency. Therefore, at equilibrium, the prices of tradable goods in two markets are not expected to differ when expressed in the same currency and thus guarantee a complete pass-through. Therefore, a change in the domestic currency in one market would cause an equal change in price in the other market, even though the markets are in two different countries. Algebraically, PPP with no transport costs and tariffs can be written thus:

$$P_t^a = EXC_t P_t^* \dots \dots \dots (1)$$

Where P_t^a represents the domestic price at time t , P_t^* stands for the world import price, and EXC_t is the nominal exchange rate.

However, due to trade frictions, the LOOP may or may not hold in certain instances. This is based on the fact that many factors, such as production cost, producers' markup, and exchange rate fluctuations, can influence both domestic and import prices (Feenstra & Taylor, 2008).

The principle of PPP is the macroeconomic counterpart to the microeconomic LOOP. While LOOP relates exchange rates to the relative prices of an individual good, PPP relates exchange rates to the relative prices of a basket of goods. Both theories serve as the theoretical background for exchange rate pass-through, depending on whether the emphasis is at the firm level or the macroeconomic level. However, PPP does not hold in the short run due to transaction costs, non-traded goods, price stickiness, imperfect competition, and some legal obstacles (Feenstra & Taylor, 2008).

2.3 Empirical Literature

Empirical scrutiny on the link between exchange rate and inflation explored numerous global contexts and methodologies, contributing to a deeper understanding of the effect of exchange rate fluctuations on domestic prices. The empirical review here synthesizes crucial recent studies to highlight their methodology and findings.

Bala et al (2025) examined exchange rate volatility and inflation rate in Nigeria and found that foreign exchange volatility significantly influences inflation in Nigeria, primarily through imported inflation and

altered consumer behaviour. Also, persistent fluctuations in the Naira's value pose challenges to price stability and economic growth. Higher import costs driven by currency depreciation led to increased prices for consumers, eroding purchasing power and creating economic uncertainty. Similarly, Anachedo et al (2025) explored the effect of exchange rate changes on inflation rates in Nigeria to ascertain the effect of exchange rate fluctuations on inflation rates with data from 1986-2023 and found that Exchange rate changes have a significantly positive effect on inflation. Using a different methodology, John et al (2025) analyzed the foreign exchange pass-through to inflation in Nigeria from 2006 to 2023, using the separate identification Structural Vector Auto Regressive (SVAR) model to capture non-linearity and lags through exchange rate-pass-through, based on higher amplification ratios of consumer prices to exchange rate fluctuations after 2014. They found evidence that cost pull brought about by depreciations is highly costly to inflation and that monetary policy cannot fully address the problem of exchange rate impulses to inflation. The impulse response functions and the variance decomposition results signify not only the short-run and long-run effects of exchange rate fluctuations on inflation, but also increased responsiveness to foreign shocks and policy actions.

Ozaji and Ekperechukwu (2025) examined the effect of exchange rate flexible system on inflation rate in Nigeria using data from 2003 to 2023, applying simple linear regression method (OLS) methods, they discovered that the exchange rate fluctuation has a significant and positive effect on inflation rate and they attribute it to fact that the practices of managed float is in theory, and not in practice, as traced by the extent at which the CBN actually intervene in the currency market when needed to stabilize the exchange rate, while the flexible system is still sustained. Ikpe (2025) analyzed the effects of exchange rate fluctuations and inflation in Nigeria using annual time series data from 1981 to 2022 in an ARDL framework. It was found that the exchange rate was positively and significantly impacting inflation, implying that exchange rate fluctuations are one of the factors that influence inflation. Tasan et al. (2024) used data from 1990 to 2022 and employed Autoregressive Distributed Lag (ARDL) to analyze the impact of exchange rate pass-through (ERPT) on the inflation rate in Nigeria. They found that the exchange rate has a positive and significant impact on the inflation rate. Using the nonlinear autoregressive distributed lag (NARDL) method on data from January 2000 to May 2021, Tiamiyu (2022) examines the degree of exchange rate pass-through to inflation for Nigeria and found that inflation is not determined by only monetary factors, while industrial production contributes to the reduction of consumer prices. Money supply and exchange rate were established to be more influential factors of inflation than the interest rate.

Yusuf et al (2022) investigated exchange rate fluctuation and inflation nexus in Nigeria from 1986 to 2019, using the ARDL technique and found that the interaction of inflation and exchange rate harms the economy in the short run, but it was positive in the long run, concluding that the monetary authority should proactively control the foreign exchange rate movement to curtail the recent surge in inflation and boost the performance of the country's economy. Similar to this finding, Ighoroje and Orife (2022) examined exchange rate fluctuation and inflation rate in Nigeria between the periods 1987 to 2019 and found that macroeconomic variables are not the major causes of inflation rate in Nigeria. Social and political issues such as unrest, consumer confidence, and the political landscape can trigger inflation.

Using a different methodology, Nuhu (2021) examined the effect of exchange rate volatility on inflation in Nigeria with annual data from 1986 to 2019 and the generalized autoregressive conditional heteroskedasticity (GARCH) and vector error correction model (VECM). The result indicated that money supply (MS) and nominal exchange rate (NER) had a positive and significant effect on consumer price index, meaning that inflation in Nigeria is caused by exchange rate fluctuations as well as an increase in money supply. Eneh and Amakor (2021) examined foreign exchange regimes and macroeconomic

performance in Nigeria from 1990 to 2020 with the Ordinary Least Squares (OLS) techniques and found that the relationship between exchange rate regimes and inflation was insignificantly positive, while the relationship between exchange regimes and current account balance (CAB) is positive but not significant at the 5% level of significance. Earlier, Njuko and Nwaimo (2019), with data from 1981 to 2015 and the VECM approach, found that fluctuating exchange rates have significantly impacted the persistence of inflation. Okoli et al. (2016) used the GARCH and Granger causality test on quarterly data spanning from 1970Q1 to 2014Q4. The study found that there is a unidirectional causality running from inflation to real exchange rate volatility in Nigeria. Differently, Enoma (2011), with data from 1986 and 2008 in an ARDL framework, found that exchange rate depreciation has a positive and significant long-run effect on inflation in Nigeria, with that inflationary rate having a lagged cumulative effect, thereby concluding that exchange rate depreciation is the main determinant of inflation in Nigeria.

In a review of countries outside Nigeria, El-Shahed et al (2025) examined the impact of exchange rate fluctuations on inflation in Egypt in an ARDL framework and found that there is a positive relationship between exchange rates and inflation, especially in the long run. Valogo et al. (2023) investigated the effect of exchange rate on inflation in the inflation targeting framework in Ghana from 2002 to 2018 using the threshold autoregressive (TAR) method and found that exchange rate depreciation beyond a monthly threshold of 0.70 percent has a significant positive pass-through effect on inflation, which gives credence to the relevance of the threshold level. Lowe (2019) investigated the relationship between the exchange rate regime and the sources of inflation in The Gambia during the period 1978-2016 and found that there is no long-run relationship between the variable exchange rate and Inflation, in addition to finding that the exchange rate has a positive but not significant relationship with the inflation rate. Madesha et al. (2013) examined the link between exchange rate and inflation in Zimbabwe between 1980 and 2007 using Granger Causality and the cointegration test. They found the existence of a long-run relationship between inflation and the exchange rate and a bidirectional causal relationship between Inflation and the exchange rate.

Irrespective of methodology or frequency of the data used, the empirical research has indicated different results on the effect of the exchange rate on inflation in Nigeria. For example, Bala et al (2025), Anachedo et al (2025), John et al (2025), Tasan et al. (2024), Kehinde (2022), Nuhu (2021), and Njuko and Nwaimo (2019) reported that found that the interaction of inflation and the exchange rate has a negative impact. Ighoroje and Orife (2022) found that macroeconomic variables are not the major causes of the inflation rate, suggesting that social and political issues such as unrest, consumer confidence, and the political landscape can trigger inflation. Eneh and Amakor (2021) found that the relationship between exchange rate regimes and inflation was positive and statistically insignificant. Okoli et al. (2016) found unidirectional causality running from inflation to real exchange rate volatility. Therefore, there is insufficient evidence to establish a clear conclusion on the effect of the exchange rate on inflation in Nigeria. This study aimed to broaden the timeframe by incorporating the recent data to reassess the effect of the exchange rate on inflation dynamics in Nigeria.

3. Methodology

This study used quarterly data spanning from 2010q1 to 2024q4. The choice of this period is guided by data availability on a quarterly basis and focuses on the period characterized by the worst exchange rate amidst an alarming rate of inflation in Nigeria. The dependent variable is the inflation rate, while the independent variables are the exchange rate, interest rate, and global oil prices. The data were sourced from the Central

Bank of Nigeria Statistical Bulletin (CBN, 2024), National Bureau of Statistics (NBS, 2024), and the World Bank (2024).

Table 1 provides a description and measurement of the variables used for this study. In addition, the specific sources of data and the expected values of each variable are as indicated.

Variables	Description and Measurement	Source	A priori Sign
Inflation Rate (INF)	This represents the domestic price level. The series is expressed in percentage (%).	CBN, 2024	Depended variable
Exchange Rate (EXR)	This is to account for exchange rate pass-through; the nominal exchange rate for Naira against the United States Dollar (N/\$). The series is expressed in the rate of N/\$, and expressed in natural log.	CBN, 2024	Positive (+)
Monetary Policy Rate (MPR)	This is to reflect the cost of borrowing, using the short-term interest rate charged by the CBN to lend money to other deposit money banks. The series is expressed in percentages (%).	CBN, 2024	Negative (-)
Money Supply (MS3)	Volume of money in circulation using Broad money supply (M3). The series is in billions of Naira (N), converted and expressed in natural log.	CBN, 2024	Positive (+)
Global Oil Prices (GOP)	This refers to the cost (market value) of a barrel of crude oil. The International Brent crude oil price (US\$/barrel) is used. The series is converted and expressed in natural log.	World Bank (2024)	Positive (+)

Source: Author's compilation, 2026.

This study is anchored on the Purchasing Power Parity (PPP) theory and the model in Ozoji and Ekperechukwu (2025) with some modifications. Their paper focused on the flexible exchange rate system and the inflation nexus in Nigeria. Their functional model is specified as:

$$INF = (EXR) \dots \dots (2)$$

Where INF is the inflation rate, and EXR is the exchange rate. In this study, the monetary policy rate and global oil prices are added to the model to account for the cost of borrowing and foreign exchange availability, and Naira stability, respectively. The functional model of this study is specified as:

$$INF = f(EXR, MPR, MS3, GOP) \dots\dots\dots (3)$$

The mathematical form of the model is expressed as:

$$INF = \beta_0 + \beta_1 EXR + \beta_2 MPR + \beta_3 MS3 + \beta_4 GOP + \varepsilon \dots\dots\dots (4)$$

The log-linear form of the model is expressed as:

$$INF = \beta_0 + \beta_1 EogEXR + \beta_2 MPR + \beta_3 \log MS3 + \beta_4 \log GOP + \varepsilon \dots\dots\dots (5)$$

Where; INF = Inflation rate, EXR = Real exchange rate, MPR = Monetary policy rate, MS3 = Broad money supply = GOP = Global oil prices, β_0 = intercept, $\beta_1 - \beta_4$ = Coefficients of the explanatory variables and ε = Error term

At the beginning, the variables employed in the model were analyzed to assess their stochastic properties and to aid in the selection of the right econometric framework for analysis. The traditional Augmented Dickey-Fuller (ADF) unit root test was employed, to be complemented by the Phillips-Perron (PP) based on the premise that PP is commonly regarded as having superior consistency than the ADF owing to its heftiness amid serial correlation and heteroskedasticity (Phillips & Perron, 1988; Hamilton, 1994). The test was done using constant and trend specifications as indicated in equation (6):

$$x_t = \beta_0 + \beta_1 x_{t-1} + \beta_2 t + \varepsilon_t \dots\dots\dots (6)$$

where x represents the variable of interest, ε_t is the residual, β_0 is the constant, $\beta_1 x_{t-1}$ is the lag value of the variable of interest, and $\beta_2 t$. A stationary time series is a variable with constant mean and variance ($\beta < 1$), while a non-stationary series has different properties over time ($\beta = 1$) or explosive and non-stable ($\beta > 1$). The null hypothesis of the ADF and PP states that there is a unit root in the series. If the p-value of the series is greater than the 5% critical value ($p > 0.05$), we cannot reject. Therefore, the decision rule is that we reject the null hypothesis if the p-value is less than the 5% significance level. This means that the series is stationary and does not have a unit root.

The ARDL bounds testing approach developed by Pesaran and Shin (1999) and Pesaran et al (2001) is used to examine the existence of a long-run relationship. The advantages of the ARDL approach over other traditional approaches lie in its flexibility in using both $I(0)$ and $I(1)$ variables, comfort with a small sample size, and providing an unbiased estimation of long-run parameters (Harris & Sollis, 2003). This is a significant advantage of the bound testing technique since the key variables should be steady while the other variables should not be (Bahmani-Oskooee & Mitra, 2008). In the end, the bound test method can be used to determine both the short-run and long-run outcomes for a given model. The long-run form of the ARDL model is presented as:

$$\begin{aligned}
\Delta(INF)_t &= \beta_0 \\
&+ \sum_{i=1}^p \varpi_i \Delta(INF)_{t-1} \\
&+ \sum_{i=1}^p \lambda_i \Delta(EXR)_{t-1} \\
&+ \sum_{i=1}^p \phi_i \Delta(MPR)_{t-1} \\
&+ \sum_{i=1}^p \Omega_i \Delta(\log MS3)_{t-1} + \sum_{i=1}^p \pi_i \Delta(\log GOP)_{t-1} + \delta_1 (INF)_{t-1} + \delta_2 (EXR)_{t-1} + \delta_3 (MPR)_{t-1} \\
&+ \delta_4 (\log MS3)_{t-1} + \delta_5 (\log GOP)_{t-1} + \varepsilon_t \dots \dots \dots (7)
\end{aligned}$$

Where Δ is the first difference operator. INF_t is the dependent variable and $EXR_t, MPR_t, MS3_t$ and GOP_t are the independent variables. ε_t is the white noise error term, $\delta_1, \delta_2, \delta_3$ and δ_4 correspond to the long-run parameters. The first step involves choosing the lag selection using criteria such as the Akaike Information Criterion (AIC) and Schwarz criterion (SC), after which equation (7) is estimated using the ordinary least squares (OLS) method. To find out if there is a long-term relationship between the variables, the F-test or Wald test is used. The estimated F-statistic values will be compared with two sets of tabulated critical values created by Pesaran et al. (2001) to test the null hypothesis $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$; there is no co-integration relationship between the variables against the alternative hypothesis $H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$ using the bounds testing procedure, which is based on the joint F-statistic or Wald statistic tests. The null hypothesis of no co-integration is rejected if the estimated F-statistic surpasses the upper bound of the critical values. If it is below the lower bound value, then the null cannot be rejected. If the estimated F-statistic falls between the two levels of the boundaries, the co-integration test is inconclusive. Lastly, the short-run relationship between the variables can be examined using the following equation in an error correction form:

$$\begin{aligned}
\Delta(INF)_t &= \beta_0 + \sum_{i=1}^p \varpi_i \Delta(INF)_{t-1} + \sum_{i=1}^p \lambda_i \Delta(EXR)_{t-1} + \sum_{i=1}^p \phi_i \Delta(MPR)_{t-1} + \\
&\sum_{i=1}^p \Omega_i \Delta(\log MS3)_{t-1} + \sum_{i=1}^p \pi_i \Delta(\log GOP)_{t-1} + \alpha ECT_{t-1} + \varepsilon_t \dots \dots \dots (8)
\end{aligned}$$

The α coefficient results of the error correction term will indicate the speed of adjustment to reach equilibrium after a short-term shock. In theory, α has to be negative and statistically significant for short-run convergence to take place. Serial correlation, heteroscedasticity, and normality tests are used to ensure goodness of fit for the selected ARDL model.

Granger causality tests are conducted to identify the direction of causality between the variables; that is, whether past values of money supply can predict inflation and vice versa (Granger, 1988). To determine the causal effect between variables, one of the variables will be positioned as a dependent variable against the other variables. The VAR of two variables can be expressed as:

$$\Delta y_t = \alpha_1 + \sum_{i=1}^k \phi_{1i} \Delta y_{t-1} + \sum_{i=1}^k \phi_{1i} \Delta x_{t-1} + \delta_1 \varepsilon_{t-1} + \varepsilon_{1t} \dots \dots \dots (9)$$

$$\Delta x_t = \alpha_2 + \sum_{i=1}^k \phi_{2i} \Delta y_{t-1} + \sum_{i=1}^k \phi_{2i} \Delta x_{t-1} + \delta_2 \varepsilon_{t-1} + \varepsilon_{2t} \dots \dots \dots (10)$$

Where x and y represent the variables of interest (INF, EXR, MPR, MS3 and GOP), and ε_t represents the residual. Next, the critical value and p-value will be compared. If the p-value falls below the critical value, a causal relationship between the variables is present; if it rises above the critical value, there is no such relationship. Causality relationships are in three forms: unidirectional causality, bi-directional causality, and no causality. In unidirectional causality, a variable x Granger causes y ($\beta_1 \neq 0$; $\lambda_1 = 0$) or variable y Granger causes x ($\beta_1 \neq 0$; $\lambda_1 = 0$). In a bi-directional causality, a variable x Granger causes y and variable y Granger causes x ($\beta_1 \neq 0$; $\lambda_1 \neq 0$). For no causality, the variables x and y are independent ($\beta_1 = 0$; $\lambda_1 = 0$), there is no causal relationship between them in any direction (Granger, 1988).

4. Results and Discussion of Findings

4.1 Presentation of Results

Table 2: Results of Descriptive Statistics

	INF	EXR	GOP	MS3	MPR
Mean	15.09563	373.6077	79.63644	33,558,243	13.42500
Median	12.83555	305.7500	75.91850	27,961,638	12.75000
Maximum	34.79606	1601.530	130.1000	1.08E+08	27.50000
Minimum	7.783374	150.0000	32.29000	10,961,596	6.000000
Std. Dev.	6.807996	338.1757	26.10838	22,853,473	4.433429
Skewness	1.468342	2.501640	0.176205	1.824831	1.462714
Kurtosis	4.641310	8.645266	2.005965	6.048613	6.070849
Jarque-Bera	28.29502	142.2546	2.780748	56.53518	44.97061
Probability	0.000001	0.000000	0.248982	0.000000	0.000000
Sum	905.7377	22416.46	4778.187	2.01E+09	805.5000
Sum Sq. Dev.	2734.579	6747406.	40217.19	3.08E+16	1159.663
Observations	60	60	60	60	60

Source: Authors' computation, 2026.

Table 2 presents the results of descriptive statistics. Among the variables, the money supply has the highest mean value, 33,558,243, while the monetary policy rate has the lowest, at 13.43. All variables show positive median values, suggesting even distribution. The exchange rate also registers the highest maximum (1601.530), and the monetary policy rate the lowest minimum (6.00). For variability, the money supply again leads, with the highest standard deviation (22,853,473), while the monetary policy rate has the lowest (4.43); this highlights that exchange rates fluctuate more widely than monetary policy rates. Low standard deviation values indicate that data are clustered near the mean, whereas high values reveal greater dispersion. All variables demonstrate positive skewness, meaning their distributions have longer right tails. Notably, global oil prices have kurtosis below 3, while other variables have kurtosis above 3; thus, global

oil price data are less peaked, and the other variables' distributions are more peaked (leptokurtic). Except global oil prices, the Jarque-Bera probability for all series indicates normal distribution at the 5% significance level.

Table 3: Results of ADF and PP Unit Root Tests

Augmented Dickey-Fuller (ADF)					
Variables	Levels		1 st Difference		Order of Integration
	T-Stat	P-Values	T-Stat	P-Value	
INF	-5.572771	0.0001	-	-	I(0)
EXR	1.238079	0.9999	-6.057015	0.0000	I(1)
MPR	0.213978	0.9997	-4.979569	0.0008	I(1)
MS3	0.069504	0.9963	-7.213614	0.0000	I(1)
GOP	-2.125195	0.5213	-7.710134	0.0000	I(1)

Philip Perron (PP)					
Variables	Levels		1 st Difference		Order of Integration
	T-Stat	P-Value	T-Stat	P-Value	
INF	-6.209008	0.0000	-	-	I(0)
EXR	-0.704244	0.9679	-5.556861	0.0001	I(1)
MPR	-0.246130	0.9905	-6.046507	0.0000	I(1)
MS3	-0.302711	0.9888	-7.295740	0.0000	I(1)
GOP	-2.182330	0.4902	-7.710153	0.0000	I(1)

Source: Author's computation, 2026.

Table 3 presents the results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests conducted using constant and trend on the variables at level and at first difference, respectively. The results, for all the techniques, show that with the exception of inflation, all the other variables (EXR, MPR, MS3 and GOP) are non-stationary at levels; hence, we cannot reject the null hypothesis of the unit root test for those variables. However, they became stationary at the 1st difference. In all, the variables were integrated in mixed order (i.e., I(0) and I(1)). This is the justification for the use of ARDL techniques in the empirical analysis.

Table 4: Result of the ARDL Bound Test

Test Statistic	Value	K	Critical Value Bounds		
F-statistic	4.700535	3	Significance	I0 Bound	I1 Bound
			10%	2.72	3.77
			5%	3.23	4.35
			2.5%	3.69	4.89
			1%	4.29	5.61

Source: Author's computation using EViews, 2026.

Table 4 presents the result of the ARDL bound test estimated with restricted constant using (3, 0, 1, 3) selected based on the Akaike Information Criterion (AIC). The result of the bound test indicates that we reject the null hypothesis of no long-run relationship because the value of the F-statistic is 4.70, higher than the upper and lower bounds of 4.35 and 3.23 at a 5% significance level, respectively. This implies that there exists cointegration among the variables included in the model. This result suggests that inflation and the exchange rate move together in the long run.

Table 5: Result of the ARDL Long Run Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEXR	0.582803	0.131255	4.440226	0.0001*
MPR	-0.086831	0.307052	-0.282791	0.7786
LMS3	0.490663	1.974142	2.781291	0.0081*
GOP	-0.094030	0.157190	-0.598193	0.5526
C	-0.103785	0.775684	-0.133798	0.8941

Note:* represents 1% significance levels.

Source: Author's computation using EViews, 2026.

Table 5 presents the result of the ARDL long-run analysis. The coefficient of the exchange rate shows a positive, statistically significant relationship with inflation at the 1% significance level. A unit increase in the Naira/Dollar exchange rate leads to about 0.582803 (or 58.3 percent) in inflation. The monetary policy rate coefficient shows a long-run negative sign and a statistically insignificant relationship with inflation. The coefficients of money supply show a positive and significant relationship with inflation at a 1 percent significance level. This implies that a 1 percent increase in money supply will lead to a rise in inflation by about 0.490663 (equivalent to 49.1 percent). The global oil price coefficient shows a long-run negative sign and a statistically insignificant relationship with inflation.

Table 6: Result of ARDL Short Run Coefficient and Error Correction

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	0.229815	0.120505	1.907106	0.0628***
D(INF(-2))	0.274430	0.127847	2.146550	0.0371**
D(LEXR)	0.168326	0.056822	2.962319	0.0048*
D(MPR)	0.513905	0.189710	2.708896	0.0094*
D(LMS3)	0.269382	3.641607	4.193034	0.0001*
D(LGOP)	0.103980	0.068574	1.516328	0.1363
D(LGOP(-1))	0.179429	0.084234	2.130124	0.0385**
D(LGOP(-2))	-0.143506	0.066231	-2.166759	0.0355**
CointEq(-1)	-0.288821	0.076659	-3.767585	0.0005*

Note: *, ** and *** represent 1%, 5% and 10% levels respectively

Source: Authors' computation using EViews, 2026.

Table 6 shows the result of the ARDL short-run coefficient. The result shows that the coefficient of the error term is negative and statistically significant at the 1 percent level. The value of the ECT is -0.288821, which implies that the previous period deviation from long-run equilibrium is corrected in the current period at an adjusted speed rate of 28.9 percent. This further reaffirms the result of the ARDL Bound test. The

short-run coefficients of the exchange rate show a positive and significant relationship with inflation at a 10 percent significance level, implying that a unit increase in the exchange rate leads to about 0.168326, equivalent to a 16.8 percent rise in inflation. This is consistent with theoretical expectations. The coefficient of the monetary policy rate shows a positive and significant relationship with inflation at a 1% significance level, implying that a unit increase in this variable will lead to about 0.513905, equivalent to about a 51.4% increase in inflation. The coefficients of money supply show a positive and significant relationship with inflation at a 1 percent significance level, implying that a unit increase in money supply leads to about 0.269382, equivalent to a 26.9 percent rise in inflation. The coefficient of global oil prices shows a positive and significant relationship with inflation at a 5% significance level after a 1-quarter lag, implying that a unit increase in this variable will lead to about 0.179429, equivalent to a 17.4% increase in inflation in the short run.

The cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) are used to test the stability of the parameters as suggested by Pesaran and Pesaran (1997). The coefficients are relatively stable and consistent, and lie within the 5 percent significance level boundary, indicating that the calculated model is stable (see Figure 1).

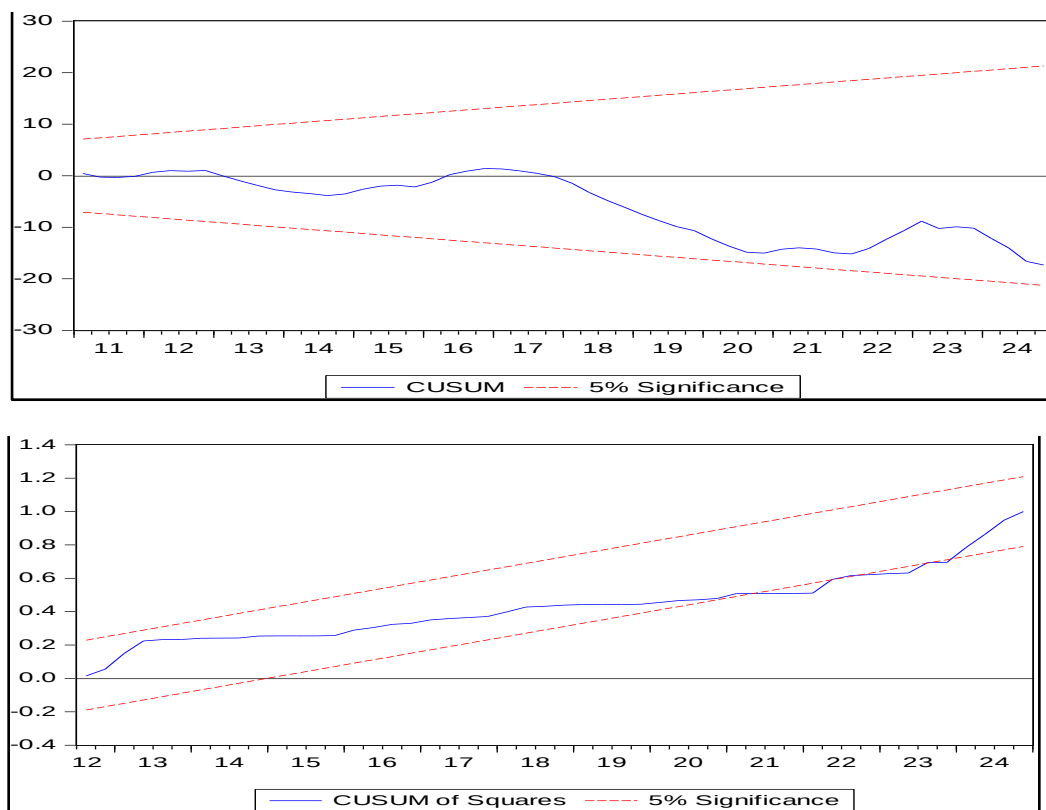


Figure 1: The CUSUM and CUSUM of Squares Stability Test
Source: Author's computation using EViews 9, 2026.

Table 7: Result of Granger Causality Test

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LEXR does not Granger-cause INF	58	3.73744	0.0303**
INFL does not Granger-cause LEXR		3.20991	0.0483**
MPR does not Granger-cause INF	58	0.94327	0.3958
INFL does not Granger-cause MPR		3.22338	0.0477**
LMS3 does not Granger-cause INF	58	4.92032	0.0306**
INF does not Granger-cause LMS3		4.80019	0.0326**
LGOP does not Granger-cause INF	58	1.37292	0.2622
INF does not Granger-cause LGOP		1.76647	0.1809

Note: * and ** represent 1% and 5% significance levels, respectively.

Source: Author's computation using EViews 9, 2026.

Table 7 presents the result of the Granger causality test. The result indicates that we reject the null hypothesis that the exchange rate does not Granger-cause inflation, as the p-value is 0.0303, which is below the 5% significance level. We also reject the null hypothesis that inflation does not Granger-cause the exchange rate, as the p-value is 0.0483, which is below the 5% significance level. This implies that there is a bidirectional causality relationship between the exchange rate and inflation. We cannot reject the null hypothesis that the monetary policy rate does not Granger-cause inflation because the p-value is 0.3958, which is above the 5% significance level. However, we reject the null hypothesis that inflation does not Granger-cause the monetary policy rate, as the p-value of 0.0477 is below the 5% significance level. This indicates that there exists a unidirectional causal relationship running from inflation to the monetary policy rate. The result indicates that we reject the null hypothesis that money supply does not Granger-cause inflation and vice versa, as both F-statistics are higher than 3.0 and the p-values are at the 5% significance level. This indicates the existence of a bidirectional causal relationship between the money supply and inflation. We cannot reject the null hypothesis that global oil prices do not Granger-cause inflation because the p-value 0.2622 is above the 5% significance level. We also cannot reject the null hypothesis that inflation does not Granger-cause global oil prices, as the p-value 0.1809 is above the 5% significance level. This implies that there is no causal relationship between the variables.

4.2 Discussion of Findings

The result of the bound test indicates that we reject the null hypothesis of no long-run relationship, which implies that there exists cointegration among the variables included in the model. This result suggests that inflation and exchange rate variables move together in the long run. This result is consistent with the results in Ikpe (2025), Tasan et al. (2024), and Yusuf et al (2022).

The long-run coefficient of the exchange rate shows a positive, statistically significant relationship with inflation at the 1% significance level. This matches theoretical expectations, as Naira depreciation drives imported inflation. When the Naira weakens, import costs rise, forcing businesses to increase prices. This pass-through effect is higher in Nigeria due to heavy reliance on imports. This aligns with Njuko and

Nwaimo (2019). The long-run coefficient of the monetary policy rate shows a negative sign and a statistically insignificant relationship with inflation. This may result from cost-push factors: high interest rates raise business costs, making firms raise prices and driving inflation rather than curbing it. This paradoxically stems from structural inefficiencies, where monetary tightening fails to manage inflation. The coefficients of money supply show a positive and significant relationship with inflation. This is consistent with the theory, as an increase in the supply of money, when it grows faster than the economy's output of goods and services, directly causes inflation due to higher purchasing power leading to increased demand and, consequently, higher prices, particularly in the long run. The global oil price coefficient shows a long-run negative sign and a statistically insignificant relationship with inflation, contrary to our theoretical expectations. This may be due to Nigeria's unique status as a major oil producer importing refined products, along with government subsidies. High oil prices mean higher state earnings, which stabilize the Naira and offset cost-push inflation from high fuel import prices. This leads to an inverse impact on global prices compared to expectations.

The coefficient of the error term is negative and statistically significant at the 1 percent level. This which implies that the previous period deviation from long-run equilibrium is corrected in the current period. This further reaffirms the result of the ARDL Bound test and affirms the results in Ikpe (2025), Tasan et al. (2024), and Yusuf et al (2022). The short-run coefficients of the exchange rate show a positive and significant relationship with inflation. This is consistent with theoretical expectations and the findings of Ozoji and Ekperechukwu (2025), Ikpe (2025), Tasan et al. (2024), and Njuko and Nwaimo (2019); however, contrary to the results in Yusuf et al (2022). The coefficient of monetary policy rate shows a positive and significant relationship with inflation. This result is consistent with theory, as an increase in the rate can ironically increase short-run inflation in Nigeria primarily through a cost-push mechanism, where higher interest rates increase the cost of doing business (loans, financing). Manufacturers pass these higher operational costs onto consumers, driving up the cost of goods and services. The coefficients of money supply show a positive and significant relationship with inflation. This is consistent with theoretical expectations, as an increase in money supply drives short-run inflation primarily due to money growth outpacing the real production of goods and services, creating "too much money chasing too few goods". This excess liquidity boosts aggregate demand faster than supply can adjust, causing prices to rise rapidly. The coefficient of global oil prices shows a positive and significant relationship with inflation after a 1-quarter lag, implying that a unit increase in this variable will lead to an increase in inflation in the short run. An increase in global oil prices (petroleum subsidy removal) can result in a delayed short-run inflationary impact due to exchange rate absorption.

The result of the Granger causality test indicated that we reject the null hypothesis that the exchange rate does not Granger-cause inflation. We also reject the null hypothesis that inflation does not Granger-cause the exchange rate. This implies that there is a bidirectional causality relationship between the exchange rate and inflation. This suggests a feedback mechanism in which exchange rate fluctuation fuels inflation through import prices, and rising inflation in turn exacerbates exchange rate fluctuation via reduced confidence and increased foreign currency demand. The result is consistent with the findings in Madesha et al (2013) for Zimbabwe. We cannot reject the null hypothesis that the monetary policy rate does not Granger-cause inflation. However, we reject the null hypothesis that inflation does not Granger-cause the monetary policy rate. This indicates that there exists a unidirectional causal relationship running from inflation to the monetary policy rate. We cannot reject the null hypothesis that global oil prices do not Granger-cause inflation. This implies that there is no causal relationship between the variables.

5. Conclusion and Recommendations

5.1 Conclusion

This study examined the impact of the exchange rate on inflation in Nigeria using quarterly time-series data spanning from 2010Q1 to 2024Q4. The study employed ARDL techniques and the Granger causality test. The result of the ARDL bound test shows the existence of a long-run relationship among the variables employed in the model. This result suggests that inflation and the explanatory variables move together in the long run. The result of the long-run coefficients of the exchange rate shows a positive and significant relationship with inflation. Similarly, the short-run coefficients of the exchange rate show a positive and significant relationship with inflation. The Granger causality test indicates the existence of a bidirectional causal relationship between the exchange rate and inflation. Based on these findings, the study concludes that the exchange rate dynamics have both short-run and long-run positive effects on inflation in Nigeria over the study period.

5.2 Recommendations

Based on these findings, the following are recommended: Strengthening the CBN's managed float system to reduce erratic currency volatility, in the short-run; While in the long-run, authorities should focus on structurally reducing reliance on imported consumer goods and raw materials by implementing aggressive import substitution strategies; Aligning the monetary framework (such as the MPR) with fiscal policies to curb excess aggregate demand and anchor long-term inflation expectations and to break the inflation depreciation cycle.

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