



THE ROLE OF PREMIUM MOTOR SPIRIT PRICES AND EXCHANGE RATE IN NIGERIA'S INFLATION DYNAMICS

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Abstract

This study examines the impact of energy prices, exchange rate fluctuations, and monetary policy on inflation dynamics in Nigeria over the period 1985–2024. Motivated by persistent inflationary pressures and the structural policy shift following the 2023 fuel subsidy removal, the study focuses specifically on Premium Motor Spirit (PMS) prices as a key driver of cost-push inflation. The Autoregressive Distributed Lag (ARDL) model is employed to capture both short-run and long-run relationships among inflation, PMS prices, exchange rate, monetary policy rate, and real GDP. The Bounds test confirms the existence of a long-run equilibrium relationship among the variables. Empirical results reveal that PMS prices and exchange rate depreciation have significant and positive effects on inflation in the long run, while the monetary policy rate reduces inflation. Real GDP has a dual effect: it reduces inflation in the short run but increases it in the long run. The error correction term indicates a moderate speed of adjustment. Robustness analysis using Vector Autoregression (VAR), impulse response functions (IRFs), and variance decomposition (VDC) confirms the dominance of exchange rate and energy price shocks in explaining inflation dynamics. The study concludes that inflation in Nigeria is largely driven by structural and external factors, and recommends coordinated monetary and structural policy interventions.

Keywords: Inflation; PMS Prices; Exchange Rate; ARDL; Nigeria; Monetary Policy

JEL Classification: E31, E52, Q43, F31, C32

1. Introduction

Inflation remains one of the most persistent and challenging macroeconomic problems in Nigeria, with far-reaching implications for economic stability and development. It erodes purchasing power, discourages savings, and complicates fiscal and monetary policy planning (Dornbusch & Fischer, 1994; Taylor, 1993). Over the years, a wide range of factors, including exchange rate volatility, energy price shocks, and monetary policy dynamics, have been identified as important drivers of inflationary pressures in Nigeria (Njoku & Nwaimo, 2019; Sani et al., 2020). Existing studies have examined the roles of external shocks, exchange rate movements, monetary conditions, and other macroeconomic factors in explaining inflation in Nigeria (Bawa et al., 2020; Uyi & Demir, 2023). However, some studies examining external and macroeconomic shocks have paid comparatively less attention to domestic energy prices, particularly the prices of Premium Motor Spirit (PMS), despite their direct relevance to transportation, production, and distribution costs. For example, studies by Danladi (2022), Tumala et al. (2021), and Danladi (2025) provide evidence on different sources of inflationary pressures in Nigeria but do not place domestic PMS prices at the centre of the inflation transmission process. This provides a basis for further examining the role of PMS prices alongside exchange rate movements in explaining inflation dynamics in Nigeria.

A major recent development that has heightened concern about inflation in Nigeria is the removal of the fuel subsidy in 2023. The policy change resulted in substantial increases in PMS prices, with implications for transportation costs, production expenses, and the distribution of goods and services. At the same time, the unification of the foreign exchange market and the associated exchange rate adjustments increased the domestic-currency cost of imported goods and production inputs. These developments are particularly important because Nigeria's high dependence on petroleum products for transportation and production creates strong links between PMS prices, exchange rate movements, and the general price level. Consequently, the recent policy reforms provide an important contemporary context for examining the channels through which domestic petroleum prices and exchange rate movements influence inflation. However, the present study does not treat the subsidy removal as a separate post-policy regime; rather, the reforms motivate the broader investigation of PMS prices and exchange rate movements within Nigeria's longer-term inflation dynamics.

In addition to PMS prices and exchange rate movements, monetary policy and real economic activity may influence the evolution of inflation. Exchange rate depreciation can increase the domestic cost of imported goods, intermediate inputs, and capital goods, thereby amplifying inflationary pressures in an import-dependent economy. Monetary policy can influence inflation through interest rates, credit conditions, liquidity, and aggregate demand, although its effectiveness may be constrained by structural rigidities and transmission lags (Musa et al., 2019; Abatcha, 2021). Real economic activity may also influence inflation through changes in aggregate supply and demand. An expansion in productive activity can ease supply constraints and reduce inflationary pressures, while demand expansion in the presence of limited productive capacity may generate additional price pressures. These relationships suggest the need for an empirical framework that examines PMS prices and exchange rate movements while accounting for monetary policy and real economic activity.

Against this backdrop, this study investigates the role of Premium Motor Spirit (PMS) prices and exchange rate movements in Nigeria's inflation dynamics over the period 1985–2024. Specifically, the study examines the short-run and long-run relationships between inflation, PMS prices, exchange rate, monetary policy rate, and real GDP using the Autoregressive Distributed Lag (ARDL) approach. The ARDL framework is appropriate for examining dynamic relationships among variables and allows the estimation of both short-run effects and long-run equilibrium relationships within a relatively small sample (Pesaran, Shin, & Smith, 2001).

This study makes three key contributions to the literature. First, it focuses explicitly on PMS prices as a measure of domestic petroleum price movements, rather than relying solely on aggregate or international energy-price indicators. This provides a more direct assessment of the domestic energy-price channel through which petroleum price changes may influence inflation. Second, the study jointly examines PMS prices and exchange rate movements within a broader macroeconomic framework that also accounts for monetary policy and real economic activity. This enables the study to assess the relative importance of domestic petroleum-price pressures and exchange rate movements in explaining inflation dynamics in Nigeria. Third, the study complements the ARDL framework with Vector Autoregression (VAR), impulse response functions (IRFs), and forecast error variance decomposition (VDC) to provide additional evidence on the dynamic responses of inflation to macroeconomic shocks. By integrating these approaches, the study provides empirical evidence on the interaction between domestic petroleum prices, exchange rate movements, monetary policy, and real economic activity in shaping inflation in Nigeria.

The study is particularly relevant in the context of recent macroeconomic reforms, including the removal of the fuel subsidy and exchange rate unification, which have heightened the importance of PMS prices and exchange rate movements for inflation management. Understanding these relationships is important for designing coordinated policies that address both domestic cost pressures and exchange rate-related inflationary pressures. The findings are therefore expected to provide useful evidence for monetary and structural policy formulation aimed at improving price stability and strengthening the resilience of the Nigerian economy.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature. Section 3 outlines the methodology and data sources. Section 4 presents and discusses the empirical results, while Section 5 concludes with policy implications.

2. Literature Review

Conceptually, inflation refers to a sustained increase in the general price level, resulting in a decline in purchasing power (Dornbusch & Fischer, 1994; Mankiw, 2016). It may arise from demand-pull factors, where aggregate demand exceeds aggregate supply or from cost-push factors driven by increases in production costs such as wages, exchange rates, and energy prices (Blanchard, 2017). In the Nigerian context, inflation dynamics are largely shaped by structural and external forces, including exchange rate fluctuations, energy price shocks, and macroeconomic policy conditions.

From a theoretical standpoint, several frameworks provide insight into the determinants of inflation. The Quantity Theory of Money posits that inflation is fundamentally a monetary phenomenon arising from excessive growth in money supply relative to output (Friedman, 1968). In contrast, Keynesian theory emphasizes the role of aggregate demand in driving price changes, particularly during periods of economic expansion (Keynes, 1936). However, in economies characterized by supply constraints and import dependence, the Cost-Push Theory becomes particularly relevant, as increases in input costs, especially energy and imported goods, are transmitted into domestic prices (Gordon, 1988). Closely related is the exchange rate pass-through framework, which explains how currency depreciation increases the domestic price of imports, thereby fueling inflation (Taylor, 2000). Structuralist perspectives further argue that inflation in developing economies is often driven by institutional bottlenecks, infrastructural deficits, and sectoral imbalances rather than purely monetary factors (Kirkpatrick & Nixon, 1976).

These theoretical insights are particularly relevant in understanding inflation in Nigeria, where the economy is highly import-dependent and sensitive to external shocks. Exchange rate depreciation tends to increase the cost of imported goods, contributing significantly to inflationary pressures. At the same time, energy prices, especially Premium Motor Spirit (PMS), play a critical role in shaping domestic price dynamics due to their direct impact on transportation, production, and distribution costs. The removal of fuel subsidies in 2023 represents a major structural policy shift, effectively exposing PMS prices to market forces and strengthening the transmission of global oil price shocks and exchange rate movements into domestic inflation.

Empirical studies on the relationship between energy prices and inflation in Nigeria have produced mixed results. For instance, Kpagih et al. (2022), using the Autoregressive Distributed Lag (ARDL) model, found that energy prices do not exert a significant long-run effect on inflation, although lagged oil prices were associated with negative short-run impacts. In contrast, Abatcha (2021), also employing an ARDL framework, reported a positive and statistically significant long-run relationship between oil

prices and inflation, suggesting that energy price shocks contribute to persistent inflationary pressures. Similarly, Bawa et al. (2024) showed that positive oil price shocks significantly increase inflation in Nigeria, emphasizing the importance of external supply-side shocks in domestic price formation. These divergent findings highlight the complexity of the energy–inflation nexus and suggest that the impact of energy prices may depend on model specification, sample period, and the nature of the variables employed.

Importantly, much of the existing literature relies on aggregate oil or energy price indicators, which may not adequately capture the direct transmission channels relevant in the Nigerian context. Given that PMS constitutes the dominant energy input in transportation and distribution, focusing specifically on PMS prices offers a more precise and policy-relevant measure of energy-induced inflation. However, empirical evidence that isolates PMS price movements, particularly in the context of the recent subsidy removal, remains limited, thereby leaving a notable gap in the literature. Exchange rate dynamics have also been widely recognized as a critical determinant of inflation in Nigeria. Njoku and Nwaimo (2019), using a Vector Error Correction Model (VECM), found that exchange rate depreciation significantly drives inflation through imported price channels, reflecting the economy's high dependence on foreign goods and inputs. This finding aligns with the broader theoretical and empirical literature on exchange rate pass-through, which posits that currency depreciation leads to higher domestic prices, especially in import-dependent economies. Extending this line of inquiry, Umamiah and Aliyu (2022) employed a nonlinear ARDL framework and demonstrated that exchange rate effects on inflation may be asymmetric, with depreciation exerting stronger inflationary pressures than appreciation. While nonlinear approaches provide deeper insights into such asymmetries, linear ARDL models remain appropriate for capturing the average short-run and long-run relationships among macroeconomic variables.

In addition to energy prices and exchange rate movements, monetary policy and real economic activity play important roles in shaping inflation dynamics. Empirical evidence generally suggests that increases in the monetary policy rate exert a dampening effect on inflation, consistent with the conventional monetary transmission mechanism (Sa'ad et al., 2023). However, the effectiveness of monetary policy in Nigeria is often constrained by structural rigidities, weak transmission channels, and implementation lags, which may limit its short-run impact on price stability. At the same time, real economic activity presents a dual relationship with inflation. While increased output can alleviate supply constraints and reduce inflationary pressures in the short run, sustained economic expansion may generate demand-pull inflation if it is not matched by corresponding increases in productive capacity.

Despite the extensive body of empirical literature, important gaps remain. Many studies focus on individual determinants of inflation in isolation, without adequately capturing the joint interactions among energy prices, exchange rate fluctuations, monetary policy, and real economic activity. Furthermore, the majority of existing studies rely on aggregate energy indicators rather than disaggregated measures such as PMS prices, which are more directly linked to domestic cost structures. Additionally, limited attention has been given to the implications of recent structural policy changes, particularly the 2023 fuel subsidy removal, which represents a significant shift in Nigeria's energy pricing regime.

Against this backdrop, this study contributes to the literature by jointly examining the effects of PMS prices, exchange rate movements, monetary policy, and real economic activity on inflation in Nigeria

within a unified empirical framework. By focusing specifically on PMS prices in the post-subsidy context and employing the ARDL approach to capture both short-run dynamics and long-run equilibrium relationships, the study provides a more comprehensive and policy-relevant understanding of inflationary processes in Nigeria.

3. Methodology and Data

3.1 Model Specification

This study employs the Autoregressive Distributed Lag (ARDL) modelling approach to examine the short-run and long-run dynamics between inflation and its key macroeconomic determinants in Nigeria. The ARDL framework is particularly suitable given its flexibility in accommodating variables integrated of different orders, $I(0)$ and $I(1)$, while also providing efficient estimates in small sample sizes. The functional relationship for the model is specified as:

$$CPI = f(PMS, USDEXCH, MPR, RGDP) \quad (1)$$

Transforming into a log-linear econometric form to ensure elasticity interpretation and reduce heteroskedasticity, the model is expressed as:

$$\log(CPI_t) = \beta_0 + \beta_1 \log(PMS_t) + \beta_2 \log(USDEXCH_t) + \beta_3 \log(MPR_t) + \beta_4 \log(RGDP_t) + \varepsilon_t \quad (2)$$

Where CPI , PMS , $USDEXCH$, MPR , $RGDP$ denotes consumer price index, petroleum prices (proxy for energy prices), exchange rate, monetary policy rate, real gross domestic product, and error term respectively. All variables are transformed into natural logarithms to stabilize variance and allow coefficients to be interpreted as elasticities.

To estimate the relationship among the variables, this study adopts the Autoregressive Distributed Lag (ARDL) model developed by Pesaran, Shin, and Smith (2001). The ARDL approach is preferred for several reasons: (i) it accommodates variables integrated of order $I(0)$ and $I(1)$, but not $I(2)$. (ii) it provides robust estimates for small sample sizes. (iii) it allows simultaneous estimation of both short-run dynamics and long-run relationships. The general ARDL (p, q_1, q_2, q_3, q_4) model is specified as:

$$\begin{aligned} \Delta \log(CPI_t) = & \alpha_0 + \sum_{i=1}^p \alpha_i \Delta \log(CPI_{t-i}) + \sum_{j=0}^{q_1} \beta_j \Delta \log(PMS_{t-j}) + \sum_{k=0}^{q_2} \gamma_k \Delta \log(USDEXCH_{t-k}) \\ & + \sum_{l=0}^{q_3} \delta_l \Delta \log(MPR_{t-l}) + \sum_{m=0}^{q_4} \phi_m \Delta \log(RGDP_{t-m}) + \lambda_1 \log(CPI_{t-1}) \\ & + \lambda_2 \log(PMS_{t-1}) + \lambda_3 \log(USDEXCH_{t-1}) + \lambda_4 \log(MPR_{t-1}) + \lambda_5 \log(RGDP_{t-1}) + \varepsilon_t \end{aligned} \quad (3)$$

To determine the existence of a long-run relationship among the variables, the study employs the Bounds testing approach. The null hypothesis of no cointegration is stated as:

$$H_0 : \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$$

against the alternative:

$$H_1 : \lambda_i \neq 0$$

The computed F-statistic is compared with the critical bounds values. If F exceeds the upper bound, cointegration exists. If F falls below the lower bound, no cointegration. If F lies between bounds, inconclusive. Once cointegration is established, the short-run dynamics are estimated using the Error Correction Model (ECM), specified as:

$$\Delta \log(CPI_t) = \sum \theta_i \Delta X_{t-i} + \psi ECM_{t-1} + \varepsilon_t \quad (4)$$

Where ECM_{t-1} is the lagged error correction term and ψ represents the speed of adjustment toward the long-run equilibrium. A negative and statistically significant ψ confirms convergence to equilibrium. To ensure the robustness and validity of the estimated model, several post-estimation diagnostic tests are conducted: (i) Serial Correlation Test (Breusch-Godfrey LM Test) - to check for autocorrelation in residuals. (ii) Heteroskedasticity Test (Breusch-Pagan-Godfrey) - to verify constant variance. (iii) ARCH Test, to detect volatility clustering. (iv) Ramsey RESET Test, to examine model specification. (v) Durbin-Watson Statistic, to confirm absence of autocorrelation. These tests ensure that the model satisfies the classical linear regression assumptions and that the results are reliable for inference.

3.2 Data

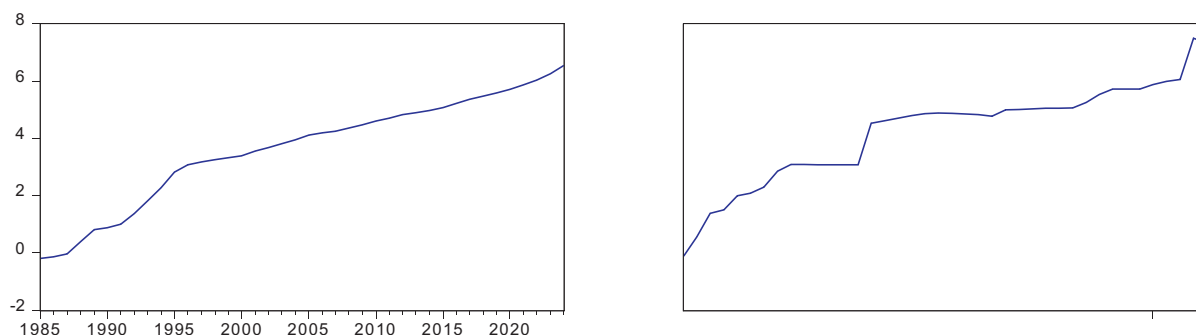
This study uses annual time-series data spanning 1985–2024. The data are sourced from credible and widely used databases. While consumer price index, exchange rate, monetary policy rate, and real GDP are obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin, PMS prices were obtained from NBS and are presented in Table 1. All variables are expressed in natural logarithms to ensure consistency and interpretability of coefficients as elasticities.

Table 1: Definition and Measurement of Variables

Variable	Description	Measurement	Expected Sign
LNCPI	Inflation	Log of Consumer Price Index	.
LNPMS	Fuel Price	Log of PMS Price	+
LNEXCH	Exchange Rate	Log of Exchange Rate (N/US\$)	+
LNMPR	Monetary Policy Rate	Log of MPR	-
LNRGDP	Real Economic Activity	Log of Real GDP	±

4. Results

As shown in Figure 1, all variables exhibit a pronounced upward trend over the sample period, reflecting persistent increases in the general price level, exchange rate depreciation, and fuel price adjustments in Nigeria. Inflation (LNCPI) appears to co-move with both exchange rate (LNEXCH) and fuel prices (LNPMS), suggesting that external and energy-related shocks play an important role in shaping domestic price dynamics.



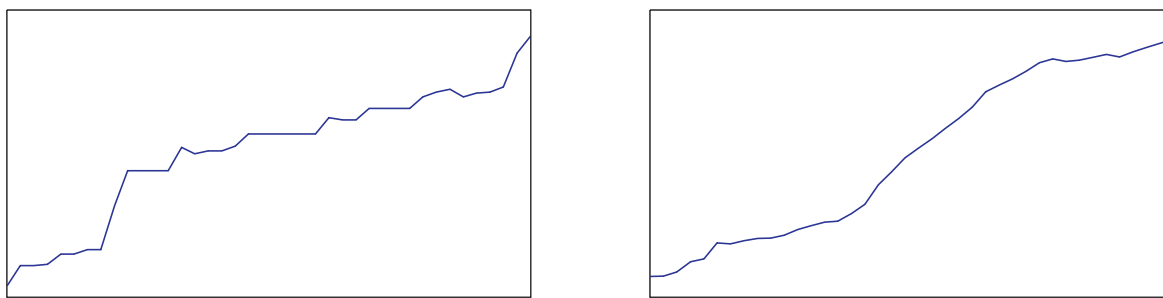


Figure 1: Trend Analysis of key Variables

Descriptive statistics reported in Table 1 further reinforce these observations. The results indicate that inflation (LNCPI) has a mean value of 3.62, accompanied by a relatively high standard deviation of 1.91, suggesting notable variability over the sample period. Fuel prices (LNPMS) exhibit the largest dispersion, with a standard deviation of 2.25. However, this apparent volatility should be interpreted with caution, as PMS prices in Nigeria have historically been subject to administrative controls and subsidy regimes. Consequently, the observed variability largely reflects discrete policy-induced adjustments, such as subsidy reforms and price deregulation episodes, rather than continuous market-driven fluctuations.

The exchange rate (LNEXCH) also demonstrates substantial dispersion, indicating significant variability in Nigeria's foreign exchange market over time. Unlike PMS prices, exchange rate movements are largely market-determined and evolve more continuously, thereby reflecting underlying macroeconomic imbalances and external shocks. In contrast, the monetary policy rate (LNMPR) and real GDP (LNRGDP) display relatively low variability, suggesting greater stability in monetary policy stance and aggregate economic activity compared to price-related variables.

The skewness statistics reveal that most variables are negatively skewed, indicating a higher occurrence of lower extreme values relative to upper extremes. Real GDP, however, appears approximately symmetric, with a skewness value close to zero. The kurtosis measures suggest that most variables are platykurtic, implying flatter distributions relative to the normal distribution, while the monetary policy rate is leptokurtic, indicating the presence of occasional extreme observations. The Jarque-Bera statistics further show that all variables fail to reject the null hypothesis of normality at conventional significance levels, as evidenced by probability values exceeding 0.05. This suggests that the variables are approximately normally distributed and suitable for subsequent econometric analysis.

Table 2: Descriptive Statistics

Variables	LNCPI	LNEXCH	LNPMS	LNMPR	LNRGDP
Mean	3.62	4.25	3.07	2.60	17.39
Median	4.03	4.85	3.69	2.60	17.41
Maximum	6.54	7.50	7.10	3.31	18.20
Minimum	-0.20	-0.11	-1.61	1.79	16.54
Std. Dev.	1.91	1.73	2.25	0.30	0.59
Skewness	-0.59	-0.60	-0.65	-0.27	0.00
Kurtosis	2.32	2.92	2.48	4.21	1.39
Jarque-Bera	3.09	2.43	3.28	2.91	4.34
Probability	0.21	0.30	0.19	0.23	0.11
Sum	144.83	169.82	122.98	104.07	695.77
Sum Sq. Dev.	141.55	116.80	197.03	3.59	13.38
Observations	40	40	40	40	40

Notes: All variables are expressed in natural logarithms. Jarque-Bera statistics test the null hypothesis of normal distribution.

Taken together, these stylized facts highlight the importance of exchange rate movements and fuel price adjustments as key drivers of inflation in Nigeria. The observed trending behavior and potential lagged relationships among the variables provide strong motivation for employing a dynamic modeling framework, such as the Autoregressive Distributed Lag (ARDL) model, to capture both short-run adjustments and long-run equilibrium relationships.

The unit root test results reported in Table 3 indicate that none of the variables is stationary at levels, as the null hypothesis of a unit root cannot be rejected for all series under both ADF and Phillips–Perron tests. However, after first differencing, all variables become stationary at conventional significance levels. This confirms that all variables are integrated of order one, $I(1)$. The consistency between ADF and PP results strengthens the robustness of the variables' stationarity properties. Importantly, the absence of $I(2)$ variables justifies the application of the ARDL bounds testing approach, which requires variables to be either $I(0)$ or $I(1)$ but not $I(2)$.

Table 3: Unit Root Test Results (ADF and Phillips–Perron Tests)

Variable	ADF Level	ADF First Diff.	PP Level	PP First Diff.	Order of Integration
LNCPI	-1.58	-3.609**	-2.062	-2.926*	$I(1)$
LNEXCH	-2.048	-6.316***	-2.067	-6.329***	$I(1)$
LNMPR	-2.305	-6.969***	-2.278	-6.976***	$I(1)$
LNPMS	-1.115	-5.145***	-1.124	-5.068***	$I(1)$
LNRGDP	-0.871	-3.806***	-0.495	-3.838***	$I(1)$

Notes: ADF = Augmented Dickey–Fuller test. PP = Phillips–Perron test. All tests include a constant

*, **, *** denote significance at 10%, 5%, and 1% levels respectively. Critical values based on MacKinnon (1996). Lag

length selected using Schwarz Information Criterion (SIC)

The empirical results as presented in Table 4 provide important insights into the dynamics of inflation in Nigeria, particularly in the context of fuel price liberalization and macroeconomic instability. First, the long-run coefficients indicate statistically significant relationships between inflation (CPI) and its key determinants. Specifically, $\log(\text{PMS})$ carries a positive coefficient (0.2964) and is significant at the 1% level, implying that fuel price increases exert substantial upward pressure on the general price level. This suggests strong cost-push inflation dynamics, reflecting the central role of energy prices in production and distribution channels. Similarly, the coefficient of $\log(\text{USDEXCH})$ (0.6531) is positive and highly significant, indicating that exchange rate depreciation significantly increases inflation. The magnitude suggests a high exchange rate pass-through, which is typical of import-dependent economies where foreign price shocks transmit quickly into domestic prices.

In contrast, $\log(\text{MPR})$ has a negative and statistically significant coefficient (-0.4005), confirming the effectiveness of monetary policy in controlling inflation. This implies that tightening monetary conditions through higher policy rates reduces inflationary pressures, consistent with orthodox monetary transmission mechanisms. The coefficient of $\text{LOG}(\text{RGDP})$ is positive and significant, suggesting that increases in economic activity are associated with higher inflation in the long run. This may reflect demand-pull inflation, where rising income and aggregate demand outpace supply capacity.

Second, the short-run results reveal important dynamic adjustments. The coefficient of $\text{DLOG}(\text{CPI}(-1))$ is positive and highly significant, confirming inflation persistence, meaning that past inflation significantly influences current inflation. The contemporaneous effect of exchange rate changes ($\text{DLOG}(\text{USDEXCH})$) is not statistically significant, but its lagged value is negative and significant. This suggests that exchange rate shocks affect inflation with a lag structure, possibly due to delayed transmission mechanisms such as contracts, pricing rigidities, or policy interventions. Economic activity (RGDP) exhibits a negative and significant impact in both current and lagged terms. This indicates that, in the short run, increases in output may reduce inflationary pressures, likely due to supply-side improvements or productivity gains. The monetary policy rate remains statistically insignificant in the short run, suggesting that monetary policy transmission is not instantaneous, and its effects materialize more strongly over the long run.

Table 4: ARDL Estimates, Cointegration and Diagnostic Tests

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long-Run Estimates				
$\text{LOG}(\text{PMSM})$	0.296383***	0.081879	3.619791	0.0012
$\text{LOG}(\text{USDEXCH})$	0.653072***	0.112377	5.811446	0.0000
$\text{LOG}(\text{MPR})$	-0.400518**	0.157437	-2.543986	0.0170
$\text{LOG}(\text{RGDP})$	0.090361***	0.023394	3.862599	0.0006
Short-Run Dynamics (ECM)				
$\text{DLOG}(\text{CPI}(-1))$	0.381692***	0.085978	4.439414	0.0001
$\text{DLOG}(\text{USDEXCH})$	0.032847	0.029933	1.097330	0.2822
$\text{DLOG}(\text{USDEXCH}(-1))$	-0.113354**	0.043990	-2.576829	0.0158
$\text{DLOG}(\text{MPR})$	0.021670	0.045419	0.477114	0.6371
$\text{DLOG}(\text{RGDP})$	-1.131136***	0.351789	-3.215382	0.0034
$\text{DLOG}(\text{RGDP}(-1))$	-1.088658**	0.403733	-2.696480	0.0119
$\text{CointEq}(-1)$	-0.336681***	0.048292	-6.971775	0.0000
Bounds Test for Cointegration				
F-statistic	8.466791	—	—	—
t-statistic	-6.971775	—	—	—

Diagnostic Tests	Statistic	Value	Prob.	Decision
Serial Correlation (BG LM)	F-statistic	1.9738	0.1600	No serial correlation
	Obs*R ²	5.1820	0.0749	No serial correlation
ARCH Test	F-statistic	0.4139	0.5242	No ARCH effect
	Obs*R ²	0.4324	0.5108	No ARCH effect
Ramsey RESET	F-statistic	2.0575	0.1634	Correct specification
	t-statistic	1.4344	0.1634	No omitted variables
Durbin-Watson	—	1.9809	—	No autocorrelation

Notes: ***, **, * denote significance at 1%, 5%, and 10% levels respectively.

Third, the error correction term $CointEq(-1)$ is negative (-0.3367) and highly significant at the 1% level, satisfying the necessary condition for convergence. This confirms the presence of a stable long-run equilibrium relationship among the variables. The magnitude implies that approximately 33.7% of any short-run disequilibrium is corrected within one period, indicating a moderate speed of adjustment. In practical terms, deviations from equilibrium caused by shocks are not immediately eliminated but are gradually corrected over time. The Bounds test further supports this conclusion, as the F-statistic (8.47) exceeds the upper critical bound at all conventional levels, leading to rejection of the null hypothesis of no cointegration. The t-Bounds statistic reinforces this finding.

Finally, the post-estimation diagnostic tests confirm the robustness of the model. The Breusch-Godfrey LM test indicates no serial correlation, ensuring that residuals are independent. The ARCH test suggests the absence of conditional heteroskedasticity, implying stable variance over time. The Ramsey RESET test fails to reject the null hypothesis, indicating that the model is correctly specified with no significant omitted variable bias. Furthermore, the Durbin-Watson statistic (~2) supports the absence of autocorrelation. Collectively, these diagnostics confirm that the model satisfies key classical linear regression assumptions, making the estimates reliable for inference and policy analysis.

Discussion of Results

The empirical findings from the ARDL model provide strong evidence that inflation dynamics in Nigeria are influenced by a combination of energy price shocks, exchange rate movements, and monetary policy actions, consistent with both theoretical expectations and existing empirical literature. The positive and statistically significant impact of exchange rate depreciation on inflation corroborates earlier findings in the Nigerian context. Specifically, this result aligns with Njoku and Nwaimo (2019), who found that exchange rate fluctuations significantly drive inflation through imported price channels. More importantly, the magnitude of the coefficient in this study suggests a relatively high degree of exchange rate pass-through, reinforcing the argument by Umaimah and Aliyu (2022) that exchange rate effects on inflation in Nigeria are not only significant but may also be asymmetric, with depreciation exerting stronger inflationary pressures than appreciation. Although the present study adopts a linear ARDL framework, the strength of the exchange rate coefficient provides indirect support for the existence of such nonlinearities.

Similarly, the positive and significant effect of fuel prices (PMS) on inflation supports the cost-push inflation hypothesis and is consistent with findings by Abatcha (2021), who reported that oil price increases significantly raise inflation in Nigeria in the long run. This result, however, contrasts with Kpagih, Amini, and Odungweru (2022), who found no significant long-run effect of energy prices on inflation. The divergence in findings may be attributed to differences in model specification, sample

period, or failure to account for nonlinearities. Indeed, the significance of PMSM in this study lends support to the argument advanced by Bawa et al. (2020) and Sani et al. (2020) that energy price shocks have nonlinear and asymmetric effects on inflation, particularly in an oil-dependent economy like Nigeria. Thus, while this study employs a linear approach, the results reinforce the broader literature advocating for asymmetric modeling frameworks such as NARDL.

The long-run negative and significant effect of the monetary policy rate confirms the effectiveness of monetary policy in controlling inflation, consistent with the monetarist perspective. However, the insignificance of monetary policy in the short run suggests the presence of policy transmission lags, which may weaken its immediate impact on inflation. This finding complements the broader empirical literature and highlights a key policy challenge in Nigeria, namely, the delayed effectiveness of monetary interventions in stabilizing prices.

The role of real GDP further reveals important dynamics. In the short run, the negative and significant relationship between output and inflation suggests that increased production helps to ease supply constraints, thereby reducing inflationary pressures. However, the positive long-run relationship indicates that sustained economic growth may generate demand-pull inflation, particularly when growth is not matched by corresponding increases in productive capacity. This dual effect reflects the complexity of the inflation-growth nexus and is consistent with findings from Musa et al. (2019), who emphasize the importance of macroeconomic interactions in shaping economic outcomes, even though their study did not directly model inflation. The significant and correctly signed error correction term confirms the existence of a long-run equilibrium relationship among the variables, with a moderate speed of adjustment. This suggests that while the system tends to return to equilibrium after shocks, the adjustment process is gradual, allowing inflationary pressures, especially those arising from exchange rate and energy price volatility to persist in the short term.

Beyond the Nigerian context, the findings are also consistent with international evidence. For instance, Ondrej et al. (2022) and Keček (2023) highlight the role of energy price shocks in driving inflation in European economies. Their findings that economies with more diversified and renewable energy sources experience lower inflation volatility further underscore the structural vulnerability of Nigeria's economy, which remains heavily dependent on fossil fuels. This structural dependence likely amplifies the inflationary impact of energy shocks observed in this study.

Overall, the results provide strong support for the argument that inflation in Nigeria is driven by both structural and external factors, including energy prices and exchange rate volatility, alongside monetary influences. Importantly, the findings also reinforce the growing consensus in the literature, particularly Uyi and Demir (2023) and Umamah and Aliyu (2022), that inflation dynamics may be nonlinear and asymmetric. Consequently, while the current study provides robust linear evidence, it also highlights the need for future research to adopt nonlinear frameworks to fully capture the complexity of inflation behavior in Nigeria.

In sum, the empirical evidence underscores that inflation in Nigeria is not solely a monetary phenomenon but is deeply rooted in structural inefficiencies and external sector vulnerabilities. This suggests that effective inflation management requires a comprehensive policy framework that integrates monetary tightening with structural reforms aimed at stabilizing the exchange rate, reducing energy dependence, and enhancing domestic productive capacity.

Robustness Check

To complement the ARDL estimates and provide further insights into the dynamic interactions among the variables, a Vector Autoregression (VAR) framework was employed. Specifically, impulse response functions (IRFs) and forecast error variance decomposition (VDC) were analyzed to examine how shocks to key macroeconomic variables propagate through the system over time.

Figure 2 shows the impulse response functions (IRFs) and accumulated IRFs based on the VAR model, which provide further insights into the dynamic effects of shocks on inflation. The results show that a positive shock to the exchange rate leads to a sustained increase in inflation over several periods, confirming strong exchange rate pass-through effects. Similarly, shocks to PMS prices generate a positive inflation response, supporting the cost-push inflation hypothesis. In contrast, a shock to the monetary policy rate produces a gradual decline in inflation, although the effect is delayed, indicating the presence of transmission lags. Overall, the IRF results reinforce the conclusion that inflation dynamics in Nigeria are driven primarily by exchange rate movements and energy price shocks, with monetary policy playing a stabilizing but lagged role.

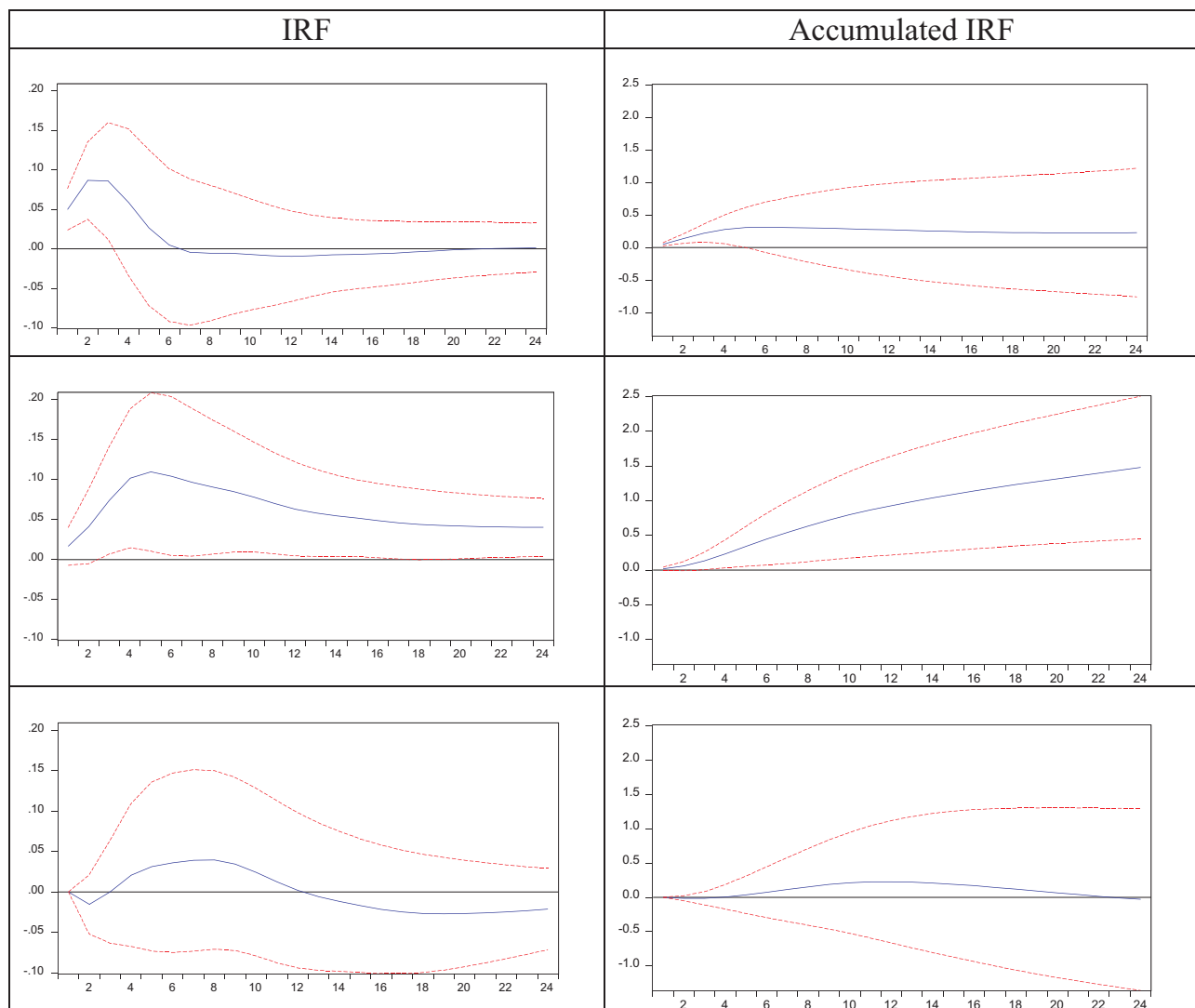


Fig. 2: Impulse Responses of Inflation to Petroleum Prices, Exchange Rate, and Monetary Policy Rate

The variance decomposition results further quantify the relative importance of each variable in explaining inflation variability over time. As reported in Table 5 and illustrated in Figure 2, inflation is initially dominated by its own shocks, accounting for approximately 64.9% of its forecast error variance in the first period. However, this dominance declines steadily as the forecast horizon increases, indicating that inflation becomes increasingly influenced by external and structural factors. By the fifth period, the contribution of inflation's own shocks falls to 43.5%, while exchange rate and PMS shocks account for 30.7% and 22.2%, respectively.

This transition is clearly visualized in Figure 3, where the share of exchange rate shocks rises sharply over time, while the contribution of inflation's own innovations declines. In the long run, exchange rate shocks emerge as the dominant driver of inflation variability. By the tenth period, exchange rate innovations explain approximately 44.9% of inflation fluctuations, exceeding the contributions of inflation's own shocks (35.0%) and PMS shocks (13.6%).

Table 5: Variance Decomposition of Inflation

Period	S.E.	PMS (%)	USDEXCH (%)	CPI (%)	MPR (%)	RGDP (%)
1	0.2996	31.70	3.36	64.95	0.00	0.00
5	0.5952	22.23	30.71	43.52	1.72	1.83
10	0.7043	13.64	44.88	34.97	4.93	1.57
24	0.7510	10.71	51.15	27.22	6.73	4.19

Notes: Values represent percentage contributions to forecast error variance of inflation. PMS = Premium Motor Spirit prices; USDEXCH = Exchange rate; CPI = Consumer Price Index; MPR = Monetary Policy Rate; RGDP = Real Gross Domestic Product. Cholesky ordering: PMS → USDEXCH → CPI → MPR → RGDP. Full variance decomposition results are reported in the Appendix.

This pattern becomes even more pronounced in the extended horizon (period 24), where exchange rate shocks account for over 51% of inflation variance. As shown in Figure 3, the upward trajectory of exchange rate contributions stabilizes at a high level, reinforcing its dominant role in shaping inflation dynamics. The contributions of monetary policy and real GDP remain relatively modest throughout the forecast horizon, although their influence increases slightly over time. This is also reflected in Figure 3, where the shares of MPR and RGDP remain comparatively low but exhibit gradual upward trends, indicating secondary but non-negligible roles in inflation determination.

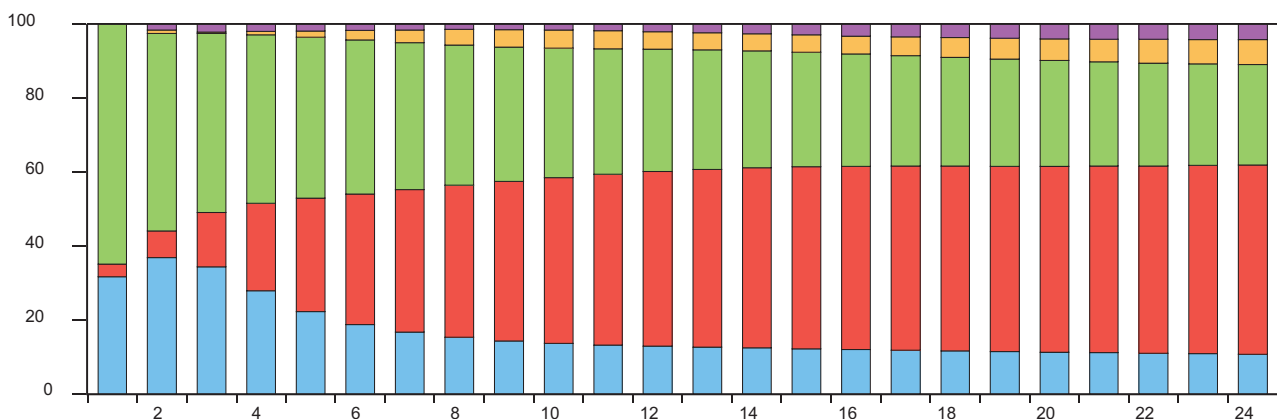


Figure 3: Variance Decomposition of Inflation

Taken together, the VAR-based evidence strongly corroborates the ARDL results. While the ARDL model establishes the existence of significant long-run relationships and short-run dynamics, the IRF and VDC analyses provide deeper insights into the transmission mechanisms and relative importance of shocks. Specifically, both approaches consistently identify exchange rate depreciation as the most influential driver of inflation in the long run, reflecting Nigeria's import-dependent structure and vulnerability to external shocks. PMS prices also play a significant role, particularly in the short to medium term, confirming the relevance of energy price shocks in driving cost-push inflation. Monetary policy, although effective in the long run, exhibits delayed impacts, highlighting the importance of improving policy transmission mechanisms. Overall, the combined ARDL and VAR results provide robust and consistent evidence that inflation in Nigeria is shaped by a complex interplay of external shocks, structural factors, and policy interventions. These findings underscore the need for coordinated macroeconomic policies that address exchange rate stability, energy price volatility, and structural constraints in the economy.

5. Conclusion

This study examined the determinants of inflation in Nigeria over the period 1985–2024, focusing on the roles of energy prices, exchange rate fluctuations, monetary policy, and real economic activity using the ARDL framework. The empirical results confirm a stable long-run relationship among these variables, with deviations from equilibrium gradually corrected over time, reflecting a moderate speed of adjustment. In the long run, energy prices and exchange rate depreciation emerged as significant drivers of inflation, highlighting pronounced cost-push and imported inflationary pressures, while the policy rate was found to exert a dampening effect, confirming the importance of monetary tightening as a stabilization tool. Real GDP also contributed positively to inflation in the long run, signaling demand-side pressures associated with economic expansion.

Short-run dynamics reveal persistence in inflation, with exchange rate effects transmitted with a lag. Economic growth, conversely, mitigates short-run inflationary pressures, likely by alleviating supply-side constraints. Diagnostic tests indicate that the model is well-specified, free from serial correlation and heteroskedasticity, and appropriate for policy inference. Collectively, these findings suggest that inflation in Nigeria is influenced not only by monetary factors but also by structural and external vulnerabilities, particularly energy price shocks and exchange rate instability. The evidence has important policy implications. Stabilizing the exchange rate should be a priority, achievable through strengthening foreign exchange reserves, promoting export diversification beyond oil, and reducing import dependence, thereby mitigating imported inflation and enhancing macroeconomic stability. The significant role of petroleum prices underscores the need for domestic capacity expansion and energy reforms, including investment in refining, gradual subsidy adjustments, and promotion of alternative energy sources to reduce vulnerability to global price shocks. While monetary policy is effective in the long run, its short-run pass-through can be improved by enhancing coordination between monetary and fiscal authorities and strengthening financial markets to ensure efficient transmission. Supply-side interventions are also critical: investments in agriculture and manufacturing, improved infrastructure, and productivity-enhancing policies can expand domestic production, ease supply constraints, and stabilize prices. Complementary structural measures, including trade reforms, industrial policies, and institutional strengthening, are necessary to address the root causes of inflation beyond monetary measures.

This study contributes to the literature by jointly examining energy prices and exchange rate dynamics in Nigeria using a robust ARDL framework and by providing updated evidence on both long-run and

short-run inflation determinants. Given the potential for nonlinear and asymmetric effects, future research should explore models such as NARDL to capture differential impacts of positive and negative shocks. Achieving sustainable price stability in Nigeria, therefore, requires a coordinated macroeconomic strategy that integrates monetary discipline with structural transformation and external sector resilience.

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