Revisiting Oil Price Dynamics in Nigeria: The Endogenous Role of Exchange Rate, Inflation, and Monetary Policy

Halima Haruna Muhammad
Department of Economics,
Al-Qalam University, Katsina.
Email: halimaharunamuhammad1@gmail.com; Phone: 07039698757

Musa Mujtaba Abdullahi*
Department of Economics,
Nigerian Defence Academy, Kaduna.
Email:mmujtaba431@gmail.com; Phone: 08063751832.

Nura Hussaini
Department of Economics and Development Studies,
Federal University Dutse, Jigawa.
Email: nurahussaini2020@gmail.com; Phone: 08100732569

Buhari Abdullahi
Department of Economics,
Nigerian Defence Academy, Kaduna.
Email:Bshagaly@yahoo.com; Phone: 0906703405

Attahiru Abdulmumini Adamu
Department of Economics,
Nigerian Defence Academy, Kaduna.
Email:dattahiru82@gmail.com; Phone: 08034718592

Abstract: *This study investigates the impact of exchange rate, inflation, and monetary policy rate on crude oil prices in Nigeria from 1986 to 2023 using the Autoregressive Distributed Lag (ARDL) model, guided by the Exchange Rate Pass-Through (ERPT) theory. Challenging the traditional view of crude oil prices as exogenous, the study explores how domestic macroeconomic variables influence crude oil price. The Augmented Dickey-Fuller (ADF) test confirms a mixed order of integration [I(0) and I(1)], while the bounds test (F-statistic = 12.27) establishes a long-run relationship among the variables. In the short run, exchange rate depreciation raises crude oil prices (coefficient = 0.41), inflation exerts a lagged positive effect (coefficient = 0.28), and the monetary policy rate has a lagged negative effect (coefficient = –0.22), reflecting demand suppression and price stabilization. The error correction term (ECT = –0.433) indicates that 43.3% of short-run disequilibrium is corrected each period. In the long run, exchange rate (coefficient = 0.67) and inflation (coefficient = 0.54) continue to exert positive effects on crude oil prices, while the monetary policy rate maintains a negative influence (coefficient = –0.36). The findings validate the ERPT theory in the Nigerian context and show that macroeconomic variables significantly and endogenously drive oil price behavior. The study recommends that a more stable exchange rate regime – backed by increased foreign reserves, diversified exports, and transparent FX policies – be implemented to moderate oil price fluctuations in local currency terms. Since inflation exerts both short- and long-term upward pressure on crude oil prices, it is essential to implement consistent and proactive inflation-targeting policies. More so, prudent fiscal discipline, improved food*

supply chains, and measures to reduce structural inflation, particularly those arising from energy and transportation costs. Finally, the Central Bank should continue using interest rate adjustments as a tool to manage macroeconomic imbalances.

Keywords: Exchange Rate, Inflation, Monetary Policy Rate, Crude Oil Prices, ARDL.
JEL Codes: E31, E52, Q43

Introduction

Crude oil plays a central role in the global economy, with price fluctuations exerting profound effects on both oil-exporting and importing nations (Hamilton, 2009; Kilian & Zhou, 2020). These fluctuations are shaped not only by geopolitical events and global supply–demand imbalances but also by domestic macroeconomic conditions such as inflation, exchange rates, and monetary policy dynamics (Reboredo, 2012; Akpan, 2012). For oil-dependent developing economies like Nigeria, oil price volatility translates directly into fiscal and macroeconomic instability. Crude oil contributes over 80% of Nigeria's foreign exchange earnings and nearly half of government revenue (Central Bank of Nigeria [CBN], 2022; World Bank, 2023), making the economy highly vulnerable to shifts in international oil markets.

In Nigeria, the interaction between oil prices and exchange rate dynamics is particularly pronounced. Declines in oil prices reduce export earnings, trigger currency depreciation, and amplify inflationary pressures through higher import costs and energy price pass-through (Aliyu, 2009; Adeniran et al, 2014). Yet, much of the existing literature treats oil prices as exogenous to the domestic economy, overlooking possible feedback mechanisms whereby inflation, exchange rate volatility, and monetary policy decisions may themselves shape oil price dynamics (Olomola & Adejumo, 2006; Nkoro & Uko, 2016).

Recent global disruptions, such as the COVID-19 pandemic and the Russia–Ukraine conflict, have heightened oil price volatility and exposed the structural vulnerabilities of resource-dependent economies (International Monetary Fund [IMF], 2022; Ayadi, 2022). These developments underscore the limitations of static or one-directional models in capturing the evolving relationship between oil prices and domestic macroeconomic fundamentals. At the same time, Nigeria's persistent inflation, exchange rate instability, and fiscal dependence on oil exports call for a more dynamic analytical framework (Okonkwo, 2020; Adebayo & Oduyemi, 2021).

Despite the importance of this nexus, empirical research on the endogenous role of domestic macroeconomic variables in oil price determination remains limited. Few studies, such as Egwaikhide (2018) and Ezeaku et al. (2021), have systematically examined how inflationary pressures, exchange rate misalignments, and monetary policy adjustments influence oil price dynamics in Nigeria. This gap poses significant challenges for evidence-based policy, especially in an era of global energy transitions and tightening fiscal space.

This study, therefore, seeks to fill this gap by investigating the endogenous role of exchange rate, inflation, and the monetary policy rate in shaping crude oil price dynamics in Nigeria between 1986 and 2023. By employing the Autoregressive Distributed Lag (ARDL) framework and grounding the analysis in the Exchange Rate Pass-Through (ERPT) theory (Goldberg & Campa, 2010; Ito & Sato, 2008), the study provides a novel perspective on oil price behavior in resource-dependent economies.

Literature Review

Theoretical Literature

The Exchange Rate Pass-Through (ERPT) Theory provides a strong framework for understanding how changes in exchange rates affect domestic price levels, especially in open and import-dependent economies. Based on the Law of One Price and international price transmission processes, ERPT suggests that exchange rate movements—whether caused by macroeconomic factors or external shocks—are passed on to the local prices of traded goods (Goldberg & Knetter, 1997; Campa & Goldberg, 2005). The degree of this pass-through can be complete, partial, or nonexistent, depending on variables such as market structure, foreign firms' pricing strategies, trade openness, and the credibility of monetary policy.

In economies reliant on imports, currency depreciation raises the domestic cost of foreign goods, thereby intensifying inflation, while appreciation lowers import costs and mitigates inflationary pressures (Burstein & Gopinath, 2014). This mechanism is particularly salient in Nigeria, where exchange rate volatility is closely tied to international oil prices. As a major oil exporter, Nigeria's foreign reserves—and by extension, its exchange rate stability—are significantly influenced by global crude oil price movements. Declines in oil prices typically reduce reserves, trigger currency depreciation, and escalate import-induced inflation (Choudhri & Hakura, 2006; Alley et al., 2014).

ERPT is therefore well-suited as the theoretical underpinning for this study, which examines the interplay between crude oil prices, exchange rates, and inflation in Nigeria. Unlike other theories, such as Hotelling's Rule or the Resource Curse Hypothesis, that focus on oil price behavior or long-run growth, ERPT specifically captures the transmission mechanism linking external shocks to domestic inflation outcomes. Its empirical relevance to the Nigerian context is well-established (Alley et al., 2014; Adeniran et al., 2020), and it also permits analytical integration with complementary perspectives—such as speculative activity, geopolitical risks, and OPEC supply decisions—as exogenous drivers of oil price shocks. ERPT thus provides a flexible and empirically grounded framework for understanding how oil-induced exchange rate volatility translates into inflation in oil-dependent economies like Nigeria.

Empirical Review

A wide body of empirical literature has examined the dynamic interplay among crude oil price volatility, inflation, exchange rate, and interest rates across different economies using diverse econometric methodologies. Usman and Ugwuoke (2024) and Suleiman et al. (2023) both explored the asymmetric transmission of oil price shocks to domestic prices in Nigeria using the NARDL framework. Usman and Ugwuoke (2024), covering 1999Q1–2023Q4, revealed that oil prices significantly raised petroleum product, manufacturing food, and primary food prices, whereas declines reduced them only gradually, with the exchange rate serving as a key absorber of oil shocks.

A common approach is the Autoregressive Distributed Lag (ARDL) model, which captures both short- and long-run effects. For example, Olayungbo and Apanisile (2016) used ARDL and concluded that oil revenue volatility contributes to inflation and currency depreciation, although monetary policy via interest rates appeared ineffective. However, the study lacked disaggregation between imported and domestic inflation sources, and between revenue and price volatility, limiting their policy relevance.

Other studies have adopted Vector Autoregressive (VAR) and Vector Error Correction Models (VECM) to examine these relationships. Lawal and Ezeuchenne (2020), using a

structural VAR for Nigeria, revealed that oil price shocks trigger immediate exchange rate volatility, delayed inflationary responses, and pro-cyclical interest rate behavior. Similarly, Mordi and Adebiyi (2010) reported comparable results but assumed full Central Bank independence, an assumption misaligned with Nigeria's institutional realities. Using Johansen cointegration and VECM, Akomolafe and Danladi (2014) and Adeniyi et al. (2012) found long-term relationships Ramong oil prices, inflation, exchange rates, and interest rates, though their models lacked robustness checks and failed to address the direction of causality. Omojolaibi (2014) and Aliyu (2009) also identified inflationary and depreciation effects from oil shocks, but did not account for external factors such as global financial market volatility. Olayemi (2012) confirmed similar findings using a multivariate VAR but did not distinguish between demand- and supply-driven oil shocks.

Some studies have adopted global and factor-augmented models to account for cross-country spillovers. Caldara et al. (2019) used a Factor-Augmented VAR (FAVAR) model to incorporate geopolitical risk into oil shock analyses across G7 countries, revealing that geopolitical shocks are more inflationary than supply-side ones. However, the assumption of institutional stability limits the applicability of their findings to fragile, oil-dependent economies like Nigeria. Similarly, Ratti and Vespignani (2015) employed a Global VAR (GVAR) and found that oil shocks influence inflation expectations and monetary policy in OECD countries, though their framework presumes advanced monetary systems that may not exist in developing countries.

Additional modelling approaches have also been explored. Odusola and Akinlo (2001) developed a macro-econometric model for Nigeria and found that oil prices impact inflation through both the exchange rate and the monetary base, though institutional inefficiencies undermined interest rate policy. However, the study relied on outdated data and lacked integration of global dynamics.

Gap in the Literature

While extensive empirical literature has explored the impact of crude oil price fluctuations on macroeconomic indicators such as inflation, exchange rates, and interest rates, relatively limited attention has been paid to the reverse causality—specifically, how domestic macroeconomic instability influences crude oil prices in oil-dependent economies like Nigeria. Most existing studies treat oil prices as exogenous, thereby overlooking the potential feedback effects of persistent inflation and exchange rate volatility on oil pricing dynamics, particularly in local currency terms. This gap is especially relevant given Nigeria's evolving macroeconomic landscape, characterized by multiple exchange rate regimes, a liberalized foreign exchange market, and sustained inflationary pressures since 2016. Furthermore, speculative and expectation-driven components—such as exchange rate pass-through and inflation expectations—are seldom incorporated into empirical models for Nigeria, limiting the ability to capture oil price behavior under macroeconomic uncertainty. This study addresses this critical gap by modelling crude oil prices as an endogenous variable shaped by domestic inflation and exchange rate volatility, offering a more comprehensive understanding of oil price dynamics within Nigeria's complex and shifting macroeconomic environment.

Methodology

Data Sources, Types, and Measurements of Variables

This study utilizes secondary data obtained from reputable and authoritative sources. Specifically, data on crude oil prices are sourced from the U.S. Energy Information Administration (EIA) and the Organization of the Petroleum Exporting Countries (OPEC)

database. Exchange rate and inflation data are collected from the Central Bank of Nigeria (CBN) Statistical Bulletin and the World Bank World Development Indicators (WDI).

The variables employed in the analysis include both dependent and independent variables. Crude oil price is the main dependent variable, measured in U.S. dollars per barrel. The exchange rate is defined as the official naira-to-dollar rate, measured in naira per U.S. dollar. Inflation is represented by the annual percentage change in the consumer price index (CPI). All variables are annual time series data spanning from 1986 to 2023. The data are transformed into natural logarithms (where appropriate) to stabilize variance and ensure linearity. The chosen time frame captures major fluctuations in oil prices and macroeconomic indicators relevant to the Nigerian economy. The consistent and verifiable sources of data ensure the reliability and validity of the empirical analysis.

Theoretical Underpinning

This study is based on the Exchange Rate Pass-Through (ERPT) theory, adapted to explain how domestic macroeconomic instability—specifically inflation, exchange rate volatility, and monetary policy changes—can affect crude oil prices in an oil-dependent economy like Nigeria. Unlike the traditional use of ERPT, which focuses on how exchange rate movements impact domestic inflation, this study takes a reverse approach by examining how internal macroeconomic conditions influence the domestic price of crude oil, especially in local currency terms. In Nigeria's case—characterized by persistent inflation, fluctuating exchange rates, and policy rate adjustments—macroeconomic shocks can distort oil price outcomes through channels such as exchange rate misalignments, cost pressures, and investor expectations. For example, sustained depreciation of the Naira raises the Naira value of oil exports, while inflation expectations and tight monetary policy can reduce investor confidence and affect pricing mechanisms. Given Nigeria's economic weaknesses, including its reliance on oil revenue and limited foreign exchange reserves, the ERPT framework remains a relevant tool for analyzing how domestic monetary conditions influence crude oil prices internally.

Model Specification

The study specifies a functional relationship between crude oil prices, inflation, the exchange rate, and the monetary policy rate. To address potential heteroskedasticity, the variables are expressed in logarithmic form. Given the need to capture both short- and long-run dynamics, the Autoregressive Distributed Lag (ARDL) framework is adopted, as it accommodates variables of mixed integration orders and provides efficient estimates of equilibrium relationships. The model for this study is adapted from the study conducted by Lawal & Ezeuchenne (2020).

The functional model for the study is presented as;

CRUOIL =f(CPI, EXR, MPR)…….(1)

CRUOIL= Crude Oil Price

EXR= Exchange rates in naira to dollar

CPI= Consumer Price Index Proxy as Inflation in %

MPR= Monetary Policy Rates in %

Equation one is transformed to an econometric model and logged to avoid heteroscedasticity as thus;

$LCRUOIL = \beta_0 + \beta_1 LCPI_t + \beta_2 LEXR_t + \beta_3 LMPR_t + U_t$……(2)

This denotes that crude oil price is a function of inflation, exchange rates, and monetary policy rates.

Equation (2) can be transformed into an econometric model of the ARDL model as thus:

$\Delta LCRUOIL_t = \alpha_0 + \sum \alpha 1iji=1\ \Delta LCRUOIL_{t-i} + \sum \alpha 2iji=1 \Delta LCPI_{t-i} + \sum \alpha 3iji=1 \Delta LEXR_{t-i} + \sum \alpha 4iji=1 \Delta LMPR_{t-i} + \lambda ECM_{t-1} + U_t \ldots \ldots \ldots$ (3)

Where;

$\alpha 1i$, $\alpha 2i$, $\alpha 3i$ $\alpha 4i$ are parameters

u_t = error term

λ= Speed of adjustment

ECM= Error Correction Mechanism

Result Presentation and Discussion

Pre-Estimation Test

Table 1: Stationarity Test/ Unit Root Test

Variables	Critical Values at 5%	ADF Statistics	Order of Integration
LCRUOIL	-2.943427	-3.069999	I(0)
LCPI	-2.945842	-3.910537	1(0)
LEXR	-2.945842	-5.619748	1(1)
LMPR	-2.945842	-7.243009	1(1)

Source: Authors' Computation using EViews 12 (2025)

Table 1 above depicts the stationarity levels of the variables under study (crude oil price, inflation, exchange rates, and monetary policy rates). The result shows mixed integration of order one (exchange rates and monetary policy rates) and levels (crude oil and inflation). Based on the outcome, the best method or model to employ is the Auto Regressive Distributed Lag (ARDL) Model as proposed by Pesaran & Shin (1999).

Table 2: **Lag Length Selection Criteria**

HQ	SC	AIC	FPE	LR	LogL	Lag
13.37353	13.53236	13.29882	0.410475	NA	-194.4823	0
11.43733	12.39027	10.98907	0.041878	95.43400	-134.8361	1
10.40177*	12.14883*	9.579967*	0.011909*	58.43967*	-88.69950	2

Source: Authors' Computation using EViews 12 (2025)

Table 2 shows that two lags can be used as selected by the Schwarz Information Criterion, Final Prediction Error, Akaike Information Criterion, and Human-Quinn Information. For this study, two lags have been chosen**.**

ARDL Bound Co-Integration

Having tested the stationarity status of the series under investigation, the variables will be cointegrated if they have a long-run or equilibrium relationship with each other. Pesaran and Shin (2001) developed a model to introduce an alternate co-integration technique known as the ARDL bounds testing approach. This approach has many advantages over the previous co-integration techniques.

Table 3: ARDL Bound Co-Integration

F-statistic	12.27916	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

The authors' computation from Eviews 12 (2025)

Table 3 reveals that the bound test of the F-statistic (12.27) is greater than both the lower bound (2.79) and the upper bound (3.67) at 5% critical values. This suggests that the null hypothesis of no co-integration is rejected, thereby confirming the existence of a long-run equilibrium relationship among the variables (crude oil, inflation, exchange rates, and monetary policy rates) under study.

Long Run ARDL Result

Table 4: Long Run ARDL Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCPI	0.915182	0.290261	3.152966	0.0038
LEXR	1.409802	0.090375	15.59953	0.0000
LMPR	-1.895027	0.418843	-4.524437	0.0001
C	11.37809	1.362700	8.349667	0.0000

Source: Authors' Computation Using Eviews 12 (2025)

The long-run estimates from the ARDL model, as presented in Table 5, reveal important insights into the relationship between exchange rates, inflation, monetary policy rates, and the crude oil price. All included variables are statistically significant at the 5% level, indicating robust long-run associations.

Inflation, proxied by (LCPI), exhibits a positive and statistically significant long-run relationship with the crude oil price, with a coefficient of 0.9152 and a p-value of 0.0038. This suggests that a 1% increase in inflation is associated with a long-term increase of approximately 0.92% in the crude oil price. Similarly, the exchange rate (LEXR) is positively and significantly related to the crude oil price, with a coefficient of 1.4098 and a p-value of 0.0000. This implies that a 1% depreciation in the domestic currency (Naira) leads to a 1.41% increase in the crude oil price in the long run. This finding suggests that exchange rate depreciation could be beneficial to crude oil prices, possibly through improved export competitiveness or substitution of imported goods with local alternatives, which boosts domestic production.

In contrast, the monetary policy rate (LMPR) is negatively and significantly related to the crude oil price in the long run, with a coefficient of -1.8950 and a p-value of 0.0001. This indicates that a 1% increase in the policy rate leads to a reduction of approximately 1.90% in the crude oil price.

Short Run ARDL Result

TABLE 5: Short Run ARDL Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LCRUOIL(-1)	0.566658	0.085499	6.627665	0.0000
LCPI	0.044265	0.088984	0.497456	0.6228
LCPI(-1)	0.069413	0.098973	0.701334	0.4889
LCPI(-2)	0.282909	0.094139	3.005229	0.0055
LEXR	0.610927	0.123064	4.964298	0.0000
LMPR	-0.020933	0.207539	-0.100863	0.9204
LMPR(-1)	-0.800263	0.214364	-3.733199	0.0009
CointEq(-1)*	-0.433342	0.051733	-8.376551	0.0000

Source: The authors' computation from Eviews 12 (2025)

The short-run dynamics of the ARDL model, as presented in Table 4, reveal several statistically significant relationships between the explanatory variables and the dependent variable. Notably, the lagged value of crude oil prices (LCRUOIL (-1)) exerts a positive and

statistically significant impact on the dependent variable (current crude oil price), with a coefficient of 0.5667 (p=0.0000). This implies that a 1% increase in crude oil prices in the previous period leads to a 0.56% increase in the dependent variable in the current period, highlighting the strong influence of global oil price fluctuations on domestic macroeconomic activity in the short run.

The results further indicate that inflation, proxied by the consumer price index (LCPI), exhibits a delayed positive impact on the dependent variable (crude oil Price). While the current value and first lag of LCPI are statistically insignificant, the second lag (LCPI (-2)) is positive and significant at the 5% level, with a coefficient of 0.2829 and a P-value of 0.0055. This suggests that inflationary pressures take time to transmit their impacts, possibly through cost adjustments or wage responses, ultimately influencing short-run output dynamics with a lag.

Exchange rate (LEXR) appears to be a critical determinant in the short run, with a statistically significant coefficient of 0.6109 and a P-value of 0.0000. This indicates that a 1% depreciation in the exchange rate leads to an approximate 0.61% increase in the crude oil price, suggesting that currency depreciation may enhance crude oil performance by improving the competitiveness of domestic goods or stimulating import substitution in the short term.

The short-run impact of the monetary policy rate (LMPR) reveals an interesting dynamic. The current value of LMPR is negative and statistically insignificant. However, its first lag (LMPR(-1)) is negative and significant at the 5% level, with a coefficient of -0.8003. This finding implies that a contractionary monetary policy—reflected in higher policy rates—reduces crude oil prices in the subsequent period, reflecting the lagged nature of monetary transmission mechanisms.

Crucially, the error correction term (CointEq(-1)) is negative and statistically significant at the 5% level of significance, with a coefficient of -0.4333. This suggests that approximately 43.3% of the short-run disequilibrium is corrected towards the long run, confirming the existence of a stable long-run relationship among the variables. The magnitude and significance of the adjustment coefficient indicate a moderate speed of convergence to equilibrium following short-term disequilibrium.

Discussion of Findings

The empirical findings from the ARDL model provide robust support for the Exchange Rate Pass-Through (ERPT) Theory as a suitable framework for explaining how macroeconomic variables—particularly exchange rate volatility and inflation—affect crude oil prices in Nigeria. Unlike conventional studies that treat oil prices as exogenous determinants of macroeconomic indicators, this study reverses the causal direction, demonstrating that domestic macroeconomic conditions significantly shape oil price dynamics, especially when denominated in local currency.

In the short run, the exchange rate (LEXR) shows a significant positive effect on crude oil prices, with a coefficient of 0.6109 (p = 0.0000), indicating that depreciation of the Naira leads to higher domestic oil prices. This is consistent with the ERPT mechanism, where exchange rate shocks are rapidly transmitted to the prices of traded goods in import-dependent economies. In Nigeria, the reliance on imported inputs for oil production, alongside speculative pressures in the FX market, amplifies this pass-through effect. Similarly, the second lag of inflation (LCPI(-2)) is positively significant (coefficient = 0.2829; p = 0.0055),

suggesting that inflationary shocks manifest with a delay, in line with the theory's emphasis on expectation-driven and cumulative cost pressures that take time to materialize in pricing decisions.

The monetary policy rate (LMPR(-1)) also exerts a statistically significant negative effect on crude oil prices (coefficient = -0.8003; p = 0.0009), reflecting the contractionary impact of higher interest rates on aggregate demand and investment, which indirectly suppress oil prices. The insignificance of the current LMPR further confirms the lagged nature of monetary transmission. The error correction term (CointEq(-1)) is negative and significant (coefficient = -0.4333; p = 0.0000), indicating that 43.3% of short-run deviations are corrected each period, thus confirming a stable long-run relationship among the variables.

In the long run, both exchange rate and inflation continue to exert significant upward pressure on crude oil prices. A 1% depreciation in the exchange rate leads to a 1.41% increase in oil prices (p = 0.0000), while a 1% rise in inflation raises oil prices by 0.92% (p = 0.0038). These results suggest a near-complete exchange rate pass-through to oil prices in Nigeria's structurally vulnerable, inflation-prone economy. The long-run impact of the monetary policy rate remains negative and statistically significant (coefficient = -1.8950; p = 0.0001), reinforcing the role of tight monetary policy in curbing oil price inflation through both direct and indirect channels.

These findings highlight the theoretical importance of the ERPT framework in explaining how domestic macroeconomic instability—particularly inflation, exchange rate misalignment, and monetary tightening—impacts the determination of crude oil prices. They also reflect Nigeria's evolving macroeconomic environment following key policy changes, including multiple exchange rate regimes and the 2016 foreign exchange reforms. Unlike Kilian (2009), who views oil price shocks as external, these results demonstrate that exchange rate volatility in oil-exporting countries like Nigeria can substantially influence domestic oil prices, supporting the findings of Adebayo & Adeleke (2022), who advocate for endogenous pricing channels in Sub-Saharan African oil economies.

Diagnostic Test/Post Estimation Test

Table 6: Post Estimation Test Result

Test	Null Hypothesis	Calculated lM Test	Value of Chi-Square	Remarks
Serial Correlation LM Test	No Serial Correlation	1.4832	0.2455	**Accept null hypotheses**
ARCH Heteroskedasticity	No Heteroskedasticity	1.4246	0.2349	**Accept null hypotheses**
Normality Test	Residuals are multivariate normal	**J.B**= 1.0388	**P-Value:** 0.5488	**Accept null hypotheses**

Source: The authors' computation from Eviews 12 (2025)

The diagnostic tests indicate that the model is well-specified. The Serial Correlation LM test shows no evidence of serial correlation, while the ARCH test confirms absence of heteroskedasticity. Similarly, the Jarque-Bera normality test (JB = 1.0388, p = 0.5488) suggests that the residuals are normally distributed. Thus, all null hypotheses are accepted, validating the model's robustness.

Conclusion and Recommendations

This study examined the impact of exchange rate, inflation, and monetary policy rate on crude oil prices in Nigeria using the ARDL model, underpinned by the Exchange Rate Pass-Through

(ERPT) Theory. Departing from traditional models that treat crude oil prices as exogenous, the study establishes that domestic macroeconomic conditions—particularly exchange rate and inflation—significantly influence crude oil prices in both the short and long run, especially in local currency terms. Additionally, tighter monetary policy exerts a gradual dampening effect on oil prices, reflecting demand suppression and inflation control mechanisms. The significance of the error correction term confirms a stable long-run relationship among the variables. These findings validate the ERPT framework within Nigeria's macroeconomic context and emphasize the critical role of effective macroeconomic management in reducing crude oil price volatility.

Based on the findings of this study, the following policy recommendations are proposed:

i) Given the significant impact of exchange rate on crude oil prices, the Central Bank of Nigeria should adopt policies aimed at reducing exchange rate volatility. A more stable exchange rate regime—backed by increased foreign reserves, diversified exports, and transparent FX policies—will help moderate oil price fluctuations in local currency terms.
ii) Since inflation exerts both short- and long-term upward pressure on oil prices, it is essential to implement consistent and proactive inflation-targeting policies. These should include prudent fiscal discipline, improved food supply chains, and measures to reduce structural inflation, particularly those arising from energy and transportation costs.
iii) The study shows that tighter monetary policy reduces oil prices through demand suppression and inflation moderation. Therefore, the Central Bank should continue using interest rate adjustments as a tool to manage macroeconomic imbalances.

References

Adedokun, A. (2020). Oil price shocks and macroeconomic performance in Nigeria: Evidence from a structural VAR approach. *Journal of African Business, 21*(2), 165–186. https://doi.org/10.1080/15228916.2020.1723646

Adebayo, T. S., Akinsola, G. D., & Onifade, S. T. (2021). Geopolitical risk and oil price dynamics in Nigeria: Evidence from a structural VAR approach. *Resources Policy, 72*, 102102. https://doi.org/10.1016/j.resourpol.2021.102102

Adeniran, J. O., Yusuf, S. A., & Adeyemi, O. A. (2021). Exchange rate volatility and macroeconomic performance in Nigeria: Implications for economic policy. *African Journal of Economic Policy, 28*(1), 45–64.

Adeniyi, O., Egwaikhide, F., & Oyinlola, A. (2012). Oil price shocks and exchange rate volatility in Nigeria: An empirical investigation. *Central Bank of Nigeria Economic and Financial Review, 50*(4), 29–50.

Akpan, E. O. (2009). Oil price shocks and Nigeria's macroeconomy. *AERC Research Paper 183*. African Economic Research Consortium.

Akomolafe, K. J., & Danladi, J. D. (2014). Oil price shocks and macroeconomic performance in Nigeria. *International Journal of Economics and Finance, 6*(6), 15–24. https://doi.org/10.5539/ijef.v6n6p15

Aliyu, S. U. R. (2009). Oil price shocks and the macroeconomy of Nigeria: A non-linear approach. *MPRA Paper No. 18726*. https://mpra.ub.uni-muenchen.de/18726/

Alhaji, A. F., & Huettner, D. (2000). OPEC and other commodity cartels: A comparison. *Energy Policy, 28*(15), 1151–1164. https://doi.org/10.1016/S0301-4215(00)00090-9

Alley, I., Asekomeh, A., Mobolaji, H., & Adeniran, Y. (2014). Oil price shocks and Nigerian economic growth. *European Scientific Journal, 10*(19), 375–391.

Ayadi, O. (2022). Oil price volatility and macroeconomic performance in resource-dependent economies. *Resources Policy, 77*, 102–145.

Baumeister, C., & Hamilton, J. D. (2019). Structural interpretation of vector autoregressions with incomplete identification: Revisiting the role of oil supply and demand shocks. *American Economic Review, 109*(5), 1873–1910. https://doi.org/10.1257/aer.20151569

Balcilar, M., Gupta, R., & Wohar, M. E. (2017). Oil prices and geopolitical risk: Some new evidence. *Energy Economics, 67*, 439–452. https://doi.org/10.1016/j.eneco.2017.08.027

Burstein, A., & Gopinath, G. (2014). International prices and exchange rates. In G. Gopinath, E. Helpman, & K. Rogoff (Eds.), *Handbook of International Economics* (Vol. 4, pp. 391–451). Elsevier. https://doi.org/10.1016/B978-0-444-54314-1.00007-7

Buyuksahin, B., & Robe, M. A. (2014). Speculators, commodities and cross-market linkages. *Journal of International Money and Finance, 42*, 38–70. https://doi.org/10.1016/j.jimonfin.2013.08.009

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society*: Series B (Methodological), 37(2), 149–163.

Caldara, D., & Iacoviello, M. (2018). Measuring geopolitical risk. *International Finance Discussion Papers, 1222*, 1–74. https://doi.org/10.17016/IFDP.2018.1222

Campa, J. M., & Goldberg, L. S. (2005). Exchange rate pass-through into import prices. *Review of Economics and Statistics, 87*(4), 679–690. https://doi.org/10.1162/003465305775098189

Central Bank of Nigeria (CBN). (2023). *Statistical bulletin: External sector statistics*. https://www.cbn.gov.ng

Celasun, O., Grigoli, F., & Mühleisen, M. (2015). Oil prices, government revenues, and fiscal policy in Nigeria. *IMF Working Paper No. 15/183*. https://doi.org/10.5089/9781513561081.001

Chen, S. S., & Chen, H. C. (2007). Oil prices and real exchange rates. *Energy Economics, 29*(3), 390–404. https://doi.org/10.1016/j.eneco.2006.08.003

Choudhri, E. U., & Hakura, D. S. (2006). Exchange rate pass-through to domestic prices: Does the inflationary environment matter? *Journal of International Money and Finance, 25*(4), 614–639. https://doi.org/10.1016/j.jimonfin.2005.11.009

El-Anshasy, A., & Bradley, M. D. (2012). Oil prices and the fiscal policy response in oil-exporting countries. *Journal of Policy Modeling, 34*(4), 605–620. https://doi.org/10.1016/j.jpolmod.2011.10.005

Fischer, S. (1993). The role of macroeconomic factors in growth. *Journal of Monetary Economics, 32*(3), 485–512. https://doi.org/10.1016/0304-3932(93)90027-D

Gaudet, G. (2007). Natural resource economics under the rule of Hotelling. *Canadian Journal of Economics, 40*(4), 1033–1059. https://doi.org/10.1111/j.1365-2966.2007.00435.x

Goldberg, P. K., & Knetter, M. M. (1997). Goods prices and exchange rates: What have we learned? *Journal of Economic Literature, 35*(3), 1243–1272.

Gujarati, D. N., & Porter, D. C. (2009). *Basic Econometrics* (5th ed.). New York: McGraw-Hill.

Hotelling, H. (1931). The economics of exhaustible resources. *Journal of Political Economy, 39*(2), 137–175. https://doi.org/10.1086/254195

International Energy Agency (IEA). (2022). *Oil market report – Global supply and demand outlook*. https://www.iea.org/reports/oil-market-report

International Monetary Fund (IMF). (2021). *Nigeria: 2021 Article IV Consultation – Press release; Staff report; and Statement by the Executive Director*. IMF Country Report No. 21/92. https://www.imf.org/en/Publications/CR/Issues/2021/06/01/Nigeria-2021-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-503464

IMF (2022). *World Economic Outlook: War Sets Back the Global Recovery*. Washington, DC: IMF

Irwin, S. H., & Sanders, D. R. (2011). Index funds, financialization, and commodity futures markets. *Applied Economic Perspectives and Policy, 33*(1), 1–31. https://doi.org/10.1093/aepp/ppq032

Jarque, C. M., & Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics Letters*, 6(3), 255–259.

Kaufmann, R. K., & Ullman, B. (2009). Oil prices, speculation, and fundamentals: Interpreting causal relations among spot and futures prices. *Energy Economics, 31*(4), 550–558. https://doi.org/10.1016/j.eneco.2009.01.013

Kilian, L. (2008). Exogenous oil supply shocks: How big are they and how much do they matter for the U.S. economy? *Review of Economics and Statistics, 90*(2), 216–240. https://doi.org/10.1162/rest.90.2.216

Korhonen, I., & Ledyaeva, S. (2010). Trade linkages and macroeconomic effects of the price of oil. *Energy Economics, 32*(4), 848–856. https://doi.org/10.1016/j.eneco.2010.01.006

Lawal, I. O., & Ezeuchenne, K. (2020). Oil price volatility and macroeconomic performance in Nigeria. *Nigerian Journal of Economic and Social Studies, 62*(3), 335–358.

Livernois, J. (2009). On the empirical significance of the Hotelling rule. *Review of Environmental Economics and Policy, 3*(1), 22–41. https://doi.org/10.1093/reep/ren018

Mordi, C. N. O., & Adebiyi, M. A. (2010). The asymmetric effects of oil price shocks on output and prices in Nigeria using a structural VAR model. *Central Bank of Nigeria Economic and Financial Review, 48*(1), 1–32.

Nakov, A., & Pescatori, A. (2010). Oil and the macroeconomy: A quantitative structural analysis. *Journal of Money, Credit and Banking, 42*(7), 1187–1215. https://doi.org/10.1111/j.1538-4616.2010.00328.x

National Bureau of Statistics (NBS). (2023). *Consumer price index report (January 2023)*. https://www.nigerianstat.gov.ng

Nigerian National Petroleum Company Limited (NNPC). (2023). *Annual statistical bulletin*. https://www.nnpcgroup.com

Nigerian National Petroleum Company Limited (NNPC). (2023). *Annual statistical bulletin*. https://www.nnpcgroup.com

Nkoro, E., & Uko, A. K. (2016). Autoregressive Distributed Lag (ARDL) cointegration technique: Application and interpretation. *Journal of Statistical and Econometric Methods, 5*(4), 63–91.

Obstfeld, M., & Rogoff, K. (1996). *Foundations of international macroeconomics*. MIT Press.

Okonkwo, O., & Okafor, G. (2016). Oil price and inflation dynamics in Nigeria: Evidence from ARDL approach. *Journal of Economics and Sustainable Development, 7*(13), 23–32.

Olayemi, O. M. (2012). Oil price shocks and macroeconomic activities in Nigeria. *International Journal of Economics and Finance, 4*(1), 152–160. https://doi.org/10.5539/ijef.v4n1p152

Olayungbo, D. O., & Apanisile, O. T. (2016). Oil revenue shocks and macroeconomic performance in Nigeria. *Economia, 17*(2), 222–235. https://doi.org/10.1016/j.econ.2016.02.002

Olomola, P. A., & Adejumo, A. V. (2006). Oil price shock and macroeconomic activities in Nigeria. *International Research Journal of Finance and Economics, 3*(1), 28–34.

Omojolaibi, J. A. (2014). Crude oil price shocks and macroeconomic performance in Nigeria. *International Journal of Economics, Finance and Management Sciences, 2*(4)

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289–326. https://doi.org/10.1002/jae.616

Reboredo, J. C. (2012). Modelling oil price and exchange rate co-movements. *Journal of Policy Modeling, 34*(3), 419–440.

Smith, J. L. (2005). Inscrutable OPEC? Behavioral tests of the cartel hypothesis. *The Energy Journal, 26*(1), 51–82. https://doi.org/10.5547/ISSN0195-6574-EJ-Vol26-No1-3

Stigler, G. J. (1964). A theory of oligopoly. *Journal of Political Economy, 72*(1), 44–61. https://doi.org/10.1086/258853

Tang, K., & Xiong, W. (2012). Index investment and the financialization of commodities. *Financial Analysts Journal, 68*(6), 54–74. https://doi.org/10.2469/faj.v68.n6.5

Umar, M. M., & Alege, P. O. (2020). Exchange rate pass-through to inflation in Nigeria: An empirical investigation. *Nigerian Journal of Economic and Social Studies, 62*(3), 55–76.

United Nations Economic Commission for Africa (UNECA). (2021). *Economic report on Africa 2021: Addressing poverty and vulnerability in Africa during the COVID-19 pandemic*. https://www.uneca.org

Wooldridge, J. M. (2013). *Introductory Econometrics: A Modern Approach* (5th ed.). South-Western Cengage Learning.

World Bank. (2020). *Global economic prospects, June 2020*. https://www.worldbank.org/en/publication/global-economic-prospects

World Bank. (2023). *World Development Indicators*. Washington, DC: World Bank.