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# Asymmetric Effect of Oil Price Shocks on Inflation Rate in Nigeria

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**ABSTRACT**
Crude oil remains one of the most critical energy resources in modern industrial economies. The oil price shock is argued to have a significant impact on a number of important macroeconomic factors, including the real GDP, exchange rate, inflation rate, and oil revenue, to name a few. Hence, the broad objective of the study is to analyze the effect of oil price shocks on Inflation in Nigeria using time series techniques, and econometric models of the Non-linear Autoregressive Distributed Lags (NARDL) model. The oil price, and inflation rate data were collected for the periods of 44 years (1981 – 2024) from the Central Bank of Nigeria, and US Energy Information Administration (EIA). The results show that the control variable: exchange rate, real GDP and oil revenue have positive and significant relationships with inflation. In the long run, the effect of oil price shocks on inflation rate show that Other explanatory variables, such as: inflation, real GDP, and oil revenue, are statistically insignificant in explaining the long-term behavior of the exchange rate indicating a gradual upward trend in the exchange rate over time, likely reflecting structural depreciation pressures and cumulative macroeconomic developments. The short-run coefficients show that immediate oil price changes have differential effects on the exchange rate. Notably, positive oil price shocks are associated with a significant short-run depreciation**.** In contrast, lagged positive shocks and negative shocks are statistically insignificant in the short run. The study therefore, recommends that government/CBN should take the following appropriate measures such as: Strengthen monetary and fiscal policy coordination, and Improve oil production and security in the Niger Delta, Nigeria.

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## INTRODUCTION

Crude oil remains one of the most critical energy resources in modern industrial economies and continues to play a central role in global economic activity. Owing to the heavy dependence of many countries on petroleum products, oil price movements are widely regarded as important indicators of global economic stability (Ismail et al., 2025). Over the past five decades, crude oil has constituted a substantial share of exports for oil-exporting economies and imports for oil-importing countries in Africa. Consequently, the pricing of crude oil has become highly sensitive to market forces, including global demand and

supply conditions, production quota decisions by the Organization of the Petroleum Exporting Countries (OPEC), increased output from non-OPEC producers, geopolitical developments, speculative activities, and global economic shocks. These factors collectively contribute to persistent oil price volatility (Garba, 2024).

In Nigeria, the oil and gas sector has historically been the dominant source of government revenue, foreign exchange earnings, and employment opportunities, thereby exerting a profound influence on economic growth and development (Saheed et al., 2025). Oil price shocks transmit through multiple macroeconomic channels, particularly oil GDP, exchange rate dynamics, inflation, and oil revenue derived from crude exports. These variables often respond either positively or negatively to global oil price movements (Garba, 2024).

Nigeria's fiscal and external sector performance remains heavily dependent on crude oil. The sector accounts for a dominant share of foreign exchange earnings and government revenue (CBN, 2024). Consequently, oil price behaviour has become a critical determinant of fiscal and monetary policy outcomes, particularly because annual budgets are benchmarked against projected oil prices (Mgbemone et al., 2024). Like many oil-exporting economies, Nigeria adopts an oil price benchmark for fiscal planning; however, weak fiscal buffers and limited savings during oil windfalls have heightened the economy's vulnerability to oil price downturns.

Nigeria possesses substantial hydrocarbon resources. As of 2024, proven oil reserves stood at approximately 37.1 billion barrels (about 2.2 percent of global reserves), while proven natural gas reserves were estimated at 5.1 trillion cubic metres (about 2.7 percent of the global total) (IEA, 2025). Nevertheless, global oil prices have exhibited pronounced volatility in recent years, falling sharply from over $100 per barrel in 2014 to about $15 in 2020 during the COVID-19 pandemic before partially recovering to around $80 per barrel by December 2024. Such instability has continued to pose significant macroeconomic management challenges.

Since the oil shocks of the 1970s, the relationship between oil price movements and macroeconomic performance has remained an important empirical question. Although numerous studies have examined the oil price–macro economy nexus, their findings remain mixed and sometimes conflicting (Bamaiyi, 2024; Bawa et al., 2020; Garba, 2024). Nigeria's growth trajectory vividly reflects this linkage: GDP growth accelerated during the oil boom of the 1970s but contracted sharply during periods of adverse oil price movements in the 1980s (Alfa, Etiler, & Musa, 2020).

Nigeria represents a compelling case of a highly oil-dependent economy with limited structural diversification. Since the discovery of crude oil in commercial quantities in 1956, the sector has remained the dominant source of government revenue and foreign exchange earnings, thereby exerting substantial influence on key macroeconomic indicators such as exchange rate, inflation, interest rate, and oil revenue. Recent fiscal data underscore this dependence: oil revenue accounted for 55.4 percent of total government revenue in 2015, 48.0 percent in 2016, 52.6 percent in 2017, 58.1 percent in 2018, 50.6 percent in 2019, 51.0 percent in 2020, 67.5 percent in 2021, 69.8 percent in 2022, 79.9 percent in 2023, and 76.7 percent in 2024 (CBN, 2024). This pattern indicates that the overall health of the Nigerian economy remains closely tied to developments in the oil sector.

The high degree of oil dependence has rendered the Nigerian economy particularly vulnerable to external shocks. For example, between 2013 and 2016, Nigeria experienced declining growth partly associated with sharp oil price fluctuations and exacerbated by disruptions in the Niger Delta region, including pipeline vandalism and militant activities (Mgbemone et al., 2024). More recently, global developments such as: the COVID-19 pandemic, geopolitical tensions involving Russia and Ukraine, and production disagreements among major oil producers have intensified volatility in the international oil market, thereby heightening macroeconomic uncertainty for oil-dependent economies such as Nigeria (Garba, 2024).

**Concept of Crude oil**

Crude oil is a naturally occurring fossil fuel composed primarily of hydrocarbons, formed over millions of years from the remains of plants and animals buried under layers of sediment, sand, or mud (Garba, 2024). It is considered a non-renewable energy source due to the long geological times required for its formation. In its natural state, crude oil can vary in colour, consistency, and composition, ranging from thin, light oils like gasoline to thick, heavy oils similar to tar (Saheed et al., 2024).

**Concept of Oil Prices**

Oil prices refer to the international market price of crude oil per barrel, typically quoted in US dollars. These prices are influenced by global supply and demand dynamics, geopolitical developments, and the location of major oil reserves (International Energy Agency [IEA], 2024). While there is no single global price for crude oil, market benchmarks such as West Texas Intermediate (WTI), Brent, and Dubai provide reference points for pricing, with actual trade prices often quoted at premiums or discounts relative to these benchmarks.

**Concept of Crude Oil Price Shocks**

Crude oil price shocks are defined as sudden and significant changes in the global price of crude oil, which can arise from shifts in supply, demand, geopolitical events, or market disruptions (Eric, 2020; Saheed et al., 2025). These shocks can be positive (price increases) or

negative (price decreases), and their effects on an economy depend on the underlying cause. For example, a price increase due to higher global demand may affect output differently than a price increase resulting from reduced oil supply.

**Concept of Macroeconomic Variables**

Macroeconomic variables are key indicators that reflect the overall health, stability, and performance of an economy. They are essential for analysing how external shocks, such as fluctuations in global oil prices, affect economic activity, government finances, and the welfare of citizens (Mishkin, 2015; Blanchard, 2017). In the context of Nigeria, four macroeconomic variables are particularly significant: Inflation rate, real GDP, exchange rate, and oil revenue**,** each playing a distinct but interconnected role in determining economic outcomes (Saheed et al., 2024; Garba, 2024).

1. ***Inflation rate*** reflects changes in the general price level of goods and services and indicates the purchasing power of money (Mankiw, 2016; Saheed et al., 2024). Oil price shocks are a major driver of inflation in oil-dependent economies like Nigeria. Higher global oil prices increase production and transportation costs, which are often passed on to consumers. Inflation can also be affected indirectly through monetary and fiscal responses to oil revenue changes (Bamaiyi, 2024; Blanchard, 2017). Persistent inflation reduces household purchasing power, distorts consumption patterns, and affects industrial production, highlighting the close link between oil market volatility and macroeconomic stability (Mgbemone et al., 2024).
2. ***Real GDP*** measures the total value of goods and services produced within the country, adjusted for inflation, and serves as a primary indicator of economic growth and productive capacity (Gutman, 2021; Joan, 2019). It provides a meaningful measure of how fluctuations in oil prices impact overall output and the standard of living. Positive oil price shocks can stimulate production, investment, and economic growth through increased oil revenue, while negative shocks can reduce output and slow economic activity (Ogbuagu, 2024; Bawa et al., 2020).
3. ***Exchange rate*** represents the value of the Nigerian Naira relative to foreign currencies and is a key determinant of trade competitiveness (Sadeeq et al., 2023; Krugman & Obstfeld, 2018). Changes in global oil prices influence foreign exchange inflows through oil exports, affecting the Naira's strength. An increase in oil prices generally strengthens the domestic currency by boosting foreign earnings, whereas a sudden decline can lead to depreciation, raising import costs and exerting inflationary pressures (Iyoha & Oriakhi, 2002; Garba, 2024). Exchange rate fluctuations also influence investment decisions, import-export dynamics, and debt servicing costs, making it a critical channel through which oil price shocks affect the broader economy (Mishkin, 2015).
4. ***Oil revenue*** constitutes the government's earnings from crude oil exports and is a central source of fiscal resources in Nigeria (Bamaiyi, 2024; Garba, 2024). Fluctuations in oil prices have direct implications for public finances, government spending, and investment in infrastructure and social services. Positive oil price shocks increase oil revenue, allowing for higher government expenditure, while negative shocks constrain fiscal capacity and may necessitate borrowing or expenditure cuts (Keynes, 1936; Ogbuagu, 2024). Given Nigeria's reliance on oil exports for foreign exchange and budgetary funding, oil revenue is a crucial channel through which global oil price changes transmit to other macroeconomic variables.

**New Keynesian Phillips Curve (NKPC)**

The New Keynesian Phillips Curve (NKPC) offers a micro-founded framework for analysing inflation dynamics in the presence of nominal rigidities and forward-looking price setting. Building on Calvo's (1983) staggered price adjustment model, the NKPC posits that current inflation depends on expected future inflation and real marginal cost. Within this framework, firms cannot adjust prices continuously due to menu costs and contractual rigidities, making inflation partly forward-looking and partly driven by cost conditions. Oil price increases enter the model as cost-push shocks because energy prices are embedded in firms' production costs. Consequently, higher oil prices raise marginal costs and induce firms to adjust prices upward, thereby generating inflationary pressures (Blanchard & Galí, 2007).

The NKPC also highlights the role of expectations and monetary policy credibility in shaping inflation outcomes. If economic agents anticipate persistent oil price increases, inflation expectations may become unanchored, leading to second-round effects on wages and prices. Conversely, credible monetary policy can dampen the pass-through of oil price shocks to headline inflation. The framework therefore provides an important bridge between real shocks originating in the energy market and observed inflation dynamics.

In the Nigerian economy, where energy costs significantly influence transportation, manufacturing, electricity generation, and household expenditures, oil price shocks are expected to transmit strongly into the Consumer Price Index. Exchange rate depreciation can further amplify this pass-through through imported inflation, given Nigeria's high dependence on imported fuel and manufactured goods. The NKPC is thus particularly useful for explaining the inflation channel of oil price shocks in Nigeria and complements the structural insights provided by the Dutch Disease and Supply Shock frameworks. Nonetheless, the

strength of the inflation pass-through depends critically on monetary policy effectiveness, exchange rate management, the degree of price and wage rigidity, and the structure of fuel pricing in the domestic economy.

Bello, *et al*. (2025), empirically examined the effect of oil price shocks on Nigeria's macroeconomic variables using time series techniques of the Non-linear Autoregressive Distributed Lags (NARDL) model. The oil price and macroeconomic variables data were collected for the periods of 42 years (1981 – 2022) from the Central Bank of Nigeria and the US Energy Information Administration (EIA). The Bound Test of the NARDL specification suggests the presence of cointegration among variables. The results show that in the short-run and long-run, oil price shocks have significant effects on macroeconomic variables such as exchange rate, inflation rate, oil revenue and government expenditure. The effect of global oil price shocks on inflation rate is positive, indicating that an increase in oil price leads to an increase in inflation rate in Nigeria; in contrast, the effect of shocks in the oil price on exchange rate is negative, indicating that an increase in global oil price leads to depreciation of exchange rate and fall in oil revenue thereby affecting government expenditure negatively in Nigeria. Hence, the study recommends that appropriate measures such as functional refineries and stable macroeconomic policies should be emphasized by the Nigerian government.

Ismail, *et al.,* (2025) empirically assessed the impact of oil price shocks on the Nigerian economy: Evidence Markov Regime-switching Models using Markov Regime Switching (MRS) models. The unit root test of ADF and PP indicated all the variables employed are stationery at first difference. The study found that the estimates lend support to the presence of regime switching for the effects of oil price shocks on real gross domestic product. It was observed that the probability regime two of oil price shocks has high volatility than regime one in the whole sample period of the study with their P-value been statistically significant. The study recommend that policy makers should look inward to diversify the economy from mono-economy of oil sector and exploit alternative revenue areas such as aggressive tax regime by taxing the rich more, solid mineral exploration, reserve management, investment in agricultural mechanization and adopt flexible policies to attract foreign investment.

Garba (2024) empirically investigated the impact of oil price shocks on selected macroeconomic variables in Nigeria using Vector Autoregressive model (VAR). The study explores the relationship among the variables. The result of the unit root test indicates that all the variables are integrated of order one (I(1)). The findings suggest that oil price shocks significantly affect the selected macroeconomic variables (unemployment rates, balance of payment, and real GDP) with implications for exchange rates, unemployment rates, and balance of payments.

Bello, *et al.,* (2024) empirically analyzed the response of selected macroeconomic variables to oil price shocks in Nigeria using time series techniques of the Vector Autoregressive (VAR) model, cointegration test, Impulse Response Function (IRFs) and Variance Decompositions (VDCs). The result of contegration test suggests the presence of cointegration among variables. The estimated VAR model affirms the response of shocks in the macroeconomic variables. The results have shown that the oil price shocks have significant response on macroeconomic variables in Nigeria. The response of inflation rate to global oil price shocks is positive, indicating that increase in oil price leads to increase in inflation rate in Nigeria; in contrast the response of exchange rate to oil price shocks is negative, indicating that an increase in global oil price leads to depreciation of exchange rate and fall in oil revenue thereby affecting government expenditure negatively in Nigeria. Hence, the study recommends that appropriate measures to be taken such as capacity utilization of the oil sector and the Nigerian government should emphasize stable macroeconomic policies as well as diversification of the economy

Ogbuagu (2024) empirically investigated the impact of oil price fluctuations on economic growth in Nigeria using Generalized Autoregressive Conditional Hetroscedasticity (GARCH) model. The study revealed that 9.1000237 of oil price and -7.436407 of OPEC supply have significant impact on economic growth in Nigeria; whereas 5.248408 of oil demand, 4.385210 of non OPEC supply and 0.009432 of exchange rate are statistically significant. The study further revealed that 9.100237 of oil price, 5.248408 of oil demand, 4.385210 of non OPEC supply and 0.009432 of exchange rate have a positive relationship with economic growth in Nigeria whereas -7.436407 of OPEC supply have a negative relationship with economic growth in Nigeria. However, the study above did not to connect the Structural Vector Autoregressive (SVAR) with the supporting theories like that of Philips Curve Theory and most of Structural Vector Autoregressive (SVAR) models adopted Philips Curve analysis in explaining the theoretical underpinning that study anchored upon.

Bello, *et al*. (2023), empirically examined how shocks in oil prices affect Nigeria's inflation and exchange rate using the Nonlinear Autoregressive Distributed Lags (NARDL) method. The results showed that that in the short-run and long-run, global oil price shock has significant effects on exchange rate and inflation rate; and the findings show that the effect of global oil price shocks on inflation rate is positive meaning that increase in oil price leads to increase in inflation rate in Nigeria; while the effect of oil price shocks on exchange rate is negative indicating the rise in global oil price leads to depreciation of exchange rate and rise in interest rate in Nigeria.

Sedeeq *et al*. (2023) empirically examined the effect of international crude oil prices on Nigeria's Gross Domestic Product applying Autoregressive Distributed Lags (ARDL) model. The study adopted secondary data such as Nigeria's Real GDP, Crude Oil Price, Real Exchange Rate and Foreign Direct Investment (FDI) that covers the period 1985 to 2020. From the analysis, it can be deduced that in the short run, there is a positive impact of oil price on real GDP which is statistically significant at one percent level. As real exchange rate rises by one percent, the real GDP rises by 1.528 per cent, all things being equal. While the long run, the effect is positive and statistically significant measuring 14.67 positive effects on the economy. It also revealed that while oil price volatility affects economic development positively in the short term, its effect in the long term is not statistically significant. Findings from the study revealed that crude prices have a positive effect on GDP in Nigeria. However, the paper has failed to adopt other econometric model such as Vector Autoregressive model (VAR) because it is easy to estimate and can adopt Ordinary Least Square (OLS) method, Vector Error Correction Model (VECM) which can be used to correct for short-run disequilibrium or deviations, Impulse Response Functions (IRFs) and Variance Decompositions (VCDs) so as to show the responses of exchange rate in different exchange rate regimes due to oil price shocks in two different countries under the study.

Bawa, *et al*. (2020) investigated asymmetric impact of oil price on inflation in Nigeria using a Non-Linear Autoregressive Distributed Lag (NARDL) approach on quarterly time series data in Nigeria. Results showed that oil price increases led to increase in headline, core and food measures of inflation in Nigeria. However, a decline in oil price resulted in a decline in the marginal cost of production and culminated in moderation of domestic inflation. Furthermore, negative oil price shocks led to higher inflation in Nigeria when exchange rate is dropped from the models, indicating that exchange rate absorbed the impact of oil price declines earlier, as lower oil prices culminated in lower external reserve, depreciation of the naira and ultimately higher inflationary pressures. However, this research attempted in bringing the theoretical underpinning of the New Keynesian model being utilized as the standard framework for analyzing the interactions between macroeconomic variables; and the New Keynesian Phillips Curve (NKPC) framework. The NKPC describes a relationship between inflation, the expectations that firms hold about future inflation and the real marginal cost of production.

The aim of this study is to empirically investigate the effect of oil price shocks on inflation rate in Nigeria.

## MATERIALS AND METHODS

The secondary data was used for the purpose of this study. The study used annual time-series data on oil price, inflation rate, and some other macroeconomic variables. Secondary data covered the macroeconomic variables' yearly transactions for 42 years (1981 – 2024) for each macroeconomic variable, which was obtained from the Central Bank of Nigeria (CBN. The oil price is the Brent crude oil price and was also obtained from the US Energy Information Administration (EIA). The following was the main focus of the data collection: variables: exchange rate, inflation rate, oil revenue and government expenditure which are the selected macroeconomic variables.

### The Specification of the NARDL Model

$INFR_t = f(OPt+, OPt-, EXCRt, OILRt, RGDPt)$ (1)

The inflation rate model in this study is adapted from Lawal et al. (2023), who examined the effects of oil price shocks on exchange rates and inflation in Nigeria from 1981 to 2021. This model is introduced to capture the spill-over effects of oil price fluctuations on production and logistics costs, which, in turn, influence overall economic activity. Following the theoretical insights of Hamilton (2003) and Bernanke et al. (1997), oil price shocks tend to increase production and distribution costs, leading to higher inflationary pressures. In the context of the Nigerian economy, inflation also reflects the responses of monetary authorities to shifts in government revenue and exchange rates caused by oil price shocks (Aliyu, 2009).

Real GDP is incorporated into the model to capture overall economic activity and its influence on exchange rate dynamics. Increases in output, particularly those driven by rising oil prices, can enhance balance-of-payments conditions and boost investor confidence, thereby supporting currency appreciation. Conversely, declines in output may increase depreciation pressures (Iyoha & Oriakhi, 2002; Aliyu, 2009).

The exchange rate reflects Dutch Disease and income transfer effects, as oil price shocks affect external competitiveness, foreign exchange availability, and resource allocation across tradable and non-tradable sectors.

Oil revenue is included as a key control variable in the inflation equation. It represents the government's earnings from crude oil sales in the international market, which provide resources for both capital and recurrent expenditures. Variations in oil revenue affect public spending, liquidity in the economy, and, consequently, the inflationary environment. For this study, oil revenue is measured as the total annual earnings from crude oil sales in the international market at the end of each financial year.

The long-run NARDL model for equation 1 is:

$$INF_t = \alpha_0 + \alpha_1 OP^+{}_t + \alpha_2 OP^-{}_t + \alpha_3 EXR_t + \alpha_4 INTR_t + \alpha_5 OILR_t + \xi_t \quad (2)$$

The short-run version (Error Correction Representation) of equation is stated as:

$$\Delta INFR_t = \mu + \sum_{i=1}^{n-1} a_i \Delta INF_{t-1} + \sum_{i=0}^{m-1} \beta_i \Delta OP^+{}_{t-1} + \sum_{i=0}^{m-1} \Upsilon_i \Delta OP^-{}_{t-1} + \sum_{i=0}^{m-1} u_i \Delta EXCR_{t-i} + \sum_{i=0}^{m-1} w_i \Delta OILR_{t-i} + \sum_{i=0}^{m-1} w_i \Delta RGDP_{t-i} + \pi \widehat{ECT}_{t-1} + \varepsilon_t \quad (3)$$

$\Delta$, $ECT_{t-1}$, $\pi$ and $\varepsilon_t$ remain as defined above.

## RESULTS AND DISCUSSION

### Descriptive Statistics of Key Variables Used

**Table 1: Descriptive Statistics Results**

| | LRGDP | LOILP | EXCR | INFR | LOILR |
|---|---|---|---|---|---|
| Mean | 9.0399 | 3.6375 | 163.23 | 19.4875 | 6.5143 |
| Median | 9.4324 | 3.5556 | 119.76 | 13.1100 | 7.5400 |
| Maximum | 12.5335 | 4.7182 | 1685.00 | 72.8400 | 9.8653 |
| Minimum | 4.9367 | 2.5431 | 0.6100 | 5.3900 | 1.9814 |
| Std. Dev. | 2.5203 | 0.6806 | 273.5355 | 16.2969 | 2.4781 |
| Skewness | -0.3215 | 0.1394 | 4.1535 | 1.7604 | -0.6646 |
| Kurtosis | 1.6870 | 1.6437 | 23.1003 | 5.1589 | 2.0116 |
| Jarque-Bera | 3.9185 | 3.5150 | 867.2228 | 31.2736 | 5.0300 |
| Probability | 0.1409 | 0.17246 | 0.0000 | 0.0000 | 0.0808 |
| Sum | 397.75 | 160.053 | 7182.46 | 857.45 | 286.63 |
| Sum Sq. Dev. | 273.13 | 19.9197 | 32173. | 11420.4 | 264.07 |
| Observations | 44 | 44 | 44 | 44 | 44 |

LRGDP = Log Real GDP, LOILP = Log Oil Price, EXCR = Exchange Rate, INFR = Inflation Rate, LOILR = Log Oil Revenue.
Source: Researcher's Computation using E-Views software

Table 1 presents the statistical properties of the variables used in the study—log of real GDP (LRGDP), log of oil price (LOILP), exchange rate (EXCR), inflation rate (INFR), and log of oil revenue (LOILR)—for the period 1981–2024. The results show that the average values of the variables over the study period are as follows: LRGDP (9.0399), LOILP (3.6375), EXCR (163.23), INFR (19.4875), and LOILR (6.5143). The exchange rate exhibits the highest variability, with a standard deviation of 273.54, indicating substantial volatility in the naira–dollar rate during the period. In contrast, oil price shows relatively low dispersion (standard deviation = 0.6806), suggesting more stability in its logged form compared to the exchange rate and inflation.

The skewness statistics indicate that LRGDP (-0.3215) and LOILR (-0.6646) are negatively skewed (left-tailed), implying that their distributions have longer tails on the lower side. Meanwhile, LOILP (0.1394), EXCR (4.1535), and INFR (1.7604) are positively skewed (right-tailed), showing the presence of extreme higher values, particularly for the exchange rate.

The kurtosis values reveal that EXCR (23.1003) and INFR (5.1589) are leptokurtic (fat-tailed), thereby indicating the presence of outliers and sharp peaks in their distributions. LRGDP (1.6870), LOILP (1.6437), and LOILR (2.0116) are platykurtic (flatter than normal), suggesting relatively moderate dispersion around the mean. Notably, the kurtosis value of inflation (above 3) indicates a departure from normal distribution rather than normality.

The Jarque–Bera statistics further confirm the distributional properties. The probability values show that LRGDP (0.1409), LOILP (0.1725), and LOILR (0.0808) are normally distributed since their p-values exceed 0.05; therefore, the null hypothesis of normality cannot be rejected for these variables. However, EXCR and INFR have probability values of 0.0000, indicating significant departures from normality. Thus, the null hypothesis of normal distribution is rejected for exchange rate and inflation rate.

Overall, the descriptive statistics suggest substantial volatility and non-normality in the exchange rate and inflation series, which justifies the use of the NARDL framework capable of handling nonlinearities and asymmetric adjustments.

### Tests for Stationarity Results

Results for the tests of stationarity which were estimated from equation 1 using Augmented Dickey Fuller (ADF) test is applied to find the existence of unit root in each of the annual time series.

**Table 2: Unit Root Tests**

| Variables | Level | | First Difference | | Order | Remark |
|---|---|---|---|---|---|---|
| | ADF | 5% Critical Value | ADF | 5% Critical Value | | |
| RGDP | 0.0083 | 3.5180 | 3.8049 | 3.5207 | I(0) | Stationary |
| LOILP | 2.5165 | 3.5180 | 5.5610 | 3.5236 | I(1) | Stationary |
| Exchang_rate | 3.1365 | 3.5236 | 7.4634 | 3.5207 | I(1) | Stationary |
| Inflation_rate | 3.0416 | 2.9314 | 6.0071 | 2.9331 | I(0) | Nonstationary |
| Loil_revenue | 1.3655 | 3.5180 | 6.1169 | 3.5207 | I(1) | Stationary |

RGDP = Log Real GDP, LOILP = Log Oil Price, EXCR = Exchange Rate, INFR = Inflation Rate, LOILR = Log Oil Revenue
Source: Researcher's Computation using E-Views software

The ADF statistics in tables 3 showed that all the variables are not stationary at level of 5% critical values, except inflation rate which is stationary at level. Consequently, the levels in the series will generate spurious results if used for information. The table also shows order of integration for oil price and selected macroeconomic variables that the variables are to be integrated of order one, and they are fit in using Nonlinear Autoregressive Distributed Lags (NARDL) for the study, then all the variables are now at first difference indicating that the series are not stationary at their level forms (*p*-value > 0.05).

**Bound Test Results**

**Table 3: Bounds Test for Nonlinear Cointegration Results**

| Bound Test | | Null Hypothesis: No Level of Relationship | | |
|---|---|---|---|---|
| Test Statistics | Value | Significance | I(0) | I(1) |
| F-statistics | 11.41 | 10% | 2.25 | 3.52 |
| | | 5% | 3.47 | 4.57 |
| | | 1% | 3.74 | 5.06 |

Source: Computed by the Researcher from using E-Views 9 (2026)

Table 3 above shows the Autoregressive Distributed Lag (ARDL) Bounds test results, investigates the long-run relationship with inflation rate as the dependent variable. The F-statistic of 11.41 is well above the lower bound (3.47) and upper bound (4.57) critical values at the 5% level. Accordingly, the null hypothesis of no cointegration is rejected. This indicates the presence of a long-run equilibrium relationship between inflation and the explanatory variables (oil price, exchange rate, oil revenue, and real GDP) over the study period.

In summary, the Bounds test results consistently confirm cointegration in all three models. This implies that despite short-run fluctuations, the variables share stable long-run relationships in Nigeria between 1981 and 2024. The findings justify the estimation of the NARDL long-run and short-run dynamics and suggest that oil price shocks have persistent macroeconomic effects on output, exchange rate behaviour, and inflation in Nigeria.

**Table 4: Long run and Short run Co-efficient Results**

| Dependent variable: INFR | | | | |
|---|---|---|---|---|
| | Long run Results | | | |
| EXCR | -0.0779 | 0.0267 | -2.9104 | 0.0093 |
| LOILR | -12.0886 | 3.5187 | -3.4354 | 0.0030 |
| LRGDP | 3.8382 | 7.3683 | 0.5209 | 0.6088 |
| Positive Oil Price | 1.3045 | 2.0656 | 0.6315 | 0.5356 |
| Negative Oil Price | 2.7440 | 4.4653 | 0.6145 | 0.5466 |
| C | -12.8412 | 28.6474 | -0.4482 | 0.6593 |
| @TREND | 2.1489 | 0.9272 | 2.3176 | 0.0324 |
| | Short run Dynamics, Error Correction Model | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| Error Correction Term (ECT) | -0.1034 | 0.3079 | -6.8307 | 0.0000 |
| D(INFR(-1)) | 0.9284 | 0.2098 | 4.4246 | 0.0003 |
| D(INFR(-2)) | 0.4950 | 0.1506 | 3.2870 | 0.0041 |
| D(EXCR) | 0.0287 | 0.0273 | 1.0506 | 0.3073 |
| D(EXCR(-1)) | -0.0152 | 0.1344 | -0.1130 | 0.9112 |

| | | | | |
|---|---|---|---|---|
| D(EXCR(-2)) | 0.2770 | 0.1214 | 2.2807 | 0.0350 |
| D(EXCR(-3)) | -0.1515 | 0.1013 | -1.4958 | 0.1520 |
| D(LRGDP) | 140.3047 | 23.3359 | 6.0123 | 0.0000 |
| D(LRGDP(-1)) | -1.3584 | 27.7490 | -0.0489 | 0.9615 |
| D(LRGDP(-2)) | -7.2513 | 26.4591 | -0.2740 | 0.7872 |
| D(LRGDP(-3)) | 81.4416 | 23.7134 | 3.4344 | 0.0030 |
| Positive Oil Price | -18.7755 | 8.9745 | -2.0920 | 0.0509 |
| Negative Oil Price | 21.5195 | 9.0212 | 2.3854 | 0.0283 |
| D(LOILR) | -2.5002 | 5.7589 | -0.4341 | 0.6693 |
| D(LOILR(-1)) | 4.2749 | 4.8854 | 0.8750 | 0.3931 |
| D(LOILR(-2)) | 11.7723 | 5.0654 | 2.3240 | 0.0320 |
| D(LOILR(-3)) | -5.1146 | 4.4807 | -1.1414 | 0.2686 |
| D(@TREND()) | 4.5202 | 1.9214 | 2.3525 | 0.0302 |
| **Model Diagnostic** | | | | |
| R-square | 0.9350 | | | |
| F-statistics value | 12.3323 | | | |
| Durbin-Watson | 1.9834 | | | |
| P-value | 0.0000 | | | |

Source: Computed by the Researcher from using E-Views 9 (2024)

Among the control variables, the long-run estimates reveal that the exchange rate has a negative and significant effect on inflation (−0.0779; p = 0.0093), implying that depreciation of the Naira tends to raise inflationary pressures. Similarly, oil revenue is negatively and significantly associated with inflation (−12.0886; p = 0.0030), suggesting that higher oil earnings may ease inflationary pressures, potentially through increased fiscal space and higher government expenditure on goods and services. Real GDP, however, shows a positive but statistically insignificant relationship with inflation (3.8382; p = 0.6088), indicating that overall output growth does not significantly drive long-run price level changes in the Nigerian economy.

The short-run dynamics, estimated using the error correction model, confirm the presence of a stable long-run relationship. The Error Correction Term (ECT) is negative (−0.1034), less than one, and highly significant (p = 0.0000), satisfying the three standard convergence conditions: negative sign, magnitude below unity, and statistical significance. The ECT coefficient implies that approximately 10.34% of any short-run deviation from long-run equilibrium is corrected each period, reflecting a steady adjustment speed of inflation toward its long-run path.

In the short run, positive oil price shocks have a marginally significant negative effect on inflation (−18.78; p = 0.0509), whereas negative oil price shocks exert a significant positive effect (21.52; p = 0.0283). This asymmetric response indicates that temporary declines in oil prices tend to increase inflation, possibly through currency depreciation or cost-push pressures, while price increases exert limited short-run effects. Changes in real GDP (ΔLRGDP) show significant positive impacts on inflation at certain lags, reflecting output-driven demand pressures. Some lagged exchange rate terms are also significant, suggesting that short-term currency fluctuations influence domestic price levels. Additionally, lagged oil revenue terms indicate delayed effects on inflation, highlighting the transmission of oil earnings into domestic spending and price formation.

The model demonstrates strong explanatory power, with $R^2$ = 0.9350, indicating that 93% of the variation in inflation is captured by the regressors. The F-statistic of 12.33 (p = 0.0000) confirms the joint significance of the explanatory variables. The Durbin–Watson statistic is 1.9834, suggesting no severe autocorrelation problem in the residuals. These diagnostic results confirm that the model is well specified and reliable for analysing both short-run and long-run dynamics.

Conclusively, the results suggest that inflation in Nigeria is asymmetrically sensitive to oil price shocks in the short run**,** with negative shocks exerting upward pressure on prices, while positive shocks have limited influence. In the long run, however, oil price fluctuations do not significantly affect inflation, and macroeconomic fundamentals such as exchange rate movements and oil revenue play a more critical role. The negative and significant ECT coefficient indicates that any short-run deviations in inflation due to shocks or disequilibria are gradually corrected over time, confirming a stable long-run equilibrium relationship between oil market dynamics and domestic price levels.

**Post Estimation Diagnostic**

The post estimations of this study are in the table 5, which reveal serial correlation LM test with probability value of 0.3535 that is greater than 0.05. Therefore, there is absence autocorrelation. İn addition, heteroskedasticity probability value is stood at 0.9642 which is also greater than 0.05, thus, absence of heteroskedasticity.

**Table 5: Post Estimation Diagnostic Results**

| | | | |
|---|---|---|---|
| **Breusch-Godfrey Serial Correlation LM Test:** | | | |
| F-statistic | 1.188424 | Prob. F(4,16) | 0.3535 |
| Obs*R-squared | 9.162117 | Prob. Chi-Square(4) | 0.0572 |
| **Heteroskedasticity Test: Breusch-Pagan-Godfrey** | | | |
| F-statistic | 0.430165 | Prob. F(19,20) | 0.9642 |
| Obs*R-squared | 11.60415 | Prob. Chi-Square(19) | 0.9018 |

Source: Researcher's Computation using E-Views software

The test of stability from CUSUM in figure 1 depicts that it is within the 5% critical line; thus, stability of estimated parameters in the study for the period under investigation. Lastly, the Jacque-Bera value is 1.8047, and its probability values are 0.4050 respectively, which are reported in Figure 2, showing that it is good for research. Hence, acceptance of null hypothesis that the error terms of the data used in the study are not normally distributed.

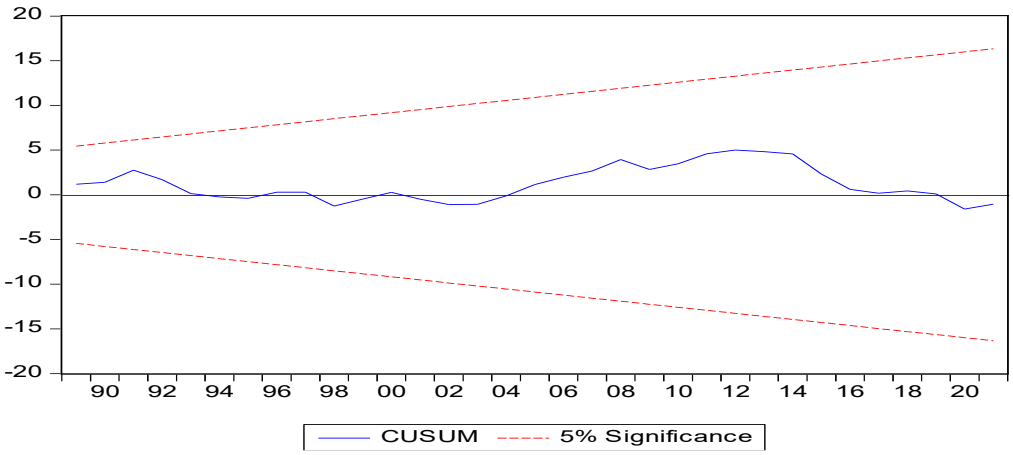


Figure 1: Stability Test
Source: Computed by the Researcher from using E-views (2024)

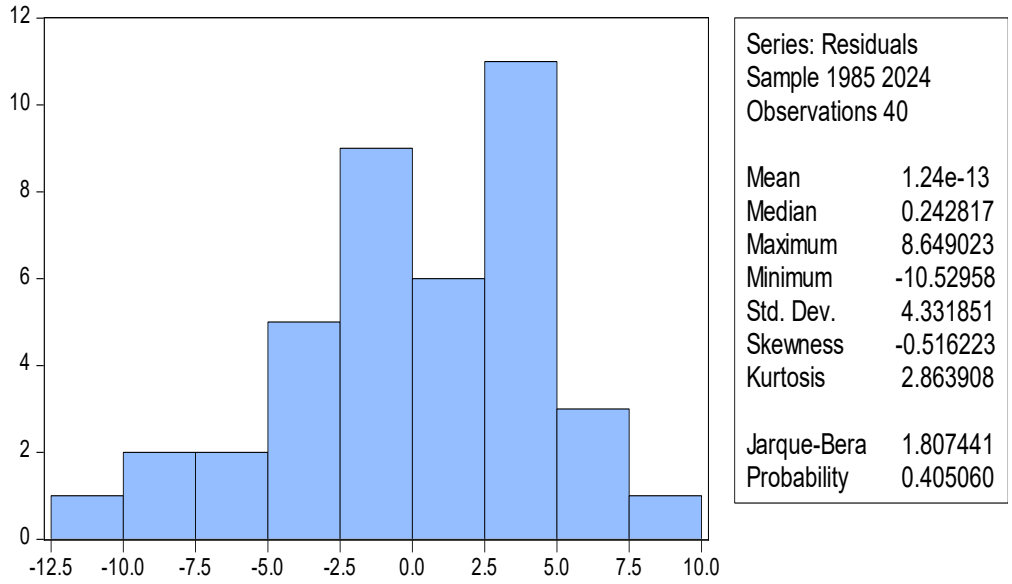


Figure 2: Normality Test
Source: Researcher's Computation using E-Views software

**CONCLUSION**

Based on the findings of this study, this study examines the dynamic relationship between oil price shocks and inflation rate; and to examine the various oil price shocks with the implications on the Nigerian economy; and hence the study adopts the NARDL model to examine the effect of oil shocks on inflation rate in Nigeria. Finally, the study concludes that oil price shocks have consequential

implications for both monetary and fiscal policy. Fluctuations in oil prices significantly affect government expenditure patterns, which in turn influence economic growth and the trajectory of real GDP over the study period. These findings reinforce the need for policy measures aimed at insulating the Nigerian economy from external oil price volatility, including economic diversification and stabilization of fiscal and monetary frameworks. However, in light of the aforementioned, the following suggestions were made: First, Nigeria should invest in modular refineries to reduce dependence on oil imports, thereby stabilizing the exchange rate controlling inflation, increase in oil revenue and oil GDP to complement government expenditure in Nigeria. Second, the Central Bank of Nigeria (CBN) should implement coordinated monetary and fiscal policies to control inflation and stabilize the exchange rate. The adoption of a single exchange rate regime for all importers and exporters is recommended to reduce volatility in foreign exchange markets. Given that both inflation and exchange rates are sensitive to global oil price shocks in the short and long run, policy interventions should target both household and production channels. For households, inflationary pressures erode purchasing power, potentially triggering wage–price spirals. On the production side, rising Producer Price Index (PPI) increases the marginal cost of production, reducing output and profits and potentially leading to layoffs. Proactive policy measures, such as targeted subsidies, interest rate adjustments, and price stabilization mechanisms, can mitigate these adverse effects.

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