



Petroleum Sector and Exchange Rate Appreciation in Nigeria

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Abstract. This paper investigates the impact of Petroleum Sector on Exchange Rate Appreciation in Nigeria over the period 1990–2025. Crude Oil Production, Crude Oil Export, Oil Export Revenue and OPEC Quota Compliance were used as a proxy for petroleum sector while exchange rate was used as a stand in for exchange rate appreciation. Secondary data were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin, NNPC OPEC Report Various Issues 2025. The Augmented Dickey-Fuller unit root test was employed to examine the stationarity properties of the variables, while Johansen Co-integration and Ordinary Least Square analysis were utilized to estimate short-run. The empirical result showed that crude oil export and oil export revenue had a negative and significant relationship with exchange rate while crude oil production exhibited a positive and significant relationship with exchange rate. However, OPEC quota compliance reported a negative and insignificant relationship with exchange rate. The study concludes that petroleum sector remains a critical lever in influencing exchange rate in Nigeria. It was recommended amongst other that the Nigerian Upstream Petroleum Regulatory Commission and Nigerian National Petroleum Company Limited should intensify efforts toward increasing and sustaining crude oil production by investing in modern extraction technologies, strengthening pipeline surveillance, and reducing operational disruptions in oil-producing regions. This will ensure consistent foreign exchange inflows and support currency stability.

Keywords: Crude Oil Production, Crude Oil Export, Oil Export Revenue, OPEC Quota Compliance Exchange Rate

1. Introduction

The petroleum sector is widely recognized as a key driver of economic growth and foreign exchange earnings in oil-dependent countries. Its performance

has direct implications for macroeconomic stability, particularly exchange rate movements, as fluctuations in petroleum production and export revenues influence the value of the domestic currency relative to foreign currencies. The petroleum sector refers to the segment of the economy involved in the exploration, extraction, refining, transportation, and marketing of crude oil and petroleum products. According to the Organisation of the Petroleum Exporting Countries (OPEC, 2020), the petroleum sector comprises upstream, midstream, and downstream activities that collectively contribute to foreign exchange earnings and fiscal revenues. The International Energy Agency (IEA, 2023) states that petroleum exports are a major source of hard currency inflows for oil-exporting economies, which can strengthen a country's currency when managed effectively.

Exchange rate appreciation occurs when a domestic currency increases in value relative to other currencies. The International Monetary Fund (IMF, 2024a) defines the exchange rate as the price of one country's currency expressed in terms of another, reflecting its relative value in foreign exchange markets. Likewise, the World Bank (2024) explains that currency appreciation enables a unit of domestic currency to purchase more foreign currency than before, typically resulting from increased demand for the domestic currency driven by strong external earnings. Higher inflows of foreign exchange from petroleum exports can increase demand for the domestic currency, potentially leading to exchange rate appreciation, reducing the cost of imports and stabilizing inflation, as noted in the World Bank's global exchange rate analysis and foreign reserve data.

In Nigeria, the petroleum sector dominates key macroeconomic indicators, especially foreign exchange earnings and export receipts. According to the National Bureau of Statistics (NBS, 2024), petroleum-related exports accounted for about 88 percent of total exports in the first quarter of 2024,

with crude oil export earnings rising to approximately 15.4 trillion naira, marking a 50.2 percent increase from the previous quarter. On an annual basis, total crude oil export revenue reached approximately 29.0 trillion naira in 2023, reflecting about 80.6 percent of overall export receipts, and crude oil production averaged 1.433 million barrels per day in 2023. These figures show that a large volume of foreign currency continues to enter the country through oil exports, highlighting the sector's role in shaping Nigeria's external sector performance.

Despite production challenges in recent years, Nigeria's petroleum export earnings continue to be central to external accounts. According to OPEC's Monthly Oil Market Report (OPEC, 2025), Nigeria's crude oil exports were valued at about 31.54 billion US dollars in 2025, which, despite being lower than in 2024, underscores the persistence of oil as a major source of foreign exchange. Nigeria's crude oil output also shifted periodically, with average daily production reported between 1.6 and 1.8 million barrels per day, reflecting recovery efforts and changes in global demand conditions. The contribution of the petroleum sector to Nigeria's economy remains significant. Statista (2024) indicates that the oil and natural gas industry accounted for 5.57 percent of Nigeria's Gross Domestic Product (GDP) in the third quarter of 2024, while it represented roughly 92 percent of the value of total exports during that period. This dominant export share illustrates how heavily Nigeria relies on petroleum for foreign currency earnings that can influence exchange rate movements through increases in foreign exchange inflows.

Empirical investigations from recognized institutions further affirm the link between petroleum sector performance and exchange rate behavior. For instance, the Central Bank of Nigeria (CBN, 2025) Foreign Exchange Market Report notes that fluctuations in crude oil export proceeds have historically correlated with movements in the naira's exchange rate against major currencies, suggesting a transmission mechanism from oil earnings to currency value adjustments. Additionally, the International Monetary Fund (IMF, 2024b) Working Paper on Oil Price Shocks and African Economies identifies significant responses of exchange rate adjustments in oil-exporting countries like Nigeria following global oil price changes, indicating that shocks to petroleum revenues can affect the external value of the local currency. To this end this paper, therefore, investigates how variations in petroleum sector performance influence exchange rate appreciation in Nigeria, emphasizing the mechanisms through which oil export

earnings, international oil prices, and foreign exchange inflows affect the domestic currency.

1.1 Statement of Problem

Despite Nigeria's heavy dependence on the petroleum sector as the primary source of foreign exchange earnings, the sector has been plagued by several structural and operational challenges that have limited its ability to support exchange rate appreciation. Key challenges include fluctuating global oil prices, declining oil production due to pipeline vandalism and oil theft, inadequate refining capacity, policy inconsistencies, and overdependence on crude oil exports. According to the Organisation of the Petroleum Exporting Countries (OPEC, 2025), Nigeria's crude oil production has remained unstable, fluctuating between approximately 1.2 and 1.8 million barrels per day in recent years due to operational disruptions and security issues. Similarly, the International Energy Agency (IEA, 2023) highlights that oil price volatility continues to expose oil-dependent economies like Nigeria to external shocks, thereby weakening the stability of foreign exchange inflows. In addition, Nigeria's oil production dropped to as low as 1.1 million barrels per day in 2022, before recovering slightly, indicating persistent structural inefficiencies in the sector.

These challenges have significantly affected Nigeria's ability to achieve sustained exchange rate appreciation. In theory, increased petroleum export earnings should lead to an appreciation of the domestic currency through higher foreign exchange inflows. However, in practice, Nigeria has experienced persistent depreciation and volatility of the naira. Data from the Central Bank of Nigeria (CBN, 2025) indicate that the naira depreciated from about ₦197 per US dollar in 2015 to over ₦1,400 per US dollar in 2025 across official and parallel markets, despite periods of relatively high oil prices. More recent data show that the naira traded above ₦1,500 per US dollar in the parallel market in early 2026, reflecting continued pressure on the currency. This suggests that petroleum earnings have not translated effectively into exchange rate appreciation. Further statistical evidence reinforces this concern. The National Bureau of Statistics (NBS, 2024) reports that although petroleum exports accounted for about 88 percent of total exports and generated over ₦15.4 trillion in the first quarter of 2024, Nigeria continued to face foreign exchange shortages and declining external reserves at different periods. On an annual basis, total crude oil export earnings were estimated at over ₦29 trillion in 2023, yet foreign exchange supply constraints persisted.

Additionally, the World Bank (2024) notes that Nigeria's foreign reserves have experienced fluctuations, falling below 34 billion US dollars at certain periods and declining further to around 33 billion US dollars in 2025, limiting the capacity of monetary authorities to defend the naira. These trends indicate that the volume of petroleum revenue alone is insufficient to guarantee exchange rate appreciation, especially in the presence of structural inefficiencies. Moreover, Nigeria's heavy reliance on crude oil exports without corresponding diversification of the economy has exacerbated exchange rate instability. The International Monetary Fund (IMF, 2024) emphasizes that oil-exporting countries with weak economic diversification often experience exchange rate volatility due to their vulnerability to external shocks. In Nigeria's case, high import dependence accounting for over 60 percent of total consumption of refined petroleum products and limited domestic refining capacity reduce the net foreign exchange benefit from crude oil exports. Furthermore, Nigeria spends billions of dollars annually on fuel imports, with estimates exceeding 10 billion US dollars per year, thereby exerting additional pressure on foreign exchange reserves and weakening the potential for currency appreciation.

Although existing empirical studies and institutional reports acknowledge a relationship between petroleum sector performance and exchange rate movements, findings remain mixed and inconclusive. While some studies suggest that increases in oil prices and export earnings can positively influence exchange rate appreciation, others indicate that such effects are either insignificant or short-lived due to macroeconomic distortions and policy constraints. For instance, Adeniyi et al. (2012), examining the Nigerian economy over the period 1980–2010, found that oil price shocks exert a significant but unstable influence on exchange rate movements, with effects dissipating in the long run. Similarly, Iwayemi and Fowowe (2011), using a VAR framework for the period 1985–2007, reported that oil price increases lead to exchange rate appreciation, but the magnitude of the effect is weak and highly sensitive to external shocks. In contrast, Aliyu (2009), covering 1986–2007, found that oil price increases significantly appreciate the real exchange rate, although the effect is mediated by inflationary pressures and monetary policy responses.

Further evidence from Hasanov (2010), focusing on oil-exporting countries including Nigeria between 1995 and 2008, suggests that oil revenue positively affects exchange rate appreciation, but structural inefficiencies reduce the sustainability of such gains.

In addition, Olomola and Adejumo (2006), analyzing Nigeria from 1970 to 2003, found that oil price shocks do not significantly influence real exchange rate volatility, thereby questioning the strength of the oil–exchange rate nexus. Supporting this position, Akpan (2009), using quarterly data from 1970 to 2007, revealed that exchange rate movements in Nigeria are driven more by monetary variables than by oil sector performance. This gap in the literature creates the need for a more comprehensive and focused investigation into the extent to which structural and operational challenges in the petroleum sector affect exchange rate appreciation in Nigeria.

1.2 Objective of the Study

The objective of the study is to investigate the relationship between petroleum sector and exchange rate appreciation in Nigeria.

The Specific objectives are:

- To examine the impact of crude oil production on exchange rate appreciation in Nigeria
- To evaluate the impact of crude oil export on exchange rate appreciation in Nigeria
- To analyze the impact of oil export revenue on exchange rate appreciation in Nigeria
- To investigate the impact of OPEC quota compliance on exchange rate appreciation in Nigeria

1.3 Research Hypothesis

The following hypothesis were formulated in null form to guide the study:

Ho₁ There is no significant relationship between crude oil production and exchange rate appreciation in Nigeria

Ho₂ There is no significant relationship between crude oil export and exchange rate appreciation in Nigeria

Ho₃ There is no significant relationship between oil export revenue and exchange rate appreciation in Nigeria

Ho₄ There is no significant relationship between OPEC quota compliance and exchange rate appreciation in Nigeria

1.4 Significance of the Study

This study on the relationship between the petroleum sector and exchange rate appreciation in Nigeria is of immense importance to various institutions, policymakers, and stakeholders due to its implications

for macroeconomic stability, foreign exchange management, and economic diversification.

First, the study is highly beneficial to the Central Bank of Nigeria (CBN), as it provides empirical insights into how petroleum sector performance influences exchange rate dynamics. The findings will assist the Bank in designing effective monetary and foreign exchange policies aimed at stabilizing the naira and improving liquidity in the foreign exchange market.

Second, the Federal Ministry of Finance will benefit from this study through a better understanding of how oil revenues impact exchange rate appreciation and fiscal stability. This will enhance budget planning, revenue forecasting, and the formulation of policies that reduce overdependence on petroleum earnings.

Third, the study is relevant to the Nigerian National Petroleum Company Limited (NNPC Ltd), as it highlights the implications of petroleum sector performance on macroeconomic outcomes. The findings can guide strategic decisions on oil production, export efficiency, and revenue optimization.

Fourth, the National Bureau of Statistics (NBS) will find this study useful in improving data collection, analysis, and reporting on petroleum sector performance and exchange rate trends. It will also provide a framework for better integration of macroeconomic indicators.

Fifth, the study is significant to the Nigerian Upstream Petroleum Regulatory Commission (NUPRC), as it offers insights into how upstream activities such as crude oil production affect foreign exchange inflows and currency stability. This will aid in regulatory policies that enhance production efficiency and sector performance.

Sixth, the Nigerian Midstream and Downstream Petroleum Regulatory Authority (NMDPRA) will benefit from the findings in understanding how inefficiencies in refining and distribution affect foreign exchange demand, especially through fuel importation, thereby influencing exchange rate movements.

Seventh, the study will be valuable to the Budget Office of the Federation, as it provides insights into the volatility of petroleum revenues and their implications for exchange rate projections. This will improve fiscal planning, expenditure management, and macroeconomic forecasting.

Finally, the study is important to academic institutions, researchers, and students in Nigeria, particularly those in economics and related fields. It contributes to existing literature by providing empirical evidence on the nexus between the petroleum sector and exchange rate appreciation, thereby serving as a reference material for future studies.

2. Literature Review

2.1 Conceptual Literature

2.1.1 Petroleum Sector

The petroleum sector occupies a strategic and indispensable position in the global economy, serving as a dominant source of energy, foreign exchange earnings, and fiscal revenue for many nations. In resource-rich economies such as Nigeria, the sector not only drives industrial activities but also significantly shapes macroeconomic outcomes, including exchange rate dynamics, economic growth, and external sector stability. Khatib (2013) defines the petroleum sector as encompassing all activities related to the exploration, extraction, and production of crude oil and natural gas, with emphasis on its revenue-generating capacity and industrial relevance. The view of this study aligns with Khatib's definition by recognizing the petroleum sector as a fundamental productive sector whose upstream activities form the basis for foreign exchange generation and economic performance, particularly in oil-exporting economies. Argüello (2013) sees the petroleum sector as a strategic economic component that influences macroeconomic stability through its strong linkages with foreign exchange earnings, trade balance, and fiscal operations. This study supports Argüello's perspective by emphasizing that the petroleum sector goes beyond production to play a crucial role in determining external sector outcomes, especially exchange rate movements in developing economies like Nigeria.

Similarly, Zand (2024) describes the petroleum sector as a complex and dynamic system comprising exploration, production, refining, and transportation activities, whose performance is influenced by global demand, technological innovation, and government policies. The study aligns with this modern view by acknowledging that the petroleum sector is not static but continuously shaped by global economic forces and policy environments, which in turn affect its contribution to macroeconomic stability. Accordingly, OPEC, (2024) defines the petroleum sector as a comprehensive value chain comprising upstream, midstream, and downstream activities, including

exploration, production, transportation, refining, and marketing of petroleum products. Recent OPEC reports further highlight that the sector operates within a volatile global environment characterized by fluctuations in oil prices and investment patterns. The position of this study is consistent with OPEC's definition, as it adopts a holistic view of the petroleum sector, recognizing that each segment contributes differently to foreign exchange inflows and overall economic performance.

Correspondingly, the International Energy Agency (IEA, 2023) describes the petroleum sector as a major driver of global energy supply and a critical source of foreign exchange earnings for oil-exporting countries. More recent outlooks emphasize that oil price volatility and global energy transition trends continue to shape the sector's performance and economic relevance. This study agrees with the IEA's perspective by highlighting the sector's central role in generating external revenues that influence exchange rate appreciation and macroeconomic stability. Furthermore, the World Bank (2024) views the petroleum sector as a key determinant of economic growth, fiscal sustainability, and balance of payments stability, particularly in developing countries. The study adopts this viewpoint by acknowledging that petroleum sector performance has far-reaching implications for both internal and external economic stability, especially in economies that depend heavily on oil exports.

The Nigerian Extractive Industries Transparency Initiative (NEITI, 2024) emphasizes that the petroleum sector remains central to revenue generation and fiscal operations in Nigeria, with detailed reporting on production, exports, and revenue flows within the industry. Additionally, the Major Oil Marketers Association of Nigeria (MEMAN, 2025) highlights that Nigeria's petroleum sector continues to face structural challenges such as production fluctuations and infrastructure constraints, despite improvements in refining capacity and output levels. The Lagos Chamber of Commerce and Industry (LCCI, 2026) further reports that the oil and gas sector remains a dominant contributor to foreign exchange earnings, though its performance is increasingly influenced by global energy transitions and domestic policy reforms. This paper, sees the petroleum sector as a broad and integrated economic sector that encompasses all processes involved in the discovery, extraction, processing, transportation, and distribution of crude oil and natural gas. It is commonly divided into upstream activities, which involve exploration and production; midstream activities, which include transportation and storage; and downstream activities,

which involve refining and marketing of petroleum products.

2.1.2 Exchange Rate Appreciation

Exchange rate appreciation represents a critical concept in international economics, reflecting the strengthening of a nation's currency in the global financial system. In an increasingly interconnected world, movements in exchange rates play a decisive role in shaping trade competitiveness, capital flows, and macroeconomic stability. For developing economies, particularly those reliant on export commodities such as crude oil, exchange rate appreciation is often closely linked to external earnings and foreign exchange inflows. Krugman and Obstfeld (2018) describe exchange rate appreciation as a situation where a country's currency rises in value relative to another currency, thereby increasing its purchasing power in international markets. This study aligns with their view by recognizing appreciation as an outcome of favorable external sector performance, particularly through increased foreign currency inflows. Mishkin (2019) defined exchange rate appreciation as a macroeconomic phenomenon driven by demand and supply forces in the foreign exchange market, where increased demand for a country's currency leads to its strengthening. The position of this study supports Mishkin's argument by emphasizing that sectors generating foreign exchange—such as the petroleum sector—play a fundamental role in driving currency demand and appreciation.

Also, the International Monetary Fund (IMF, 2024) defines exchange rate appreciation as an increase in the value of a domestic currency relative to foreign currencies under a given exchange rate regime, often influenced by capital inflows, export performance, and macroeconomic fundamentals. This study adopts the IMF's standpoint by highlighting that exchange rate appreciation is not only market-driven but also influenced by policy interventions and external sector dynamics. Similarly, the World Bank (2024) explains that currency appreciation occurs when a country experiences strong foreign exchange inflows, improved trade balance, or increased investor confidence, leading to higher demand for its currency. The study agrees with this position, particularly in the context of oil-exporting economies, where export revenues significantly shape exchange rate behavior. Aizenman et al. (2022) argue that exchange rate appreciation in resource-rich economies is often associated with commodity price booms, which increase export revenues and strengthen the domestic currency. This study aligns with this modern perspective by recognizing that fluctuations in

commodity-dependent sectors, especially petroleum, can directly influence the direction and magnitude of exchange rate movements.

3. Theoretical Literature

3.1 Dutch Disease Theory

The Dutch Disease Theory was first formulated by Corden and Neary (1982) to explain the economic effects of a resource boom on a country's economy. The term originated from the Netherlands' experience in the 1960s, when the discovery of natural gas led to a significant appreciation of the Dutch guilder. While the resource boom increased foreign exchange earnings, it simultaneously created challenges for other sectors, particularly manufacturing and agriculture, by making them less competitive internationally. At its core, the theory posits that a surge in resource exports, such as petroleum, generates a substantial inflow of foreign currency, which leads to the appreciation of the domestic currency. This exchange rate strengthening improves the purchasing power of the country for imports and helps stabilize macroeconomic indicators. However, it may also result in deindustrialization or reduced competitiveness of non-resource sectors due to higher relative costs.

Proponents of the theory argue that resource booms are a powerful driver of macroeconomic stability. Corden and Neary (1982) note that increased resource exports generate foreign currency inflows that strengthen the domestic currency, allowing countries to import capital goods and consumer products at lower costs, which can stimulate overall economic growth. Similarly, Aizenman et al. (2022) emphasize that in resource-rich economies, such inflows are essential for sustaining exchange rate appreciation and maintaining fiscal stability. They argue that when managed effectively, resource-led currency appreciation can improve living standards, reduce import costs, and enhance a country's international financial position. Opponents, however, caution against the potential negative effects of over-reliance on resource-driven currency appreciation. Gelb (2010) contends that resource booms can crowd out investment in non-resource sectors, leading to reduced economic diversification and increased vulnerability to commodity price volatility. Van Wijnbergen (1984) further argues that the theory may oversimplify economic dynamics, as currency appreciation does not always lead to deindustrialization if appropriate fiscal and monetary policies are in place. Critics therefore highlight the risk of excessive dependence on petroleum revenues, which may render an economy

fragile, particularly in countries like Nigeria, where oil revenue represents a significant share of government income and foreign exchange earnings.

The Dutch Disease Theory is relevant to this study because it provides a direct theoretical link between petroleum sector performance and exchange rate appreciation. In Nigeria, petroleum exports are the primary source of foreign exchange inflows, and the theory explains how increased oil revenues can strengthen the Naira while also highlighting potential risks such as sectoral imbalances and over-dependence on oil. It allows the study to examine both the benefits, including currency strengthening and import cost reduction, and challenges, such as vulnerability of non-oil sectors and oil price dependence, associated with petroleum-driven exchange rate movements. This theory was chosen to anchor the study because it clearly explains the economic process through which petroleum exports influence exchange rate appreciation, aligns perfectly with the study's focus, and has strong empirical support in resource-dependent economies. By using this theory, the study can draw insights into how Nigeria's reliance on petroleum affects exchange rate stability and provide recommendations for managing external sector risks, while offering a holistic understanding of both the positive and negative implications of resource-driven currency movements.

3.2 Resource-Based View Theory

The Resource-Based View Theory was developed by Barney (1991). The theory emphasizes that resources, whether tangible or intangible, are central to performance outcomes and sustainable competitive advantage. In the context of national economies, natural resources, such as petroleum, can be viewed as strategic assets that generate significant revenue, enhance external sector performance, and stimulate economic growth. According to Barney (1991), the mere possession of resources is not sufficient; their strategic deployment is what drives economic benefits and strengthens macroeconomic variables. In this sense, the petroleum sector in resource-rich economies like Nigeria can be seen as a pivotal resource whose optimal use can impact exchange rate movements through foreign currency generation. Proponents of Resource-Based View Theory argue that leveraging unique resources enables economies or organizations to outperform others. Peteraf (1993) asserts that the strategic exploitation of valuable and rare resources fosters sustainable economic advantages and enhances resilience against external shocks. In the Nigerian context, petroleum resources, when effectively managed and exported, serve as a source of foreign

exchange that can strengthen the Naira and improve macroeconomic stability. Similarly, Wernerfelt (1984) notes that resource-based advantages are durable and difficult for competitors to replicate, highlighting the importance of natural resource endowments as key drivers of external sector performance. These perspectives suggest that the petroleum sector's contribution to Nigeria's exchange rate appreciation can be understood through the lens of Resource-Based View Theory, as it treats petroleum as a strategic national asset that generates tangible economic value.

Opponents, however, caution against overreliance on resource endowments. Critics argue that Resource-Based View Theory may overemphasize the role of existing resources while underestimating the importance of institutional frameworks, policy effectiveness, and global market dynamics. Collis and Montgomery (1995) argue that resources alone cannot guarantee economic success without appropriate management, policy interventions, and complementary capabilities. In the Nigerian context, mismanagement of petroleum resources or overdependence on oil revenues can reduce the effectiveness of this resource in driving sustainable currency appreciation, especially during periods of global oil price volatility. The Resource-Based View Theory is relevant to this study because it provides a framework to understand how Nigeria's petroleum resources, as strategic national assets, can influence the appreciation of the domestic currency. By focusing on the strategic importance of petroleum, Resource-Based View Theory allows the study to analyze the mechanism through which resource endowments translate into external sector benefits, particularly exchange rate strengthening. The theory also provides insights into the conditions under which petroleum resources contribute positively to macroeconomic stability, emphasizing the role of effective management and utilization.

3.3 Empirical Literature

Adamu (2025) investigated the interaction between oil price, exchange rate, and petroleum product pricing in Nigeria's downstream sector using weekly data (2024–2025). The ARDL model was employed with variables including crude oil price (OP), exchange rate (EXR), inflation rate (INF), and premium motor spirit price (PMS). Findings revealed that exchange rate (EXR) has a positive and significant effect on PMS prices, indicating strong exchange rate pass-through. Crude oil price (OP) also positively affects PMS, while inflation (INF) reinforces price increases in the downstream petroleum sector. Additionally, Olu, et al. (2025) examined the nexus between oil price,

exchange rate volatility, and trade transactions in Nigeria from 2008–2024. The study used a GARCH (1,1) model and included variables such as crude oil price (OP), exchange rate volatility (EXRV), and trade transactions (TRD). The findings showed that crude oil price (OP) significantly increases exchange rate volatility (EXRV), while exchange rate volatility negatively affects trade transactions (TRD). This implies that instability in the petroleum sector transmits into the external sector.

Adamu (2025) further showed that exchange rate fluctuations significantly influence petroleum import dependence and supply dynamics in Nigeria. The ARDL model included variables such as exchange rate (EXR), petroleum import dependency (PID), crude oil price (OP), and domestic supply (DS). Findings indicated that exchange rate depreciation increases petroleum import costs and dependency (PID), while also raising domestic petroleum prices. Still, Olu et al. (2025) also revealed that oil price volatility transmits into exchange rate volatility, which negatively affects Nigeria's external trade balance. The variables used include crude oil price volatility (OPV), exchange rate volatility (EXRV), and trade balance (TB). The findings showed that OPV significantly increases EXRV, while EXRV negatively impacts TB, leading to trade imbalances.

Danjuma and Abu (2024) examined effects of oil (crude and premium motor spirit (PMS)) price fluctuations on real exchange rate in Nigeria using annual time series data ranging from 1980 to 2022. In addition, the study employed Nonlinear Autoregressive Distributed Lag Model (NARDL) Bound test within the ARDL framework to capture asymmetries effects of oil price fluctuations on real exchange rate. The study further employed Granger causality test to assess for causal relationship among the variables. The NARDL Bound test of co-integration confirmed long-run relationships between oil price fluctuations and real exchange rate. The result of NARDL revealed that positive and negative fluctuations in crude oil price have negative effect on real exchange rate in Nigeria in the long-run, but have fluctuating (appreciate and depreciate) effects on real exchange rate in the short run. In the same vein, positive and negative fluctuations in the price of PMS depreciated real exchange rate in Nigeria in the long-run, but positive fluctuations in price of PMS increased real exchange rate in the short run, but negative fluctuation in price of PMS reduced real exchange rate in the short run. Granger causality test indicated bi-directional relationship between price of premium motor spirit and real exchange rate in Nigeria.

Igbinovia and Ogiemudia (2021) analyzed oil price and exchange rate volatility in Nigeria over the period 1983–2019. The study employed VECM and Granger causality techniques, using variables such as crude oil price (OP), exchange rate (EXR), interest rate (INT), inflation rate (INF), and external reserves (EXRsv). Findings indicated that crude oil price (OP) significantly influences exchange rate (EXR) volatility both in the short run and long run. Interest rate (INT) and inflation (INF) also contributed to exchange rate instability, while external reserves (EXRsv) helped stabilize the exchange rate. Similarly, Igbinovia et al. (2021) further confirmed that oil price shocks contribute significantly to exchange rate instability using simultaneous equation modeling and cointegration techniques. The variables used include crude oil price shocks (OPS), exchange rate (EXR), and macroeconomic stability indicators. The findings showed that positive oil price shocks lead to exchange rate appreciation, while negative shocks cause depreciation, confirming the volatility of EXR in response to petroleum sector fluctuations.

Lawal (2021) examined asymmetric effects of oil price changes on Nigeria's exchange rate from 1996–2019 using a Nonlinear ARDL (NARDL) model. The study used variables such as Brent crude oil price (OP), exchange rate (EXR), and decomposed oil price into positive changes (OP^+) and negative changes (OP^-). Findings showed that positive oil price shocks (OP^+) lead to exchange rate appreciation, while negative shocks (OP^-) cause more pronounced depreciation, indicating asymmetric effects in both the short and long run. Furthermore, Usman (2018) investigated the impact of crude oil price and exchange rate on economic growth in Nigeria from 1970–2016. The study used the Vector Error Correction Model (VECM) and included variables such as GDP, crude oil price (OP), exchange rate (EXR), inflation rate (INF), and interest rate (INT). The results showed that crude oil price (OP) has a positive and significant long-run relationship with GDP, while exchange rate (EXR) also positively influences GDP in the long run but exhibits short-run fluctuations. Inflation (INF) negatively affects growth, while interest rate (INT) showed an insignificant effect.

Eze and Okpala (2016) evaluated the causal relationship between oil price and exchange rate in Nigeria for the period 1985–2014 using Granger causality and VECM techniques. The model included oil price (OP), exchange rate (EXR), and foreign reserves (RES). The results showed a unidirectional causality running from oil price (OP) to exchange rate (EXR), while foreign reserves (RES) were found to

buffer exchange rate volatility. Moreover, Osigwe (2015) examined the relationship between oil price, exchange rate, and economic performance in Nigeria covering the period 1980–2012. The study employed OLS and Two-Stage Least Squares (TSLS) techniques using variables such as crude oil price (OP), exchange rate (EXR), and gross domestic product (GDP). The findings revealed that crude oil price (OP) has a positive and significant effect on GDP, while exchange rate (EXR) fluctuations significantly influence economic performance. Specifically, exchange rate depreciation was found to negatively affect GDP, indicating that instability in EXR undermines economic growth.

Umar and Kilishi (2015) examined the impact of oil price volatility on exchange rate and economic growth in Nigeria covering 1980–2013. The study adopted the GARCH model, using oil price volatility (OPV), exchange rate (EXR), and GDP growth (GDPG). Findings revealed that oil price volatility (OPV) significantly drives exchange rate instability (EXR), while exchange rate fluctuations negatively affect GDP growth (GDPG), highlighting the vulnerability of the economy to oil shocks. Consequently, Ayadi (2014) investigated the transmission mechanism between oil revenue and exchange rate fluctuations in Nigeria from 1981–2012. The study used Ordinary Least Squares (OLS) and included oil revenue (OREV), exchange rate (EXR), government expenditure (GEXP), and external debt (EXTD). The results indicated that oil revenue (OREV) significantly influences exchange rate (EXR), with higher oil earnings leading to currency appreciation. Government expenditure (GEXP) was found to exert upward pressure on exchange rate depreciation.

Oladipo (2013) analyzed the effect of oil price shocks on exchange rate dynamics and macroeconomic stability in Nigeria over the period 1980–2011. Using the Autoregressive Distributed Lag (ARDL) approach, the study incorporated oil price (OP), exchange rate (EXR), inflation rate (INF), and trade openness (TOP). Results showed that oil price (OP) has a statistically significant positive impact on exchange rate (EXR), while inflation (INF) weakens the domestic currency. Trade openness (TOP) was found to intensify exchange rate responsiveness to oil shocks. Accordingly, Akinlo (2012) examined the long-run relationship between oil prices and exchange rate volatility in Nigeria from 1986–2010. The study employed Johansen cointegration and GARCH models, including variables such as oil price (OP), exchange rate volatility (EXRV), and interest rate (INT). The findings confirmed that oil price volatility significantly increases exchange rate volatility

(EXRV), while interest rate (INT) plays a mitigating role in the adjustment process.

Adeniyi (2011) explored the dynamic interaction between oil price movements and exchange rate behaviour in Nigeria over the period 1986–2008. The study utilized the Vector Autoregression (VAR) framework, incorporating crude oil price (OP), exchange rate (EXR), money supply (MS), and output (GDP). Empirical results revealed that shocks to oil price (OP) exert a strong influence on exchange rate (EXR), with oil price increases leading to exchange rate appreciation, while monetary variables (MS) moderate the magnitude of this effect. Likewise, Omojimito and Akpokodje (2010) assessed the responsiveness of exchange rate to oil price fluctuations during the period 1970–2008. The study applied cointegration and Error Correction Model (ECM) techniques, using exchange rate (EXR), oil price (OP), external reserves (RES), and government expenditure (GEXP). The results showed that oil price (OP) has a significant positive effect on exchange rate (EXR), while external reserves (RES) help stabilize the currency. Government expenditure (GEXP) was found to amplify exchange rate pressures. Finally, Aliyu (2009) investigated oil price shocks and their macroeconomic implications in Nigeria between 1970 and 2007 using a Structural VAR (SVAR) approach. The model included variables such as oil price (OP), real exchange rate (RER), real GDP (GDP), and inflation (INF). Findings indicated that oil price shocks significantly appreciate the real exchange rate (RER), while inflation (INF) responds positively to oil price increases. The study emphasized that exchange rate movements in Nigeria are largely driven by oil sector developments.

3.4 Gaps and Value Addition

The empirical literature on the petroleum sector and exchange rate dynamics in Nigeria reveals a rich but somewhat fragmented body of evidence shaped by differences in scope, variables, and methodology. A careful review shows that most studies, particularly recent ones such as Adamu (2025) and Olu et al. (2025), concentrate on short-term dynamics within the downstream petroleum sector and external sector linkages. These studies, largely based on ARDL and GARCH frameworks, consistently demonstrate that crude oil price (OP) and exchange rate (EXR) interactions are significant, with exchange rate pass-through strongly influencing petroleum product prices (PMS) and trade outcomes (TRD, TB). Similarly, Danjuma and Abu (2024), using a more advanced NARDL framework, extend the discussion by capturing asymmetries, revealing that both positive

and negative oil price fluctuations exert varying effects on the real exchange rate in the short and long run. Earlier studies such as Igbinovia and Ogiemudia (2021), Lawal (2021), and Usman (2018) reinforce the dominant narrative that oil price (OP) remains the central driver of exchange rate (EXR) behaviour in Nigeria. These studies, employing VECM, NARDL, and related cointegration techniques, highlight the presence of both short-run volatility and long-run equilibrium relationships, with macroeconomic controls such as inflation (INF), interest rate (INT), and external reserves (RES) playing complementary roles.

Even earlier contributions including Eze and Okpala (2016), Osigwe (2015), Umar and Kilishi (2015), and Ayadi (2014) adopt OLS, VECM, and GARCH methodologies to show that oil revenue (OREV) and oil price volatility (OPV) significantly influence exchange rate movements, often leading to appreciation during oil booms and depreciation during downturns. Foundational studies such as Oladipo (2013), Akinlo (2012), Adeniyi (2011), Omojimito and Akpokodje (2010), and Aliyu (2009) further confirm that oil price shocks are key determinants of exchange rate dynamics, with consistent evidence of volatility transmission and macroeconomic vulnerability in Nigeria. Despite this extensive body of work, a critical gap remains evident when the literature is assessed in relation to the present study's focus, scope, and variables. First, the overwhelming majority of studies rely heavily on crude oil price (OP) or oil price volatility (OPV) as the primary proxy for the petroleum sector, thereby neglecting other critical dimensions such as crude oil production (COP), crude oil export (COE), oil export revenue (OER), and OPEC quota compliance (OQC). This narrow measurement fails to fully capture Nigeria's oil sector performance, particularly the role of production capacity, export volumes, and institutional compliance in shaping exchange rate outcomes. Second, while several studies address exchange rate volatility and depreciation, limited attention has been given specifically to exchange rate appreciation, which is central to understanding the Dutch Disease phenomenon in an oil-dependent economy like Nigeria.

In terms of scope, many existing studies either cover earlier periods (1970–2015) or focus on more recent short-term windows (e.g., 2024–2025), thereby creating a temporal disconnect. There is a lack of a comprehensive analysis spanning a broader and more policy-relevant period such as 1990–2025, which captures major structural changes in Nigeria's oil sector, including deregulation efforts, OPEC policy

shifts, and external shocks. Methodologically, although advanced techniques such as NARDL, VECM, VAR, and GARCH have been widely applied, most studies emphasize price-based transmission mechanisms rather than structural and institutional variables like OPEC quota compliance (OQC), which can significantly influence production and export behaviour. Consequently, this study departs from existing literature by incorporating a more robust and disaggregated petroleum sector framework using crude oil production (COP), crude oil export (COE), oil export revenue (OER), and OPEC quota compliance (OQC) as explanatory variables of exchange rate (EXR). By extending the scope to 1990–2025 and focusing explicitly on exchange rate appreciation, the study provides a more comprehensive and policy-relevant understanding of how petroleum sector performance and institutional compliance shape exchange rate dynamics in Nigeria. This approach not only fills the identified gaps in variable selection and scope but also strengthens the empirical linkage between the petroleum sector and exchange rate behaviour within the Nigerian context

4. Methodology

This study used ex-post facto research design. The ex-post facto research design was used because the facts has been established and cannot be manipulated by the researcher while secondary data were collected from the Central Bank of Nigeria (CBN) Statistical Bulletin, NNPC, OPEC Report Various Issues 2025 on Crude Oil Production (COP); Crude Oil Export (COE): Oil Export Revenue (OER) and OPEC Quota Compliance (OQC): were used to proxy petroleum sector while Exchange Rate (EXR), serves as the dependent variable. The Augmented Dickey Fuller (ADF) method was used in order to do the unit root test on the model that was developed. Taking into consideration the results of the ADF, the research used the Ordinary Least Square (OLS).

4.1 Analytical Framework

The Dutch Disease Theory was formulated by Max Corden and Peter Neary (1982). The theory explains how a boom in the natural resource sector particularly oil sector can lead to an appreciation of the real exchange rate, thereby reducing the competitiveness of other sectors such as manufacturing and agriculture. In the context of Nigeria, increased oil production, export, and revenue inflows tend to strengthen the domestic currency (naira), which may distort the structure of the economy and create overdependence on the oil sector. This framework is therefore suitable

for analyzing how oil-related variables influence exchange rate dynamics in Nigeria.

4.2 Model Specification

The model of this study is built on the work of Danjuma and Abu (2024), who examined the impact of oil price fluctuations on exchange rate in Nigeria. Their baseline model is specified as:

$$RER_t = f(OP, PMS, INF) \quad 1$$

Where

RER = Real Exchange Rates, OP = Crude Oil Price, PMS = Premium Motor Spirit, INF = Inflation Rate, oil price

However, to better capture the structural realities of Nigeria’s oil-dependent economy and align the study with the Dutch Disease framework, certain modifications were made to the baseline model. Specifically, oil price (OP) was replaced with broader oil sector performance indicators such as crude oil production (COP), crude oil export (COE), and oil export revenue (OER), which more directly reflect Nigeria’s oil sector dynamics. Additionally, OPEC quota compliance (OQC) was introduced to capture institutional and regulatory influences on oil output. Furthermore, the dependent variable was modified from real exchange rate (RER) to nominal exchange rate (EXR) to reflect the practical policy relevance in Nigeria.

Thus, the modified model is specified as:

$$EXR = f(COP, COE, OER) \quad 2$$

The mathematical model could be symbolically expressed as;

$$EDI = \beta_0 + \beta_1 DCPS + \beta_2 MS + \beta_3 SMCP + \beta_4 BDP \quad 3$$

$$EDI = \beta_0 + \beta_1 DCPS + \beta_2 MS + \beta_3 SMCP + \beta_4 BDP + e \quad 4$$

Where:

EXR = Exchange Rate, COP = Crude Oil Production, COE = Crude Oil Export, OER = Oil Export Revenue, OQC = OPEC Quota Compliance, f = functional relationship β_0 = Intercept of relationship in the model/constant B₁-B₄ = Coefficients of each independent or explanatory variable e = Stochastic or Error term.

4.3 Description of Variables in the Model

Exchange Rate (EXR): This is the value of a country’s currency relative to another currency, typically expressed as the amount of domestic currency needed to purchase one unit of foreign currency. Exchange rate is measured in US\$

Crude Oil Production (COP): This refers to the total volume of crude oil extracted from the country’s oil fields over a given period. An increase in crude oil

production will have positive effect on exchange rate. Crude of Production is measured in US\$. Thus $\beta_1 > 0$
Crude Oil Export (COE): This measures the quantity of crude oil sold to foreign markets. Higher exports generate more foreign exchange, which can appreciate the domestic currency, strengthening the exchange rate. Crude Oil Export is measured in Billions of Naira Annually. Hence, $\beta_2 > 0$
Oil Export Revenue (OER): This represents the total income earned from selling crude oil abroad. An increase in oil export revenue usually improves the exchange rate as it raises foreign currency inflows, enhancing the balance of payments and demand for the

domestic currency. Oil Export Revenue is measured in Billions of Naira Annually. Hence, $\beta_3 > 0$
OPEC Quota Compliance (OQC): This measures how closely a member country adheres to its assigned production limit set by OPEC. Higher compliance may negatively affect the exchange rate if it limits production and reduces oil exports, lowering foreign exchange earnings. Conversely, low compliance that increases output may temporarily boost currency inflows, though it can risk long-term market stability. OPEC Quota Compliance is measured in %. Thus, $\beta_4 > 0$

5. Results and Discussion of Findings

Table 1: Descriptive Statistics

	EXR	COP	COE	OQC	OER
Mean	181.7139	1510556.	1355278.	93.88889	6575.000
Median	132.0000	1600000.	1500000.	94.00000	6750.000
Maximum	415.0000	1900000.	1700000.	98.00000	10000.00
Minimum	4.500000	1000000.	900000.0	90.00000	3500.000
Std. Dev.	136.7998	293782.7	241808.5	2.594255	2265.944
Skewness	0.634378	-0.362840	-0.490588	0.073966	0.086373
Kurtosis	3.065958	1.531030	2.681140	1.797426	1.642535
Jarque-Bera	3.723263	4.026729	4.053150	2.202102	2.808827
Probability	0.155419	0.133539	0.131786	0.332521	0.245511
Sum	6541.700	54380000	48790000	3380.000	236700.0
Sum Sq. Dev.	654996.7	3.02E+12	2.05E+12	235.5556	1.80E+08
Observations	36	36	36	36	36

Source: E-view 13 Output

The descriptive statistics for Exchange Rate (EXR), Crude Oil Production (COP), Crude Oil Export (COE), OPEC Quota Compliance (OQC), and Oil Export Revenue (OER) provide insight into their central tendencies, dispersion, and distributional characteristics over the 36 observations. The mean value of EXR is 181.7139, indicating the average exchange rate over the study period. The maximum value of 415.0000 and minimum value of 4.500000 reveal a very wide range, reflecting substantial fluctuations in the exchange rate. The high standard deviation of 136.7998 further confirms significant volatility, implying that the exchange rate deviates considerably from its mean, which is consistent with periods of both stability and sharp depreciation. This large deviation suggests instability in the foreign exchange market over time. For COP, the mean value is 1,510,556 barrels per day, with a maximum of 1,900,000 and a minimum of 1,000,000. The standard deviation of 293,782.7 indicates moderate variability in crude oil production. The deviation from the mean suggests fluctuations in output levels, likely influenced by operational challenges, OPEC restrictions, and external shocks.

The mean value of COE is 1,355,278 barrels per day, with a maximum of 1,700,000 and a minimum of 900,000. The standard deviation of 241,808.5 shows moderate dispersion around the mean. This implies that crude oil exports vary over time, reflecting changes in production levels, export capacity, and global demand conditions. The deviation indicates that export performance is not constant and responds to both domestic and international factors. OQC has a mean value of 93.88889 percent, with a maximum of 98.00000 and a minimum of 90.00000. The relatively low standard deviation of 2.594255 indicates minimal dispersion, suggesting that Nigeria’s compliance with OPEC quotas is relatively stable over the study period. The small deviation from the mean implies consistency in adherence to production quotas. For OER, the mean value is 6,575.000, with a maximum of 10,000.00 and a minimum of 3,500.000. The standard deviation of 2,265.944 indicates substantial variability in oil export revenue. This large deviation from

the mean reflects fluctuations in global oil prices, export volumes, and exchange rate movements, which significantly affect revenue generation.

In terms of distributional properties, the skewness values indicate that EXR (0.634378), OQC (0.073966), and OER (0.086373) are positively skewed, suggesting a longer right tail and the presence of higher extreme values. Conversely, COP (-0.362840) and COE (-0.490588) are negatively skewed, indicating a longer left tail and relatively more lower values in the distribution.

The kurtosis values show that EXR (3.065958) is approximately mesokurtic, implying a distribution close to normal. However, COP (1.531030), COE (2.681140), OQC (1.797426), and OER (1.642535) are platykurtic, indicating flatter distributions with thinner tails compared to the normal distribution. The Jarque-Bera statistics and corresponding probability values further confirm the normality of the variables. The probability values for EXR (0.155419), COP (0.133539), COE (0.131786), OQC (0.332521), and OER (0.245511) are all greater than the 0.05 significance level. This implies that the null hypothesis of normal distribution cannot be rejected for all variables. Conclusively, the results indicate that all variables are approximately normally distributed. Consequently, the data satisfy the normality assumption, and it is appropriate to proceed with further econometric analysis, including the unit root test.

Unit Root Test

A unit root test known as the Augmented Dickey Fuller (ADF) test was used in the research project to determine the order of integration of the variables that were being investigated. This was done in order to pick the proper approach and prevent false regression.

Table 2: Unit Root Test Using Augmented Dickey Fuller (ADF)

Variables	Levels		First Difference		Order of Integration	P-value
	T. Statistics	5% Critical Value	T. Statistics	5% Critical Value		
LEXR	-2.594729	-2.948404	-6.725051	-2.951125	I(1)	0.0000
LCOP	-1.838858	-2.948404	-6.962632	-2.951125	I(1)	0.0000
LCOE	-2.183601	-2.948404	-5.507559	-2.951125	I(1)	0.0001
OQC	-2.462819	-2.983972	-6.166548	-2.951125	I(1)	0.0000
LOER	-1.156876	-2.948404	-5.130784	-2.951125	I(1)	0.0002

Source: Extracts from E-view 13. * Level of significance at 5%

This study employs the Augmented Dickey-Fuller (ADF) unit root tests to check the order of integration of the variables and the results are presented in Table 2. The results of Augmented Dickey-Fuller (ADF) showed that the variables were not stationary at level I(0) but became stationary after first difference I(1). The ADF result revealed that LEXR, LCOP, LCOE, OQC and LOER are all stationary after first difference. This outcome makes the Johansen co-integration appropriate for investigating the long-run relationship among these variables.

Johansen Co-integration Test

Table 3: Test for Johansen co-integration using Trace and Max-Eigen statistic

Hypothesized	Trace	0.05		Hypothesized	Max-Eigen	0.05	
No. of CE(s)	Statistic	Critical Value	Prob.*	No. of CE(s)	Statistic	Critical Value	Prob.*
None	69.28709	69.81889	0.0551	None	25.05555	33.87687	0.3812
At most 1	44.23153	47.85613	0.1052	At most 1	19.54986	27.58434	0.3731
At most 2	24.68168	29.79707	0.1731	At most 2	11.36786	21.13162	0.6106
At most 3	13.31382	15.49471	0.1038	At most 3	7.820036	14.26460	0.3973
At most 4 *	5.493780	3.841465	0.0191	At most 4 *	5.493780	3.841465	0.0191

Source: Authors compilation from E-Views 13

Table 3 depicts the Johansen test for the presence of a cointegrating relationship among the time series data in the study of the impact of petroleum sector on exchange rate appreciation in Nigeria. Relying on the exposition of the trace statistics and the max-eigen statistic, we assert that there are no cointegrating relationships in the study. This assertion became necessary since the trace statistics values are less than their critical values. Also, the max-eigen statistics values are less than their critical values. On the basis of the above, the null hypothesis of no cointegrating relationship among the series is hereby accepted. Given the absence of long-run convergence among the series, we then proceed to estimate their short-run dynamics using the ordinary least square (OLS).

Short-Run Estimation Results for the Model

The results of the short-run dynamics association of the model are presented in table 4 below

Table 4: ARDL Short and Long-run Result for the Model

Variable	Coefficient	Std. Error	t-Statistics	Prob
C	0.276890	0.064679	4.280988	0.0002
LCOP	0.960666	0.314942	3.050296	0.0007
LCOE	-0.445714	0.177810	-2.506687	0.0057
OQC	-0.001686	0.107089	-0.015741	0.9875
LOER	-0.664072	0.212261	-3.128568	0.0007
Adj R ² = 0.668592, F-statistics = 18.65247 (0.000000), DW = 1.987311				

Source: Authors computation using E-view 13 2026

Table 5 presents the Ordinary Least Square (OLS) results, capturing the short-run between petroleum sector and exchange rate appreciation in Nigeria. The model exhibits a high explanatory power with an adjusted R² of 0.668592, implying that approximately 67% of the variations in exchange rate appreciation (EXR) are explained by the included regressors. The Durbin-Watson statistic of 1.987311 confirms the absence of first-order autocorrelation, while the F-statistic of 18.65247 underscores the overall statistical robustness and goodness-of-fit of the model.

The logarithm coefficient of crude oil production (LCOP) is positive (+0.960666), indicating that a 1% increase in the logarithm coefficient of crude oil production (LCOP) is associated with 0.96% increase in the log value of exchange rate appreciation (LEXR). The p-value (0.0007) confirms statistical significance at the 5% level, validating the theoretical proposition that crude oil production will have positive effect on exchange rate. Thus, the null hypothesis of no significant relationship is rejected. Similarly, the log value of crude oil export revenue (LCOE) is negative (-0.445714). This implies that a unit increase in the log value of crude oil export (LCOE) will lead to about 0.45% fall in the log value exchange rate appreciation (LEXR). The p-value (0.0057) confirms statistical significance at the 5% level. These outcomes do not validate the theoretical proposition that higher exports generate more foreign exchange, which can appreciate the domestic currency, strengthening the exchange rate. Thus, the null hypothesis of no significant relationship is rejected.

Interestingly, the log value of crude oil export revenue (LCOE) is negative (-0.001686). This suggests that a unit increase in the log value of OPEC quota compliance (OQC) will lead to about 0.002% decrease in the log value exchange rate appreciation (LEXR). The p-value (0.9875) confirms statistical insignificance at the 5% level. These results validate the theoretical proposition that higher compliance may negatively affect the exchange rate if it limits production and reduces oil exports, lowering foreign exchange earnings. Thus, the null hypothesis of no significant relationship is accepted. Finally, the log value of oil export revenue (LOER) is negative (-0.664072). This implies that a unit increase in the log value of oil export revenue (LOER) will lead to about 0.66% decrease in the log value exchange rate appreciation (LEXR). The p-value (0.0007) confirms statistical significance at the 5% level. These outcomes do not validate the theoretical proposition that increase in oil export revenue usually improves the exchange rate as it raises foreign currency inflows, enhancing the balance of payments and demand for the domestic currency. Therefore, the null hypothesis of no significant relationship is rejected.

Diagnostic Test

Table 5: Ramsey Reset Test, Serial Correlation LM Test and Homoscedasticity Test Results

	F-Statistic	Prob-Value
Ramsey Reset Test	3.555414	0.1527
Breusch-Godfrey Serial Correlation LM Test	2.435561	0.3164
Breusch-Pagan-Godfrey Heteroskedasticity Test	1.275924	0.8150

Source: Author's Computation 2026

From Table 5, the results of the diagnostic test shows that the linearity test using Ramsey Reset test indicates that the f-statistic (3.555414) with computed p-value of 0.1527 which is greater than 5 percent (0.05) critical value, hence the study reject the null hypothesis and conclude that the model is correctly specified. The result of the Serial or Autocorrelation Test using Breusch-Godfrey Serial Correlation LM Test shows that the f-statistic is 2.435561, with a

Chi-Square probability value is 0.3164. This indicates that the probability value of about 31 percent (0.3164) is greater than 5 percent (0.05) critical value; hence the study confirms no serial correlation in the model. The result of the heteroscedasticity test using Breusch-Pagan-Godfrey test shows that the f-statistic is 1.275924 with a Chi-Square probability value of 0.8150. The result suggests that there is no evidence of heteroskedasticity in the model since the probability Chi-square value is more than 5 percent ($P > 0.05$). So, residuals do have constant variance which is desirable in regression meaning that residuals are Homoscedastic.

Figure 1: Normality Test



Figure 1, shows summary of the normality test with Jarque-Bera value of 1.659495 and a corresponding probability value of 0.436159 more than 0.05 level of significance, indicating that the residuals are normally distributed

Figure 2: Stability Test

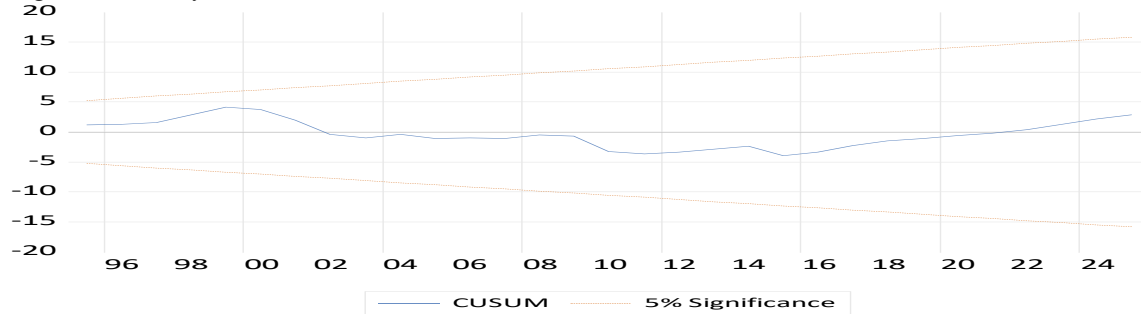


Figure 2 shows summary of the stability test, the result showed that the model is stable. This is evident to the fact that the blue line is in-between the two red (-5 & +5) or less than 0.05 level of significance.

6. Discussion of Findings

6.1 Crude Oil Production and Exchange Rate Appreciation in Nigeria.

The Ordinary Least Square (OLS) estimation indicates that crude oil production (COP) exerts a positive (+0.960666) and statistically significant (0.0007) impact on exchange rate (EXR), suggesting that increase in crude oil production will have positive effect on exchange rate. The statistical significance, as evidenced by the p-value, confirms that crude oil production (COP) is a key determinant of exchange rate in Nigeria. Consequently, the null hypothesis of no significant relationship between crude oil production and exchange rate is decisively rejected. This implies that there is a significant relationship between crude oil production and exchange rate

6.2 Crude Oil Export and Exchange Rate Appreciation in Nigeria.

The Ordinary Least Square (OLS) estimation indicates that crude oil export (COE) had a negative (-0.445714)

but statistically significant (0.0057) impact on exchange rate (EXR), suggesting that increase in crude oil export will negatively affect exchange rate. The statistical significance, as evidenced by the p-value, confirms that crude oil export (COE) is a major determinant of exchange rate in Nigeria. Consequently, the null hypothesis of no significant relationship between crude oil export and exchange rate is rejected. This means that there is a significant relationship between crude oil export and exchange rate

6.3 OPEC Quota Compliance and Exchange Rate Appreciation in Nigeria.

The Ordinary Least Square (OLS) estimation indicates that OPEC quota compliance (OQC) had a negative (-0.001686) and statistically insignificant (0.9875) impact on exchange rate (EXR), suggesting that increase in OPEC quota compliance will negatively affect exchange rate. The statistical insignificance, as evidenced by the p-value, confirms that OPEC quota compliance (OQC) is a key determinant of exchange rate in Nigeria. Consequently, the null hypothesis of

no significant relationship between OPEC quota compliance (OQC) and exchange rate is accepted. This means that there is no significant relationship between OPEC quota compliance (OQC) and exchange rate

6.4 Oil Export Revenue and Exchange Rate Appreciation in Nigeria.

The Ordinary Least Square (OLS) estimation indicates that oil export revenue (OER) had a negative (-0.664072) and statistically significant (0.0007) impact on exchange rate (EXR), suggesting that increase in oil export revenue will negatively affect exchange rate. The statistical significance, as evidenced by the p-value, confirms that oil export revenue (OER) is a key determinant of exchange rate in Nigeria. Consequently, the null hypothesis of no significant relationship between oil export revenue (OER) and exchange rate is rejected. This means that there is a significant relationship between oil export revenue (OER) and exchange rate

7. Conclusion and Recommendation

7.1 Conclusion

The study on the relationship between petroleum sector and exchange rate appreciation concludes that crude oil export and oil export revenue had a negative and significant relationship with exchange rate while crude oil production exhibited a positive and significant relationship with exchange rate. However, OPEC quota compliance reported a negative and insignificant relationship with exchange rate. The study concludes that petroleum sector remains a critical lever in influencing exchange rate in Nigeria

7.2 Recommendations

The Nigerian Upstream Petroleum Regulatory Commission and Nigerian National Petroleum Company Limited should intensify efforts toward increasing and sustaining crude oil production by investing in modern extraction technologies, strengthening pipeline surveillance, and reducing operational disruptions in oil-producing regions. This will ensure consistent foreign exchange inflows and support currency stability.

Additionally, the Nigerian Export Promotion Council in collaboration with the Central Bank of Nigeria should promote export diversification within the petroleum sector by encouraging local refining and value addition. Policies aimed at reducing dependence on crude oil exports while improving the efficiency of

export proceeds repatriation will strengthen the foreign exchange market and reduce pressure on the naira.

Furthermore, the Federal Ministry of Petroleum Resources should work closely within the framework of the Organization of the Petroleum Exporting Countries to ensure effective monitoring and strategic compliance with production quotas. Aligning international obligations with domestic economic priorities will improve coordination and enhance the overall effectiveness of petroleum sector policies.

Finally, the Central Bank of Nigeria alongside the Federal Ministry of Finance Nigeria should strengthen foreign exchange management and revenue utilization frameworks by ensuring that oil export earnings are efficiently managed, transparently accounted for, and strategically invested through institutions such as the Nigeria Sovereign Investment Authority. This will help build external reserves, reduce exchange rate volatility, and promote long-term macroeconomic stability in Nigeria.

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