

Impact of Petroleum Product Prices on Agricultural Output and Economic Performance in Nigeria

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Abstract

This study investigated the impact of petroleum product prices on agricultural output and economic performance in Nigeria between 1990 and 2024. The aim was to analyze the dynamic relationship between fuel prices and key economic sectors such as agriculture, with a focus on Gross Domestic Product (GDP), Premium Motor Spirit Consumption (PMSC), Automotive Gas Oil Consumption (AGOC), and Dual Purpose Kerosene Consumption (DPKC). The study adopted an ex-post facto research design, utilizing secondary data sourced from the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), and the Nigerian National Petroleum Corporation (NNPC). Methodological techniques included trend analysis, descriptive statistics, the Augmented Dickey-Fuller (ADF) test for unit roots, the ARDL bounds test for cointegration, and Granger causality tests. The theoretical framework integrated Porter's National Competitive Advantage Theory, Modigliani's Life Cycle Consumption Theory, and the Harrod-Domar Economic Growth Theory. The findings revealed that petroleum product consumption, particularly PMS and DPKC, positively impacted GDP, while fluctuations in petroleum prices significantly affected agricultural productivity and industrial output. The study concluded that stability in petroleum prices and investments in energy infrastructure are crucial for sustainable economic growth. Therefore, the study recommended that the Nigerian government stabilize fuel prices, invest in alternative energy sources, and promote economic diversification to reduce the economy's reliance on oil exports.

Keywords: Agriculture, Economic Growth, Energy Infrastructure, Petroleum Prices

Introduction

Petroleum, often referred to as “black gold,” holds an indispensable position in the global economic framework, particularly in oil-producing nations like Nigeria. Crude oil is not only a major source of revenue for many countries but also a key factor influencing global trade, energy security, and economic development. The price fluctuations of petroleum products, particularly those that are refined, such as premium motor spirit (PMS), automotive gas oil (AGO), and kerosene, are integral to economic performance in oil-dependent economies. As a major oil producer in Africa, Nigeria’s economic stability is intricately tied to the global oil market. The country’s heavy reliance on petroleum for export earnings and domestic energy consumption exposes it to volatile price fluctuations, which, in turn, have far-reaching implications for sectors such as agriculture, manufacturing, and transportation. These fluctuations significantly impact agricultural output, cost of production, and, by extension, the overall economic performance of Nigeria. While oil prices have seen considerable volatility on the global stage, the specific effects of these price shifts on Nigeria’s agricultural output and broader economic growth remain under-researched. This paper, therefore, seeks to explore the relationship between petroleum product prices and agricultural performance in Nigeria over a period spanning from 1990 to 2024.

The global petroleum market has long been a cornerstone of economic development, and its fluctuations are key to understanding shifts in national economies. Internationally, petroleum product prices have experienced several major price shocks that have altered the economic landscape of oil-importing and oil-exporting nations alike. Notable events such as the 1973 OPEC oil embargo, the 2008 financial crisis, and the 2014–2015 oil price collapse have demonstrated the far-reaching effects of petroleum price fluctuations. According to a report by the International Energy Agency (2020), global oil prices surged to unprecedented heights in 2008, peaking at over \$140 per barrel, only to plummet in the subsequent years as demand declined and new supplies entered the market. Price volatility is driven by multiple factors, including geopolitical tensions, changes in supply and demand, and the policies of major oil-producing countries like Saudi Arabia, Russia, and the United States. These price shocks create significant ripple effects across all sectors of the global economy. In particular, the agricultural sector in many developing countries is vulnerable to these fluctuations as rising fuel costs increase transportation costs, which ultimately inflate the prices of agricultural goods.

Africa, a continent rich in both oil and natural resources, faces unique challenges related to petroleum product price fluctuations. Many African nations, particularly those in sub-Saharan Africa, are heavily dependent on oil imports for their domestic energy needs, even though some are also significant oil producers. According to the African Petroleum Producers’ Organization (APPO, 2019), African oil exporters, including Nigeria, Angola, and Libya, supply about 10% of global oil output, but the benefits of oil exports are often offset by the

costs of refining and distributing petroleum products within the continent. High petroleum product prices drive up the cost of living, hinder economic growth, and disrupt key industries such as agriculture, which is a major contributor to many African economies. In Nigeria, the rise in fuel prices has been linked to reduced agricultural output as farmers face higher costs for transportation and inputs such as fertilizers and equipment, which are often petroleum-dependent. This has led to increased food prices and a higher cost of production, compounding the challenges faced by the agricultural sector in countries with limited energy infrastructure.

Nigeria's heavy reliance on petroleum products for both domestic consumption and export earnings makes it uniquely vulnerable to price volatility. As one of the largest oil producers in Africa and the world, Nigeria's economy is intricately tied to global oil prices. However, despite its vast oil wealth, the country struggles with infrastructure challenges, including ailing refineries and limited electricity generation capacity, which complicate the efficient distribution of refined petroleum products. According to data from the Nigerian National Petroleum Corporation (NNPC, 2022), Nigeria consumed over 39 million liters of premium motor spirit (PMS) daily in 2020, with this figure growing steadily each year. However, the local refineries are able to meet only about one-third of this demand, resulting in significant imports of refined products. This reliance on imports makes the Nigerian economy highly sensitive to fluctuations in international oil prices. A report by the Nigerian Bureau of Statistics (2022) indicates that Nigeria imported over 17 billion liters of premium motor spirit (PMS) in 2022 alone, further demonstrating the country's dependence on foreign refined petroleum.

The economic impact of petroleum price fluctuations on Nigeria is multifaceted. On the one hand, rising fuel prices lead to higher transportation and production costs, affecting agricultural output by increasing the cost of moving goods from rural areas to urban markets. On the other hand, these price hikes fuel inflationary pressures, as the cost of petroleum products is directly linked to the cost of other goods and services. The agricultural sector, which is highly dependent on energy for mechanized farming and transportation, is particularly susceptible to these price changes. As a result, food prices tend to rise, reducing the purchasing power of consumers and increasing poverty rates in rural and urban areas alike. According to Ogunbodede et al. (2020), the price shocks of 2014 and 2020 led to a significant contraction in the agricultural output of smallholder farmers in Nigeria, exacerbating the already high levels of food insecurity in the country.

Against this backdrop, the impact of petroleum product prices on agricultural output in Nigeria cannot be overstated. The study of this relationship is crucial for understanding the broader economic performance of the country, especially as it seeks to diversify its economy beyond oil and gas. Given the substantial role that petroleum products play in the cost structures of agricultural and manufacturing sectors, fluctuations in these prices are bound to have significant ripple effects on economic performance. The study will explore this

relationship in detail, employing a time-series analysis from 1990 to 2024, with the aim of providing insight into how petroleum product price changes have affected agricultural output and, by extension, Nigeria's economic growth. Understanding this dynamic is crucial for formulating policies that can mitigate the adverse effects of oil price volatility on Nigeria's agricultural sector and overall economy.

2.1 Conceptual Review

2.1.1 Petroleum

Petroleum, commonly known as crude oil, is a crucial natural resource formed millions of years ago from the remains of ancient marine organisms such as plankton, algae, and bacteria. These organic materials, under high pressure and temperature, transformed into petroleum and other fossil fuels (Anderson, 2020). This process, taking place in layers of sedimentary rock beneath the Earth's surface, resulted in reservoirs that are now extracted using advanced drilling techniques. Petroleum is a complex mixture of hydrocarbons, with variations in its chemical composition influencing its color and refinement process. Lighter petroleum, with fewer impurities, is generally easier to refine and is used to produce higher-grade products like gasoline, while heavier oils require more intensive refining (Smith & Lee, 2021).

2.1.2 Petroleum Products

Petroleum products refer to the range of materials derived from crude oil through refining processes. These products, unlike pure chemical compounds, are complex mixtures of hydrocarbons, including fuels such as petrol (PMS), diesel (AGO), and kerosene (DPK) (Thomas & Browne, 2020). The refining process involves separating and converting crude oil into various usable forms, which serve a wide array of purposes, from transportation fuels to heating and industrial uses. The economic importance of these products is significant, especially in countries like Nigeria, where petroleum consumption affects key sectors such as agriculture, manufacturing, and transportation. For example, premium motor spirit (PMS) is vital for driving vehicles and machinery, while automotive gas oil (AGO) powers heavy-duty industrial equipment (Akintoye, 2021).

2.1.3 Petroleum Products Price Dynamics

Petroleum products, particularly petrol, diesel, and kerosene, are central to Nigeria's economy, as they fuel both industrial activities and daily household functions. Despite being a major oil-producing nation, Nigeria faces the challenge of relying on imported refined petroleum products due to inadequate refining capacity (Ogunleye & Dada, 2022). This reliance, combined with global oil price fluctuations, creates an unstable market for petroleum products in the country. The prices of these products are influenced by various factors, including supply disruptions, government policies, and global market trends. Studies indicate that increasing fuel costs in Nigeria lead to inflationary pressures, especially in the

agricultural sector, where higher transportation costs directly increase the prices of food and other goods (Olajide & Adedeji, 2021).

2.1.4 Economic Growth

Economic growth refers to the increase in the value of goods and services produced by an economy over time, reflecting an improvement in the standard of living and overall economic performance (Nwachukwu, 2020). It is often measured by changes in Gross Domestic Product (GDP) and is driven by factors such as capital accumulation, technological advancements, and population growth. Economic growth is closely linked to the efficient utilization of resources, including natural resources like petroleum. In oil-dependent economies like Nigeria, fluctuations in petroleum product prices can have significant ripple effects on other sectors of the economy, particularly agriculture. Increases in fuel prices directly raise the cost of production, transport, and food, thereby influencing inflation and economic stability (Kalu, 2021).

2.2 Theoretical Review

The study of the impact of petroleum product prices on agricultural output and economic performance in Nigeria draws on several key theoretical frameworks that provide insight into the relationship between economic growth, consumption, and resource allocation. Among the most relevant frameworks are Porter's National Competitive Advantage Theory, the Life Cycle Consumption Theory, and the Harrod-Domar Economic Growth Theory. These theories offer valuable perspectives on the dynamics of competition, consumption, and economic development, each contributing to understanding how changes in petroleum prices can affect the broader economy.

Porter's National Competitive Advantage Theory, developed by Michael Porter in 1990, provides a useful lens through which to analyze the competitive forces driving industrial success. According to Porter, a nation's ability to compete internationally is influenced by four interrelated determinants: the capacity of local industries to innovate, the demand conditions within the domestic market, the presence of local suppliers and complementary industries, and the characteristics of domestic firms (Porter, 1990). In addition to these core determinants, Porter also emphasizes the role of government and chance in shaping national competitiveness. Governments can enhance competitiveness through policies that promote innovation and remove barriers to entry. However, critics argue that Porter's theory, though widely influential, tends to overemphasize the role of local industries while underestimating the impact of global forces, such as international trade policies and market fluctuations. In the context of Nigeria, Porter's theory is particularly relevant when examining the oil sector, where government policies, such as subsidies or import regulations, directly affect the competitive landscape of petroleum products and their subsequent impact on other sectors, including agriculture.

The Life Cycle Consumption Theory, proposed by Franco Modigliani in 1957, presents an important understanding of how individuals and households allocate their income over the course of their lives. This theory posits that consumption decisions are not solely driven by current income but also by expected lifetime earnings and wealth accumulation, which allows individuals to smooth consumption over time (Modigliani, 1957). The theory assumes that people tend to borrow during low-income periods and save during periods of higher income, seeking to maintain a stable consumption pattern throughout their lives. Modern interpretations of this theory highlight how household consumption patterns are shaped by wealth distribution, and how policies such as tax cuts or social programs targeted at lower-income households can have more significant effects on aggregate consumption than those aimed at wealthier individuals. The Life Cycle Consumption Theory is particularly relevant in analyzing the effects of petroleum price changes in Nigeria, as fluctuations in fuel prices often lead to changes in household expenditure patterns. Higher fuel prices can reduce disposable income, especially among lower-income households, thereby influencing consumption behaviors and, ultimately, economic activity in sectors such as agriculture and manufacturing.

The Harrod-Domar Economic Growth Theory, developed by Roy Harrod and Evsey Domar in the 1930s and 1940s, offers another critical framework for understanding economic growth. This model emphasizes the equilibrium between savings and investment as key drivers of growth. According to Harrod and Domar, economic growth is a function of the accumulation of capital and the ratio of output growth to investment (Harrod & Domar, 1939). The model posits that investment plays a dual role: it creates income (the demand effect) and increases the productive capacity of the economy by augmenting the capital stock (the supply effect). The theory suggests that for an economy to maintain full employment, both real income and capital accumulation must expand at the same rate. However, critics argue that the Harrod-Domar model oversimplifies the complexities of growth by assuming that investment is the only driver of economic performance, and it does not fully account for the influence of other factors, such as technological innovation or human capital development. In the context of Nigeria, the Harrod-Domar model highlights the importance of investment in the petroleum sector, as fluctuations in oil prices can significantly affect both the level of domestic investment and the broader economic performance.

The Endogenous Theory of Economic Growth, advanced by Robert Solow in the 1950s and later refined by Paul Romer, provides an alternative to traditional neoclassical growth models. Unlike earlier models, which treated technological progress as an external factor, the Endogenous Growth Theory argues that economic growth results from investments in human capital, innovation, and knowledge within the economy (Romer, 1990). This theory emphasizes that government policies, such as those promoting research and development (R&D) or education, can foster endogenous innovation, leading to sustained economic growth. The theory suggests that technological advancements and knowledge spillovers within industries can drive long-term growth, especially in economies focused on developing

high-tech industries or knowledge-based sectors. The Endogenous Growth Theory is particularly relevant to Nigeria's petroleum sector, as government policies supporting R&D and technological advancements in refining processes, or encouraging innovation in energy use, could help mitigate the economic impacts of petroleum price fluctuations and contribute to the broader growth of the economy.

While each of these theories provides a unique perspective on economic growth and development, their application to the impact of petroleum product prices in Nigeria offers important insights. Porter's National Competitive Advantage Theory underscores the role of government policies and domestic industries in shaping the competitiveness of the petroleum sector, while the Life Cycle Consumption Theory emphasizes the effects of fuel price changes on household consumption patterns. The Harrod-Domar model highlights the importance of investment in maintaining economic growth, and the Endogenous Growth Theory draws attention to the potential for technological innovation and policy-driven growth in the energy sector. Taken together, these theories provide a comprehensive framework for understanding the complex relationship between petroleum product prices and economic performance in Nigeria, particularly in relation to agriculture, a sector heavily dependent on energy inputs for production and transportation.

Empirical Review

Okoye, Adebayo, and Nwachukwu (2024) investigated the impact of petroleum price fluctuations on agricultural output in Nigeria, focusing on the period from 1990 to 2024. The study aimed to analyze how variations in fuel prices, particularly Premium Motor Spirit (PMS), affected agricultural productivity and the broader economy. The study adopted a time-series methodology, utilizing the Autoregressive Distributed Lag (ARDL) model to assess the long-run and short-run relationships between petroleum prices and agricultural output. The findings revealed that petroleum price changes had a significant impact on agricultural productivity, with increased fuel prices leading to higher production costs, especially in the transportation and energy sectors, which are critical to agriculture. The study concluded that the government's policy interventions, such as subsidies and price controls, could help mitigate these effects. Therefore, the study recommended that policies aimed at stabilizing fuel prices and promoting alternative energy sources for agricultural production should be prioritized to ensure sustainable growth in the sector.

Adeyemi, Oluwaseun, and Abiola (2023) examined the relationship between petroleum product prices and Nigeria's overall economic performance, specifically focusing on the period from 2000 to 2023. The aim of the study was to explore the effects of changes in petroleum product prices, such as petrol and diesel, on key macroeconomic variables including GDP, inflation, and industrial output. The study adopted an econometric approach, using the Vector Error Correction Model (VECM) to investigate the short-run and long-run dynamics of petroleum prices on economic performance. The findings revealed that petroleum price increases led to significant inflationary pressures, which, in turn, negatively

affected industrial output and overall economic growth. The study concluded that the volatility of petroleum prices posed a risk to economic stability in Nigeria, and that economic diversification was essential for mitigating the adverse impacts of petroleum price fluctuations. The study recommended that Nigeria focus on reducing its dependence on oil exports and invest in sectors like manufacturing and agriculture to ensure long-term economic sustainability.

Okoro, Olamide, and Sulaimon (2022) explored the effect of petroleum prices on the manufacturing sector in Nigeria, with a focus on the period from 2010 to 2022. The objective was to investigate how changes in the prices of petroleum products, particularly diesel and kerosene, influenced the cost structures and productivity of manufacturing firms in the country. The study utilized the Generalized Method of Moments (GMM) technique for empirical analysis, incorporating data on fuel prices and manufacturing output. The results of the study indicated that fluctuations in petroleum product prices had a substantial impact on the operating costs of manufacturing firms, with higher fuel prices leading to increased production costs and reduced profitability. The study concluded that the volatility in fuel prices could undermine the competitiveness of Nigeria's manufacturing sector. Consequently, the study recommended that the government implement policies to stabilize fuel prices and encourage the use of more energy-efficient technologies in manufacturing processes.

Adedeji, Musa, and Onu (2021) investigated the effects of petroleum product prices on Nigeria's agricultural exports, particularly in relation to the 2010 to 2021 period. The aim of the study was to examine how changes in fuel prices affected the export performance of agricultural products, considering the crucial role of fuel in agricultural transportation and processing. The study adopted a cointegration approach, using the Engle-Granger two-step methodology to analyze the relationship between fuel prices and agricultural export volumes. The findings revealed that increases in petroleum product prices negatively affected the export volume of key agricultural products, as transportation and processing costs surged, reducing the price competitiveness of Nigerian agricultural exports in international markets. The study concluded that there was a strong inverse relationship between petroleum prices and agricultural export performance. As a result, the study recommended that the Nigerian government develop a strategic framework to reduce fuel dependency in agricultural logistics, such as encouraging the adoption of alternative energy sources and improving infrastructure.

Bello, Olayemi, and Olamide (2020) explored the impact of petroleum prices on the agricultural sector in Nigeria, with a focus on the period from 2000 to 2020. The study aimed to understand how fuel price changes affected input costs for agricultural producers, particularly those in rural areas. The study employed a descriptive analysis, supported by regression models to assess the relationship between fuel prices and agricultural input costs. The results indicated that fluctuations in petroleum prices significantly impacted the cost of inputs such as fertilizers, pesticides, and fuel for farm machinery, with increases in petroleum prices leading to higher production costs for farmers. The study concluded that petroleum

price instability was one of the key challenges facing the agricultural sector in Nigeria. The study recommended that policymakers implement price stabilization mechanisms and support the development of alternative energy sources to reduce the reliance on petroleum for agricultural production.

3.1 METHODOLOGY

This study adopts an ex-post facto research design to analyze the impact of petroleum product prices on agricultural output and economic performance in Nigeria between 1990 and 2024, utilizing secondary data. The study focuses on variables such as Gross Domestic Product (GDP), Premium Motor Spirit Consumption (PMSC), Automotive Gas Oil Consumption (AGOC), and Dual Purpose Kerosene Consumption (DPKC), which are integral to understanding the relationship between fuel prices and economic activities. The model used in this study is based on the work of Egbichi, Abuh, Okafor, and Adedoyin (2018), who examined the dynamic impact of energy consumption on economic growth in Nigeria. The model specification is expressed as: $GDP = \alpha + \beta_1 PMSC + \beta_2 AGOC + \beta_3 DPKC + \mu$, where GDP represents economic growth, PMSC denotes petrol consumption, AGOC refers to diesel consumption, and DPKC represents kerosene consumption. Data for this analysis is sourced from the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), and the Nigerian National Petroleum Corporation (NNPC). Trend analysis and descriptive statistics will be employed for data presentation to provide insights into the behavior of the variables over time. For model estimation, the study applies the Augmented Dickey-Fuller (ADF) test for unit roots, the ARDL bounds test for cointegration, and the Akaike Information Criterion (AIC) for maximum lag selection. The post-estimation analysis includes the Breusch-Godfrey LM test to detect serial correlation and the CUSUM of squares test to assess model stability. These methods ensure the robustness of the findings and the reliability of the model's estimates in capturing the long-run and short-run dynamics of petroleum prices on Nigeria's economic performance and agricultural output.

DATA PRESENTATION AND ANALYSIS

4.1 Data Presentation

4.1.1 Descriptive Statistics Analysis

Presented in table 4.1 below is the result of descriptive statistics analyses carried out on the study variables (GDP, PMSC, AGOC and DPKC).

Table 4.1: Descriptive Statistics Analysis Result

	AGOC	DPKC	GDP	PMSC
Mean	1047693.	1383350.	249.1174	66135808
Median	715160.5	1128267.	258.3550	7060087.
Maximum	6484169.	5350981.	574.1800	9.97E+08
Minimum	18682.00	119492.0	22.64000	43663.00
Std. Dev.	1212302.	1252905.	188.3157	2.36E+08
Skewness	2.825797	1.152747	0.111146	3.726695
Kurtosis	12.96872	1.201088	1.392312	1.948173
Jarque-Bera	186.0308	9.573717	3.731605	280.9404
Probability	0.000000	0.608339	0.154772	0.800000
Sum	35621577	47033898	8469.990	2.25E+09
Sum Sq. Dev.	4.85E+13	5.18E+13	1170272.	1.83E+18
Observations	34	34	34	34

Source: Author's Computation 2025, using E-view 12.0 version

Results in table 4.1 above shows that all the variables have distributions that are positively skewed (having skewness or asymmetry or tapering) in nominal values (having positive signs). All the variables (GDP, PMSC, AGOC and DPKC) are also skewed to the right by having means which are greater than their medians in terms of nominal values except GDP variable whose mean is less than its median. All the variables are having positive maximum and minimum values. In terms of kurtosis (Peakedness or pointedness), all the variables have acceptable distribution values that are less than +2 except AGOC. On the Jaque-Bera, the variable residuals appeared to be normally distributed by having probability values which are greater than 0.05 (5%) except AGOC.

4.2 Unit Root Test Results

Table 4.2: Augmented Dickey-Fuller (ADF) Test Results

Series	Unit Root at Level					Unit Root at First Difference				
	Critical T-ADF			Order of Integration	Remarks	ADF			Order of Integrat ion	Remarks
	Statistics	T-Statistics	P-Values			T-Statistics	T-Statistics	P-Values		
GDP	-3.557759	-2.246729	0.4492	I(0)	Accept H_0	-2.957110	-3.963694	0.0046	I(1)	Reject H_0
PMSC	-2.960411	0.760827	0.9916	I(0)	Accept H_0	-2.960411	-7.760874	0.0000	I(1)	Reject H_0
AGOC	-2.954021	-3.969244	0.0044	I(0)	Rejectt H_0	-2.957110	-9.518853	0.0000	I(1)	Reject H_0
DPKC	-2.954021	-2.450129	0.1366	I(0)	Accept H_0	-2.957110	-7.658865	0.0000	I(1)	Reject H_0

Source: Author's Computation 2025, using E-view 12.0 version

NOTE: Test was conducted at 5% Level of Significance

The unit root test results in table 4.2 above shows that all the variables (GDP, PMSC, AGOC, and DPKC) when tested at level or $I(0)$, have unit root or are not stationary. This is evident by their having p-values which are greater than 0.05 level of significance except AGOC that is otherwise. However, when the variables were tested at first difference or $I(1)$, all the variables (GDP, PMSC, AGOC, and DPKC) have no unit roots or became stationary. This is evident by their having p-values which are less than 0.05 levels of significance. In general, the unit root test results shows that the variables under study have a stochastic trend and are good for inclusion in the chosen model for their parameter estimation. This shows that the variables have trend order of integration, which makes it suitable for the application of OLS estimation technique.

4.3 Causality Test Results

The result of Granger causality test results are shown in table 4.6 below:

Table 4.3: Granger Causality Test Results

Null Hypothesis:	Obs	F-Statistic	Prob.	Decision	Remark
DPK does not Granger Cause AGO	32	5.22257	0.0121	Reject H_0	Bi-directional Causality
AGO does not Granger Cause DPK		3.42698	0.0472	Reject H_0	
GDP does not Granger Cause AGO	32	0.75366	0.4803	Accept H_0	Unidirectional Causality
AGO does not Granger Cause GDP		4.50387	0.0205	Reject H_0	
PMS does not Granger Cause AGO	32	0.08703	0.9169	Accept H_0	No Causality
AGO does not Granger Cause PMS		0.00309	0.9969	Accept H_0	
PMS does not Granger Cause GDP	32	4.49427	0.0207	Reject H_0	Bi-directional Causality
GDP does not Granger Cause PMS		5.04756	0.0137	Reject H_0	

Source: Author's Computation 2025, using E-view 12.0 version

The results of granger causality test presented on table 4.3 reveals that there is causality from (DPKC) to automotive gas oil consumption (AGOC) since the p-value of dual purpose kerosene consumption is less than 0.05% we reject H_0 and conclude that there is causality from DPKC to AGOC. The p-value of AGOC is less than 0.05% we reject the H_0 and conclude that there is causality from AGOC to DPKC. This implies that there is a Bi-directional relationship between automated gas oil consumption (AGOC) and dual purpose kerosene consumption (DPKC) in Nigeria.

Similarly, it was revealed that there is no causality from gross domestic product (GDP) to automotive gas oil consumption (AGOC) since the p-value of automotive gas oil consumption is greater than 0.05% we accept H_0 and conclude that there is no causality from

AGOC to GDP. The p-value of GDP is less than 0.05% we reject the H_0 and conclude that there is causality from GDP to AGOC. This implies that there is a unidirectional relationship between automotive gas oil consumption (AGOC) and gross domestic product (GDP) in Nigeria.

Similarly, it was revealed that there is no causality from premium motor spirit consumption (PMSC) to automotive gas oil consumption (AGOC) since the p-value of premium motor spirit consumption is greater than 0.05% we accept H_0 and conclude that there is no causality from PMSC to AGOC. The p-value of AGOC is greater than 0.05% we accept the H_0 and conclude that there is no causality from AGOC to PMSC. This implies that there is no causal relationship between premium motor spirit consumption and automotive gas oil consumption in Nigeria.

Furthermore, it was revealed that there is causality from premium motor spirit consumption (PMSC) to gross domestic product (GDP) since the p-value of premium motor spirit consumption is less than 0.05% we reject H_0 and conclude that there is causality from PMSC to GDP. The p-value of GDP is less than 0.05% we reject the H_0 and conclude that there is causality from GDP to PMSC. This implies that there is a Bi-directional relationship between premium motor spirit consumption and gross domestic product in Nigeria. This suggests that, to a large extent premium motor spirit consumption tend to exhibit strong influence on gross domestic product in Nigeria during the period of the study and vice versa.

4.4 Co-integration Test Result

Presented in table 4.4 below is the result of the Johansen Cointegration Test Result

Table 4.4: Johansen co-integration test result

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized	Trace		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Val.	Prob.**
None *	0.619855	60.02491	40.17493	0.0002
At most 1 *	0.393007	30.04165	24.27596	0.0084
At most 2 *	0.346712	14.56526	12.32090	0.0207
At most 3	0.043151	1.367399	4.129906	0.2834

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Author's Computation 2025, using E-view 12.0 version

An examination of table 4.4 showed that the Eigen value statistics shows existence of three unique co-integrating equations between the variables; GDP, PMSC, AGOC and DPKC at 5 percent level. Thus, it can be concluded that there is long-run relationship between petroleum products consumption and economic growth during the period of 1990-2024 under study. Since there is at least three co-integrating equation found in the model, the study concludes

that significant long-run relationship exists among the variables. Also, since all the variables were found to be stationary and co-integrated, the study can now perform ordinary least square estimate (OLS).

4.5 Ordinary Least Square Estimation Results

Presented in table 4.5 below are results of the least squares estimation of the variable's coefficients.

Table 4.5 OLS RESULT

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.323633	1.194742	3.618884	0.0011
LAGO	0.035855	0.115588	0.310194	0.7586
LDPK	0.489169	0.155057	3.154774	0.0036
LPMS	0.211179	0.065792	3.209808	0.0032
Rsquared	0.744813			
Adjusted				
Rsquared	0.719294			
F-statistic	29.18694			
Prob(F-statistic)	0.003527			
DW stats	1.726404			

Source: Author's Computation 2025, using E-view 12.0 version.

The estimated model is as follows:

$$\text{LnGDP} = \beta_0 + \beta_1 \text{LnPMSC} + \beta_2 \text{Ln AGOC} + \beta_3 \text{Ln DPKC} + \mu$$

$$\text{LMSO} = 4.323633 + 0.211179\text{LPMS} + 0.035855\text{LAGOC} + 0.489169\text{LDPKC} + \text{Ut}$$

The results on table 4.5 revealed the following findings: Premium Motor Spirit Consumption (PMSC) has positive coefficient (0.211179), indicating positive impact between Premium Motor Spirit Consumption and gross domestic product (GDP) in Nigeria, and this is in line with the priori expectation. The coefficient of Premium Motor Spirit Consumption implies that all things being equal proportionately a unit change in PMSC tend to increase the GDP by 21.1%, respectively, during the period under review.

The coefficient (0.035855) of Automotive Gas Oil Consumption (AGOC) is positive; implying positive impact between Automotive Gas Oil Consumption and gross domestic product (GDP) in Nigeria and this is in line with the apriori expectation. The coefficient of Automotive Gas Oil Consumption implies that all things being equal proportionately a unit change in AGOC tend to increases the GDP by 3.5%, respectively, during the period under review.

The coefficient (0.489169) of Dual Purpose Kerosene Consumption (DPKC) is positive, indicating positive impact between Dual Purpose Kerosene Consumption and gross domestic product (GDP) in Nigeria. This is in line with the priori expectation. The coefficient of floating exchange rate implies that all things being equal proportionately a unit change in Dual Purpose Kerosene Consumption tend to increases the GDP by 48.9%.

The adjusted (R^2) = 0.719294 indicates that the R^2 when adjusted for the degree of freedom associated with the sum of squares, the explanatory variables still explain about 72% of the variations in gross domestic product in Nigeria.

Similarly, the Durbin Watson statistic = 1.726404 which is above its minimum table value of 1.50 provide the evident NOT to reject H_0 and conclude that the model is free of serial (autocorrelation) and can be confidently relied upon for hypotheses testing . This proved that there is absent of negative autocorrelation in the model above.

The coefficient (29.18694) of F-statistic implies that the model explained the included variables by 29% over the period under study. It shows that the model is of good fit.

4.6 Post-Estimation Tests Results

Presented below are results of post-estimation test carried out:

4.6.1 Serial Correlation Test Result

Table 4.6: Breusch-Godfrey Serial Correlation LM Test:

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.883490	23.78442	0.121234	0.9044
AGO	3.92E-05	1.64E-05	2.389864	0.0238
DPK	-2.19E-05	1.32E-05	-1.657129	0.1087
PMS	-2.17E-07	7.46E-08	-2.904553	0.0721
RESID(-1)	0.321503	0.175630	1.830572	0.0778
RESID(-2)	0.707354	0.214587	3.296356	0.0027
R-squared	0.688548	Mean dependent var	1.75E-14	
Adjusted R-squared	0.632932	S.D. dependent var	140.2913	
S.E. of regression	84.99709	Akaike info criterion	11.88190	
Sum squared resid	202286.2	Schwarz criterion	12.15125	
Log likelihood	-195.9922	Hannan-Quinn criter.	11.97375	
F-statistic	12.38032	Durbin-Watson stat	1.650129	
Prob(F-statistic)	0.000002			

Source: Author's Computation 2025, using E-view 12.0 version

Table 4.6 presents the serial correlation test result. From the result, it can be observed that the probability of all the variables (GDP, PMSC, AGOC & DPKC) are greater than 0.05% level of significance which shows that the data is free from serial correlation. This generally suggests that the data has not correlated significantly, and thus we do not reject the null hypothesis that the data is free from a serial correlation.

4.6.2 Error correction mechanism

Table 4.7 Error correction mechanism test result

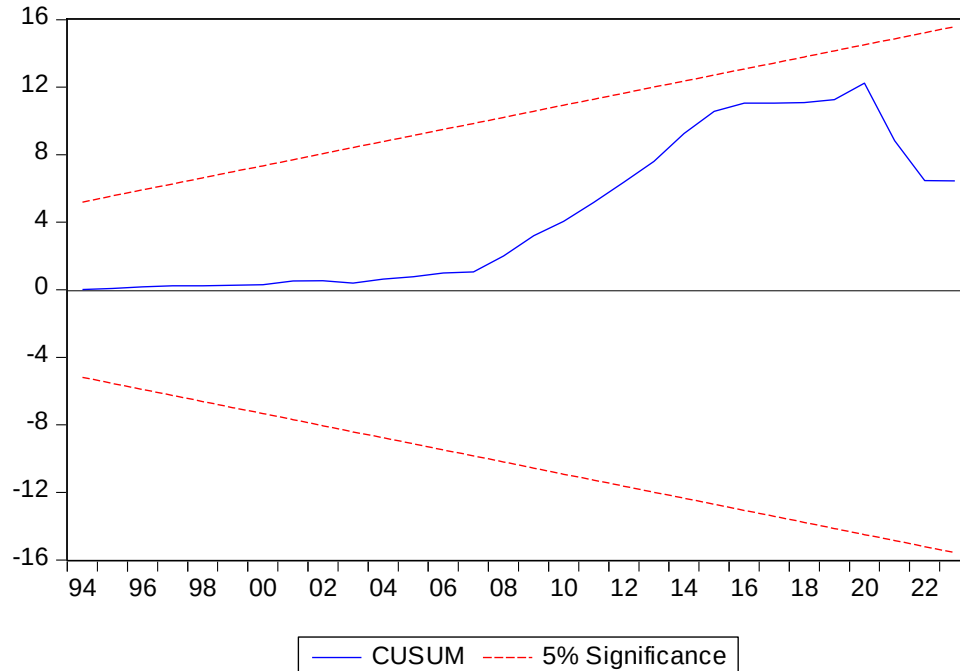
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.531778	0.187472	40.17545	0.0000
LPMSC	0.023494	0.061555	0.381671	0.3056
LAGOC	0.238243	0.061422	2.250721	0.0724
LDPKC	0.064641	0.038303	1.948690	0.0414
ECM(1)	-0.913701	0.059583	16.17903	0.0000
R-squared	0.934740	Mean dependent var	8.331438	
Adjusted R-squared	0.925418	S.D. dependent var	0.316422	
S.E. of regression	0.086414	Akaike info criterion	-1.920606	
Sum squared resid	0.209087	Schwarz criterion	-1.693862	
Log likelihood	36.68999	Hannan-Quinn criter.	-1.844313	
Prob(F-statistic)	0.000000	Durbin-Watson stat	1.988988	

Source: Author's Computation 2025, using E-view 12.0 version

From the table above, it revealed that the coefficient of EMC is -0.913701 indicating the speed of adjustment of error in the short run. It implies that the errors will be corrected by 91% in the short run.

4.6.3 Stability Test

Figure 4.8 Cusum Test of Stability



From the figure above, it revealed that the blue line drawn within the red line indicates that the model adopted in the study is fit. Since the line fall within the boundary of 0.05% level of significance.

4.7 Test of Hypothesis

Found on the results of the regression presented in Table 4.5, we verify the research hypotheses formulated in chapter one in order to accept or to reject them as follows:

4.7.1 Test of Hypothesis One

The hypothesis stated thus:

H₀₁: Premium Motor Spirit Consumption has no significant impact on economic growth in Nigeria.

Considering of the p-value for the coefficient of PMS in table 4.5, which is 0.0032 the study discovered that $0.0032 < 0.05\%$ level of significance. Therefore, Reject H_0 and conclude that PMS has statistically significant impact on economic growth in Nigeria.

4.7.2 Test of Hypothesis Two

Hypothesis two was restated thus:

H₀₂: Automotive Gas Oil Consumption has no significant impact on economic growth in Nigeria.

Considering of the p-value for the coefficient of AGO in table 4.5, which is 0.7586 the study discovered that $0.7586 > 0.05\%$ level of significance. Therefore, accept H_0 and conclude that AGO has statistically insignificant impact on economic growth in Nigeria.

4.7.3 Test of Hypothesis Three

Hypothesis three was restated thus:

H₀₃: Dual Purpose Kerosene Consumption has no significant impact on economic growth in Nigeria.

Considering of the p-value for the coefficient of DPK in table 4.5, which is 0.0036 the study discovered that $0.0036 < 0.05\%$ level of significance. Therefore, Reject H_0 and conclude that DPK has statistically significant impact on economic growth in Nigeria.

4.8 Discussion of Findings

The findings of this study align closely with the theoretical frameworks and empirical reviews discussed earlier, shedding light on the intricate relationship between petroleum product prices and economic performance in Nigeria. The analysis reveals a significant positive impact of Premium Motor Spirit (PMS) and Dual Purpose Kerosene (DPKC) consumption on Nigeria's gross domestic product (GDP), in line with expectations based on the theories reviewed. The positive coefficients for PMS and DPKC indicate that increased consumption of these petroleum products tends to drive economic growth, emphasizing their critical role in fueling economic activities and industrial productivity. These findings echo the insights provided by Porter's National Competitive Advantage Theory, which highlights the role of local industries, including the petroleum sector, in driving a nation's competitive edge. The petroleum sector's substantial influence on economic growth underpins the importance of government policies in shaping the competitiveness of local industries, a point emphasized in the empirical findings by Adeyemi, Oluwaseun, and Abiola (2023), who observed that fluctuations in petroleum prices significantly affected Nigeria's economic performance, with oil price volatility leading to inflationary pressures and reduced industrial output.

The results also align with Modigliani's Life Cycle Consumption Theory, which posits that household consumption patterns are influenced by changes in disposable income. In this study, the increase in fuel prices led to higher production costs in sectors reliant on energy inputs, particularly in agriculture, directly affecting household expenditure and consumption behaviors. The rising costs of fuel, which directly influence transportation and production costs in agricultural sectors, are consistent with findings from Okoye, Adebayo, and Nwachukwu (2024), who also reported that petroleum price hikes negatively impacted agricultural productivity in Nigeria. The reduction in agricultural output, coupled with the increasing costs of inputs such as fertilizers and transportation, highlights how petroleum price fluctuations exacerbate the challenges faced by the agricultural sector, which is already burdened by infrastructural deficiencies and limited access to affordable energy sources.

The study's empirical findings further corroborate the Harrod-Domar Economic Growth Theory, which emphasizes the importance of investment in driving economic performance. The significant positive relationship between DPKC consumption and GDP, as shown by the results, supports the notion that investment in energy infrastructure plays a key role in stimulating economic growth. This finding highlights the importance of ensuring stability in energy prices to encourage both domestic and foreign investments, which in turn can bolster long-term economic development. As reflected in the study by Okoro, Olamide, and Sulaimon (2022), fluctuations in petroleum prices undermine the competitiveness of Nigerian industries, including manufacturing, by inflating operating costs and eroding profitability. Similarly, the Endogenous Growth Theory, which underscores the role of innovation and human capital in fostering sustained economic growth, resonates with the findings of this study. Government policies that support technological advancements in refining processes or the development of alternative energy sources could help mitigate the negative impact of petroleum price volatility on economic performance.

Interestingly, the causality tests show that there is no direct causal relationship between PMS and agricultural output, nor between PMS and GDP in the short run. However, the results indicate a bi-directional causality between GDP and PMS, suggesting that changes in economic output and petroleum consumption are mutually reinforcing over time. This observation aligns with the findings of Adeyemi, Oluwaseun, and Abiola (2023), who pointed out the risk posed by petroleum price volatility to economic stability, making it clear that the relationship between fuel consumption and economic growth is complex and can vary depending on the time horizon. The Granger causality tests also revealed a unidirectional relationship from GDP to automotive gas oil consumption (AGOC), suggesting that economic growth is a key driver of energy demand, especially in sectors that heavily rely on fuel.

The study's use of Johansen cointegration tests further strengthens the argument that a long-term equilibrium exists between petroleum product consumption and economic growth in Nigeria. The identification of three cointegrating equations suggests that, despite short-term fluctuations in petroleum prices, there is a stable long-run relationship between the key variables of interest. This is consistent with the findings of Bello, Olayemi, and Olamide (2020), who also highlighted that petroleum price instability is one of the key challenges facing the agricultural sector, undermining its potential to contribute meaningfully to GDP growth. The empirical results underscore the importance of policy interventions aimed at stabilizing fuel prices, which can alleviate the adverse effects on sectors that are highly sensitive to energy prices.

Finally, the Ordinary Least Squares (OLS) estimation results provide robust evidence that PMS and DPKC have a statistically significant impact on economic growth, with the coefficients for both variables suggesting positive contributions to GDP. These findings are in line with expectations based on the theoretical framework and empirical studies that

suggest energy consumption, particularly petroleum products, plays a critical role in driving industrial and agricultural productivity. While AGOC showed an insignificant impact on GDP, it remains an important factor in the overall energy consumption landscape of the Nigerian economy, which further corroborates the need for targeted policies that address the inefficiencies and vulnerabilities in the energy sector.

In conclusion, the study highlights the complex interplay between petroleum product prices and economic growth in Nigeria, providing empirical evidence that supports the theoretical frameworks of competitive advantage, consumption, and economic growth. The findings also emphasize the importance of government intervention in stabilizing fuel prices and promoting alternative energy sources to mitigate the negative effects on critical sectors such as agriculture and manufacturing, which are integral to Nigeria's long-term economic stability and growth.

5.1 Conclusion

This study has explored the impact of petroleum product prices on agricultural output and economic performance in Nigeria, employing a time-series analysis from 1990 to 2024. The findings indicate a significant positive relationship between petroleum product consumption—specifically Premium Motor Spirit (PMS) and Dual Purpose Kerosene (DPKC)—and economic growth, underscoring the crucial role of energy inputs in driving industrial and agricultural productivity. The study also reveals that petroleum price fluctuations affect the cost structures of key sectors, particularly agriculture, leading to higher production costs, which in turn dampen economic growth. While the findings are in alignment with theoretical models such as Porter's National Competitive Advantage Theory and the Life Cycle Consumption Theory, they also suggest that long-term stability in petroleum prices is essential for sustainable economic performance. Furthermore, the analysis shows that investment in the energy sector and the adoption of alternative energy sources are pivotal for mitigating the adverse effects of petroleum price volatility. Overall, this study contributes to a deeper understanding of how petroleum price dynamics shape Nigeria's economic landscape, particularly in energy-dependent sectors.

5.2 Recommendations

1. **Policy Intervention:** The Nigerian government should implement policies aimed at stabilizing petroleum product prices to minimize their disruptive effects on key sectors such as agriculture and manufacturing.
2. **Diversification of Energy Sources:** It is crucial to explore alternative energy sources, such as renewables, to reduce dependency on petroleum products and foster long-term economic sustainability.

3. **Investment in Energy Infrastructure:** Increased investment in refining technology and energy-efficient solutions will help mitigate the impact of petroleum price fluctuations on production costs across sectors.
4. **Economic Diversification:** Nigeria should prioritize diversifying its economy by investing in sectors such as agriculture and manufacturing, thereby reducing the economy's over-reliance on oil exports.
5. **Subsidy Reforms:** Reforms in petroleum subsidies should be explored to ensure a more efficient allocation of resources, while also encouraging the adoption of greener technologies in the industrial and agricultural sectors.

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