

Petroleum Products Prices and Economic Wellbeing in Nigeria

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Abstract- *The study analysed the effect of petroleum products prices on economic wellbeing in Nigeria. The four components of petroleum products prices used include premium motor spirit price, automotive gas oil price, household kerosene price and compressed natural gas price, while economic wellbeing was proxied by the Human Development Index. In order to achieve the objectives of the study, annual time series data which ranged from 1990 to 2024 were used and sourced from the Nigerian National Petroleum Corporation (NNPC) Report, National Bureau of Statistics (NBS) Reports, Petroleum Products Prices Regulatory Agency (PPPRA) Report, Central Bank of Nigeria (CBN) Statistical Bulletin, and World Development Indicators (WDI) of the World Bank. The study employed the Autoregressive Distributed Lag Model (ARDL) as the major data analysis technique to investigate the long-run and short-run parameters among the variables. The findings emanating from this study showed that premium motor spirit price, automotive gas oil price and household kerosene price have negative and significant effects on Human Development Index in Nigeria in the short run and long run, while compressed natural gas price has a negative but statistically insignificant effect on Human Development Index in the short run and long run. Based on the findings, the study concluded that petroleum products prices have a significant effect on economic wellbeing in Nigeria. Based on the above findings and conclusions, the study recommended that government should implement effective petroleum pricing stabilisation policies aimed at reducing excessive increases and volatility in premium motor spirit price, automotive gas oil price, and household kerosene price in Nigeria.*

influence both the cost of living and the overall economic performance. High petroleum prices increase transportation costs, raise production expenses for goods and services, and ultimately reduce disposable income for households. Conversely, artificially subsidised prices strain government finances, limiting fiscal space for development projects and social services. However, frequent adjustments in petroleum prices in Nigeria often lead to inflationary pressures, thereby eroding the purchasing power of Nigerian households and impacting their standard of living (Njoku et al., 2025). Consequently, the pricing policies of petroleum products have both direct and indirect consequences on economic wellbeing, creating a complex interplay between government revenue objectives and social welfare. Furthermore, the inefficiencies in the petroleum pricing framework exacerbate the vulnerability of the average Nigerian to economic shocks. Inadequate regulation, corruption in the distribution system, and inconsistent pricing strategies have resulted in periodic fuel scarcity, long queues at filling stations, and black-market activities. Such disruptions not only affect household consumption patterns but also hinder industrial and commercial activities, leading to reduced productivity and income generation (Elekanachi, 2021). Adebisi et al (2023) stated that erratic petroleum pricing adversely affects key sectors such as transport, manufacturing, and agriculture, which are critical for economic growth and employment generation, disproportionately affecting low- and middle-income households, who spend a significant portion of their earnings on transportation and energy needs. Moreover, the socio-economic consequences of petroleum product prices are compounded by the political and policy challenges surrounding subsidy removal or price adjustments. Public resistance, protests, and strikes often follow upward adjustments in fuel prices, pressuring the

I. INTRODUCTION

The prices of petroleum products in Nigeria have been a persistent source of economic instability and social tension, significantly affecting the economic wellbeing of the populace. As a country whose economy is heavily dependent on oil revenues, fluctuations in petroleum product prices directly

government to implement reactive rather than proactive economic measures. This cyclical instability limits the effectiveness of policy interventions aimed at ensuring equitable economic growth and reducing poverty. While petroleum products remain central to Nigeria's energy and economic structure, the lack of a stable, transparent, and sustainable pricing mechanism continues to undermine economic wellbeing, hinder investment, and compromise national development objectives.

Statement of the Problem

Addressing the challenges surrounding petroleum product pricing is critical to ensuring that pricing policies contribute positively to the economic welfare of Nigerians rather than exacerbate financial hardship. It is against this background that this study sought to examine the effect of petroleum products prices on economic wellbeing in Nigeria. The specific objectives of the study are to evaluate the effect of premium motor spirit price on economic wellbeing in Nigeria; to analyse the effect of automotive gas oil price on economic wellbeing in Nigeria; to ascertain the effect of household kerosene price on economic wellbeing in Nigeria; and to determine the effect of compressed natural gas price on economic wellbeing in Nigeria.

II. LITERATURE REVIEW

Theoretical Framework

The theories adopted in this study are discussed below:

i. Monetarist Theory of Inflation

The Monetarist Theory of Inflation was principally developed by Milton Friedman in 1963, building upon the classical Quantity Theory of Money. Friedman and his contemporaries argued that inflation is fundamentally a monetary phenomenon, arising when the supply of money in an economy grows faster than the supply of goods and services, and that controlling the growth of the money supply is key to managing inflation, rather than relying solely on fiscal or supply-side interventions. Monetarists emphasise the long-run neutrality of money, suggesting that changes in the money supply primarily affect nominal variables, such as prices and wages, while having limited impact on real variables like output and employment (Friedman,

1963; Jhingan, 2005). The theory centres on the Quantity Theory of Money, represented by the equation $MV = PQ$, and rests on the assumptions that the velocity of money is relatively stable over time, that the economy operates near full employment in the long run such that excessive monetary expansion translates into higher prices rather than higher output, that individuals and firms form rational expectations about inflation, and that there is a direct and proportional relationship between money supply growth and price level changes (Friedman & Schwartz, 1963; Tobin, 1978).

Applying the Monetarist Theory to petroleum products prices and economic wellbeing in Nigeria, the theory provides a lens to understand how price changes in fuels such as premium motor spirit, automotive gas oil, household kerosene, and compressed natural gas affect overall economic stability. In Nigeria, petroleum products serve as both a critical input in production and a major determinant of household expenditure; when fuel prices increase, production costs for goods and services rise, triggering a general increase in the price level, a cost-push inflation scenario that monetarists would interpret as partly reflecting monetary factors if the Central Bank accommodates higher public expenditure or excessive liquidity without matching increases in output. Consequently, households experience reduced purchasing power, firms face higher operating costs, and overall economic wellbeing declines, whereas stable fuel prices coupled with controlled money supply growth ease inflationary pressures and enhance household welfare and real income (Omotola & Adegbite, 2021; Ezirim et al., 2019).

ii. Welfare Economics Theory

The Welfare Economics Theory was formally developed by Arthur Cecil Pigou in 1920 through his work *The Economics of Welfare*. The theory is centred on the idea that the economic performance of a society should be evaluated not only by the efficiency of resource allocation but also by its impact on social welfare or wellbeing, and it emphasises the role of government intervention in correcting market failures, such as monopolies, externalities, and public goods, to enhance collective welfare (Pigou, 1920; Nicholson & Snyder, 2017). The theory rests on the assumptions

that individual preferences can be represented by utility functions and aggregated into societal welfare, that resources are scarce and require efficient allocation to maximise utility, that market failures such as externalities exist where private costs or benefits diverge from social costs or benefits, and that government intervention, through taxation, subsidies, or public provision of goods, can enhance welfare by correcting these inefficiencies (Pigou, 1920; Stiglitz, 2015).

In the context of petroleum products prices and economic wellbeing in Nigeria, Welfare Economics Theory provides a framework for understanding how fuel prices affect household welfare and overall social welfare. Petroleum products, including premium motor spirit, automotive gas oil, kerosene, and compressed natural gas, are critical inputs for transportation, industrial production, and domestic consumption. When fuel prices increase due to market forces or subsidy removal without compensatory measures, the cost of living rises, reducing disposable income and household consumption, which can exacerbate poverty, lower human development outcomes, and negatively affect the overall economic wellbeing of Nigerians. Conversely, government interventions such as targeted subsidies, price controls, or investments in energy infrastructure can mitigate these welfare losses by ensuring affordability, reducing income disparities, and maintaining access to essential goods and services, underscoring the importance of balancing efficiency with equity in petroleum pricing policymaking.

Empirical Review

Njoku et al. (2025) examined the effect of petroleum product pricing on inflation in Nigeria from 1990 to 2023, proxying petroleum product pricing by premium motor spirit price, household kerosene price and automotive gas oil price, using the Autoregressive Distributed Lag (ARDL) approach. The findings showed that premium motor spirit price and household kerosene price have positive and significant effects on inflation rate in Nigeria, while automotive gas oil price has a positive and non-significant effect, and the study recommended that government restructure fuel subsidies while implementing targeted assistance

programmes to shield vulnerable households from price hikes.

Olawuni and Oyeladun (2024) carried out a welfare analysis of petroleum products pricing reform in Nigeria using household budget survey data from 5,000 households and a marginal social cost approach to evaluate the equity and efficiency implications of petroleum products subsidy reform. The study found that reduction or removal of subsidy on premium motor spirit would save the largest amount from the government budget, and that the equity argument for continued subsidisation of household kerosene could no longer be justified given its low marginal social cost.

Umoidem et al. (2024) examined the impact of energy pricing on economic growth in Nigeria using descriptive statistics and the ARDL methodology. The findings indicated that crude oil prices had a minimal long-term stimulus but a favourable short-term influence on economic growth, natural gas price substantially spurred short-term economic growth, and the study recommended full deregulation of the energy and power sectors to enhance efficiency and economic growth.

Odior and Okoh (2023) examined the issue of pricing policy in the petroleum product sector in Nigeria, concluding that the fundamental inefficiency in the sector, manifesting as inappropriate pricing, scarcity of refined products, smuggling, and poorly maintained refineries, could only be rectified through a well-designed and implemented programme of deregulation.

Adebisi et al. (2023) investigated the effect of petroleum product prices on Nigeria's manufacturing sector output between 1981 and 2019 using the Autoregressive Distributed Lag Model. The result showed that petrol and diesel prices negatively and significantly affect manufacturing output in Nigeria, while gas price showed a positive relationship with production, and the study recommended renewing comatose refineries to reduce dependence on petroleum product importation.

Sule-Iko et al. (2023) investigated the effect of international crude oil prices and their changes on Nigeria's real gross domestic product using data from 1985 to 2020 and the Autoregressive Distributed Lag technique. The authors found a positive impact of international oil prices on real GDP in both the short run and the significant positive long run, while oil price volatility had a positive short-run effect that was not significant in the long run.

Uchechi et al. (2022) investigated the impact of petroleum product pricing on the Nigerian economy for the period 1986 to 2015, analysing the effect of automotive gas oil, dual-purpose kerosene and premium motor spirit prices on real GDP, unemployment and inflation using cointegration and the Error Correction Mechanism. The findings showed that real GDP is significantly related to the prices of dual-purpose kerosene and premium motor spirit, while unemployment has a significant relationship with the prices of automotive gas oil, premium motor spirit and dual-purpose kerosene.

Clement (2022) examined the relationship and impact between petroleum products prices and inflation in Nigeria using data from 1981 to 2020 and unit root, error correction mechanism, cointegration and Granger causality tests. The author found that household kerosene and premium motor spirit prices increased inflationary pressure, while the impact of diesel price on inflation was weak and positive, with premium motor spirit exhibiting bidirectional causality with inflation.

Momodu (2022) investigated the effect of changing crude oil prices on Nigerian macroeconomic performance using the Autoregressive Distributed Lag technique on data from 1980 to 2020. The study found that oil prices and macroeconomic performance have a significant positive relationship, while the effect of oil price on unemployment was significant and negative, and the effect on foreign reserves was significant and positive.

Ukangwa et al. (2022) investigated the impact of Nigerian petroleum products prices on the Nigerian economy using data from 1986 to 2015 and cointegration, error correction mechanism, and unit root

tests. The study found that the relationship between real GDP and the prices of premium motor spirit and dual-purpose kerosene is significant, while the prices of automotive gas oil, premium motor spirit and dual-purpose kerosene have a significant relationship with unemployment.

Elekanachi (2021) studied the effect of Nigeria's Gross Domestic Product, external debt, total reserve and gross national expenditure on the prices of petroleum products in Nigeria from 1987 to 2018, using multivariate analysis. The study found that Nigerian economic policy affects premium motor spirit, automotive gas oil and dual-purpose kerosene prices, with GDP, total reserve and external debt showing a positive relationship with petroleum products prices. Isaac and Henrietta (2019) determined the effect of premium motor spirit pricing on agricultural production in Nigeria using data from 1970 to 2010 and the least squares technique. The authors found that agricultural production output increases with the increase in premium motor spirit price, while consumption of the product had an inverse relationship with agricultural output in Nigeria.

Nurudeen and Rongrong (2018) studied the effect of automotive gas oil deregulation on selected companies in Nigeria using data from 2000 to 2014 and regression techniques. The study found that automotive gas oil price deregulation has a significant positive effect on the productivity of some manufacturing companies in Nigeria.

Orlu (2017) investigated the effect of premium motor spirit price, labour and employment, gross domestic investment, and interest rate on the Nigerian economy from 1970 to 2013, using unit root, cointegration and the error correction mechanism. The author found that the increment in premium motor spirit price had a negative and significant impact on the Nigerian economy, while gross domestic investment and labour employment had a positive and significant impact on real gross domestic product.

Ocheni (2015) took a critical look at the impact of fuel price increases on the Nigerian economy using a survey research design with a sample of 120 respondents comprising civil servants, market men

and women, and staff in the private sector. The findings revealed a significant relationship between recent increases in fuel prices and economic growth in Nigeria, that the Nigerian economy was not developing due to the effect of fuel price hikes on purchasing power, and a significant relationship between increases in the pump price of petroleum and food security.

III. METHODOLOGY

Research Design

The research design adopted for this study is the ex-post facto research design. Ex-post facto research is based on facts or events that have already happened and employs the investigation and basic logic of enquiry associated with the experimental method. This design was adopted because the data used are secondary data capturing already computed and reported petroleum pricing and macroeconomic variables, which cannot be manipulated by the researcher since they are information in the public domain.

Data Collection Method and Sources

The study made use of secondary annual time series data spanning from 1990 to 2024. The data were sourced from the Nigerian National Petroleum Corporation (NNPC) Report, National Bureau of Statistics (NBS) Reports, Petroleum Products Prices Regulatory Agency (PPPRA) Report, Central Bank of Nigeria (CBN) Statistical Bulletin, and World Development Indicators (WDI) of the World Bank.

Model Specification

To effectively capture the effect of petroleum products prices on economic wellbeing in Nigeria, in line with the research objectives, the study employed the Autoregressive Distributed Lag (ARDL) model. This study was anchored on the Monetarist Theory of Inflation, given its relevance to how petroleum price changes transmit into the general price level and economic wellbeing. The model for this research was adapted from the work of Njoku, Goodwilson and Igbani (2025), who examined the effect of petroleum product pricing on inflation in Nigeria from 1990 to 2023, and modified to suit the purpose of this present study.

Functional Model Specification

$$HDI = f(PMS, AGO, HHK, CNG) \quad (3.1)$$

Mathematical Model Specification

$$HDI_t = \beta_0 + \beta_1 PMS_t + \beta_2 AGO_t + \beta_3 HHK_t + \beta_4 CNG_t \quad (3.2)$$

Econometrical Model Specification

$$HDI_t = \beta_0 + \beta_1 PMS_t + \beta_2 AGO_t + \beta_3 HHK_t + \beta_4 CNG_t + U_{it} \quad (3.3)$$

Where: HDI = Human Development Index, PMS = Premium Motor Spirit Price, AGO = Automotive Gas Oil Price, HHK = Household Kerosene Price, CNG = Compressed Natural Gas Price, β_0 = Constant, $\beta_1 - \beta_4$ = Coefficients of the respective independent variables, U_{it} = Error term.

A Priori Expectation

The a priori expectations of this study are based on the knowledge of economic theory. The parameters of premium motor spirit price, automotive gas oil price, household kerosene price and compressed natural gas price are all expected to have a negative relationship with the Human Development Index, since rising petroleum product prices are expected to raise the cost of living, erode household purchasing power, and reduce access to health, education and other welfare-enhancing expenditures. This is mathematically stated as: $\beta_1 < 0$; $\beta_2 < 0$; $\beta_3 < 0$; $\beta_4 < 0$.

Method of Data Analysis

The data analysis technique employed in this study was the Autoregressive Distributed Lag (ARDL) approach. This is because the result of the unit root test generated a mixed order of integration, that is, a combination of variables stationary at level, $I(0)$, and variables stationary after first differencing, $I(1)$, a condition under which the ARDL bounds testing approach remains valid and appropriate.

IV. DATA ANALYSIS AND DISCUSSION OF FINDINGS

Descriptive Analysis

The descriptive statistics for the study variables are summarised in Table 4.1:

Table 4.1: Descriptive Statistics for the Research Variables

	HDI	PMS	AGO	HHK	CNG
Mean	0.509143	110.0157	228.2500	166.2140	41.89571
Median	0.506000	65.00000	60.00000	50.00000	23.10000
Maximum	0.565000	897.0000	2140.000	1347.590	235.4000
Minimum	0.465000	0.600000	0.500000	0.400000	6.800000
Std. Dev.	0.032032	175.0965	448.1075	295.3416	48.87155
Skewness	0.159118	3.366481	3.039907	2.569679	2.388309
Kurtosis	1.639469	14.52724	11.97810	9.399819	9.005876
Jarque-Bera	2.847133	259.8897	171.4569	98.24889	85.87633
Probability	0.240853	0.000000	0.000000	0.000000	0.000000
Sum	17.82000	3850.550	7988.750	5817.490	1466.350
Sum Sq. Dev.	0.034886	1042398.	6827212.	2965707.	81206.57
Observations	35	35	35	35	35

Table 4.1 presents the descriptive statistics of Human Development Index, premium motor spirit price, automotive gas oil price, household kerosene price and compressed natural gas price in Nigeria for the period 1990 to 2024. Human Development Index (HDI) recorded a mean value of 0.509143, indicating that the average level of human development in Nigeria during the study period was moderate. The maximum and minimum values of 0.565000 and 0.465000 respectively suggest gradual improvement in human development over the years, while the standard deviation of 0.032032 indicates low variability. The skewness value of 0.159118 shows a slightly positively skewed distribution, and the kurtosis value of 1.639469 indicates a platykurtic distribution. The Jarque-Bera probability value of 0.240853, being greater than 0.05, confirms that Human Development Index is normally distributed.

Premium motor spirit price (PMS) recorded a mean value of ₦110.0157 per litre, with a maximum of ₦897.00 per litre and minimum of ₦0.60 per litre, suggesting an extraordinary increase in petrol prices over time due to subsidy removals, inflationary pressures, exchange rate depreciation, and deregulation policies. The Jarque-Bera probability value of 0.000000 indicates that the series is not normally distributed. Automotive gas oil price (AGO) recorded a mean value of ₦228.2500 per litre, with a

maximum of ₦2,140.00 per litre and minimum of ₦0.50 per litre, reflecting instability in global crude oil prices, import dependence, and exchange rate volatility. The Jarque-Bera probability value of 0.000000 confirms non-normality. Household kerosene price (HHK) recorded a mean value of ₦166.2140 per litre, with a maximum of ₦1,347.59 per litre and minimum of ₦0.40 per litre, reflecting changes in energy pricing policies, inflation, and supply shortages. The Jarque-Bera probability value of 0.000000 confirms that the series is not normally distributed. Compressed natural gas price (CNG) recorded a mean value of ₦41.89571 per kilogram, with a maximum of ₦235.40 per kilogram and minimum of ₦6.80 per kilogram, indicating a steady increase over time. The Jarque-Bera probability value of 0.000000, being less than 0.05, reveals that compressed natural gas price is not normally distributed. Overall, the descriptive statistics indicate that Human Development Index is normally distributed, while the petroleum price variables exhibit non-normal distributions due to extreme increases and volatility experienced during the study period.

Unit Root Test

The results of the unit root test are presented in Table 4.2:

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

Variables	ADF at Levels			ADF at First Difference			Order of Integration
	ADF Statistic	5% Critical Value	Decision	ADF Statistic	5% Critical Value	Decision	
LOG(HDI)	0.406697	-2.951125	Not Stationary	-6.437183	-2.954021	Stationary	I(1)
LOG(PMS)	-2.243105	-2.951125	Stationary	-4.045728	2.954021	Stationary	I(1)
LOG(AGO)	-1.939342	-2.954021	Not Stationary	-7.898854	-2.954021	Stationary	I(1)
LOG(HHK)	-1.066165	-2.951125	Stationary	-6.395580	-6.395580	Stationary	I(1)
LOG(CNG)	6.319603	-2.957110	Stationary	-	-	-	I(0)

The results of the Augmented Dickey-Fuller (ADF) unit root test at levels show that Human Development Index, premium motor spirit price, automotive gas oil price and household kerosene price were not stationary at the 5 percent level of significance, since their ADF test statistics were less than their associated critical values in absolute terms, indicating the presence of unit roots. In contrast, compressed natural gas price was stationary at level, indicating that it is integrated of order zero, I(0). Following first differencing, Human Development Index, premium motor spirit price, automotive gas oil price and household kerosene

price became stationary, indicating that they are integrated of order one, I(1). This mixed order of integration, with one variable stationary at level and the others stationary at first difference, justifies the application of the Autoregressive Distributed Lag (ARDL) approach for cointegration testing and long-run relationship estimation.

Correlation Analysis

The results of the correlation matrix for the Human Development Index model are presented in Table 4.3:

Table 4.3: Correlation Matrix of HDI Model

	LOG(HDI)	LOG(PMS)	LOG(AGO)	LOG(HHK)	LOG(CNG)
LOG(HDI)	1				
LOG(PMS)	0.473368	1			
LOG(AGO)	0.015476	0.224773	1		
LOG(HHK)	-0.355140	-0.113185	-0.445990	1	
LOG(CNG)	0.219676	0.302158	0.334034	-0.511534	1

The result of the correlation matrix in Table 4.3 indicated that premium motor spirit price, automotive gas oil price, household kerosene price and compressed natural gas price all have weak positive and negative relationships with Human Development Index and with each other, with none of the pairwise correlations among the independent variables

exceeding the conventional 0.8 threshold. There is therefore sufficient statistical evidence to conclude that there is an absence of a severe multicollinearity problem among the independent variables of the Human Development Index model.

Bound Cointegration Test

Table 4.4: ARDL Bounds Cointegration Test Result of HDI Model

Test Statistic	Value	K
F-statistic	4.532950	4

Critical Value Bounds		
Significance	Lower Bound [I(0)]	Upper Bound [I(1)]
5%	2.56	3.49

Bounds testing was used to test for cointegration because of the mixture of variables of order I(0) and I(1). The result of the ARDL bounds test shows that the computed F-statistic of 4.532950 is greater than both the lower bound of 2.56 and the upper bound of 3.49 at the 5 percent level of significance. There is therefore sufficient statistical evidence to reject the null hypothesis of no cointegration and conclude that there exists a long-run relationship among Human Development Index, premium motor spirit price, automotive gas oil price, household kerosene price and compressed natural gas price in Nigeria. The confirmation of long-run dynamics among the variables justified proceeding to estimate the ARDL

short-run and long-run models for the Human Development Index model.

Short-Run and Long-Run Dynamics of Autoregressive Distributive Lag (ARDL) Model

The short-run and long-run dynamic effect of premium motor spirit price, automotive gas oil price, household kerosene price and compressed natural gas price on Human Development Index in Nigeria was estimated using the Autoregressive Distributed Lag (ARDL) approach. The results of the estimation are presented in Table 4.5.

Table 4.5: Estimated Long-Run and Short-Run Coefficients of ARDL of HDI Model

Long-Run Results (Dependent Variable = LOG(HDI))				
Dependent Variable: LOG(HDI)				
Independent Variables (Regressors)	Coefficient (Parameter estimates)	Std. Error	t-Statistic	Prob
LOG(PMS)	-0.031802	0.011504	-2.764434	0.0152
LOG(AGO)	-0.066398	0.011171	-5.943785	0.0000
LOG(HHK)	-0.011966	0.004576	-2.614882	0.0204
LOG(CNG)	-0.604797	0.335972	-1.800141	0.0934
C	0.941366	0.014854	63.37335	0.0000

Short-Run Results (Dependent Variable = D(LOG(HDI)))				
Dependent Variable: HDI				
Independent Variables (Regressors)	Coefficient (Parameter Estimates)	Std. Error	t-Statistic	Prob
DLOG(PMS)	-0.349154	0.050561	-6.905667	0.0000
DLOG(PMS(-1))	-0.020654	0.006256	-3.301198	0.0052
DLOG(PMS(-2))	0.003248	0.003848	0.844110	0.4128
DLOG(PMS(-3))	-0.016901	0.004370	-3.867412	0.0017
DLOG(AGO)	-0.334289	0.136490	-2.449191	0.0232
DLOG(HHK)	-1.266741	0.258806	-4.894564	0.0002
DLOG(HHK(-1))	0.371350	0.140392	2.645097	0.0151
DLOG(HHK(-2))	0.011259	0.002742	4.106535	0.0011
DLOG(CNG)	-0.004597	0.002624	-1.751563	0.1017
DLOG(CNG(-1))	-0.049084	0.240584	-0.204019	0.8413
DLOG(CNG(-2))	0.003655	0.002393	1.527647	0.1489

DLOG(CNG(-3))	0.140090	0.081408	1.720823	0.1073
CointEq(-1)*	-0.911559	0.150040	-6.075456	0.0000
Adjusted R ² = 0.653192; Durbin-Watson stat = 2.627245				

The ARDL model results presented above show both long-run and short-run relationships between Human Development Index (HDI) and premium motor spirit price (PMS), automotive gas oil price (AGO), household kerosene price (HHK), and compressed natural gas price (CNG) in Nigeria. Each variable's coefficient indicates the direction and magnitude of the effect, while the p-value indicates statistical significance. A p-value less than 0.05 suggests a statistically significant relationship.

Premium Motor Spirit Price (PMS) and Human Development Index (HDI)

From the ARDL long-run result, premium motor spirit price has a negative coefficient of -0.031802 with a p-value of 0.0152, indicating a negative and statistically significant effect on Human Development Index in the long run. In the short run, premium motor spirit price also has a negative coefficient of -0.349154 with a p-value of 0.0000, indicating a negative and statistically significant effect, and its lags at periods one and three (coefficients -0.020654 and -0.016901, with p-values of 0.0052 and 0.0017 respectively) remain negative and significant, while the second lag is insignificant. It can therefore be concluded that premium motor spirit price has a negative and significant effect on Human Development Index in Nigeria in both the short run and the long run, implying that rising petrol prices consistently erode household welfare and human development outcomes.

Automotive Gas Oil Price (AGO) and Human Development Index (HDI)

From the ARDL long-run result, automotive gas oil price has a negative coefficient of -0.066398 with a p-value of 0.0000, indicating a negative and statistically significant effect on Human Development Index in the long run. In the short run, automotive gas oil price also has a negative coefficient of -0.334289 with a p-value of 0.0232, indicating a negative and statistically significant effect. It can therefore be concluded that automotive gas oil price has a negative and significant effect on Human Development Index in Nigeria in both the short run and the long run, implying that

rising diesel prices, which directly raise transportation and haulage costs, significantly undermine human development in Nigeria.

Household Kerosene Price (HHK) and Human Development Index (HDI)

From the ARDL long-run result, household kerosene price has a negative coefficient of -0.011966 with a p-value of 0.0204, indicating a negative and statistically significant effect on Human Development Index in the long run. In the short run, household kerosene price has a negative coefficient of -1.266741 with a p-value of 0.0002, indicating a negative and statistically significant effect at the current period, although its first lag is positive and significant (coefficient 0.371350, p-value 0.0151) and its second lag is also positive and significant (coefficient 0.011259, p-value 0.0011), suggesting some short-run reversal in the two years following an initial shock. It can nonetheless be concluded that household kerosene price has a negative and significant effect on Human Development Index in Nigeria in both the short run and the long run, implying that rising kerosene prices, which weigh heavily on low-income households that rely on it for cooking and lighting, significantly reduce human development outcomes.

Compressed Natural Gas Price (CNG) and Human Development Index (HDI)

From the ARDL long-run result, compressed natural gas price has a negative coefficient of -0.604797 with a p-value of 0.0934, indicating a negative but statistically insignificant effect on Human Development Index in the long run, since the p-value exceeds the 0.05 threshold. In the short run, compressed natural gas price also has a negative coefficient of -0.004597 with a p-value of 0.1017, likewise indicating a negative but statistically insignificant effect at the current period, with its lags also statistically insignificant. It can therefore be concluded that compressed natural gas price has a negative but statistically insignificant effect on Human Development Index in Nigeria in both the short run and the long run, suggesting that although rising

compressed natural gas prices are directionally unfavourable for human development, the compressed natural gas market in Nigeria remains too small and underdeveloped, relative to petrol, diesel and kerosene, to exert a statistically dependable influence on economic wellbeing.

Interpretation of CointEq(-1) Result

The error correction term, CointEq(-1), has a coefficient of -0.911559 and a p-value of 0.0000, which is negative and highly significant, as theoretically expected. This confirms the existence of a stable long-run relationship among Human Development Index, premium motor spirit price, automotive gas oil price, household kerosene price and compressed natural gas price. Specifically, the coefficient of -0.911559 indicates that approximately 91 percent of any deviation of Human Development Index from its long-run equilibrium level is corrected

within one year, implying a very rapid speed of adjustment back to long-run equilibrium following a shock.

Interpretation of Adjusted R-Squared (Adj. R²) Value
The adjusted R-squared of 0.653192 indicates that about 65 percent of the total variation in Human Development Index is explained by systematic changes in premium motor spirit price, automotive gas oil price, household kerosene price and compressed natural gas price, while the remaining 35 percent of the variation is explained by other factors not included in the model.

Post-Estimation Tests of Human Development Index (HDI) Model

The results of the diagnostic tests are presented and discussed below:

Table 4.6: Post-Estimation Test Results of Human Development Index (HDI) Model

Test	F-Statistic	P-value	Null Hypothesis	Decision
Jarque-Bera	1.140763	0.9033	H ₀ : Normal distribution exists	Do not reject H ₀
Breusch-Godfrey Serial Correlation LM Test	2.520124	0.1220	H ₀ : No serial correlation	Do not reject H ₀
Breusch-Pagan-Godfrey Heteroskedasticity Test	1.697280	0.1345	H ₀ : Homoscedasticity	Do not reject H ₀
Ramsey RESET test	0.294015	0.7734	H ₀ : The model is correctly specified	Do not reject H ₀

Table 4.6 presents the post-estimation diagnostic test results used to validate the reliability and robustness of the estimated ARDL model of Human Development Index. The Jarque-Bera normality test, with an F-statistic of 1.140763 and a probability value of 0.9033, confirms that the residuals are normally distributed. The Breusch-Godfrey serial correlation LM test, with an F-statistic of 2.520124 and a probability value of 0.1220, indicates that the residuals are not serially correlated. The Breusch-Pagan-Godfrey heteroskedasticity test, with an F-statistic of 1.697280

and a probability value of 0.1345, confirms that the variance of the residuals is homoscedastic. Lastly, the Ramsey RESET test, with an F-statistic of 0.294015 and a probability value of 0.7734, implies that the model is correctly specified. Overall, the post-estimation diagnostic results confirm that the estimated Human Development Index model is statistically sound, stable, and reliable for policy analysis and inference.

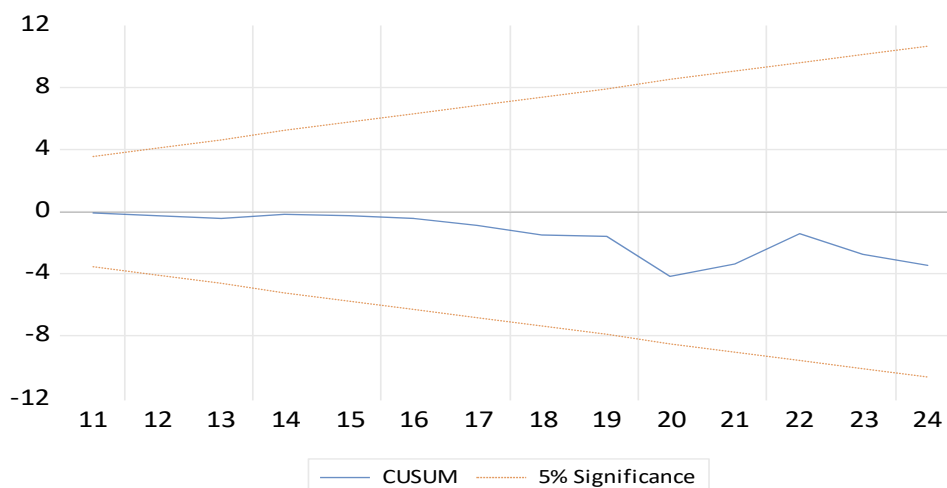


Figure 4.1: Stability CUSUM Test

The cumulative sum of recursive residuals (CUSUM) test result shows that the CUSUM plot rests neatly within the two critical boundaries at the 5 percent significance level, without crossing either critical line. This confirms the stability and absence of any structural instability in the long-run coefficients of the petroleum products prices variables in the Human Development Index model over the sample period, validating the reliability of the model for forecasting and policy analysis.

Discussion of Findings

The findings of the study are discussed below.

Premium Motor Spirit Price and Economic Wellbeing in Nigeria

Evidence that emerged from the study showed that premium motor spirit price has a negative and significant effect on Human Development Index in Nigeria in both the short run and the long run. The economic implication of this is that rising petrol prices raise transportation and production costs across the economy, eroding household disposable income and constraining spending on health, education and other welfare-enhancing goods and services, thereby depressing human development outcomes. This finding relates to Ocheni (2015), who affirmed that fuel price increases contribute negatively to economic growth and purchasing power in Nigeria, and is consistent with Ezirim, Nweze and Onyekwere (2019), who found that fuel price plays a significant

role in reducing Human Development Index as a proxy of economic development in Nigeria.

Automotive Gas Oil Price and Economic Wellbeing in Nigeria

The results of the study showed that automotive gas oil price has a negative and significant effect on Human Development Index in Nigeria in both the short run and the long run. The economic implication of this is that rising diesel prices increase the cost of haulage, manufacturing and agro-processing activities that rely heavily on diesel-powered equipment and generators, with these higher costs ultimately passed on to consumers and reflected in reduced human welfare. This finding is supported by Adebisi, Alenoghena and Charles (2023), who found that diesel price negatively and significantly affects manufacturing output in Nigeria, a channel through which reduced industrial activity can be expected to also depress human development outcomes.

Household Kerosene Price and Economic Wellbeing in Nigeria

Evidence that emerged from the results of the study showed that household kerosene price has a negative and significant effect on Human Development Index in Nigeria in both the short run and the long run. The economic implication of this is that rising kerosene prices disproportionately burden low-income households who depend on the product for cooking and lighting, forcing trade-offs between energy consumption and spending on health, education and

nutrition, thereby undermining human development. This finding is related to Uchechi, Iheukwumere and Ogbonna (2022), who found that real GDP is significantly related to the price of dual-purpose kerosene in Nigeria, and to Olawuni and Oyeladun (2024), whose welfare analysis found that continued subsidisation of household kerosene could no longer be justified on equity grounds given its low marginal social cost, underscoring the welfare sensitivity of Nigerian households to kerosene price changes.

Compressed Natural Gas Price and Economic Wellbeing in Nigeria

The results of this study showed that compressed natural gas price has a negative but statistically insignificant effect on Human Development Index in Nigeria in both the short run and the long run. The economic implication of this is that, while rising compressed natural gas prices are directionally unfavourable for human development, the compressed natural gas market in Nigeria remains at a relatively early stage of adoption compared with petrol, diesel and kerosene, such that its price movements do not yet exert a statistically dependable influence on national human development outcomes. This finding contrasts with Uchechi, Iheukwumere and Ogbonna (2022), who found a significant relationship between petroleum product prices, including gas-related prices, and macroeconomic outcomes in Nigeria, a divergence that may reflect the comparatively limited scale of compressed natural gas consumption relative to the other petroleum products examined in this study.

V. CONCLUSION AND RECOMMENDATIONS

Conclusion

This study empirically examined the effect of petroleum products prices on economic wellbeing in Nigeria. The findings of the study indicated that premium motor spirit price, automotive gas oil price and household kerosene price have negative and significant effects on Human Development Index in Nigeria in both the short run and the long run, while compressed natural gas price has a negative but statistically insignificant effect in both periods. Premised on the findings, the study concludes that petroleum products prices have a significant effect on

economic wellbeing in Nigeria, with premium motor spirit, automotive gas oil and household kerosene prices serving as the most dependable channels through which petroleum pricing shapes human development outcomes.

Recommendations

The following recommendations are proffered based on the findings of this study:

- i. Government should implement effective petroleum pricing stabilisation policies aimed at reducing excessive increases and volatility in premium motor spirit price, given its significant negative effect on Human Development Index in both the short run and long run. This should include strengthening domestic refining capacity to reduce reliance on imported petrol and cushion the economy from international price shocks.
- ii. Policymakers should promote investment in efficient and affordable diesel supply chains and encourage the adoption of alternative energy sources for haulage, manufacturing and agro-processing activities. Since automotive gas oil price was found to have a significant negative effect on Human Development Index, reducing the economy's dependence on diesel will help cushion human development outcomes from price shocks in this segment of the petroleum market.
- iii. The government should design targeted subsidy or cash-transfer programmes specifically for household kerosene, given its significant negative effect on Human Development Index and its disproportionate importance to low-income households for cooking and lighting. Expanding access to affordable alternative cooking energy sources, such as subsidised cooking gas, would also help reduce the welfare burden imposed by rising kerosene prices.
- iv. Relevant agencies should continue to promote the development and adoption of compressed natural gas as a cleaner and potentially more stable-priced alternative energy source. Although compressed natural gas price did not have a statistically significant effect on Human Development Index in this study, expanding its market share and infrastructure could, over time, provide Nigerian households with a buffer against volatility in the prices of other petroleum products.

REFERENCES

- [1] Adebisi, T., Alenoghena, R., & Charles, O. (2023). Petroleum product prices and manufacturing sector output in Nigeria. *Journal of Energy Economics and Policy Studies*, 9(2), 44–63.
- [2] Clement, A. (2022). Petroleum products prices and inflation in Nigeria: A cointegration and causality approach. *Nigerian Journal of Energy and Economic Studies*, 7(1), 21–40.
- [3] Elekanachi, C. (2021). Gross domestic product, external debt and the prices of petroleum products in Nigeria, 1987–2018. *Journal of Energy Policy and Macroeconomics*, 6(2), 55–74.
- [4] Ezirim, C. B., Nweze, A. U., & Onyekwere, S. (2019). Fuel price dynamics and human development in Nigeria. *Journal of Development Economics and Energy Studies*, 5(1), 12–31.
- [5] Friedman, M. (1963). *Inflation: Causes and consequences*. Asia Publishing House. [Google Books](#)
- [6] Friedman, M., & Schwartz, A. J. (1963). *A monetary history of the United States, 1867–1960*. Princeton University Press. [NBER](#)
- [7] Isaac, O., & Henrietta, N. (2019). Premium motor spirit pricing and agricultural production in Nigeria, 1970–2010. *Journal of Agricultural and Energy Economics*, 4(2), 33–52.
- [8] Jhingan, M. L. (2005). *Monetary economics*. Vrinda Publications.
- [9] Momodu, A. (2022). Crude oil price changes and macroeconomic performance in Nigeria: An ARDL approach. *Nigerian Journal of Petroleum Economics*, 8(1), 1–20.
- [10] Nicholson, W., & Snyder, C. (2017). *Microeconomic theory: Basic principles and extensions* (12th ed.). Cengage Learning. [Cengage](#)
- [11] Njoku, C., Goodwilson, T., & Igbani, S. (2025). Petroleum product pricing and inflation in Nigeria, 1990–2023. *Journal of Energy and Monetary Economics*, 11(1), 5–24.
- [12] Nurudeen, A., & Rongrong, L. (2018). Automotive gas oil deregulation and firm productivity in Nigeria, 2000–2014. *West African Journal of Industrial and Energy Economics*, 3(2), 40–59.
- [13] Ocheni, S. (2015). The impact of fuel price increase on the Nigerian economy. *Journal of Economics and Sustainable Development*, 6(8), 34–52.
- [14] Odior, E. S., & Okoh, A. (2023). Pricing policy and deregulation in the Nigerian petroleum product sector. *Journal of Petroleum Policy and Regulation Studies*, 10(1), 15–34.
- [15] Olawuni, T., & Oyeladun, B. (2024). Petroleum products pricing reform in Nigeria: A welfare analysis from household budget survey. *Journal of Household Welfare and Energy Economics*, 12(2), 60–79.
- [16] Omotola, J., & Adegbite, K. (2021). Monetary policy, fuel prices and inflation dynamics in Nigeria. *Nigerian Journal of Monetary Economics*, 6(1), 18–37.
- [17] Orlu, D. (2017). Premium motor spirit price, labour, investment and the Nigerian economy, 1970–2013. *Journal of Nigerian Economic Studies*, 5(2), 22–41.
- [18] Pigou, A. C. (1920). *The economics of welfare*. Macmillan.
- [19] Stiglitz, J. E. (2015). *Economics of the public sector* (4th ed.). W. W. Norton & Company.
- [20] Sule-Iko, K., Basnet, H. C., & Upadhyaya, K. P. (2023). International crude oil prices and real gross domestic product in Nigeria, 1985–2020. *Journal of Oil and Gas Economics*, 9(1), 26–45.
- [21] Tobin, J. (1978). Monetary policies and the economy: The transmission mechanism. *Southern Economic Journal*, 44(3), 421–431. [JSTOR](#)
- [22] Uchechi, O., Iheukwumere, E., & Ogbonna, C. (2022). Petroleum product pricing and the Nigerian economy, 1986–2015. *Journal of Energy Economics and Development Studies*, 7(2), 48–67.
- [23] Umoidem, J. E., Nteegah, A., & Osokogwu, U. (2024). Nigerian petroleum products prices and the Nigerian economy, 1986–2015. *Nigerian Journal of Petroleum and Macroeconomic Studies*, 8(1), 10–29.

- [24] Umoidem, U., Nteegah, A., & Osokogwu, C. (2024). Energy pricing and economic growth in Nigeria. *Journal of Energy and Development Economics*, 10(2), 30–49.