Petroleum Products' Prices and Standard of Living in Nigeria: Multi–regression model Approaches

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DOI: 10.56201/ijssmr.v10.no9.2024.pg219.233

Abstract
The study analyse the effects of the prices of refined petroleum products like Premium Motor Sprit (PMS), Automotive Gas Oil (AGO) and Dual Purpose Kerosene (DPK) on living standard in Nigeria for the period of thirty–eight years leaning on secondary data from 1986 to 2023. The living standard is disaggregated into its components like income, health and education and the times series data for the said variables were sourced from National Bureau of Statistics and World Bank Development Indicator. Upon determination of the stochastic properties of the series using KPSS, the Auto–Regressive Distributed Lag models and OLS regression technique was utilized to examine the magnitude of the effects of the prices of refined petroleum products on living standard in Nigeria. The study found the presence of long–run relationship between the prices of refined petroleum product and living standard in Nigeria. Also the study revealed that, the price of PMS exerts positive effect on income; the price of AGO negatively affects healthcare expenditure in Nigeria and the price of DPK effect the consumption expenditure negatively in Nigeria. The study therefore, recommends among others that, the price of refined product of petroleum like PMS, DPK and AGO be left wholly to the market forces to determine; the federal government of Nigeria should ensure the total quantity of PMS and AGO required for local consumption be refined locally. This would reduce the burdens of unfavourable exchange rate on the importation of refined PMS, DPK and AGO into the country.

Keywords: *A Multi Regression Models: ARDL; OLS; Petroleum products' prices; Standard of living; Nigeria*

Introduction

Nigeria is a rich country endowed with abundant of human and natural resources that placed her as advantage nation in the midst of her peers in terms of growth and enhanced living standard (Moukhtar, Alhassan & Ahmad, 2021). In addition to the vast arable land, sea and rivers surrounding her geographical territories couple with high population density living within her land surface, Nigeria is also blessed with quantum deposition of solid mineral like tin, limestone, zinc, iron ore, gold deposit, oil and gas, among others (Alhassan & Mustafa, 2020).

Consequently, Nigeria has since the discovery of oil and gas deposit in huge commercial quantity enlisted among the oil producing nations and subsequently became the number one oil producing nation in Africa, number six oil producing country in the World and second largest in the World with gas deposits (Aslam & Lawan, 2016). Hence, oil has become vital product driving economic activities of almost all the economic agents (households, firms and government) in the country. For example, refined petroleum product (being a sub–product of oil) serves as an intermediate input for industries and alternative source of energy or power to both households, industries and government (Sani, Ismaila, Danlami, Sani & Yusuf, 2020; Nwaoha, Onwuka, Ejem, Obisike & Ogbuewu, 2018).

In this view, looking at the importance of oil to the Nigerian economy and most specifically, the vital roles of composite product of refined petroleum products (like Premium Motor Sprit–PMS, Automotive Gas Oil–AGO and Dual Purpose Kerosene–DPK) to both industries and household sectors of the economy, its production level and domestic price of refined product of oil cannot be trivially dealt with. Because, variation in the level of production and domestic price of the composite refined oil product chiefly influences the annual appropriation in Nigeria and subsequent budgetary allocation to key sector of the economy like education and health whose output bears direct link with health and literacy level of the citizens that also represent key indicators of living standard in the country. This thus, attracts attentions of researchers, scholars and policymakers to investigate the nexus between domestic price of composite products of refined petroleum and the key indicator of living standard like health and education in Nigeria.

In this regards, Nwaoha, Onwuka, Ejem, Obisike and Ogbuewu (2018) stress that composite products of refined petroleum hold significant influence on living standard in the country and as such, variations in the price of these products exerts adverse effects on education and healthcare accessibility as well as disposable income which are the key indicator of living standard in the country. Therefore, this presupposes that, the desirable standard of living can be twisted by prevailing domestic price of refined petroleum products. Also, Eregha, Mesagan, and Olawale (2015) opined that, upward movement in the domestic price of the refined petroleum product contribute to the lingering problem of inflation which in turn inversely influence purchasing power of the citizenry thereby limiting their ability to access quality education and health as well as consumption of right quantity and quantity of food; hence, living condition of the citizen in the country is affected. In a similar manner, Isyaka (2014) held that, changes in the domestic price of refined petroleum product like PMS caused fluctuation in the supply and distribution of the product thereby causing untold physical and psychological hardship to the lives of citizenry; hence, lowers living standard in the country.

Form the foregoing, it is established that, any alteration to the prevailing domestic price of refined petroleum product particularly, the price of PMS bears direct consequential effects on living standard in the country. For instance, the policy direction of the intervention of government on partial removal of petroleum subsidy in 2012 and total deregulation of petroleum industry in 2023 generated upward shift in the price of PMS from ₦65 in 2007 to ₦97 in 2012 and ₦197 in 2023 to ₦560 in the same 2023 respectively. This thus, led to consequential rise in inflation rate to 12.0% in 2012 from its initial stance of 6.6% in 2007 and 18.8% in 2022 to 29.92% with subsequent rising poverty rate from 54% in the same 2007 to 61.0% in 2012 and 63% in 2022 to 68% in 2023 due to limiting access to quality healthcare services, quality education and moderate sheltering as well as deteriorated consumption (NBS, 2019; 2024). In another direction, fall in the price of refined petroleum product of PMS from ₦141 in January, 2012 to ₦97 in February of the same 2012 led the inflation rate to fall from 12.0% in 2012 to 7.96% in 2013 and subsequent fall in poverty rate from 61.0% in 2012 to 55.55% in 2013. This is an indicative of the facts that, any policy action directed towards altering domestic price of refined petroleum product bears direct impact on living standard of people through rising inflation rate and consequential rising price of basic necessity of life like food stuff, Medicare and education, among others. From the foregoing, this study investigates the effect of the price of composite product of refined petroleum and living standard in Nigeria as the broad objective of this study while, the specific objectives of the study includes:

i. Effect of the price of premium motor spirit (PMS) on national income
ii. Effect of the price Automotive Gas Oil (AGO) on healthcare expenditure in Nigeria.
iii. Effect of the price of Dual Purpose Kerosene (DPK) on consumption expenditure in Nigeria.

2. Literature Review

2.1 Theoretical Background

2.1.1 Theory of Demand

The conventional neoclassical theory of demand is adopted as theoretical framework underpinning this study. The theory of demand was originally credited to famous work of Adam Smith, in his book "an inquiry into the nature and causes of wealth of Nations" otherwise shortened as "The Wealth of Nations" published in 1776 and subsequently refined by Alfred Marshal in his book "Principles of Economics" published in 1890. Following the principle of free market or liberal market economy, Marshal generally assumed that, the price of goods and services are determined by the free interaction of demand and supply thereby reaching a stationary point called "an equilibrium point" (Rosser & Rosser, 2003). Therefore, the attained equilibrium point produces the price that guaranteed right quantity for utility maximization of the consumer, giving that the consumer is a *homo economicus*. In this view, utility maximization is expressed as a function of quantity of a product consumed which is governed by the price of that product, assuming that, the price of the product is the only determining factor here (Cetris Paribus) (Gregory & Stuart, 2013).

Consequently, the model relating the living standard of citizenry to the price of refined petroleum products of PMS, AGO and DPK is built around law of demand. Since, the consumer welfare or wellbeing is expressed as a function of the quantity of products being demanded and consumed which is thus guided by the market price of that same product. This therefore implies

that, the quantity of refined petroleum product of PMS, AGO and DPK is a negative function of its respective price thus, express as:

$QD = f(P) < 0$ ……(1)

Where QD stand for quantity demand which represent the living standard of citizenry and P is the respective price of the refined petroleum products of PMS, AGO and DPK

2.2 Empirical Review

Empirical study of Samuel, Raymond and Ayobola (2023) investigated the impact petroleum product prices on the Nigerian economy. Utilizing ARDL model to found that, the prices of AGO and PMS negatively affect the manufacturing output in Nigeria while, the price liquefy gas positively affect the production of manufacturing sector in Nigeria. Meaning that, rising price of AGO and PMS led the output of manufacturing sector to falls and consequently, this affects manufacturing sector capacity to employ more economic resources like labour and capital and thus, affects the income of these economic resources; hence, their consumption expenditure is negatively affected. With the aid of OLS multiple regression models, Ukangwa, Ikechi & Ben (2022) studied the impact petroleum product pricing and Nigerian economy to found that, AGO and PMS portends positive significant impact on RGDP in Nigeria while, DPK bears negative and significant impact on RGDP in Nigeria. However, the study found that, AGO positively and insignificantly impact on inflation rate in Nigeria but PMS and DPK negatively impact on inflation rate in Nigeria. This means that rise in the price of AGO led the inflation rate to rise thereby, results in falling purchasing power and falling living standards in Nigeria whereas, rise in the prices of PMS and DPK led the inflation rate to falls thereby, results in rising purchasing power of money; hence, risen living standards in Nigeria. Furthermore, AGO and PMS have positive impact on unemployment in Nigeria while, DPK negatively impact on unemployment in Nigeria.

More so, Henry, Emmanuel, Eseosa and Abiola (2020) studied the petroleum subsidy withdrawal, fuel price hike and the Nigerian economy. The study utilized input –output model and matrix equation model to found that, reduction in subsidy on petroleum products led the prices of petroleum products rise and subsequently, leads to rise in the price of other products in Nigeria. Impliedly, this affects the purchasing power of economic agents (households, firms and government) and reduces the value of money income for consumption and healthcare expenditures. Similarly, Nwaoha, Onwuka, Ejem, Obisike and Ogbuewu (2018) studied the movement of petroleum pump price and standard of living in Nigeria, using OLS method of estimating the time series data for variables in the study and discovered that upward movement in price of petroleum product contribute to rising inflation and falling per capita income. This implies that, as the price of petroleum products rises, per capita income falls; hence, the the living standard in Nigeria falls.

Gatawa and Zakari (2017) evaluated the impact of change in the price of petroleum product on the wellbeing of the households in Zaria metropolis of Zaria local government area of Kaduna State. The study utilized descriptive and inferential statistics to analysed the sourced data from the sampled respondents in the study area to uncovered that, increase in prices of petroleum necessitated increase in the prices of products or services that requires petroleum product as either intermediate input in the cycle of the production process of such product or service thereby leading to increase in the price of such products. This thus, led to the loss in the real value of money and fall in the purchasing power of the household which in turn lowers the

living standard of individuals in the area and country at large. Therefore, changes in the price of petroleum products bear multiplier effects on the lives of all economic agents predominantly households and firms.

Roland (2017) examined the impact of domestic pricing of petrol on economic growth in Nigeria between 1970 and 2013. The study utilized Johansen cointegration and error correction mechanism for estimating the specified models in the study and found that, a unit rise in the price of refined petroleum product of PMS result to falls in the output produced by firms and unit of products consumed by households. This means that, the price of refined petroleum product (PMS) negatively affects the production level and the living standard.
Eregha, Mesagan, and Olawale (2015) examined the petroleum products prices and inflationary dynamics in Nigeria using OLS technique of estimation for the study. The study found that, the prices of refined petroleum product of PMS and AGO correlated with inflation rate in Nigeria. That is, rise in the price of refined petroleum product of PMS and AGO leads to rising inflation rate which in turn contribute to the rising living cost and fall in living standard in the country.

Isaac and Simon (2015) empirically investigated fuel price hike and vulnerability of households in Nigeria with particular focus on Ibadan metropolis, Oyo State–Nigeria. The study employed descriptive statistics and Tobit regression model to found that, higher income earners (households) adopted fewer but better cushion–effect strategies and become less affected by the fuel price rises. Whereas, low income earners (households) adopted more but poor–cushion effect strategies and become more vulnerable to the fuel price increase. Consequently, the study concluded that, about seventy percent of the sampled respondents fell into the trapping of poverty due to rising fuel prices and subsequent fall in the real value of money, and purchasing power of money. This thus, induced increase in the cost of living thereby contribute to the worsening living standard in Ibadan metropolis of Oyo State, Nigeria.

Stephen (2015) analysed the impact of fuel price increase on Nigerian economy, using the Pearson product movement correlation on the surveyed data from 120 sampled respondents and reveal that, there is significant and negative correlation between the rising price of petroleum products and economic growth in Nigeria owing to loss in the real value of money and subsequent falls in the purchasing power of individuals occasioned by rising inflation rate resulted from high price of petroleum product. And loss in purchasing power of individuals would means rising cost of living and falls in living standard in the country.

Innocent, Ogbu and Job (2015) assessed the impact of petroleum subsidy on consumer price index in Nigeria, using cointegration and the Error Correction Model (ECM) as the estimation method to discovered that rise in price of fuel do not only immediately impacted rise on the price of consumables and poverty rate in the country but also distort socio–economic wellbeing of the country in the short–run.

Isyaka (2014) investigated the implications of price changes on the distribution of petroleum products in Gwagwalada Abuja, Nigeria. The study used OLS as a method of estimation to reveal that, fluctuation in the supply and distribution of the refined petroleum product of PMS and DPK was attributed to upward changes in the prices of the products which caused artificial scarcity of the products and this in turn lead to rising price of the refined petroleum product such as price of PMS in the country. This in turn results to loss in the real value of money,

purchasing power of individuals and increasing cost of living; hence, decline in the living standard in the country.

Bobai (2012) utilized OLS to analyse the nexus between the prices of refined petroleum products of PMS, AGO and DPK, and inflation rate in Nigeria with peculiar emphasis on the impact of rise in the price of petroleum product on Nigerian economy. Upon estimating the coefficients of the employed variables in the specified models of the study, the study found that, there exist presence of direct and positive relationship between the price of the refined petroleum product of PMS, AGO and inflation rate in Nigeria. However, it was found that, the price of PMS exerts greater influence on the rate of inflation than the price of AGO. Whereas, the price of DPK was found to be negatively correlated with the rate of inflation in the country. In a nutshell, the findings from this study evidently established that, rise in the price of refined petroleum product (PMS and AGO) significantly contributes to the rising inflation rate in the country which in turn reduced the real value of money and lowers the purchasing power of individuals. This consequently results in lowering living standard of citizenry; whereas, the price of DPK negatively contribute to the inflation rate in the country.

3. Methodology

3.1 Data and Sources of Data

This study adopted multiple regression techniques to investigate the price of refined petroleum products and living standard in Nigeria where the living standard is disaggregated into consumption expenditure, healthcare expenditure and income level, leaning on time series spanned from 1986-2023. The data for the price of PMS, AGO and DPK was obtained from National Bureau of Statistics (NBS, 2023); while the data for the indicators of living standard like Gross National Income per capita (GNIPC), consumption expenditure, health expenditure and exchange rate were obtained from World Bank Development Indicator (WDI, 2023). The choice of this period for the study was influenced by the availability of dataset for the variables under investigation.

3.2 Model Specification

In accordance to the theory of demand, the model for this study is specified in terms of inverse of quantity–price relationship in original demand function as:

$$Qty = f(P) < 0 \quad \ldots\ldots (3.1)$$

Where Qty is the total quantity of output demanded; P is the price of the unit of quantity demanded which is guided by the underlined assumption of Ceteris Paribus governing the demand function. Since, the Nigerian economy is limited by capacity to domestically refine the right quantity of Petroleum products for local consumption, it is therefore become imperative to import the supplementary quantity needed to meet–up with right quantity demanded domestically. Therefore, the act of importing refined petroleum products from abroad necessitate the inclusion of exchange rate in the specified model being estimated. And so, the restatement of equation (3.1) with inclusion of exchange rate is expressed as:

$$Qty = f(Fp, EXCR) \quad \ldots\ldots (3.2)$$

Where Qty is the quantity of refined petroleum products of PMS, AGO and DPK, EXCR is exchange rate. Therefore, since living standard is determined by the those indicators like total

amount of net earnings, consumption expenditure and healthcare expenditure which is measured in terms of Gross National Income per population (GNIPC), consumption expenditure (as a percentage of GDP) and total health expenditure respectively. Therefore, equation (3.2) would be restated as:

LS= *f*(Fp, EXCR) …… (3.3)

Where LS is living standard expressed as a function of the quantity of refined petroleum products of PMS, AGO and DPK, EXCR is exchange rate.

Consequently, the LS in equation 3.2 would be disaggregated into indicators of living standard under investigation as stated in the specific objectives as:

GNIPC = *f* (PMSp, EXCR) ……. (3.3.1)

Where GNIPC is Gross National Income per capita as indicator of living standard. So, the mathematical model of the equation of (3.4) is specified as:

GNIPC = PMSp + EXCR ……. (3.3.2)

The econometric model of the equation (3.5) is specified as:

$GNIPC_t = \beta_0 + \beta_1 PMSp_t + \beta_2 EXCR_t + \varepsilon_t$ …….. (3.3.3)

HExp. = *f* (AGOp, EXCR) ……. (3.3.4)

Where HExp. is health expenditure as indicator of living standard, and the mathematical model of the equation of (3.4) is specified as:

HExp. = AGOp + EXCR ……. (3.3.5)

The econometric model of the equation (3.5) is specified as:

$HExp._t = \beta_0 + \beta_1 AGOp_t + \beta_2 EXCR_t + \varepsilon_t$ …….. (3.3.6)

Cons.Exp. = *f* (DPKp, EXCR) ……. (3.3.7)

Where Cons.Exp. is consumption expenditure as indicator of living standard

Cons.Exp. = DPKp + EXCR ……. (3.3.8)

The econometric model of the equation (3.5) is specified as:

$Cons.Exp._t = \beta_0 + \beta_1 DPKp_t + \beta_2 EXCR_t + \varepsilon_t$ ……. (3.3.9)

3.3 Model estimation Procedure

Firstly, the study test the stochastic properties of the data series of the variables specified in the model using Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root test framework. In preference to KPSS in this study is due to the problem of size distortion associated with both Augmented Dickey Fuller (ADF) and Philip Perron (PP) even though, PP is stronger than ADF

for its greater reliability in the midst of serial correlation and heteroscedasticity (Hamilton, 1994). The unit root test for variables carried out with both trend and intercept is specified as:

$$\Delta LS_t = \beta_0 + \beta_1 LS_{t-1} + \beta_2 T + \sum_{i=0}^{n} \varphi\, i\, \Delta LS_{t-i} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.4)$$

Where, β_0, β_1, β_2 and φi... φ_n are parameters to be estimated, and ε_t is the white noise disturbance term.

Subsequent to the conduction of unit root test, the test for cointegration using Auto-regressive Distributed Lad model otherwise referred to as ARDL Bound test by Pesaran, Shin & Smith (2001) for the broad model is carried out. The ARDL Bound test is preferred for its accommodating power of conducting cointegration test for the combined stationary and non-stationary series and also considering the entire variables in the cointegrating equation as endogenous (Pesaran *et al*., 2001). Thus, the estimated ARDL cointegration model test is specified as:

$$\Delta InLS_t = \phi_0 + \delta_1 InLS_{t-1} + \delta_2 PMSp_{t-1} + \delta_3 AGOp_{t-1} + \delta_4 DPKp_{t-1} + \delta_5 EXCR_{t-1} + \sum_{i=1}^{q} \beta_{1i} \Delta InLS_{t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta PMSp_{t-i} + \sum_{i=1}^{q} \beta_{3i} \Delta AGOp_{t-i} + \sum_{i=1}^{q} \beta_{4i} \Delta DPKp_{t-i} + \sum_{i=1}^{q} \beta_{5i} \Delta EXCR_{t-i} + \pi_1 ECT_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.5)$$

Where model variables are as defined earlier, Δ is a first differenced operator, β_0 is an intercept term, β_1 to β_5 are short run coefficients, δ_1 to δ_5 are long run parameters and q being the optimal lag orders and the π_1 is the speed of adjustment parameter, while, ECT is the residual series from the long–run equations model.

Nonetheless, all the estimated models in the series of equations specified in the study is subjected to residual diagnostic tests like Breusch–Pagan for serial correlation, RESET: Ramsey's test for misspecification or specification error, Jarque-Bera test for normality, Breusch-Pagan-Godfrey heteroscedasticity and cumulative sum (CUSUM) and cumulative sum of square (CUSUMSQ) recursive estimates for stability of the estimated coefficients.

4. Result Presentation and Discussion of Findings

4.1 Results Presentation and Interpretation

Table 4.1: The Results of KPSS Unit Root Test

Variables	LM-Stat.				
	Level		1st Difference		Remark
	KPSS–Stat.	5% C/V	KPSS–Stat.	5% C/V	
InCons.Ex.	0.204494**	0.146000	0.366004**	0.146000	I(0)
InH	0.228897**	0.146000	0.245650**	0.146000	I(0)
InGNIPC	0.227891**	0.146000	0.122151**	0.146000	I(0)
PMS	0.126795**	0.146000	0.500000**	0.146000	I(1)
AGO	0.190707**	0.146000	0.123183**	0.146000	I(0)
DPK	0.179100**	0.146000	0.143941**	0.146000	I(0)
EXCR	0.173917**	0.146000	0.164772**	0.146000	I(0)

Source: Author's computation (2024).

The results of KPSS unit root test shown in table 4.1revealed that, the respective KPSS–statistics (i.e. t–statistics) for all variables except for PMSp are greater than critical value at 5% level of significance at zero order of integration (i.e. I/0) while, KPSS–statistics (i.e. t–statistics) for PMSp is less than critical value at 5% level of significance at zero order of integration (i.e. I/0) and became greater than critical value at 5% level of significance after taking the first difference for the series of the variables (i.e. I/1). Consequently, the hypotheses that, the variable has unit root at order zero (i.e. I/0) is accepted for all variables under investigation except for PMS that is rejected at order zero became stationary at order one (i.e. I/1). Subsequently, the model of the study was estimated with two (2) lag periods as the maximum lag length as shown in the table 4.2

Table 4.2: The Result of Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1497.712	NA	4.76e+27	83.59512	83.90303	83.70259
1	-1247.596	389.0693	7.05e+22	72.42201	74.88526*	73.28175
2	-1170.169	90.33206*	2.01e+22*	70.84271*	75.46131	72.45472*

Source: Author's Computation (2024).

The table 4.2 shows the result of lag length selected for the estimated of the study where two (2) lag periods was selected for the models of study being estimated because of the dominance of the two (2) lag periods among the length selection test criteria as detailed in the table. The result of the stated objectives is presented in following order.

i. Effect of the price of premium motor spirit on income in Nigeria.

Following the results of KPSS unit root test, the first objective of the study that set out to examined the effect of the price of premium motor spirit (PMSp) on income whose series are integrated at mixed order of integration, that is I(0) and I(1), the ARDL model was utilized to estimate the model and the result of ARDL model is thus presented in table 4.2

Table 4.3: Results of Cointegration Test

Dependent Variable	Function	F-Statistic	K
LS.	f(GNIPC./PMSp EXCR)	23.47411******	**2**
Critical Values Bounds			
10%		5%	
I(0)	I(1)	I(0)	I(1)
2.63	3.35	3.1	3.87
1%			
I(0)	I(1)		
4.13	5.00		

Source: Author's Computations.

As revealed in table 4.3, the result of ARDL bound test for cointegration shows that there is cointegrating or long-run relationship income in Nigeria and the price of premium motor spirit (PMSp) in Nigeria since, the computed F-statistics (23.47411***)** is greater than upper bound

critical values (5.00) at K equal to 2 and one per cent (1%) level of statistical significance. While, the result of the long–run impact of PMSp on income is presented in table 4.4

Table 4.4: The Result of Long–run Impact of PMSp on Income and Short –run Dynamic Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10187.13	9392.630	-1.084588	0.2860
PMS**	112.6446	27.60575	4.080476	0.0003
EXCR**	422.0403	146.5176	2.880475	0.0069
CointEq(-1)*	-0.128600	0.012706	-10.12089	0.0000

Source: Author's computation (2024)

The table 4.4 shows that the price of premium motor spirit (PMSp) portends a positive and significant effect on national income in the long-run in Nigeria and this conform to apriori expectation. This means that, one per cent rise in the price of premium motor spirit (PMSp) effect 112.645 per cent increase on national income per capita (GNIPC) in the long–run in Nigeria. Interestingly, the result of such positive effect of the price of premium motor spirit (PMSp) on national income per capita (GNIPC) is statistically significant since the p-values (0.0003) is less than 0.05 or 5% statistical level of significance. This finding is however, in disagreement with the findings of a study by Nwaoha, Onwuka, Ejem, Obisike and Ogbuewu (2018) and Bobai (2012) that, rise in the price of premium motor spirit (PMSp) exert indirect negative influence on national income through rising inflation rate that eventually erodes the real value of increase experience in the national income thereby, making the actual increase in the national income not to translated to the growing national income. This is because, the risen price of PMS traditionally spurs inflation rate that consequently reduces the real value of money and as such, if increase in the nominal value of money is experienced, such increase is naturally consumed by rising inflation rate occasioned by rising price of PMS in Nigeria.

However, as discovered by the finding of this study, positive would mean rising income of the nation which subsequently translated into the rising income per capita. Consequently, rising per capita income would increase income earnings of individual that induces consumption, health and education expenditure thereby, enhancing living standard of the people in Nigeria.

Similarly, the table 4.4 shows that the exchange rate (EXCR) portends a positive and significant effect on national income per capita (GNIPC) in the long-run in Nigeria and this negate the apriori expectation. This means that, one per cent rise in exchange rate (EXCR) effect 422.040 per cent increase on national income per capita (GNIPC) in the long–run in Nigeria. Worthy of note, the result of such positive effects of exchange rate (EXCR) on national income per capita (GNIPC) is statistically significant since the p-values are 0.0069 which is less than 0.05 or 5% statistical level of significance.

4.1.1: Diagnostic Results

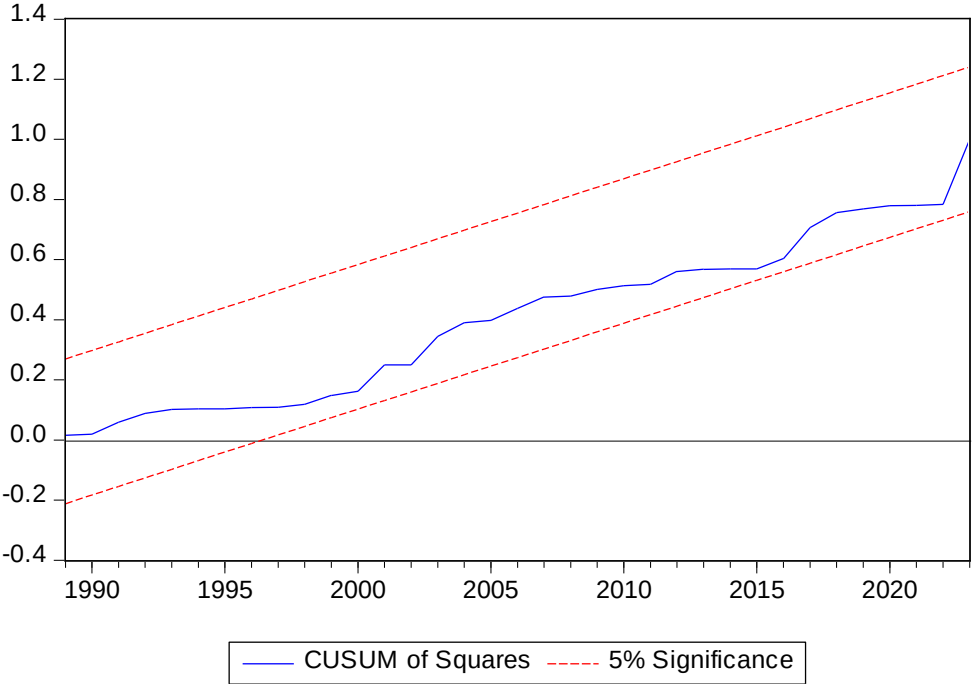
Table 4.5: Results of Residual Diagnostics

Tests		Outcomes	
		Coefficients	Probability
Heteroskedasticity: Breusch-Pagan-Godfrey test	**F-stat.**	0.982974	0.3856
	NR^2	2.206521	0.3318
Breusch-Godfrey Serial Correlation LM Test	**F-stat.**	0.485969	0.9194
	NR^2	14.14669	0.7751
Normality Test	Jarque-Berra	0.17073	0.9182
Ramsey-RESET	**F-stat.**	2.497879	0.1238

Source: Author's Computation (2024).

From the estimated post estimation residual diagnostics test, it is empirically evident shown in the table 4.5 that, there is no evidence of serial correlation in the estimated model and that the model is free from Heteroskedasticity. This is because, the p-value of both tests (serial correlation- 0.3856 and heteroskedasticity-0.9194) was found to be greater than 0.05 or 5%. Also shown in the table 4.5, the Ramsey Regression Specification Error Test (RESET) specification error test showed that the model was well mathematically specified as the p-value 0.1238 was found to be greater than 0.05 or 5%. Similarly, the residual term is normally distributed. Because, the Jarque-Berra which is the test for normality distribution revealed that the result attained a normal distribution with a bell shaped symmetrical distribution at 5% significant level because its p-value 0.9182 is greater than 0.05 or 5% statistical level of significance.

Fig. 4.1



ii. Effect of the price of automotive gas oil (AGO) on healthcare expenditure in Nigeria

Following the result of KPSS unit root test which shows that, the price of automotive gas oil (AGOp) and healthcare expenditure (InH) as well as exchange rate (EXCR) were integrated at order zero (i.e. I/0), the OLS regression technique was employed to estimate the magnitude of the effect of the price of automotive gas oil on the healthcare expenditure; hence, the result of OLS regression technique is presented in table 4.6.

Table 4.6: The Result of effect of the price of AGO on Healthcare Expenditure in Nigeria

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGO	-0.007699	0.003089	-2.492173	0.0176
EXCR	0.022499	0.003958	5.684096	0.0000
C	21.36210	0.408830	52.25178	0.0000
R-squared	0.638852			
Adj. R-squared	0.618215			

Source: Author's computation (2024).

The table 4.6 show that, the price of automotive gas oil portends negative effect on the healthcare expenditure in Nigeria at significant level of statistics. This conforms to the apriori expectation that rising price of AGO lead to falling healthcare expenditure in Nigeria. This means that, one per cent rise in the price of AGO lead the healthcare expenditure to fall by 0.0077 per cent. Impressively, the result of negative effect of AGOp on InH is statistically significant because, the p–value (0.0176) of such negative effect on healthcare expenditure is less than 0.05 level of statistical significance. This findings corresponding to the findings of a study by Samuel, Raymond and Ayobola (2023) and Eregha, Mesagan, and Olawale (2015) that, rise in the price of AGO lead to fall in living condition of people that includes healthcare expenditure in Nigeria. This is so because, increase in the price of AGO birth upward shift in the price of other consumables that improve living condition like consumption expenditure and healthcare expenditure. Rising prices of petroleum products like AGO induces rising inflation on material inputs needed in production that consequently translated to prices of commodities which resultantly affects the living condition of people most especially as regards to expenditure on healthcare provision for self.

Similarly, the table 4.6 shows that the exchange rate (EXCR) portends a positive and significant effect on healthcare expenditure (InH) in Nigeria and this negate the apriori expectation. This means that, one per cent rise in exchange rate (EXCR) effects 0.0225 per cent increase on healthcare expenditure (InH) in Nigeria. Worthy of note, the result of such positive effect of exchange rate (EXCR) on healthcare expenditure (InH) is statistically significant since the p-values are 0.0000 is less than 0.05 or 5% statistical level of significance. Also, the coefficient of determination (R^2 adjusted) (0.618215) shows that, the variables specified in the estimated regression model are approximately 62% best fitted into the estimated regression model.

iii. Effect of the price of automotive gas oil (AGO) on consumption expenditure in Nigeria

Following the result of KPSS unit root test which shows that, the price of dual purposes kerosene (DPKp) and consumption expenditure (Cons.Exp.) as well as exchange rate (EXCR) were integrated at order zero (i.e. I/0), the OLS regression technique was employed to estimate the magnitude of the effect of the price of dual purpose kerosene on the consumption expenditure; hence, the result of OLS regression technique is presented in table 4.8.

Table 4.7: The Result of effect of the price of DPK on Cons.Exp. in Nigeria

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DPK	-0.035916	0.010412	-3.449486	0.0015
EXCR	0.159134	0.021285	7.476233	0.0000
C	47.35296	2.328227	20.33864	0.0000
R-squared	0.746682			
Adj. R-squared	0.732206			

Source: Author's computation (2024).

The table 4.7 indicates that, the price of dual purpose kerosene (DPK) bears negative effect on the consumption expenditure in Nigeria at significant level of statistics. This conforms to the apriori expectation that rising price of DPK lead to falling consumption expenditure in Nigeria. This means that, one per cent rise in the price of DPK lead the consumption expenditure to fall by 0.0360 per cent. Impressively, the result of negative effect of DPKp on Cons.Exp. is statistically significant because, the p–value (0.0015) of such negative effect of the price of dual purpose kerosene on consumption expenditure is less than 0.05 level of statistical significance. This findings is in agreement to the findings of a study by Ukangwa, Ikechi & Ben (2022) and Bobai (2012) that, rise in the price of DPK lead to fall in living condition of people that includes consumption expenditure in Nigeria. This is so because, increase in the price of DPK birth upward movement in the price of other consumables that improve living condition like consumption expenditure and healthcare expenditure. So, rising prices of petroleum products like DPK induces rising inflation on cooking input needed in food preparation that consequently translated to rising consumption; hence, living condition of people most especially as regards to expenditure on consumption is adversely affected.

In addition, the table 4.7 indicates that the exchange rate (EXCR) exerts positive and significant effect on consumption expenditure (Cons.Exp.) in Nigeria and this negate the apriori expectation. This means that, one per cent rise in exchange rate (EXCR) effects 0.159 per cent increase on consumption expenditure (Cons.Exp.) in Nigeria. It is noteworthy that, the result of such positive effect of exchange rate (EXCR) on consumption expenditure (Cons.Exp.) is statistically significant since the p-values are 0.0000 is less than 0.05 or 5% statistical level of significance. Also, the coefficient of determination (R^2 adjusted) (0.7322) shows that, the variables specified in the estimated regression model are approximately 73.2% best fitted into the estimated regression model.

5. Conclusion and Recommendation

Admittedly, the price of refined petroleum products like Premium Motor Spirit (PMS), Automotive Gas Oil (AGO) and Dual Purpose Kerosene as well as Exchange rate plays influential roles in the determination of the indicators of living standard like income, consumption expenditure and health expenditure in Nigeria. This study is built on conventional neoclassical theory of demand and employed both linear Auto–regressive Distributed Lag Models and OLS regression technique to examined the effects of the price of refined petroleum products of PMS, AGO and DPK as well as the rate of exchange on the examined indicators of living standard for the period of thirty–eight (38) years. The study therefore found that, rise in the price of PMS lead to rise in income; rise in the price of AGO lead to fall in the healthcare expenditure and rise in the price of DPK lead to fall in consumption expenditure in Nigeria. More so, rise in the rate of exchange contribute to the deteriorating living standard in Nigeria through rising inflation rate due to their overbearing influences of cost of exchanging Naira to foreign currencies like USD on living conditions of citizenry in Nigeria. On this notes, the study therefore suggested the following recommendations:

(i). since, the refined petroleum products of PMS and AGO are crucial commodities that serve both domestic and industrial purposes, the determination of its prices should be left wholly to the mechanism of market forces. The intervention by government in the price determination process that often causes sudden obstruction in the supply and distribution of the products, and subsequent unanticipated price hike of the products that bears direct effects on living standard in Nigeria should be drastically minimized.

(ii). Nigerian government must be up to the task to ensure that the required quantity of PMS and AGO for domestic consumption should be refined locally instead of relying on the importation of refined PMS, DPK and AGO for domestic uses by putting to use optimally and expanding the capacity of existing local refineries. This would help to address the problem of hike in the price of PMS, DPK and AGO due to the volatile nature of Naira–dollar exchange rate that accompanied the importation of the refined PMS, DPK and AGO into the country.

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