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Impact of Petroleum Products Price Changes on Prices of Food Items in the Nigerian Economy

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Abstract: There seems to be disequilibrium between food items and petroleum price changes in Nigeria. Every petroleum price change is followed by a rise in the prices of food items and increased poverty. This study therefore examines the impact of petroleum product price changes on the prices of food items in the Nigerian economy. Annual time series data from 1991 to 2021 are employed and the study adopt ARDL approach to determine the long-run and short-run relationship between the price of premium motor spirits and the price of food items in Nigeria. However, as it is reported by the unit root test there is a mixture of 1(0) and 1(1) order of cointegration. With these results, it is more suitable to apply the ARDL approach. The results show that the price of premium motor spirit has a positive and significant impact on food items during the short run but in the long run, the prices of premium motor spirits have a positive and insignificant impact on the food items in Nigeria. The results of the Toda and Yamamoto (1995) causality tests show that there is a unidirectional causality running from the price of food items to the price of premium motor spirit and from the exchange rate to the price of food items. Therefore, the government should implement policies that encourage agricultural productivity which has great potential of boosting food supply so as to reduce the price of food items across the country. This way, timely increases in petroleum prices would generate more revenue without inflationary trends in food items.

Keywords: Food item, Premium Motor Spirit, Broad money supply, Real GDP, Exchange rate, Population growth rate, and Government expenditure.

1. Introduction

In Nigeria, the issues surrounding petroleum pricing are not new; Olawepo-Hashim (2021) dated it back to the 1970s during the regime of General Yakubu Gowon, when the price of premium motor spirit (PMS) was first increased from 6 kobo to N8.45 kobo per litre in 1973. Since then and up to 2020, petroleum price have increased periodically for about 30 different times. Conspicuously, the hike in petroleum prices between 2015 and 2020 has seen the premium motor spirit (PMS) increase from N26 in 2001 to N97 in 2015. The price hike further moved from N100 to N165 between 2016 and 2021.

On the other hand, gasoline (AGO) prices controlled by the government with little infrequent adjustments have been relatively stable over time. The gasoline price was ₦ 65 per litre between 2005 and 2011, except in 2007 and 2008 when it was raised to ₦ 75 per litre for a month and then lowered to ₦ 70 per litre. In 2012 the price of diesel was deregulated, with the government removing the gasoline subsidy and allowing the retail price to rise above ₦ 100 per litre. With the deregulation, the price increased to ₦ 230 in 2016 and ₦ 280 in 2020. In 2021, the price of diesel rose to ₦ 539.32 per litre. For DPK (kerosene) the price increased in 2000 from ₦ 17.5 to ₦ 50 per litre in 2005, then to ₦ 75 in 2012, ₦ 200 in 2016, and ₦ 335.54 in 2020 (Sakanko, Adejor & Adeniji, 2021).

These incessant adjustments in domestic prices of petroleum products in Nigeria have been attributed to changes in global crude oil prices. Any time crude oil price goes up in the international market there is always a resultant increase in domestic prices of petroleum products in Nigeria. On the reverse side, when the international oil price falls in the global market, there is also a hike in the domestic price of petroleum products because the value of Nigeria's currency depreciates. Changes in the global crude oil price are a result of many factors like the COVID – 19 induced price fluctuation and the war in Ukraine; both of which have shocked the commodity markets altering the global prices of oil trade (Baffes et al, 2014).

One of the major, implications of upward changes in the prices of petroleum products in Nigeria has always been the upward trend in the general price level. The general price levels in Nigeria rose from 6.9 percent in 2000 to 18.9 percent in 2001and then rose to 15.7 percent and 16.5 percent in 2016 and 2017 respectively. As of December 2020, arising from a price hike in petroleum products, inflation galloped and remained undesirably double-digit at 13.3% from 2020 to 2021Q1 (Sakanko, Adejor & Adeniji 2021).

Generally, these upward changes in prices of domestic petroleum products in Nigeria affect economic activities that depend on petroleum products as sources of energy. The implication is that farmers have to spend more on transporting their farm produce to the markets. Not only this, but diesel and petrol are also the main source of fuel for small-scale industries like bakeries, and corn and rice mills. The problem is exacerbated because Nigeria generates insufficient electricity to power these activities. This makes the energy costs of an average producer both in the formal and informal sectors one of the highest in the world (Olawepo-Hashim 2021). These excessive costs are consequently transferred to the cost of foodstuff which the final consumer bears.

Thus, the increase in prices of diesel and petrol will automatically raise the prices of other commodities generally, especially food items. In addition, high natural-gas prices have raised fertilizer prices, putting upward pressure on agricultural prices and food items. High energy prices are also driving up the cost of cooking gas in Nigeria thus affecting household-consumption and the income of food vendors, thereby increasing the prices of overall food items in Nigeria. In the midst of very high and persistent poverty, are these conjectures myths or reality in Nigeria? If they are a reality, to what extent do petroleum prices contribute to the inflationary trends? Do other associated macroeconomic variables contribute to the scary scenario? These pertinent questions require empirical and measurable answers for an effective policy formulation.

It is in the light of the above that this paper investigates the impact of domestic prices of petroleum products on the prices of food items in Nigeria. Specifically, the objective of the study is to examine the impact of prices of PMS on prices of food items in Nigeria using time series data from 1991 to 2021. This period is of particular interest because while the price of PMS rose from N100 to N165, the poverty level of Nigeria in percentages rose from 33.6 to 40 and this was in line with prices of food items that jumped from 136.2 CPI to 354.3 CPI (https:// knoema>Economy). To achieve this, the paper is divided into 5 sections. After the introduction, section 2 reviews relevant literature, section 3 presents the methodology adopted for the study, section 4 presents and analyses the data, and section 5 concludes

2. Literature Review

This section gives the working definition of the keywords used in the investigation, presents the theoretical framework of the study and ends with the empirical literature.

2.1. Keywords

The price of the food items is the average price that consumers are charged for food across the country. The changes in f*ood prices* affect both the producers and consumers of goods and services. Price changes are usually defined in terms of price fluctuations, but changes may of course be negative (a fall) or positive (a rise) with any of them having a positive or negative effect on the economy (Ayadi, 2005). Oil price fluctuation is synonymous with oil price oscillation and volatility. Every economic series fluctuates either positively or negatively, upward or downward but is never constant in the long run. The instability in oil price emanates from changes or fluctuations in either demand or supply side of the international oil market (Hamilton, 1983).

The money supply comprises banknotes, and coins, outside the central bank circulating within a period of time. M_0, M_1, M_2, and M_3 measure currency and liquid instruments held in different types and sizes of accounts in operation within Nigeria (Udoh, *et al,* 2019).

David, Gianivigi, Stanley, and Rudiger (2011) defined economic growth as the rate of change in real output. Economic growth is the percentage of annual income in real GNP or per capita real GNP in the long run. It is an imperfect but good measure of the rate of increase in economic well-being.

The exchange rate is measured as the price/rate of naira to the dollar. It measures the external value of a currency and provides a direct relationship between domestic and foreign prices of goods and services (Abubakar & Felix, 2018).

The Population growth rate is the summary parameter of trends in population density or abundance. It tells whether density and abundance are increasing, stable or decreasing, and how fast they are changing. Population growth rate describes the per capita rate of growth of a population, either as the factor by which population size increases per year (Richard and Jim, 2002).

Government expenditure refers to the spending by governments and agencies at any level. For example, government expenditure on real goods and services purchased from outside suppliers; spending on employment in state services such as administration, defense and education, spending on transfer payments to pensioners, the unemployed and the disabled; spending on subsidies and grants to industry and payments of debt interest (Black, 2002).

2.2. Theoretical Framework

This study adopts dynamic demand function or distributed lag models of demand. The idea behind dynamic demand function is that current quantity purchase is a

function of price, income and stock. The number of lags for the independent variables depends on the particular relationship under investigation. Generally, consumer durables lags farer backward than consumer non-durables. The variant of the Dynamic Lag Model that is of particular application to this study is the dynamic lag model for consumer non – durables propounded by Houtakker & Taylor as cited in Koutsoyiannis (1979). The model is given as:

$$Q_{t} = a_0 + a_1P_t + a_2\Delta P_t + a_3Y_t + a_4\Delta Y_t \pm a_5S_t \quad (1)$$

P_t = Current price in period t

ΔP_t = Change in price between period t and t-1

Y_t = Current income in period t

ΔY_t = Change in income between period t and t-1

S_t = Stock of durables/habit

The independent variables of the dynamic demand functions include lagged values of the price of the product, of the income and quantity demanded (which is represented as stock) as separate variables influencing current demand. Demand in any period depends on the current index of the independent variable and the size of the change in that independent variable that had taken place i.e. price, income and stock. The sign of the stock (S_t) will be negative for durables and positive for non-durables (because the higher our purchases of non-durables, the stronger the habit). If the commodity is a durable one, past purchases constitute stocks that determine present and future purchases. However, if the commodity is a non-durable, past purchases reflects a habit which influences current and future patterns of demand. Also the more recent of the levels of income and demand have greater influence on present consumption than the more remote ones.

In this regards, petroleum products are non-durable and so whatever stock would relinquish in the short run. For machineries especially in the developing nations like Nigeria, petroleum products are the main energy that drives the machineries and the production process. For households, the current price change matters but the size of the change is the deciding factor on the consumers' attitude to the price change. For poor nations like Nigeria, the income of the consumer cannot be ignored in any transaction, but the change in income due to price variation of a good like petroleum products is central to the prediction of attitude. To crown it all, the Dynamic Lag Model for Consumer Non – Durables seems to reflect a macroeconomic structure more than the limited traditional law of demand, hence its adaptation in this study.

2.3. Empirical Literature

Mohammed (2022) examined the impact of oil price fluctuations on food prices in Iraq between 2001 and 2020.The study adopted the Johansen cointegration test and the Autoregressive Distributed Lag bound test to analyse the relationship between crude oil price and food prices. The results of the study provided evidence indicating that a long-run relationship between crude oil prices and food prices exists in Iraq.

Sakanko, Adejor, and Adeniji (2021) investigated the impact of petroleum pump prices on the consumer price index in Nigeria. The study adopted the Nonlinear Autoregressive distributive lag method to analyze the objectives of the study for the period 1980 to 2020. The result of the study show there exists a long-run equilibrium relationship between the consumer price index and petroleum pump price. It further showed an asymmetric relationship between the petroleum pump price and the consumer price index in Nigeria.

Babalola and Salau (2020) investigated the impact of petroleum pump prices on the consumer price index in Nigeria between 2000 and 2019. The study employed the panel pooled mean/ARDL cointegration technique, which separated the impact into short and long run periods. The study found that in the short run, the price of petrol had a significant direct impact on the consumer prices of food items. However, these prices had no significant impact in the long run period; the price of kerosene indicated a significant inverse impact on consumer price in the short run but positive in the long-run.

Wale-Awe and Suleiman (2020) examined the effect of PMS pricing on inflationary dynamics in Nigeria between 1980 and 2018. The study employed the ARDL and causality techniques for analysis and their study found the price of PMS increases inflationary tendencies in the country. Meanwhile, the causality test revealed the absence of causality between PMS pricing and inflationary dynamics in Nigeria.

Kanu, et al (2019) investigated the relationship between automotive gas oil, premium motor spirit, dual-purpose kerosene prices, and consumer products prices in Nigeria. The study employed the multiple linear regression (OLS) technique using data between 1996 and 2018. The result of the study revealed that prices of automotive gas oil, petroleum motor spirit, and dual- purpose kerosene have a positive and significant impact on consumer product prices in Nigeria.

Shahriyar, Jeyhun and Fariz (2019) investigated the relationship between inflation, oil prices and exchange rate in Azerbaijan using the vector error correction model (VECM) to the data ranging from 1995 to 2017. The results show that the oil prices

and exchange rate have a positive and statistically significant impact on inflation in the long run.

Kelikume (2017) investigated the asymmetric effects of exchange rate and oil price shocks on inflation in Nigeria using monthly data obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin for the period 2006M1-2016M6. The study employs the impulse response functions (IRFs) to determine the reaction of inflation to shocks from the exchange rate and oil price. Similarly, the immediate effect of a shock to the oil price in 12 months is about a 52% increase in the price level. While the effect of an increase in oil price in 12 months is about a 4 3% increase in the price level.

Nwoko, Aye, and Asogwa (2016) investigated the impact of oil prices on the volatility of food prices in Nigeria. Specifically, the study analyzed the relationship between oil price and individual prices of maize, rice, sorghum, soya beans, and wheat from 2000 to 2013. The price volatility for each crop was obtained using the Generalized Autoregressive Conditional Heteroskedascity model. Thus, the study used a VAR model to investigate the short-run relationship, and the result revealed a positive and significant short-run relationship between oil price and the individual selected food price volatility apart from rice and wheat price volatility.

Lu *et al.* (2013) examined the effect of oil price shocks on inflation in Taiwan utilizing a bi-variate GARCH approach and data covering 1986 -2008. They reported that oil price increase had positive effects on inflation in Taiwan and revealed a persistent volatility spillover from oil price to inflation during the period.

Bobai (2012) analyzed the relationship between petroleum prices and inflation in Nigeria. The study focused on the impact of petroleum product price increases on the Nigerian economy from 1990 to 2011. The study used the ARDL approach and result shows that increases in petroleum product price have a positive and significant effect on inflation in Nigeria.

After review of empirical literature on the impact of petroleum products price changes on the prices of food items across the countries of the world. Indeed, some studies have shown either a negative or positive relationship between the variables. With these inconclusive results, the literature gap identified is that studies by Bobai (2012), Nwoko, Aye, and Asogwa (2016), Lu et al. (2013), Kelikume (2017), Shahriyar, Jeyhun and Fariz (2019), Kanu, et al (2019), Babalola and Salau (2020), Mohammed (2022) has been criticized because they used small sample periods, or the statistical coverage is less than 30 years. Consequently, their results may not be reliable for

decision-making and forecasting. Another shortcoming identified is that recent studies by Wale-Awe and Suleiman (2020), Kanu, *et al* (2019), Shahriyar, Jeyhun and Fariz (2019), and Kelikume (2017) do not covers the Covid-19 induced economic recession in Nigeria. Therefore, the relevance of this study is that it has extended the sample to captures the 2008-2009 global financial and economic crises, and the Nigerian 2016-2017 and the recent COVID-19 induced economic recessions that adversely retard the growth rate of the Nigerian economy. .

3. Research Methodology

3.1. Model Specification

This study employed the ARDL bound test method and the autoregressive distributed lag model (ECM) to analyses the objectives. The study period covers the range 1991 to 2021. This will enable the study to incorporate all the periods of major international oil price changes and also capture the structural changes that took place in the economy. The functional model adopted for usage in this study is as follows;

$$PFI = f\ (PPMS, BMS, RGDP, EXCH, PGR, GEXP) \quad (2)$$

Where:

PFI = Price of food items, PPMS = Price of premium motor spirit, BMS = Broad money supply), RGDP= Real GDP, EXCH = exchange rate (It is the price of a country's currency expressed in terms of one unit of another country's currency. It is measured as the exchange rate of the naira to the dollar), PGR=Population growth rate, and GEXP= Government expenditure.

3.2. Technique of Estimation

The method of evaluation starts with the stationarity test of the variables to ascertain their reliability for the regression estimation. When the different orders of integration are known, the next procedure is conducting a bound test for co-integration. Should co-integration exist the ARDL error correction model is estimated where the speed of transmission will be determined.

3.3. The Test for Stationarity (Unit Root)

The unit root test precedes the bound test analysis since the majority of economic data do exhibit a non-stationary trend which could lead to misleading results. The paper adopted the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron test.

3.4. The Autoregressive Distributed Lag Model (ARDL)

Bound Test

This was done using a critical value divide into the lower limit and upper limit, test statistics are expected to fall above the lower and upper limits for cointegration to exist. The lists of the variables were checked to know which of the variables will be integrated at levels and at order 1.

The ARDL equation is thus stated below.

$$\Delta PFI_t = \beta_0 + \beta_1 \sum_{i=1}^{n} \Delta PFI_{t-1} + \beta_2 \sum_{i=1}^{n} \Delta PPMS_{t-1} + \beta_3 \sum_{i=1}^{n} \Delta BMS_{t-1} + \beta_4 \sum_{i=1}^{n} \Delta RGDP_{t-1} + \beta_5 \sum_{i=1}^{n} \Delta EXCH_{t-1} + \beta_6 \sum_{i=1}^{n} \Delta PGR_{t-1} + \beta_7 \sum_{i=1}^{n} \Delta GEXP_{t-1} + ECM_{t-1} \quad (3)$$

The coefficient of the error correction (ECM_{t-1}) will indicate the percentage of the error corrected each year that is, the speed of adjustment. In equation 2 above the signs of β_2, to β_7 are expected to have a positive relationship with the price of food items.

4. Results and Discussion

4.1. Statistical Properties of Data Series

At this pre-estimation stage, the study carried out a unit root test using the Augmented Dickey-Fuller (ADF), and Phillip Peron (PP) tests. The results of the tests are presented as follows:

Table 1: Results of Unit Root Tests

Unit root tests				
Augmented Dickey-Fuller (ADF)			*Phillips Perron (PP)*	
Level 1(0)				
Variables	*Constant Without Trend*	*Constant With Trend*	*Constant Without Trend*	*Constant With Trend*
LPFI	-3.0451*	-3.6968*	-3.3816*	-3.8107*
LPPMS	-3.5292**	-3.2057**	-5.8012*	-7.3718*
LIBMS	- 3.4517	-3.4749	-2.6147	-2.6631

contd. table 1

LRGDP	-0.7205	-1.1553	0.5055	-1.9493
LEXR	-1.7900	-1.0256	-1.8443	-2.4803
LPGR	-0.2193	-3.0608	-0.3522	-2.5713
LGEXP	-0.7205	-1.1953	-0.5055	-1.9493
		First Difference 1(1)		
LPFI	-4.3464	-3.8353	-3.6791	-7.8675
LPPMS	-3.9826	-4.7115	-3.9354	-4.7044
LBMS	-3.9858*	-3.8941**	-4.7883*	-4.9962**
LRGDP	-3.9151*	-3.8432**	-3.8683*	-3.7687**
LEXCH	-5.3671*	-5.2744**	-5.4011*	-5.3293*
LPGR	-4.4141*	-4.3061**	-4.4141*	-4.3061**
LGEXP	-3.9131*	-3.8432**	-3.8583*	-3.7687**

Note: ***, ** and * denotes significant at 1%, 5% and 10% significance level, respectively.
Source: Researcher's computations using E-Views 9 (2022).

The result of the unit root test reported in Table 1 shows that the price of food items and price of premium motor spirit are stationary at level 1(0) while at first differences 1(1); broad money supply; real GDP, exchange rate, population growth rate and government expenditure are stationary. However, the results of the Unit Root Test point out that the variables are integrated in a different order that is level 1(0) and first differences I(1), the study proceeds to adopt the ARDL Model otherwise known as the Bound test to determine if there is long run cointegration between the variables of interest.

4.2. ARDL Cointegration Test

To determine the long-run relationships among the variables, the study applied the autoregressive distributed lag (ARDL) cointegration technique. The result is shown as follows.

Table 2: Result of ARDL Bound Test

F-statistic	*8.8778*	*4*
Level of significance	The critical value I(0) Bound	The critical value I(1) Bound
10%	2.12	3.23
5%	2.45	3.61
1%	3.15	4.43

Source: Researcher's computations using E-Views 9 (2022).

The bounds test shown in Table 2 above indicates a long run equilibrium relationship among the variables. This is because the F-statistic value of 8.8778 is greater than the lower and upper bound of the critical value at 5% respectively.

Table 3: Results of short run ARDL Coefficient

Cointegrating Form				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(PPMS)	0.404650	0.059253	6.829147	0.0005
D(BMS)	-1.648319	0.162522	-10.142144	0.0001
D(RGDP)	-0.000012	0.000001	-10.084211	0.0001
D(EXCH)	-0.230032	0.044385	-5.182684	0.0020
D(PGR)	0.505082	1.564621	1.843304	0.1149
D(GEXP)	0.000000	0.000000	4.063593	0.0066
C	-0.141467	2.531042	-16.450111	0.0000
Coint Eq(-1)	-0.807488	0.055821	-16.256975	0.0000

Source: Researcher's computations using E-Views 9 (2022).

The results in Table 3 show that the price of premium motor spirit has a positive and significant impact on food items in Nigeria at 1% level of significance. This indicates that an increase in prices of premium motor spirits by 1% would increase the price of food items by roughly 40%. The broad money supply, Real GDP, and the exchange rate have a negative and significant impact on food items while population growth rate and government expenditure have a positive and significant impact on the price of food items during the short run. Besides, the error correction model report that the speed of adjustment from short run disequilibrium to long run equilibrium relationship corrected annually is 0.81%.

Table 4: Long Run Coefficients

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
PPMS	0.266122	0.291226	0.913798	0.3961
BMS	0.953952	0.486777	1.959732	0.0977
RGDP	-0.000007	0.000003	-2.537123	0.0443
EXCH	0.470196	0.160548	2.928698	0.0263
PGR	0.481455	0.067580	2.919754	0.0266
GEXP	0.000000	0.000000	1.326585	0.2329

Source: Researcher's computations using E-Views 9 (2022).

Similarly, in Table 4, the results show that in the long run prices of premium motor spirits have a positive and insignificant impact on the food items. This also indicates that an increase in prices of premium motor spirits by 1% would reduce the price of food items by roughly 58% in Nigeria. The broad money supply has a positive and significant effect on price of food items at 10% levels of significance. Also, indicate that an increase in broad money supply by 1% would increase price of food items by 95% while Real GDP has a negative and significant impact on the price of food items at a 5% level of significance. This shows that an increase in Real GDP by 1% would reduce the price of food items by 0.07% respectively. The exchange rate has a positive and significant effect on price of food items at a 10% level of significance. This implies that an increase in exchange rate by 1% would increase the price of food items by 47%. The Population growth rate has a positive and significant effect on the price of food items at a 5% level of significance. This shows that an increase in population growth rate by 1% would increase the price of food items by 48% in Nigeria during the study period.

4.3. Post.-Estimation Tests

The adequacy of the ARDL model is verified by employing the residual diagnostics test such as the normality test, Serial Correlation LM Test, and Heteroskedasticity Test. The results are presented as follows.

Table 5: Normality Test

Statistic	*Value*
Skewness	-0.4250
Kurtosis	3.5082
Jarque-Bera	2.9972
Probability	0.2234

Source: Researcher's computations using E-Views 9 (2022).

The results of the normality test in Table 5, show that the Skewness is -0.4250, kurtosis 4.5082 and the Jargue-bera probability value is 2.9972 (0.2234). This implies that the conditions for normality are all met because the Skewness is negatively skewed and less than one, and kurtosis is 3, while Jarque-bera probability is not significant at any significant level. Therefore, the data is normally distributed.

Table 6: Other Diagnostic Test Results

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	3.4373	Prob. F(3,3)	0.1688
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.3754	Prob. F(17,6)	0.9478

Source: Researcher's computations using E-Views 9 (2022).

In Table 6 above, the Breusch-Godfrey test for autocorrelation LM Test is used and the result indicates the computed p-value of 0.1688 was not significant at any lag level. This implies no serial correlation problem. The test result for Heteroskedasticity: Breusch-Pagan-Godfrey generated reveals that the p-value of 0.9478 was not statistically significant which indicates the absence of the Heteroskedasticity problem.

4.4. Stability Diagnostic Test

The stability of the ARDL model is tested by employing the stability diagnostics test such as Ramsey RESET Test and recursive estimates Test, and Heteroskedasticity Test. The results are presented as follows.

Table 7: Ramsey RESET Test Results

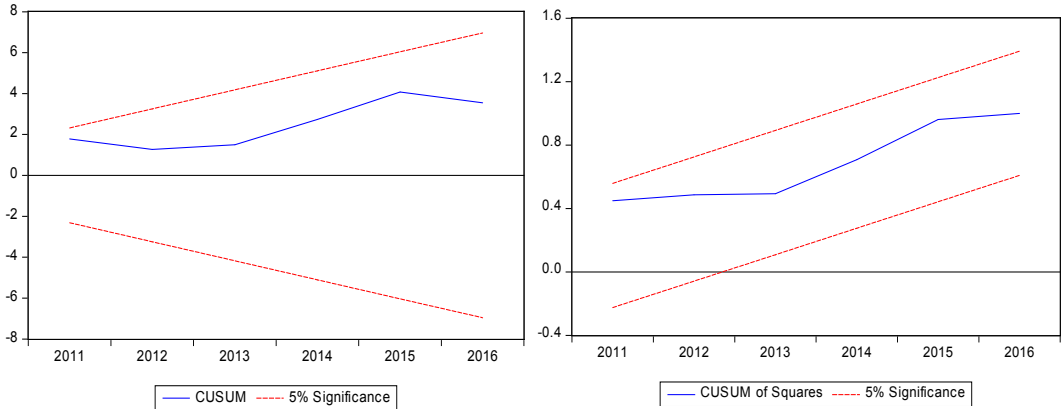
	Value	*df*	*Probability*
t-statistic	1.083376	5	0.3281
F-statistic	1.173704	(1, 5)	0.3281
F-test summary:	*Sum of Sq.*	*df*	*Mean Squares*
Test SSR	20.59734	1	20.59734
Restricted SSR	108.3424	6	18.05707
Unrestricted SSR	87.74506	5	17.54901

Source: Researcher's computations using E-Views 9 (2022).

The Ramsey Reset test shows there are no misspecifications of the model because the probability value of0.3281 was not statistically significant at any levels. This implies that the variables in the model are stable for further economic predictions.

4.4.1. Recursive Estimates

The research study makes use of the Cumulative Sum of recursive residuals (CUSUM) developed by Brown, Dublin, and Evans (1975) in testing the stability of the parameters of the model within a 5% level of significance. The results of the CUSUM and CUSUM Square are shown in Figures 1 and 2.



Source: Researcher's computations using E-Views 9 (2022).

In figure 1, the results of the CUSUM plot for the stability of the model show the CUSUM test and CUSUM of Square test are within a 5% level of significance. There are no chances of having spurious regression because the blue line is in-between the two red lines. The decision rule is that all the coefficients of the error terms in the regression estimates are normally distributed. This also implies variance stability and reliability of the model and parameters over the study period. Also, CUSUM and CUSUM squares tests show that the models are stable and can be used for policy formulation.

4.5. Causality Test Results

The study used the (TY) Toda and Yamamoto (1995) to discover the direction of a causal relationship between the price of premium motor spirit and the price of food items in Nigeria from 1991 to 2021. The result is presented as follows:

The results of the causality tests presented in Table 8 show the first null hypothesis is that the price of food items does not granger cause the price of premium motor spirit in Nigeria Thus, as shown by the significance of the *ñ*-values (0.0109) the null hypothesis of no causality between the variables is rejected because unidirectional

Table 8: TY Causality Test

Causality	*Chi-sq*	*df*	*Prob.*
LPFI does not Granger cause LPPMS	9.0301	2	0.0109**
LPPMS does not Granger cause LPF	0.2464	2	0.8841
LBMS does not Granger cause LPFI	0.0666	2	0.9673
LRGDP does not Granger cause LPFI	0.1708	2	0.9181
LEXCH does not Granger cause LPFI	10.2466	2	0.0060*
LPGR does not Granger cause LPFI	0.8549	2	0.6522
LGEXP does not Granger cause LPFI	0.6842	2	0.7103

* and ** represent 1% and 5% levels of significance.

Source: Researcher's computations using E-Views 9 (2022).

causality runs from the price of food items to the price of premium motor spirit. However, there is also a unidirectional causality between the exchange rate and the price of food items as reported by the significance of the *ñ*-values (0.0060) during the study period.

5. Conclusion

This study examines the impact of petroleum product price changes on the prices of food items in the Nigerian economy. Annual time-series data from 1991 to 2021 are employed and the study adopts the ARDL approach to determine the long-run and short-run relationship between the price of premium motor spirit and the price of food items in Nigeria. By the unit root test, there is a mixture of 1(0) and 1(1) order of cointegration. With these results, it is more suitable to apply the ARDL approach. The ARDL results show that the price of premium motor spirits has a positive and significant impact on food items during the short run but in the long run, the prices of premium motor spirits have a positive and insignificant impact on the food items in Nigeria. The results of the Toda and Yamamoto (1995) causality tests show that there is a unidirectional causality running from the price of food items to the price of premium motor spirit and from the exchange rate to the price of food items as reported by the significance of the *ñ*-values. The study recommends that the government should adopt prudent policy measures to deal with the factors identified as sources of increase in the price of food items such as increase in petroleum price, exchange rates instability, increase in the supply of money and, the population growth rates.

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