PETROLEUM PRODUCTS PRICE CHANGES, EXCHANGE RATE AND PRICES OF FOOD ITEMS IN NIGERIA

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ABSTRACT
The study investigated the link between petroleum products price changes, exchange rate and price of food items in Nigeria using monthly data from January 2010 to December 2021. The study used the Augmented Dickey Fuller (ADF) unit root test procedure in testing the stationarity of the variables and adopted the Autoregressive Distributed Lag Model (ARDL) models in analyzing the data. The ARDL estimated result found evidence that price of PMS and exchange rate has a significant positive impact on prices of food items in Nigeria in the short run and long run periods. The study therefore, recommended that government planned subsidy removal on PMS should be a gradual process instead of a onetime total removal to prevent further hikes in the prices of food items and other commodities in the country. In addition, the local refining of crude oil should be revisited and revamped to boost production and over importations of refined petroleum products for domestic use which will also check exchange rate deprecation.

Keywords: Petroleum product prices, exchange rate, prices of food items, ARDL
JEL Classifications: C32, F31, Q11

1. INTRODUCTION

In recent periods Nigeria has been experiencing hikes in the prices of food items. These upward changes in consumer food prices since 2016 have resulted in the hardship experienced in the country. The constant increasing price of food items in Nigeria has negative effect on the living standards of average Nigerian citizens making it a serious cause for concern. The implication is that average Nigerians can only buy smaller baskets of food items for their daily living. This hike in food prices is mainly attributable to factors that have pushed up input costs such as petroleum product prices and fluctuations in exchange rate. Generally, the changes in prices of food items in Nigeria have overtime occurred alongside changes in exchange rate and prices of petroleum products.

In 1996 exchange rates was ₦21.90 per US Dollar, while the price of PMS was ₦11 per litre; whereas the price of food items was 23.99%. In 2001 exchange rates has gone higher than in 1996 to ₦111.94 per US Dollar, price of PMS was also changed to ₦22 per litre, whereas the price of food items ended with 28.02%., five years after in 2011, exchange rate ended with a value of ₦153.86 per US Dollar; price of PMS was ₦65 per litre and price of food items ended lower than in 2001 to 10.30%. As of 2016 exchange rates was ₦253.49 per US Dollar, price of PMS was ₦145 per litre, and the price of food items increased to 14.95%., However, in 2021 exchange rates was ₦399.96 per US Dollar, price of PMS was ₦162 per litre; with price of food items staying at 20.40% (CBN 2021; NBS 2021).

The pattern of exchange rate depreciation and that of hike in prices of petroleum products imply prices of food items will continue to follow the trend if nothing is done to curb the movement pattern. As the exchange rate increases and the prices of petroleum products continue to rise, it means that farmers have to spend more in transporting their farm produce to the markets. Since the petroleum products are sources of fuel for the generators at the corn mills, rice mills, bakeries and small scale industries etc. As a result price of food items will continue to rise

However, there have been unresolved research controversies relating the impact of energy prices on the food market, with many researchers having the opinion that increase in the price of oil play a major role in the upsetting experiences in the food market (Abbott, Christopher & Wallace, 2008; Mitchel 2008). Other researchers such as (Zhang, Luanne, Cesar, & Wetzstein, 2010) are of the opinion that changes in oil prices has no direct impact on prices of food items.

Therefore, the study examined the link between prices of premium motor spirit (PMS), automated gas oil (AGO) and exchange rate and prices of food items in Nigeria using monthly data covering the period 2010 to 2021. Following the introduction is the literature review in section 2, while section 3 contained the methodology. The empirical results are presented and discussed in section 4, while section 5 is made up of conclusion and policy recommendations.

2. REVIEW OF RELATED LITERATURE

2.1 Brief Conceptual Clarifications and Theoretical Literature

Price changes referred to increase or decrease in prices with an attendant effect on the economy (Ayadi, 2005). Petroleum product price fluctuation is synonymous to increase or decrease in oil prices. Price is vital in the course of moving food products from the farmers to the consumers and determines the interactions between the suppliers and the consumers. However, instability in prices such as the oil price emanate from changes in the market forces in the oil market (Hamilton, 1983). In the case of the Nigerian economy, the international oil market dictates the changes in domestic petroleum prices as most of the refined products used in the country are imported. This expresses the role of exchange rate in analyzing the changes in prices of petroleum products in Nigeria. Exchange rate here is conceptualized as the rate at which one currency is exchanged for another (Sorsa, 1999).

However, literature abound emphasizing the link between variations in prices and other macroeconomic variables as depicted in the real business cycle theory. The business cycles theory was propounded by Hamilton (1988) and explained how external fluctuations in the economy like exchange rate or oil changes have impact on the economy. The model has extension known as the international real business cycle that explains a linear functional form relationship between exchange rate and consumption. The theory explains that shocks in the business cycle are as a result of real shocks with resultant impact on consumption and prices. However, the model failed to explain the adjustment process of exchange rate. In addition, a clear perception in explaining the relationship between exchange rate and price changes was first given by (Dornbusch, 1976). He was the first to develop a framework explaining the link between exchange rate and price changes. He pointed out that when exchange rates are high implying depreciation in domestic currency, it will trigger a rise in general prices and the reverse will be the case when the exchange rate falls. Thus, a change in exchange rate will increase the cost of production in the economy which eventually leads to rise in prices of consumer goods.

2.2 Empirical Literature

Studies have examined the relationship between oil prices and prices of consumer items globally and in Nigeria. Mohammed (2022) investigated how oil price changes affect food prices in Iraq between 2001 and 2020 using the Johansen cointegration test and the ARDL bound test. The result of the study provided evidence indicating the existence of a one directional causality relationship between crude oil price and food prices, and a positive response for food prices due to one standard deviation shock in oil price. Gummi, Rong, Bello, Umar and Mu'azu (2021) attempted to find out how oil price impact on food prices in Nigeria using monthly data covering the period January 2000 to September 2019. The study employed the asymmetric and partial structural change models and the result found that increase in crude oil price reduces the price of food, while decrease in crude oil price affects movements in food price in the long-run. The short-run result found that both positive and negative changes in oil price exert positive effects on food price in Nigeria. Kanu, Idume, Nwokeiwu, Ugwu, Ikpor and Edeogu (2019) investigated the nexus between petroleum products prices such as AGO, PMS, DPK and prices of consumer items in Nigeria using data between 1996 and 2018. The study employed the multiple linear regression (OLS) and the result revealed that prices of AGO, PMS and DPK significantly lead to increase in prices of consumer products in Nigeria.

Similarly, Sakanko, Adejor and Adeniji (2021) examined how pump prices of petroleum impact on prices of consumer price index in Nigeria for the period 1980 to 2020. The study adopted the Nonlinear Autoregressive distributive lag method and the result showed an asymmetric connection between the pump prices of petroleum products and the consumer price index in Nigeria. Babalola and Salau (2020) investigated the impact of petroleum pump price on consumer price index in Nigeria between 2000 and 2019. The study adopted the panel pooled mean ARDL technique. The study found that in the short run, the price of petrol had significant impact on consumer prices but not in the long run, it also found that the price of kerosene has a significant negative impact on consumer price in the short run and a positive impact in the long-run. Wale-Awe and Sulleiman (2020) examined the impact of prices of PMS on inflationary changes in Nigeria using data from 1980 to 2018 using the ARDL and causality techniques. The result opined that the price of PMS inflate prices in the country, while the causality test revealed the absence of causality between prices of PMS and inflation in Nigeria. In the same vein, Nwoko, Aye and Asogwa (2016) studied oil price and prices of selected food items such as maize, rice, sorghum, soya beans, and wheat between 2000 and 2013. The study used a VAR model to investigate relationship and revealed that oil price has a positive and significant short-run effect on the individual selected food price volatility apart from rice and wheat price volatility.

In addition, Peersman, Rüth, and Der-Veken (2021) examined how oil price changes caused by oil supply interruptions affect USA food commodity prices using a structural time-varying-parameter Bayesian Vector Autoregression technique. The result found that higher oil price caused by supply fluctuations did not cause increase in food commodity prices before the start of 20^{th} century, but had positive spillover effects in more recent periods. Also, the study reported that windfalls in world food commodity supply caused by poor yield caused a positive change on prices of crude oil since the early 2000s as against that of the preceding era. Using a sample of twenty one (21) countries importing food and exporting oil between 2001 and 2015 (Olayungbo, 2021) examined the causality link between oil and food prices in a using the panel ARDL model. The result showed a negative relationship between food prices and oil price while a positive relationship exist in the long period. The causality test showed that food prices caused variations in oil price. Studies have also examined the impact of oil price changes on prices of

certain commodities. Investigating the impact of crude oil prices on changes in prices of copper and maize in Sub-Saharan Africa (SSA) and Latin America countries between January 1982 to June 2021 and January 2000 to June 2021, (Kaulu 2021) employing the Vector Autoregressive and Vector Error Correction models found that long-run relationships exist between crude oil price and copper prices on the one hand and maize prices on the other hand for the 1982 to 2021 period. There was a contrary result for the shorter sample (2000 to 2021) where no long-run relationships exist.

Similarly, Prabheesh and Laila (2020) investigated the link between the prices of crude oil and palm oil in Indonesia between the first quarters of 2000 and fourth quarter of 2019. The authors adopted the linear and non-linear Autoregressive Distributed Lag model and found that crude oil prices have a significant non-linear impact on palm oil produce. Comparing the impact of oil price on food prices between high and low-income oil-exporting countries covering two periods, 2000Q1 to 2013Q1 and 2013Q2 to 2019Q4, (Chen, Gummi, Lu & Mu'azu 2020) adopting the Fully Modified Ordinary Least Squares and Dynamic Ordinary Least Squares techniques revealed the presence of an inverse relationship between oil and food prices in the long run using full samples 2000Q1to 2019Q4 and between 2000Q1 to 2013Q1 and 2013Q2 to 2019Q4 in high-income countries. For low-income countries and all the countries combined during 2013Q2 to 2019Q4 period, the study found oil and food prices moving together in the long run.

Empirical findings have also focused on the relationship between oil price and exchange rate. Adejola, Obiakor, Onakoya, Okwu, and Olalekan, (2022) in a study on the relationship between oil price and exchange rate in Nigeria from January 1980 to December 2020 found a mixed relationship between oil prices and exchange rates using the framework of wavelet analysis. The study also tested a causality relationship and found that there is a unidirectional causality from oil price to exchange rate in the short and medium run but bidirectional causality in the long run in Nigeria. Umar and Umar (2022) investigated the unequal effects of exchange rate fluctuations on food prices in Nigeria between the first quarters 2008 to fourth quarter of 2020. Using the ARDL non-Linear model, the study revealed a significant and an asymmetric positive link between exchange rate and food inflation both in the long-run and short-run.

Ajala, Sakanko and Adeniji (2021) also investigated the asymmetric effect of oil price on exchange rate and stock prices using the Nonlinear Autoregressive Distributive Lag (NARDL) technique from January 1996 to September 2020. The findings showed that changes in oil price have an unbalanced impact on the exchange rate and stock price both in the short-run and long-run. Adenekan, Hilili and Okereke (2020) studied the connection among oil price, exchange rate and stock market performance with the application of Vector Autoregressive (VAR) technique between January 5, 2010 and April 8, 2019. The result showed that uncertainties in crude oil price significantly impact on shares in the first two periods, but very little after these periods. It also revealed that changes in exchange rate may lead to fluctuations in the stock market. Ikuemonisan, Ajibefun, and Mafimisebi (2019) examined the volatility of changes in prices of food index returns, changes in index returns on imported food prices, value of dollars at the parallel market and inter-bank rate from the period1991 to 2017. The authors analyzed the result using exponential generalized autoregressive conditional heteroscedasticity model and found that exchange rate volatility affects volatility of prices of food index returns but it is higher on the fluctuations on imported food price returns.

More so, there also findings relating to oil price, exchange rate nexus and their impact on welfare. Onov, Ngutsav, Ijirshar and Akudo, (2021) studied the nexus between electricity and petrol price increase and how they impact on welfare of urban families in Benue state. The study

employed a 3-stage sampling approach to get data from 384 urban households using a Seemingly Unrelated Regression (SUR) and compensating variation for the analysis and the result found that petrol price increase had negative impact on the welfare of urban households in Benue State. Also, Efayena, Buzugbe and Olele (2019) examined the impact of changes in oil price on the consumer expenditure in Nigeria covering the period 1980 to 2017. The study adopted the Autoregressive Distributed Lag model and the result found that increase in oil prices negatively affected the consumer expenditure pattern in Nigeria.

Nwosu, Ihugba, and Osmond (2019) examined how differences in oil price relate to industrial output in Nigeria using the Bayesian Vector Autoregression (BVAR) and EGARCH models from January 1986 to December 2015. The results showed that shocks to differences in oil price hike industrial production and output growth in Nigeria. Olayungbo (2019) investigates the causality relationship between oil price, exchange rate, trade balance and foreign reserve in Nigeria between 1986Q4 and 2018Q1. The result showed evidence that no Granger causality relationships exist between oil price and trade balance and for oil price and exchange rate. Omolade, Ngalawa, and Kutu (2019) investigated the influence of crude oil price shocks on the economic performance of Algeria, Nigeria, Egypt, Angola, Gabon, Equatorial Guinea and Congo Republic which are eight Africa's oil-producing countries from 1980 to 2016. Using the Panel Structural VAR model, the study showed differences in how output responds to sharp increases and declines in oil prices.

The study has reviewed empirical works focusing on the oil prices, exchange rate and food price relationship with varying methodological approaches and variables. However, most studies have measured food prices using inflation, but studying swings in food price is better done with consumer price index of food items rather than using inflation values. This study adds to literature by measuring food prices using consumer price index of food items. Using inflation values involves calculating changes in the consumer price index, while the consumer prices relate to changes in the cost of living, that is, it track the changes in what the consumers pay for a basket of goods over time. The study also adds to literature by using monthly data that is updated to 2021 which reflect recent changes in the variables.

3. METHODOLOGY

3.1 Theoretical Framework.

The theoretical base of this paper relied on the theoretical model of (Dornbusch, 1976). Literature have opined that changes in oil price and exchange rate relate positively for oil exporting countries, implying a negative relationship for oil importing countries. This implies that higher oil prices will cause the appreciation of the domestic currency in oil exporting countries. This theoretical underpinning explaining how fluctuations in exchange rate relate with price changes was developed by (Dornbusch, 1976) in a theoretical model focusing on the relationship between exchange rate and price changes. He used the concepts of market concentration, total amount of import and domestic production in explaining the relationship between exchange rate and domestic prices such as the domestic prices of petroleum products and that of food items.

Building on the model, Agenor & Montiel (1996) explained the transmission mechanism how exchange rate affect prices by asserting that due to swings or changes in the currency values, the uncertainties in values can affect domestic prices through the volume of trade channel where negative trade shocks will push up other prices in the domestic economy. This scenario is applicable to the Nigerian economy that imports most of the refined petroleum products used in the country, the rise in exchange rate (depreciation of the domestic currency) will hike the prices of the imported refined petroleum products which directly increase the consumer prices index.

3.2 Sources of Data

The study used monthly time series data covering the period 2010 to 2021. The study period is to chosen due to data availability and to give room for a good degree of freedom for the results. Data on price of food items, exchange rate and crude oil price are sourced from the Central Bank of Nigeria statistical bulletin 2021, while data on prices of PMS and AGO are sourced from the National Bureau of Statistics (2021) publications.

3.3 The Method of data analysis

This study employed the ARDL bound test method and the Autoregressive Distributed Lag model to analyze the data ranging from 2010Q1 to 2021Q4. The functional form specification in investigating exchange rate, petroleum product price fluctuations and prices of food items is as follows;

PrFI = f (PrPMS, PrAGO, EXCH, COILPr)…..... 3.1

where

EXCH = exchange rate (It is measured as the rate the naira exchange to the dollar).

COILPr = International crude oil price. PrFI = Price of food items (Proxied by consumer price index of food items. PrPMS = Price of premium motor spirit and PrAGO = Price of automotive gas oil. The method of evaluation starts with the stationarity test of the variables to ascertain their reliability for the regression estimation, and the study employed the ADF stationarity test procedure. When the different orders of integration are known, the next procedure is conducting a bound test for co-integration, and should co-integration exist the ARDL error correction model is estimated where the speed of transmission will be determined.

3.4 Model Specification

The model used for the analysis is the ARDL with the adoption of the bound test for cointegraton. The bound test was done using a critical value divided into lower limit and upper limit, test statistics is expected to fall above the lower and upper limits for a 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.

$$\Delta PrFI_t = \beta_{0+}\beta_1\sum_{i=1}^{n}\Delta(PrFI)_{t-1} + \beta_2\sum_{i=1}^{n}\Delta(PrPMS)_{t-1} + \beta_3\sum_{i=1}^{n}\Delta(PrAGO)_{t-1} + \beta_4\sum_{i=1}^{n}\Delta(COILPr)_{t-1} +$$

$$\beta_5\sum_{i=1}^{n}\Delta(EXCHR)_{t-1} + \psi_1 PrFI_{t-1} + \psi_2(PrPMS)_{t-1} + \psi_3(PrAGO)_{t-1} + \psi_4(COILPr)_{t-1} + \psi_4(EXCHR)_{t-1}$$

$$+ \delta_1 ECM_{t-1} \text{ …….....……..…3.2}$$

The coefficient of the error correction (ECM_{t-1}) indicates the percentage of the error corrected each year that is, the speed of adjustment. In equation 3.2 above the signs of $\beta_{2,}$ to β_4 are expected to have positive relationship with price of food items. This study adopted the ARDL model because it incorporates variables that are of the mixed order of integration 1(0) and 1(1). Also the ARDL model incorporates enough lag lengths to give room for the data generating process and is highly suitable when the sample size is relatively small.

4. RESULTS, FINDNGS AND DISCUSSION

4.1 Unit root test results

Table 1: Augmented Dickey-Fuller (ADF) Unit root test results

Table 1and 2 present the order of integration of the variables used in the estimation. The ADF suggested acceptance of the hypothesis of presence of unit root for all the variables (Prices of PMS, AGO, food items, crude oil price and exchange rate) as they were not stationary at levels. They were differenced and became stationary at first difference, suggesting integration at order one.

Table 1: ADF Unit root test for the series in levels and fist difference

	Level		1st difference		Result
Variable	ADF stat	5 % critical value	ADF Stat	5 % critical value	Remark
PrFI	-2.270532	-2.883753	-2.243026	-1.943304	I(1)**
PrPMS	-2.571844	-3.441552	-11.96454	-1.943090	I(1)**
PrAGO	-3.224737	-3.441552	-11.69317	-1.943090	I(1)**
COILPr	-2.721195	-3.441777	-8.601176	-1.943090	I(1)**
EXCHR	2.231673	-1.943140	-5.950584	-2.882279	I(1)*

Source: Authors computation; ** (stationary at 5%).

Table 2: Lag order selection criteria

Included observations: 136

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2780.434	NA	4.24e+11	40.96227	41.06935	41.00578
1	-1794.776	1884.347	310468.8	26.83494	27.47743	27.09603
2	-1654.223	258.3692	56841.19	25.13563	26.31354*	25.61430*
3	-1625.611	50.49110	54100.95*	25.08252*	26.79585	25.77877
4	-1605.495	34.01943	58536.77	25.15434	27.40309	26.06818
5	-1590.241	24.67676	68328.87	25.29766	28.08181	26.42907
6	-1578.341	18.37462	84261.37	25.49031	28.80988	26.83930
7	-1549.091	43.01412*	81063.79	25.42781	29.28280	26.99438
8	-1536.392	17.74242	100305.1	25.60870	29.99910	27.39285

Source: Authors computation

* indicates lag order selected by the criterion

After the stationarity test, the test for the VAR lag length selection criterion was conducted in order to prevent the over-parameterization of the ARDL model, the lag length selection test presented in table 2 favours lag 3 as the suitable lag length of the variables using the AIC as decision criteria.

Table 3: Bound test (cointegration test)

Test –Statistic		Critical Value Bounds			Remark
F-Statistics	K	Sig. level	Lower Bound	Upper Bound	
5.305004	3	1%	3.74	5.06	Co-integrated
		5%	2.86	4.01	Co-integrated
		10%	2.45	3.52	Co-integrated

Source: Authors computation

The F-statistics as reported in Table 3 revealed that there is the presence of equilibrium relationship amongst the variables in the long run when price of food items is the dependent variable because its F-statistic (5.305004) is greater than the upper-bound and lower critical value at 5% significance level. This implies that the null hypothesis of no long run relationships among the variables is rejected.

4.2 Estimated Short-Run and Long Run Coefficients

Table 4: The ARDL equation (3, 0, 0, 0, 0)

Short Run Coefficients				
	Dependent Variable: PrFI			
Variables	Coefficient	Std. Error	T-statistics	Probability
D(PrFI(-1))	0.684705	0.081819	8.368550	0.0000
D(PrFI(-2))	0.206912	0.081412	2.541533	0.0122
D(PMS)	0.002378	0.000758	3.137203	0.0090
D(AGO)	-0.000967	0.000884	-1.093884	0.2760
D(COILPr)	-0.000838	0.000561	-1.493895	0.1376
D(EXCH)	0.001102	0.000464	2.376569	0.0189
CointEq(-1)	-0.022765	0.005339	-4.264280	0.0000
Long Run Coefficients				
Constant	14.181744	4.575986	3.099167	0.0024
PrPMS	0.066600	0.032550	2.046082	0.0409
PrAGO	-0.042480	0.039425	-1.077494	0.2832
COILPr	-0.036791	0.027488	-1.338408	0.1830
EXCH	0.048426	0.016928	2.860661	0.0049
Diagnostic Tests				
Ramsey RESET test	0.2282			
Serial Correlation LM test	0.0967			
Heteroskedasticity Test (BPG)	0.4422			

Source: Authors computation using E-views 10.0

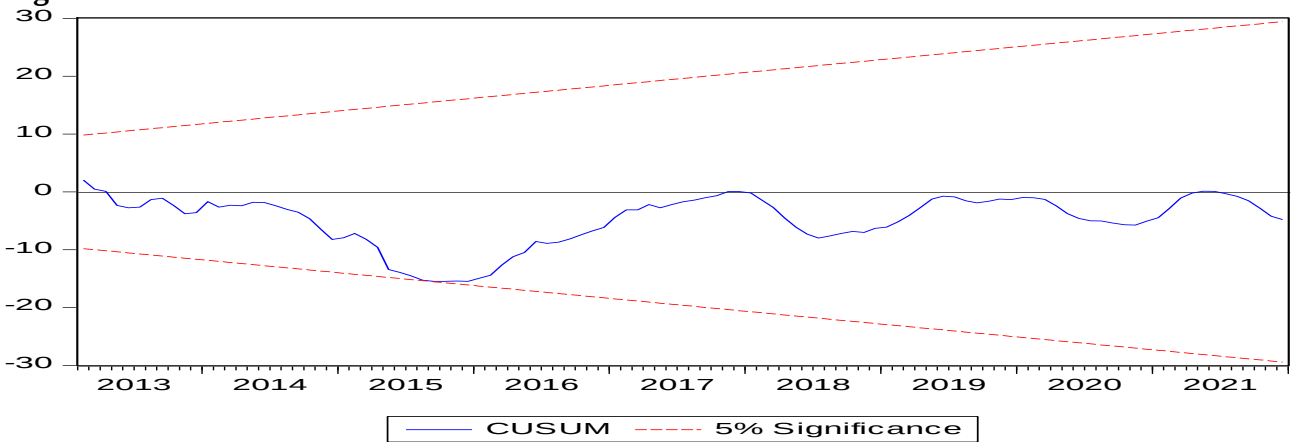
Table 4 revealed the short run and long run results of the study. From the table, prices of PMS and exchange rate have significantly impact on on price of food items at 5% significant level in the short run, while price of AGO is negatively related to price of food items but not statistically significant. The result also show that a percentage increase in prices of premium motor spirit will lead to a 0.23% increase in price of food items in Nigeria in period under review. Moreover, a percentage increase in exchange rate will lead to 0. 11% increase in price of food items in Nigeria. In the long run, when the price of PMS increase by one percent there will be a resultant 6% increase in price of food items in Nigeria; the same is applicable to exchange where a percentage increase in exchange rate will lead to a 4% increase in price of food items in Nigeria.

Thus, both long run and short run results addressed the objective of the study and validated the hypothesis that price of petroleum products and exchange rate have a significant positive impact on price of food items in Nigeria. This result is expected since Nigeria is both an oil exporting and importing country with deficits trade balance, implying that importing refined petroleum products with an increasing exchange rate (depreciating local currency) will increase

the price of refined oil products paid by consumers which have a resultant increase in prices of other items consumed locally including food items. The outcome of this result was supported by the results of (Umar & Umar 2022), (Kanu, Idume, Nwokeiwu, Ugwu, Ikpor & Edeogu, 2019) and (Wale-Awe & Sulleiman 2020). Umar and Umar (2022) reported that a significant and asymmetric positive link between exchange rate and food inflation both in the long-run and short-run. Also, Kanu, Idume, Nwokeiwu, Ugwu, Ikpor and Edeogu (2019) found that prices of automotive gas oil, premium motor spirit and dual purpose kerosene have significant and positive impact on consumer products prices in Nigeria, while (Wale-Awe & Sulleiman (2020) found the price of PMS to increase inflationary tendencies in Nigeria. However, positive impact of price of PMS on price of food items did not agree with (Gummi, Rong, Bello, Umar & Mu'azu 2021) who showed evidence that positive margins in crude oil price reduce the price of food. The paper equally reported that the price of PMS significantly lead to increase in price of food items in Nigeria in the long run, this result is contrary to (Babalola & Salau 2020) who found that that the price of petrol had no significant effect on consumer price in the long run period.

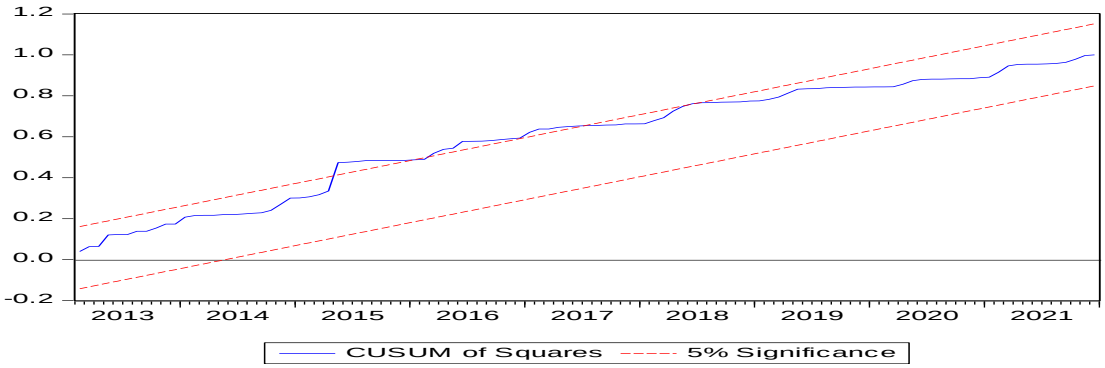
The post-estimation diagnostics indicate that the null hypothesis of no serial autocorrelation is accepted, given the non-statistically significant value of the BG test. Furthermore, the residuals are homoscedastic, as shown by the non-significant BPG test results. Again, the model passes the test for specification bias as indicated by the RESET test statistic where all the probability values are significant, thus implying rejection of the individual hypotheses. Finally, result showed that stability is established as the CUSUM test did not go outside the critical line, only the CUSUM Square did go outside the critical lines with a margin in 2015 but remain on the line thereafter.

Figure 1: CUSUM test at 5%



Source: Authors computation

Figure 2: CUSUM Square test at 5%



5. Conclusion and Policy Recommendation

The paper examined how changes in prices of petroleum products (premium motor spirit and automated gas oil), exchange rate relate with that of food items in Nigeria using monthly data spanning from 2010-2021. The paper found that prices of petroleum products (PMS) and exchange rate significantly and positively impact on food prices in Nigeria both in the short run and long run periods. The paper also found price of AGO not having a significant effect on price of food items in Nigeria. This implies that PMS prices and exchange rate appears to be influential in the rising food prices in Nigeria in recent years, this is not a surprising outcome with PMS widely used across the country for industrial, agricultural, transportation and domestic use. The result also supports the role exchange rate plays in price fluctuations in Nigeria due to the importation of refined petroleum products and most consumable items used in the country.

A major concluding remark is energy prices are expected to rise more globally and locally in the event of a prolonged war between Russia and Ukraine, or additional sanctions on Russia, prices could be even higher than currently anticipated. Also domestic prices of petroleum products are also expected to rise further with the subsidy removal plan of the government in 2023. This implies that, commodity prices especially food prices are expected to rise further in the country. In the light of this, the study recommends that government plan subsidy removal on PMS should be a gradual process instead of a onetime total removal to prevent further hikes in the prices of food items and other commodities in the country. The local refining of petroleum products should be revisited and revamped to boost production and over importations of refined petroleum products for domestic use which will also check exchange rate deprecation. Policies that will reduce continuous rise in exchange in Nigeria should target more on increasing local production generally and reducing the trade deficits

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Appendix

ARDL Bounds Test
Date: 10/24/22 Time: 07:29
Sample: 2010M04 2021M12
Included observations: 141
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	5.305004	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

ARDL Cointegrating And Long Run Form
Dependent Variable: PRFI
Selected Model: ARDL(3, 0, 0, 0, 0)
Date: 10/24/22 Time: 07:30
Sample: 2010M01 2021M12
Included observations: 141

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PRFI(-1))	0.684705	0.081819	8.368550	0.0000
D(PRFI(-2))	0.206912	0.081412	2.541533	0.0122
D(PRPMS)	0.002378	0.000758	3.137203	0.0090
D(PRAGO)	-0.000967	0.000884	-1.093884	0.2760
D(COILPR)	-0.000838	0.000561	-1.493895	0.1376
D(EXCH)	0.001102	0.000464	2.376569	0.0189
CointEq(-1)	-0.022765	0.005339	-4.264280	0.0000

Cointeq = PRFI - (0.0166*PRPMS -0.0425*PRAGO -0.0368*COILPR + 0.0484*EXCH + 14.1817)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PRPMS	0.066600	0.032550	2.046082	0.0409
PRAGO	-0.042480	0.039425	-1.077494	0.2832
COILPR	-0.036791	0.027488	-1.338408	0.1830
EXCH	0.048426	0.016928	2.860661	0.0049
C	14.181744	4.575986	3.099167	0.0024

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.333491	Prob. F(2,131)	0.2200
Obs*R-squared	2.179112	Prob. Chi-Square(2)	0.0967

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.224686	Prob. F(7,133)	0.7005
Obs*R-squared	18.84434	Prob. Chi-Square(7)	0.4422
Scaled explained SS	4.37110	Prob. Chi-Square(7)	0.1000

Ramsey RESET Test
Equation: UNTITLED
Specification: PRFI PRFI(-1) PRFI(-2) PRFI(-3) PRPMS PRAGO COILPR EXCH C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.210598	132	0.2282
F-statistic	1.465546	(1, 132)	0.2282

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.021260	1	0.021260
Restricted SSR	1.936123	133	0.014557
Unrestricted SSR	1.914863	132	0.014507