

PREMIUM MOTOR SPIRIT (PMS) PRICING AND INFLATIONARY DYNAMICS IN NIGERIA

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ABSTRACT

The study examines the effect of PMS pricing on inflationary dynamics in Nigeria between 1980 and 2018. Inflation was used as the dependent variable for the study, while the prices of PMS (Premium Motor Spirit, simply called petrol), AGO (Automotive Gas Oil, simply called diesel), and DPK (Dual Purpose Kerosene, simply called kerosene), as well as the exchange rate, were used as independent variables. The study employed the ARDL and causality techniques for analysis. It was discovered in the study that 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. Thus, the study recommended that the government should stabilise the price of PMS and align it with the wage rate.

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KEY WORDS

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Introduction

In recent decades, oil has been the mainstay of the Nigerian economy and has played a vital role in influencing the economic activities and socio-political affairs of the country (Odularu, 2007). The discovery of crude oil has had both positive and negative effects on the economy. Prominent among the positive effects includes the boost it provides to government revenue and national productivity. For instance, in 2018, crude oil production accounted for about 47.95% of total industrial productivity, 58.06% of total government revenue and 92.6% of total exports in Nigeria (CBN, 2018). On the other hand, the discovery of oil has provided an opportunity for adverse social and environmental conditions such as oil spillage, bunkering

and corrupt practices; this led Klieman (2012), Ross (2015), Benghida (2017) and Moise (2020) to state that oil-producing African countries were under the yoke of the "oil curse" or "natural resource curse". Although agriculture had been considered the cornerstone of the economy before the discovery of oil in 1956, the Nigerian oil industry began to play a prominent role in the economic milieu of the country after the Nigerian civil war in 1970 (Akpaeti, 2018). The oil sector can be categorised into two major activities: upstream and downstream. Upstream activities include the exploration, production and transportation of crude oil and gas to the point where they are transformed into refined products, while downstream activities deal with the

processing of crude oil into refined products, and the distribution and marketing of all the petroleum products to the point of sale to consumers (Aminu and Olawore, 2014). The importance of the oil sector in an economy cannot be over-emphasised. For an economy to run effectively, there must be an efficient and sustainable supply of petroleum products (Aminu and Olawore, 2014). Oil is seen as a major source of energy, and a failure in its supply can cause chaos in the flow of economic activities of a country (Varma et al., 2007). Consequently, its consumption is inevitable, and the demand for it increases as economic activities increase in countries around the world.

In Nigeria, the demand for petroleum has been driven by increases in vehicular traffic, and as private standby power generators serve as an alternative to the inadequate supply of electricity through the national grid. Unfortunately, there exists a paradox in the economy, because fuel scarcity and inflationary tendencies continue to dominate the economy in cycles despite the increasing supply of the product to meet growing demand (Aminu and Olawore, 2014). Furthermore, a noticeable trend in the observation of PMS prices is their persistent and unpredictable increase which does not correspond to global trends, thus leading to inflationary pressures. In the extant literature, there have been few contributions on the impact of PMS pricing on inflationary dynamics. Isaac (2017), Eregha et al. (2015), Orlu (2017), and Olo-mola and Adejumo (2006), among others, considered inflation without considering the causal relations among the variables. Furthermore, certain other variables which are relevant to PMS prices in Nigeria such as Dual Purpose Kerosene (DPK) and the exchange rate were not considered. It is on this basis that this study seeks to provide an answer to the following question: Do the

prices of petroleum products exert a significant effect on general inflation in Nigeria?

1. Literature review

In 1908, a German company called "The Nigerian Bitumen Company" began the search for crude oil in Nigeria. The license granted was for exploration of petroleum at Araromi in the present-day Ondo State. The outbreak of the First World War in 1914 brought a halt to this adventure. The company did not resume operations after the war because of the discouraging results during its operating period. In 1937, Shell D'Arcy was granted exploration licenses covering the entire nation. This adventure was again suspended at the outbreak of the Second World War in 1941, only to resume later in 1946. Shell D'Arcy merged with British Petroleum (BP) to become Shell Petroleum Development Nigeria Limited, which discovered oil in commercial quantities in 1956. The first oil field began production in 1958 yielding 5100 barrels per day (bpd). Oil was discovered later in other areas of both Rivers and Bayelsa States. Shell BP, an Anglo/Dutch company, initially had a monopoly over oil prospecting in Nigeria, but it was later joined by other oil companies such as Mobil, Texaco Overseas, Agip and Gulf (ICAN, 2014).

Nigeria joined the Organisation of Petroleum Exporting Countries (OPEC) in 1971 and established the Nigerian National Petroleum Corporation (NNPC), a state-owned and controlled company, in 1977; it became a major player in both the upstream and downstream sectors (Blair, 1976). The major outputs from petroleum were PMS (Premium Motor Spirit, simply called petrol), AGO (Automotive Gas Oil, simply called diesel), and DPK (Dual Purpose Kerosene, simply called kerosene), while many other plastic, pharmaceutical and synthetic materials sprang up as by-products (Oluwaseyi, 2019).

While the discovery of oil gave an early indication of economic development, it signalled at the same time a danger of grave consequence: oil revenues fuelled already existing ethnic and political tension, which came to a head with the civil war that lasted from 1967 to 1970. As the war commenced, the literature reflected the hostility, the impact, and the fate of the oil industry. Oil was to turn Nigeria into an industrial power and a prosperous country based on its large middle class, but the country had become a debtor nation by the 1980s. The suddenness of the economic difficulties of the 1980s "bust years" had an adverse effect on class relations and the oil workers who understood the dynamics of the industry. As if to capture the labour crisis, writings on oil workers during this period covered many interrelated issues, notably working conditions, strikes, and state labour relations (OPEC Annual Report, 1983).

The theory of inflation was propounded by classical economists and popularised by Keynes (1930). The major tenet of the theory lies in prices responding to a rise in production costs. Keynes (1930) assumed that pressure by trade unions would increase wages, and that business entities, in a bid to combat a decline in income, would increase product/service prices, leading to inflation. In subsequent years, more contributions to the literature such as that of Samuelson (1958) and Solow (1969) discovered that not only can labour cost lead to an increase in price and then inflation, but also an increase in taxes and component costs such as the cost of raw materials and other components used in processing. Therefore, in an industrialised economy where most productive facilities run on oil products as a source of power, an increase in such cost components will lead to an increase in product prices in order to maintain stable profit levels, thus leading to inflation.

Vast numbers of studies as regards the subject matter exist, some of which are reviewed here. In India, Sultan et al. (2020) studied the relationship between oil price and inflation between 1970 and 2017. The study used the VECM technique, revealing that oil price has a positive effect on inflation. Renou-Maissant (2019), while considering eight developed countries between 1991 and 2016, analysed oil price as a determinant of inflation. The study, which used the oil-augmented Philips curve for analysis, revealed that oil prices determine inflation. Mukhtarov et al. (2019) examined the impact of oil prices on inflation in Azerbaijan between 1995 and 2017. Utilising the VECM technique, they concluded that oil prices exert a positive effect on inflation. In Europe, Zivkov et al. (2018) examined the effect of oil price changes on inflation in 11 countries. The study adopted the wavelet-based Markov switching approach, revealing that oil price changes lead to slight increases in inflation. In Nigeria, Isaac (2017) analysed the relationship between the price of petroleum products and inflation in Nigeria between 1980 and 2016. Using the ARDL technique, he discovered that the price of petroleum products has a direct relationship with inflation. However, the study failed to examine the causal relationship between the prices of petroleum products and inflation. Eregba and Mesagan (2017) studied the effect of energy consumption and oil price on the macroeconomic performance of five energy-dependent African countries between 1970 and 2015. Adopting the panel data FMOLS technique, it was revealed that oil price has a negative effect on inflation. Choi et al. (2017) examined the nexus of oil prices and inflationary dynamics in 72 countries between 1970 and 2015. Adopting the Generalised Methods of Moments and the Panel Vector Autoregressive techniques, they revealed that oil prices increase inflation.

In Nigeria, Nwoko et al. (2016) studied the effect of oil price on the volatility of food price between 2000 and 2013. The study used the GARCH and VAR techniques, revealing that oil price increases the price of food in the economy. Eregba et al. (2015) examined the effect of petroleum product prices on inflationary dynamics in Nigeria between 1994 and 2012 using the Ordinary Least Squares technique for analysis, revealing that prices of PMS and AGO have a positive effect on inflation in Nigeria. In Pakistan, Malik (2016) examined the effect of oil price changes on inflation between 1980 and 2013. Using the augmented Philips curve framework, it was discovered that oil price increases inflation. Ocheni (2015) adopted a survey research design approach to evaluate the impact of fuel price increases on the Nigeria economy. The study employed a sample size of 120 persons selected at random as follows: civil servants (18), market men and women (55) and staff in the private sectors (47). The study uses the Pearson product moment correlation coefficient to examine the relationships, revealing that there is a significant relationship between the increases in fuel prices and economic growth in Nigeria. The paper recommended that the Government should retain a fuel subsidy while advancing the rehabilitation of the existing refineries and the construction of the three proposed refineries, so that the fuel subsidy could be removed as soon as these new refineries become operational. Kapusuzoglu and Ulusoy (2015) studied the interaction between oil price and the price of agricultural commodities between 1990 and 2014 around the world. Using the pairwise causality technique, a unidirectional causality running from oil price to agricultural commodity prices was discovered.

Aminu and Olawore (2014) investigated the challenges of distributing PMS in the FCT, Abuja and its environs. The study employed primary data obtained from a sample of 171 respondents at petrol stations in the study area. The study showed that all the independent variables (low refining output, inadequate pipeline infrastructure, pipelines vandalism and rupture and bridging of petrol through road transportation) significantly affect PMS supply and bring about a scarcity of the product in the FCT and its environs. However, the study also inferred that inadequate pipeline infrastructure has the greatest impact on PMS supply. The study concluded that there is a need for massive investment in pipeline infrastructure by means of public-private partnership. In the same vein, Musa (2014) employed the Error Correction Model to explain the short- and long-run dynamics of petroleum in Nigeria between 1980 and 2012. The study revealed that price and income elasticity of demand for petroleum products has a long-run impact on the demand for energy in Nigeria. Because of the short-run fluctuations, the impact of the elasticity on energy demand does not exist in the short run. The study recommends that government should restructure and reposition the power sector and other alternative sources of energy to reduce the demand pressure on petroleum products, which will help to foster future energy security in the country. In Algeria, Bouchaour and Al-Zeaud (2012) studied the effect of oil price distortion on macroeconomic performance. Adopting the VECM technique, it was revealed that oil price increases inflationary tendencies.

Using the OLS regression method, Odu-laru (2007) analysed the relationship between the crude oil sector and Nigerian economic performance. The study reveals that crude oil consumption and export have contributed to the improvement of

the Nigerian economy, and recommends that government should implement policies that would encourage the private sector to participate actively in the crude oil sector. Also, Olomola and Adejumo (2006) investigated the effect of oil price shock on output, inflation, the real exchange rate and the money supply in Nigeria using quarterly data from 1970 to 2003. Using the VAR method to analyse the data, the study inferred that oil price shock does not affect output and inflation in Nigeria. However, it observed that oil price shocks did significantly influence the real exchange rates. The implication was that a high real oil price gives rise to a wealth effect that appreciates the real exchange rate.

On a general note, a review of the earlier contributions revealed that most studies on Nigeria focused on the effect of oil products and their prices on economic growth. However, the few studies which considered the effect on inflation did not examine the causal relationship between the variables, while the influence of the international community on oil was neglected. Aminu and Olawore (2014) used primary data obtained from employees of gas stations in the capital city of Nigeria up to 2012, but this study used data covering the entire industry obtained from the regulator of the industry in Nigeria and the Central Bank of Nigeria and extended coverage to 2018. This study also included causality and exchange rate effects.

2. Methods

The study adopts an economic approach in analysing the relationship between PMS Price and inflationary dynamics in Nigeria from 1980 to 2018. A descriptive analysis was conducted to reveal the relationship between the variables. An econometric approach of the Auto Regressive Distributed Lag modelling and Pairwise Causality techniques were adopted to test for the

relationship between the variables. The study made use of time series annual data from 1980 to 2018 extracted from the Nigerian Oil and Gas Industry Annual Reports and CBN Statistical Bulletins. The data was analysed using the E-Views 9 statistical package.

Model Specification

The objective of the study is to investigate the relationship between PMS Price and crude oil price in measuring the inflationary dynamics in Nigeria. Hence, the model formulated for the study was adopted from the study of Eregha et al. (2015); this model, which now includes the exchange rate as one of the dependent variables, is stated below as:

$$INF = f(PMS, AGO, DPK, EXGR) \quad (3.1)$$

$$INF = \alpha + \beta_1 PMS + \beta_2 AGO + \beta_3 DPK + \beta_4 EXGR + \varepsilon \quad (3.2)$$

Where:

INF = Inflation Rate

PMS = Price of Premium Motor Spirit

AGO = Price of Automotive Gas Oil

DPK = Price of Dual Purpose Kerosene

EXGR = Exchange Rate

α = constant

β = the degree of variability or slope of each independent variable

ε = error term.

Estimation Techniques

Unit Root Test

Ordinarily, time series data are prone to non-stationarity which may generate spurious results. As a result, it is essential that Unit Root Tests are conducted to ascertain the Stationarity of data. Thus, the Augmented Dickey Fuller URT, as developed by Dickey and Fuller (1981), was utilised.

Auto Regressive Distributed Lag (ARDL)

The ARDL technique bounds testing approach to cointegration, developed by Pesaran and Shin (1999), is preferred to the Johansen and Juselius (1990) approach to cointegration because it can handle low power problems. Furthermore, the ARDL approach is preferred for long-run analysis. The ARDL analysis is accompanied by various diagnostics or post-estimation tests such as the serial correlation and heteroscedasticity tests, among others.

Pairwise Causality Test

One major shortcoming of the ARDL is that it fails to provide evidence on the direction of causality between the variables. The pairwise causality test, developed by Granger (1969), was used to determine the causal direction between variables. This may end up as either unidirectional or bi-directional.

3. Results

Descriptive Statistics

Table 1 above revealed that inflation is higher than petroleum prices on average, as depicted by their mean values, while the standard deviation revealed that the Automotive Gas Oil (diesel) price has the highest deviation. Meanwhile, the skewness showed that all variables are negatively skewed, except for inflation, which means that all variables except inflation are concentrated on the right tail side of the distribution graph because the left tail was longer. Thus, it means that their respective mean values are lower than their median values, except for inflation. Also, Kurtosis revealed that all variables are normal and platykurtic. This is corroborated by the Jarque-Bera statistic which has a probability value pointing to normal distribution within the data set.

Table 1. Descriptive analysis

Statistics	INF	PMS	AGO	DPK	EXGR
Mean	2.685334	2.258343	2.297538	1.900405	3.421653
Median	2.542084	3.100052	2.994481	2.859336	4.577650
Maximum	4.288203	4.976734	5.347108	5.393628	5.723847
Minimum	1.683102	-1.897120	-2.207275	-2.207275	-0.494255
Std. Dev.	0.701099	2.426058	2.525727	2.420742	1.972463
Skewness	0.835472	-0.535187	-0.390599	-0.436934	-0.764307
Kurtosis	2.780458	1.655397	1.667034	1.674505	2.280094
Jarque-Bera	4.497068	4.676622	3.779523	3.990919	4.520297
Probability	0.105554	0.096490	0.151108	0.135951	0.104335
Sum	102.0427	85.81702	87.30645	72.21539	130.0228
Sum Sq. Dev.	18.18699	217.7730	236.0340	216.8198	143.9526
Observations	38	38	38	38	38

Source: Own elaboration.

Table 2. Pre-Estimation Test (ADF Unit Root Test)

Variables	Critical Values @ 5%	ADF T-Stat.	Prob. Value	Integration Order
INF	-2.9411	-3.4064	0.0169	I(0)
PMS	-6.5139	-2.9434	0.0000	I(1)
AGO	-2.9458	-5.8098	0.0000	I(1)
DPK	-2.9434	-5.8792	0.0000	I(1)
EXGR	-2.9458	-5.1649	0.0001	I(1)

Source: Own elaboration.

The Augmented Dickey Fuller Unit Root Test revealed that all variables except inflation were stationary at first difference. On the other hand, inflation was stationary at

level. The need for an ARDL bounds test will require the optimal lag length selection criteria.

Table 3. Optimal lag length selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-170.8803	NA	0.015939	10.05030	10.27250	10.12701
1	-57.96641	187.1145*	0.000107*	5.026652	6.359808*	5.486857*
2	-38.42038	26.80599	0.000160	5.338307	7.782426	6.182017
3	-6.958112	34.15903	0.000143	4.969035*	8.524116	6.196249

Note: * connotes the appropriate lag length as determined by each criterion

Source: Own elaboration.

The lag selection criteria as determined by the Akaike Information Criteria (AIC) se-

lected 3 as the appropriate lag length for the ARDL analysis.

Table 4. ARDL Bounds Test

Model	F-Statistics	No. of Regressors (k)
INF = $\hat{f}(PMS, AGO, DPK, EXGR)$	65.1943	4
Critical Value Bounds		
Level of Significance	Lower Bound I(0)	Upper Bound I(1)
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source: Own elaboration.

The ARDL Bounds test revealed that a long-run relationship between the variables exists, as the value of the F-Statis-

tics is greater than the upper bounds at all level of significance.

Table 5. ARDL Long Run Result

Variable	Coefficient	T-Statistics	Prob.
PMS	0.615836	3.172425	0.0037
AGO	-0.529197	-2.213374	0.0352
DPK	-0.401342	-1.371808	0.1810
EXGR	0.336521	1.734923	0.0938
C	2.133617	5.316655	0.0000

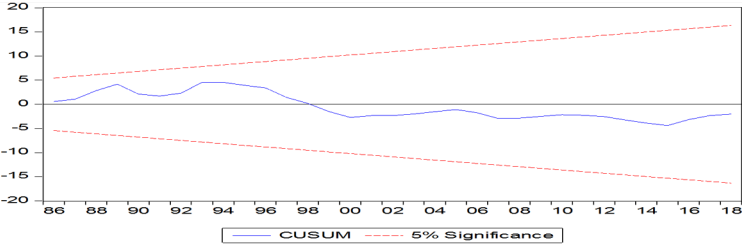
Source: Own elaboration.

Table 5 presented the ARDL result revealing that the price of Premium Motor Spirit has a significant and positive effect on inflation to the tune of 0.6158 units. This implies that a unit increase in PMS pricing will spur inflation by 0.6158 units. Also,

AGO (diesel) and DPK (kerosene) pricing exert a negative effect on inflation to the tune of 0.5292 and 0.4013 units respectively. This implies that a unit increase in AGO and DPK pricing will reduce inflation by 0.5292 and 0.4013 units respectively.

On the other hand, the exchange rate was found to be positively related to inflation to the tune of 0.3365 units. This connotes that an increase in the exchange rate will spur inflation by 0.3365 units. However, PMS and AGO pricing were found to be the only significant variables.

Table 6. ARDL Post Estimation Diagnostics

Serial Correlation Test		Heteroscedasticity Test		Normality Test	
Statistics	Prob.	Statistics	Prob.	JB Statistics	Prob.
0.3084	0.7373	1.3237	0.2726	1.4958	0.4734
					

Source: Own elaboration.

The post-estimation diagnostics revealed that the model has no problems of autocorrelation, heteroscedasticity, instability or abnormal data distribution as presented by the various diagnostics tests. Moreover, the CUSUM test revealed that the model has no problem of instability, as the CUSUM line falls in between the 5% critical bands.

Table 7. Pairwise Causality Test

Direction	F-Stat.	Prob.
PMS flows to INF	1.8225	0.1780
INF flows to PMS	0.5439	0.5858
AGO flows to INF	1.6686	0.2045
INF flows to AGO	2.2759	0.1191
DPK flows to INF	1.1610	0.3260
INF flows to DPK	1.2501	0.3001
EXGR flows to INF	0.7914	0.4622
INF flows to EXGR	2.7131	0.0821

Source: Own elaboration.

Table 7 revealed that no causality between PMS pricing and inflation exists. This implies that PMS pricing does not determine the changes in prices (i.e. inflation).

4. Discussion

The ARDL result revealed that PMS pricing has a significantly positive effect on inflation. This result is in line with the theoretical expectation and conforms to the cost push inflation theory. This result implies that an increase in the price of PMS

will definitely lead to an increase in the rate of inflation in Nigeria. This is borne out in practice: the price of petrol drives the price of products and services in the country. First, the power supply in the nation is inconsistent; as such, the productive sector of the country relies on PMS to fuel their power generators, and this has led to an increase in production costs which subsequently increases the price of goods and services. Also, the transport system thrives on PMS, meaning that an increase in the

price of PMS leads to an increase in the cost of transportation. Thus, transportation as an aid to trade significantly affects the prices of commodities because commuters will add the increased cost of transport to the prices of their commodities. This is equally in line with the empirical discovery of Renou-Maissant (2019), Isaac (2017) and Eregha et al., (2015).

On the contrary, the price of DPK (kerosene) and AGO (Diesel) were found to cause a fall in inflation. This implies that an increase in the price of DPK and AGO will reduce inflation. This may be because most producers of goods and services in the economy use less kerosene and diesel compared to PMS which is used in production and transportation. Nevertheless, the causality result revealed that PMS has no causal relationship with inflation. This denotes that PMS and inflation do not determine changes in the behaviour of the other.

Conclusions

The price of petroleum products has been discovered to affect the prices of other commodities within the Nigerian economy. More specifically, an increase in the price of PMS also plays a major role in increasing the price level in Nigeria. This is because the Nigerian economy still thrives on petrol in terms of fuel for power through generators due to poor electricity supply as well as fuel for vehicles for transportation of humans, goods and services. Furthermore, there exists an economic incongruity as regards the increase in demand for PMS which should stimulate the economy and drive down inflation; rather, it led to a persistent increase in inflationary tendencies. Moreover, there is an absence of alignment between the Nigerian PMS price and global standards despite its status as an oil-producing country. It is on this basis that this study investigated the impact of

PMS pricing on inflationary dynamics in Nigeria between 1980 and 2018.

The study used the inflation rate as the dependent variable and the prices of PMS, DPK and AGO as well as the exchange rate as the independent variables while making use of ARDL and causality techniques. The study revealed that PMS pricing exerts a significant and positive effect on inflation, implying that PMS pricing increases inflation in Nigeria. Nevertheless, the causality test revealed that PMS pricing has no causal relationship with inflationary dynamics in Nigeria. Therefore, the study recommends that the Nigerian government should try as much as possible to stabilise the price of PMS within the country to protect the country from vagaries in price and instability in micro and macro-economic planning. Also, the fixing of the PMS price should be proportionate to the wage rate to ensure that the PMS price does not become a heavy burden on the people. Furthermore, the pricing of PMS should be done to reflect the movement of prices of the product in the international markets: it should not be used to stabilise the fortunes of government. However, a focus on PMS price stabilisation should be preferred to wage rate indexing with the PMS price, as the latter may equally lead to cost-push inflation if not properly checked.

In summary, this study contributes to the extant literature by providing causal evidence on the effect of PMS pricing on inflationary dynamics in Nigeria. The study revealed the absence of causality between PMS pricing and inflationary dynamics; this implies that changes in the behaviour of PMS pricing will not determine changes in the behaviour of inflation. However, the study was limited to the Nigerian economy using the ARDL and causality techniques only. Therefore, as a possible direction for future research, the Sub-Saharan region as well as other oil-producing economies can be considered

in replicating this research. Another area of emphasis is the comparison of the behaviour of inflation in reaction to changes in oil prices between two oil-producing nations or amongst many OPEC countries.

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