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Modelling Exchange Rates and PMS Prices Impact on Inflation in Nigeria (1985-2020): A Regression Analysis

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ABSTRACT

On the rise in Premium Motor Spirit (PMS) prices and cash rates, a conventional least squares analysis was used to determine the relationship between the respondent variable, inflation, and the explanatory variables, PMS price and exchange rate. According to the results, as evidenced by the conventional least squares regression, the PMS price and money rate were significant drivers of inflation, accounting for about 88% of the fluctuation in inflation. Additionally, the Breusch-agnostic test revealed that the residuals of the direct regression model were not heteroscedastic, and the ACF and PACF tests revealed that the error terms did not have autocorrelation. The Jarque-Bera ordinariness test was used to express the perceived background noise as normal. As demonstrated by the findings, the increase in the price of PMS and the decline in the value of the Naira influenced Nigerian inflation. Finally, based on the research econometric outcomes and interpretations, the study discussed the policy implications of these findings and offered recommendations. For future work, research should be conducted on energy transition and efficiency.

1. Introduction

Oil is an essential component of both industry and transportation. As a result, production costs and consumer prices follow the same path as oil prices. Furthermore, volatility in oil prices may have a short-term impact on overall production if firms postpone investment decisions due to uncertain economic conditions or expenses associated with resource reallocation procedures [1]. Nigeria is rich in natural resources, with crude oil products making for a large share of the total. On a macroeconomic level, the petroleum sector contributes a significant portion of the country's foreign revenue and employs a considerable portion of the workforce [2]–[4]. Furthermore, the considerable increase in oil earnings has had a significant impact on Nigeria's foreign relations, with oil politics frequently taking center stage in the country's recent history of international relations. On the other

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hand, it has been established that the ongoing volatility of crude oil prices on the global market has an impact on Nigerian macroeconomic indices [5]. Since Nigeria's economy is dependent on a single source of foreign currency, crude oil exports have historically been the main source of revenue. As a result, the volatility of crude oil prices will have an impact on the stability of the economy's macroeconomic indexes. The cost of production of foreign enterprises has been found to be influenced by fluctuations in crude oil prices, and because Nigeria is import-dependent, an increase in crude oil prices raises the cost of imported goods, which is then passed on to domestic pricing via an increase in the overall price level.

The government has regulated petroleum prices since 1973, when the government took over the domestic market from private oil businesses [6]. Petroleum products should theoretically be priced in Nigeria using worldwide crude oil prices because the marginal supply (liters) is imported, and therefore, the import price should be reflected. In other words, the economic price of importing the marginal unit of consumption should be equal to the import parity price. This has not always been the case for several reasons, not the least of which is socio-political in nature [7]. Given that the marginal supply (liters) is imported, the pricing of petroleum products in Nigeria should theoretically be set by the global crude oil price. Three factors, according to their study, affected the government's position.

One of the government's purposes in protecting the poor from the effects of rising prices. The second reason is that industrial production costs must be decreased since energy products are key inputs in manufacturing processes. The risk of increased energy prices resulting in inflation is the third argument. Both oil-producing and oil-consuming governments routinely intervene in the market to affect product pricing. The level of such involvement is determined by the country's particular demands and the value of the product. Furthermore, it should be noted that the price of crude oil is not the only cost associated with the production and distribution of petroleum products; other expenditures such as refining, shipping, and distribution are incurred. In the forefront is the import price. In other words, the economic price of importing the marginal unit of consumption should be equal to the import parity price [8]. This has not always been the case, for several reasons, not the least of which is socio-political in nature.

Many scholarly disputes in Nigeria about the causes of inflation are mostly economic in nature. As a result, monetary policy has usually focused on controlling monetary aggregates, a stance driven in part by the idea that inflation is primarily a monetary issue. The practice of regulating inflation through monetary policy appears to have persisted for a long time. It is critical to examine the impact of the ongoing increase in Premium Motor Spirit (PMS) prices and the currency rate on Nigeria's inflation rate. One of the study's merits is its applicability to the Nigerian economy, which strengthens the study's claim. Since the study's goal is to illustrate the multiplier effect that increases in domestic PMS and currency value have on the economy's products and services, supply management has been investigated [9], [10]. This research contributes to the theoretical and empirical findings. The improvements implemented are more likely to provide more favorable empirical outcomes. This study serves as a starting point for further exploration. Furthermore, this research shows the Central Bank of Nigeria (CBN) and policymakers that frequent price increases in petroleum items are a major driver of inflation in Nigeria. As a result, the duty to do such constant study in an economy has become as prominent in public conversation as any other economic problem.

The goal of the investigation was to perform a scientific review of [11], which ignited the investigation. According to Afolabi in the late 90s, when PMS prices rose and the value of the Naira fell in Nigeria, the entire price level of goods and services rose virtually instantly, as did the overall price level of the economy [11]. Previous studies investigated the relationship between the PMS price, the currency rate, and inflation, but their findings were limited to international crude oil prices, which had no direct impact on domestic expenditure and were therefore excluded from this study

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[12], [13]. A novel aspect of this study is that it employed a linear regression model to analyze the impact of the local price of PMS and the exchange rate on inflation in Nigeria.

This research aimed to look at the impact of PMS pricing and currency rates on inflation in Nigeria, with a focus on the following goals in mind. First, to display the variable summary statistics. Second, to create a linear regression model based on the data. Third, to ensure that the fitting mode is adequate

Nigeria's oil industry is vital to the country's economy. In 2006, Uwakonye, Osho, and Anucha published that it created the most foreign exchange profits, accounting for more than 90% of total foreign exchange earnings and the entire amount necessary for national growth at all socioeconomic and political levels [14]. Most of the Nigerian crude oil is sold unprocessed, and when refined, it yields a wide range of products, from gasoline to heavy liquids used in road tarring. In Nigeria, rises in the price of petroleum products have increased inflation, a high cost of living, and an unequal distribution of income [5], [15], [16]. Nigeria witnessed the formation of several racial groupings between 1980 and 2021. Even though the increase in 2020 resulted from a worldwide market shock induced by the COVID-19 epidemic, the government voiced alarm [17]. When petroleum product prices were raised twice yearly between 1990 and 2007, most of the increase occurred between 1990 and 2007 [16]. Since 2016, petroleum commodities, particularly premium motor spirit, have been exposed to considerable upward revisions. However, the hike in 2020 was tied to worldwide market shock, and the tainted gasoline crisis has lately rocked Nigerian marketers. The country's product and service price fluctuation has been one of the most significant repercussions. When the price of oil products rises, it has an impact on transportation, commodity prices, and other services [11], [16], [18], [19]. A linear regression model was used in the study to examine the influence of changes in the price of PMS and the exchange rate on inflation in Nigeria.

A variety of considerations must be taken into consideration when creating predictive regression models. The first is modeling adequacy, which refers to the ability of the independent variable to account for the variability of the dependent variable [20], [21]. The coefficient of determination (R2), which is defined as the proportion of variance explained by the independent variable in the dependent variable, is usually utilized to determine it. Although a high R2 score is almost always a reliable measure of a model's ability to fit the data, the unexplained fluctuation in the residuals, which can occasionally contain vital information, is typically ignored [22], [23]. Some assumptions concerning the distribution of error terms must be made for linear regression models to be effective [24]–[27]. When some assumptions of the linear regression model are violated, the residuals reflect this in the data. Model flaws can be discovered using residual analysis. Many diagnostic techniques are based on the evaluation of model residuals to establish whether the regression assumption has been broken. Reference [28] defines model adequacy or diagnostic evaluation as integrating all relevant information, indicating no substantial departure from statistical assumptions when calibrated to the data. The residual analysis and overfitting techniques are two ways to analyze the adequacy of a model [28].

The term "relative residuals" refers to the difference between the true value of a period series and the normal value predicted by a fitted applicant model. They are crucial in determining if a model has captured all data associated with the information. The premise of free residuals is critical for determining the model's suitability. Additionally, if the residuals of a model are related, the model should be adapted to accurately reflect the quantifiable relationship between the evaluated components [29]. Additionally, if the residuals are truly uncorrelated, a model is acceptable in this case, the Breusch-Pagan heteroscedasticity test, and the Jarque-Bera ordinariness test were frequently used to measure model ampleness, which is primarily concerned with ensuring that the residual series are autonomous [30].

Previous research has emphasized the intricate relationship between inflation, fuel prices, and exchange rates. Changes in exchange rates and PMS prices have an impact on inflation. However,

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there is still little research on the dynamics of these interactions in the context of Nigeria, making a thorough model diagnostic approach necessary. Also, an economy's purchasing power, investment choices, and economic stability are all impacted by inflation, a crucial macroeconomic indicator. It is essential for policymakers to comprehend the causes of inflation to execute efficient monetary policies. Exchange rates and PMS prices are two important variables that might affect inflation in Nigeria. In this study, the effect of these variables on inflation in Nigeria over a 35-year period were modeled and evaluated.

2. Methodology

The methodology used were subdivided into subunits: data collection method tag as data method, data analysis method (flow chart).

2.1. Data

The data was collected from the CBN secondary source, and the assessment based on this work utilized annual data on expansion, the price of premium motor spirit, and the exchange rate from 1985 to 2020. The data extracted from the CBN statistics bulletins; the scope of this paper is within the data collected from Nigeria based on CBN records at https://www.cbn.gov.ng.

2.2. Data Method

This study sought to determine the influence of premium motor spirit pricing and currency exchange rates on Nigerian inflation. The CBN made annual data on the exchange rate of the Nigerian Naira versus the US dollar, inflation, and the price of PMS available to this research. The study used the analytical programming E-views and Gretl to examine secondary data from 1985 to 2020 (Version 1.10.1-64). This period was chosen by the researcher because data was available, and the researchers wanted to update their work on assessing the influence of PMS prices and currency rates on inflation.

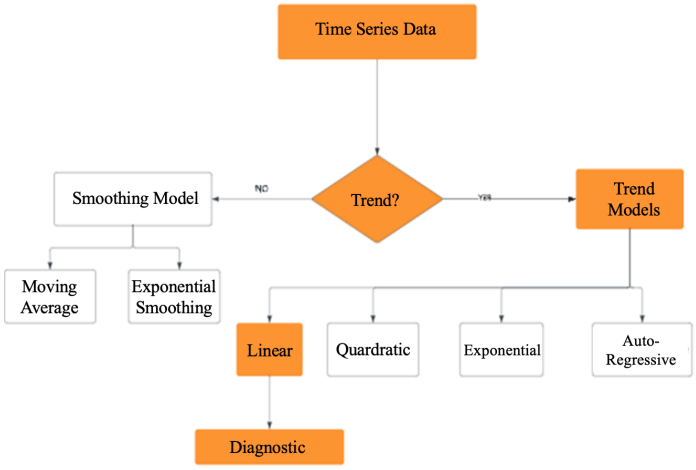

Fig. 1 Method flowchart [30]–[33].

The proposed method was based on the time-series data science method, as shown in Fig. 1. The steps in the diagnostics test included data collection, cleansing and treatment of missing values, it also included data analysis, which encompassed visual plots, residual plots, and testing for serial correlation (specifically, the absence of multicollinearity). Subsequent process involved, determining variance homoscedasticity, residual normalization, model fittings, followed by conclusion.

2.3. Model

According to [31] a conventional regression model is defined as follows:

$$y_t = \emptyset_0 + \emptyset_1 X_{1,t} + \emptyset_2 X_{2,t} + \ldots\ldots\ldots\ldots + \emptyset_n X_{n,t} + \varepsilon_t$$

Simple form of (1) is in (2).

$$y_t = \emptyset_0 + \sum_{i=1}^{n} \emptyset_i X_{i,t} + \varepsilon_t \quad (1)$$

where y_t denotes the response (dependent) variable, $\emptyset_i$ denotes regression parameters, $X_{i,t}$ denotes explanatory (independent)t variables, and ε_t denotes error term which is white noise form. Thus, in a time series regression model with independent variables, the dependent variable is a linear combination of independent factors recorded during the same period as the dependent variable. The least squares estimation method can be used to generate estimates of the model parameters in (1).

2.4. Estimate of Linear Regression Coefficients using OLS Method

The algorithm for least square procedure uses the criterion that the solution must give the smallest possible sum of squared deviations of the observed from the estimates of their true means provided by the solution. Let numerical estimates of the parameters be $\widehat{\emptyset}_0$ and $\widehat{\emptyset}_1$ respectively, and let

$$\hat{y}_t = \widehat{\emptyset}_0 + \widehat{\emptyset}_1 \hat{X}_t \quad (2)$$

Assume that y_t is the predicted mean for each X_t , $t = 1,2, \ldots \ldots \ldots n$.

The least squares principle chooses $\widehat{\emptyset}_0$ and $\widehat{\emptyset}_1$that minimize the sum of squares of residuals, Sum of Squares Error (SSE) denoted by $(\sum_{t=1}^{n} {\varepsilon_t}^2)$

$$\sum_{t=1}^{n} {\varepsilon_t}^2 = [\sum_{i=1}^{n} (y_t - \hat{y}_t)^2] \quad (3)$$

where ${\varepsilon_t}^2 = y_t - \hat{y}_t$ denotes the *i*th observation's observer residuals.

Also, we can express in terms of y_t, X_t, $\widehat{\emptyset}_0$ and $\widehat{\emptyset}_1$. Consequently, (4) is obtained.

$$\varepsilon_t = [y_t - \emptyset_0 - \emptyset_1 X_t] \quad (4)$$

Equations (3) and (4) yield (5).

$$\sum_{t=1}^{n} {\varepsilon_t}^2 = [\sum_{i=1}^{n} (y_t - \emptyset_0 - \emptyset_1 X_t)^2]. \quad (5)$$

Taking partial derivative of SSE with respect to the regression constant $\emptyset_0$, we have

$$\frac{\partial(\sum_{t=1}^{n} {\varepsilon_t}^2)}{\partial \emptyset_0} = \frac{\partial(\sum_{i=1}^{n} (y_t - \emptyset_0 - \emptyset_1 X_t)^2)}{\partial \emptyset_0}. \quad (6)$$

With some subsequent rearrangement, the estimate of $\emptyset_0$ denoted by $\widehat{\emptyset}_0$ is obtained as

$$\widehat{\emptyset}_0 = \left[\left[\frac{\sum_{t=1}^{n} y_t}{n}\right] - \emptyset_1 \left[\frac{\sum_{t=1}^{n} X_t}{n}\right]\right] \quad (7)$$

Taking partial derivative of (5) with respect to the regression coefficient$\emptyset_1$, we have

$$\frac{\partial(\sum_{t=1}^{n} {\varepsilon_t}^2)}{\partial \emptyset_1} = \frac{\partial(\sum_{i=1}^{n} (y_t - \emptyset_0 - \emptyset_1 X_t)^2)}{\partial \emptyset_1} \quad (8)$$

By rearranging (8), the value for $\widehat{\emptyset}_1$ can be determined.

$$\widehat{\emptyset}_1 = \left[\frac{\sum_{t=1}^{n} y_t X_t - \left[\frac{(\sum_{t=1}^{n} y_t)(\sum_{t=1}^{n} X_t)}{n}\right]}{\sum_{t=1}^{n} {X_t}^2 - \left[\frac{(\sum_{t=1}^{n} X_t)^2}{n}\right]}\right] \quad (9)$$

If the Ordinary Least Squares (OLS) conditions are met, the evaluations in (7) and (9) can be used to fit the forecasting model [31]–[34].

3. Results and Discussion

In this section, the results of this work are presented, and the purpose of this section is to demonstrate the effect of the exchange rate and the cost of PMS on inflation in Nigeria using annual

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data on inflation, exchange rate, and cost of PMS in Nigeria, as well as to evaluate the model through analytic tests. The index contained data from 1985 to 2020. The programming software Gretl and E-Views were used to conduct quantitative examinations.

3.1. Data Summary and Statistics

Table 1 shows the information's outline dimensions. This graphic displays the mean, median, maximum, and minimum characteristics of the components, as well as their standard deviation, skewness, kurtosis, interquartile reach, and certainty span (CI).

Table 1. Summary Statistics of the Variables

Variable	Mean	Median	Minimum	Maximum
Exchange rate	111.88	119.57	0.89000	358.80
PMS price	55.345	36.500	0.20000	165.70
Inflation	19.158	12.155	5.3800	72.840
Variable	Std. Dev.	C.V.	Skewness	Ex. Kurtosis
Exchange rate	100.17	0.89534	0.78469	-0.12506*
PMS price	55.199	0.99736	0.70943	-0.92454*
Inflation	17.694	0.92361	1.7425	1.6944
Variable	5% Perc.	95% Perc.	IQ range	Missing obs.
Exchange rate	1.6210	314.68	134.57	0
PMS price	0.36575	156.45	96.500	0
Inflation	5.6690	59.520	9.0325	0

Source: Researcher's computation from Gretl (2021)

The table above demonstrates that the mean and median upsides of all components were within their maximum and minimum qualities, implying a high degree of consistency across the factors examined. In comparison to a standard spread, the skewness was positive (0 for ordinary appropriation). The kurtosis was negative, marked by an asterisk (*) in Table 1, except for inflation, which was positive. The existence of slight kurtosis establishes that none of the three series is leptokurtic (fat tail). Additionally, Table 1 indicates that the switching scale had a base value of 0.89 and a maximum value of 358.8. The cheapest PMS was N 0.2, while the most expensive was N 165.7.

3.2. Variables Trends

The trend can be shown in Fig. 2, Fig. 3, and Fig. 4 using lines and alphabetic marks.

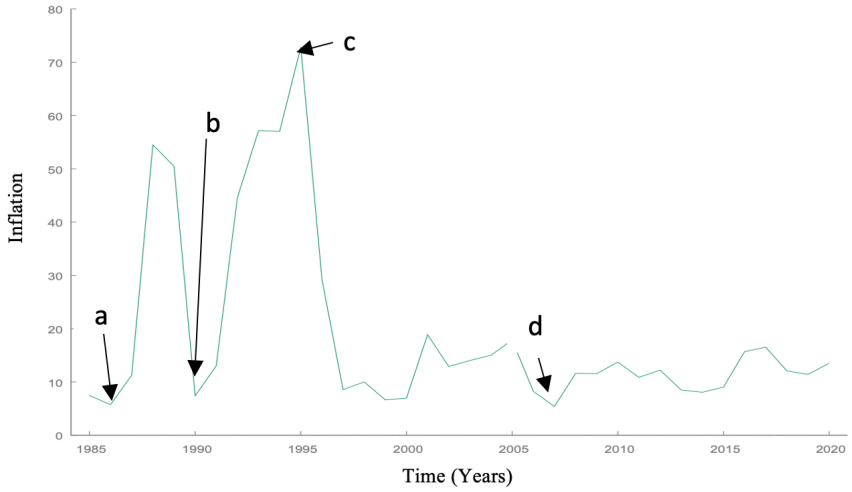

Fig. 2 Graph of Nigeria inflation from 1985–2020.

With the data and the graphical representation in Fig. 2, the zigzag movement of inflation in Nigeria indicates changes in inflation in Nigeria. Inflation was at low as value 8 in the year 1985 at position marked a, the trend increased in 1994 and drastically decreased to value below 10 in 1990 marked as b. It also went back to its position in1993 and then rose to value 78 in 1997 marked as c, which was the highest inflation experienced by Nigeria in 1985 until 2020. Then, the inflation again fell drastically to value less than 10 pointed as d. The lowest inflation occurred from 2000 to 2008, despite its low fluctuations from 1997 to 2020.

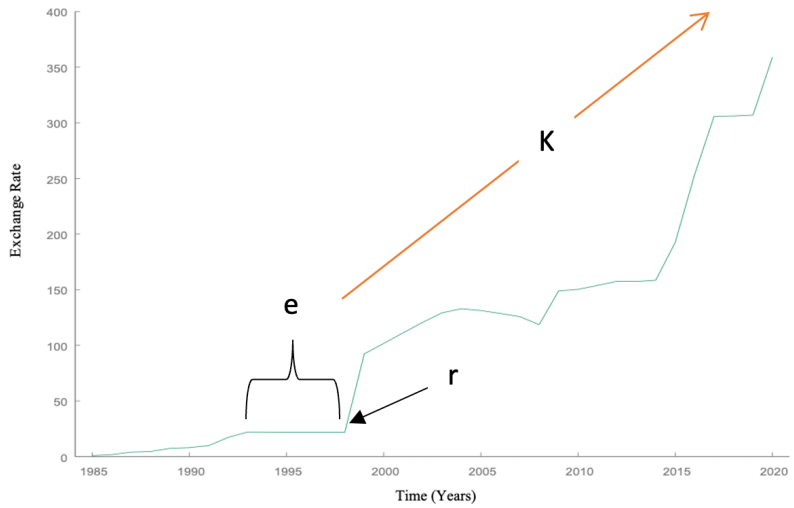

Fig. 3 Graph of Nigeria exchange rate from 1985–2020.

The zigzag movement of the currency rate against the US dollar in Nigeria demonstrates variation of the exchange rate from 1985 to 2020, as seen in the data and graphical representation in Fig. 3 with K arrow direction and Fig. 4.

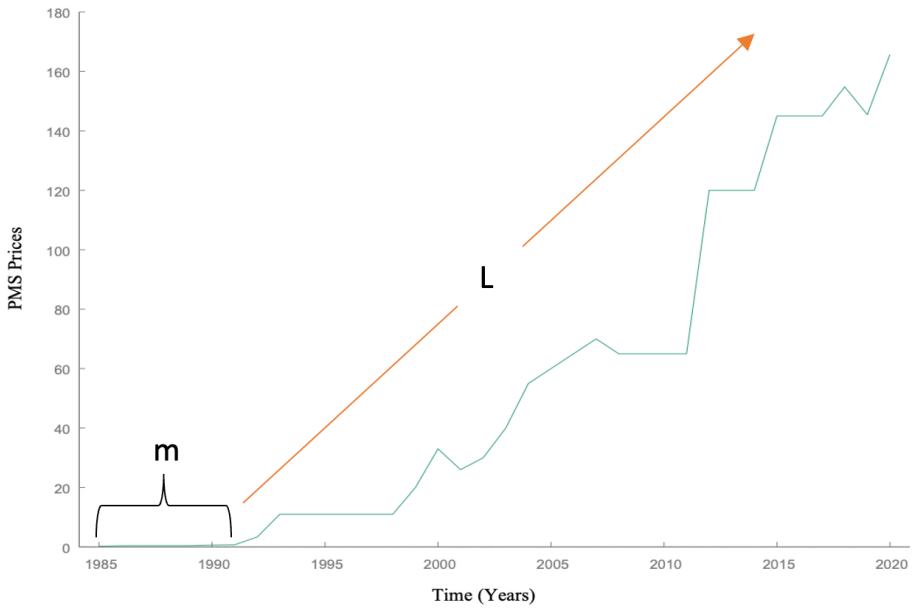

Fig. 4 Graph of price of PMS from 1985–2020.

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This figure shows that from 1985 through 1990 tag as e, the pricing remained steady at this period. It began to climb in 1992 at point marked r, remained relatively constant from 1985 to 1991 interval tag m, and then began to rise again in 1998 till 2020 with some noise as we can notice from arrow L.

3.3. Estimates

Table 2 summarizes the estimates for the variables, together with their standard errors, T values, and P values.

Table 2. Estimates from Linear Regression Models

L R Model	Breusch-Pagan Result			
	Estimates	***S. E***	***T-Value***	***Prob.***
Intercept	26.5143	4.2700	6.209	0.004951
Exchange rate	0.27966	0.04734	5.907	1.42
PMS price	0.2766	0.03757	7.258	3.03

Source: Researcher's Computation in EViews (2022)

Table 3 shows the outcomes of the model's goodness of fit test, which was used to evaluate the model's validity in relation to the hypotheses.

Table 3. Model Fitness

Inf. Model	Goodness of fit test		
	Calculated Values	***R-Square***	***Prob.***
F Statistics	88.22	0.88	0.000013

Source: Researcher's Computation in Eviews (2022)

Equation (10) represents a linear regression model used to forecast inflation using the exchange rate and the price of PMS as predictor variables. The intercept term, often known as the constant term, had a value of 2.65143. When both the exchange rate and the PMS price were zero, it showed the projected level of inflation. A zero-exchange rate and PMS price, though, might not make much sense in this situation. Coefficient 0.279663 showed that, while holding the PMS price constant, the model forecasted an increase in inflation of 0.279663 units for every unit increase in the exchange rate. This suggested that the inflation rate was forecast to rise by about 0.28 units when the exchange rate rose. As for the PMS price component, with a steady exchange rate, the model's coefficient of 0.2766 indicated that for every unit increased in the PMS price, it forecasted an increase in inflation of 0.2766 units. It implied that, assuming the exchange rate stayed the same and the price of PMS increased by one unit, the inflation rate was anticipated to increase by roughly 0.28 units.

Overall, this regression equation shows a link to an increase in the anticipated inflation rate. The degree to which the currency rate and with respect to their respective coefficients (0.279663 and 0.2766), PMS price on inflation is represented.

$$Inflation = 2.65143 + 0.279663\ exchangerage + 0.2766\ PMS\ Price. \quad (10)$$

As shown in Table 2, all independent variables were significant, as the exchange rate ($1.42\times10^{-0.6}$) and the PMS price ($3.03\times10^{-0.8}$) had p-values less than the 5% significance level and account for nearly 88% ($R^2 = 0.8832$) of the variation in inflation. Additionally, as indicated in Table 2, the p-value ($1.3\times10^{0.5}$) associated with the F-statistics (88.22) was less than the 0.05 level of significance, showing that the independent factors have a cumulative effect on the dependent variable's variance. As illustrated in Table 3, the observed data was distributed normally in contrast to the alternative hypothesis (Ha): There is a deviation from the distribution in the observed data. For a significance level of 0.05 (α), the threshold points lead to rejecting the null hypothesis. A high R2(0.823952) indicated that the model fit the data well. It was not, however, the primary criterion for evaluating a model's efficacy when used to make conclusions. Certain assumptions about the distribution of error

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terms must be established to ensure the correct operation of linear regression models. For example, if the assumptions of variance homogeneity, normality, and multicollinearity or serial correlation are violated, the OLS become inefficient and no longer has the lowest variance in a category of unbiased estimation techniques and thus is not BLUE. In addition, the traditional error term estimation method becomes incomplete and the conventional equation for the OLS estimators of predicted value variance becomes incomplete. As a result, the standard technique for estimating the variance of regression coefficients using OLS is equally skewed.

3.4. Model Diagnostic

Fitting the regression model is only the first stage of regression analysis due to the model's reliance on specific assumptions. Diagnostics for regression models to validate model assumptions were based on hypothesis tests to test serial correlation, variance homoscedasticity, and residual normalization.

3.4.1. Model Diagnostic Testing for Serial Correlation and Multicollinearity

The autocorrelation function (ACF) and partial autocorrelation function (PACF) of the residuals (PACF) were plotted to analyze serial correlation in the model. There was no serial correlation if the ACF and PACF lagged of the fitted model's residuals were both 0. In comparison, if the ACF and PACF components had significant coefficients, a serial correlation existed in the model's residuals. As illustrated in Fig. 5, all correlations are contained inside the threshold constraints, implying that the model's residual lacks serial correlation.

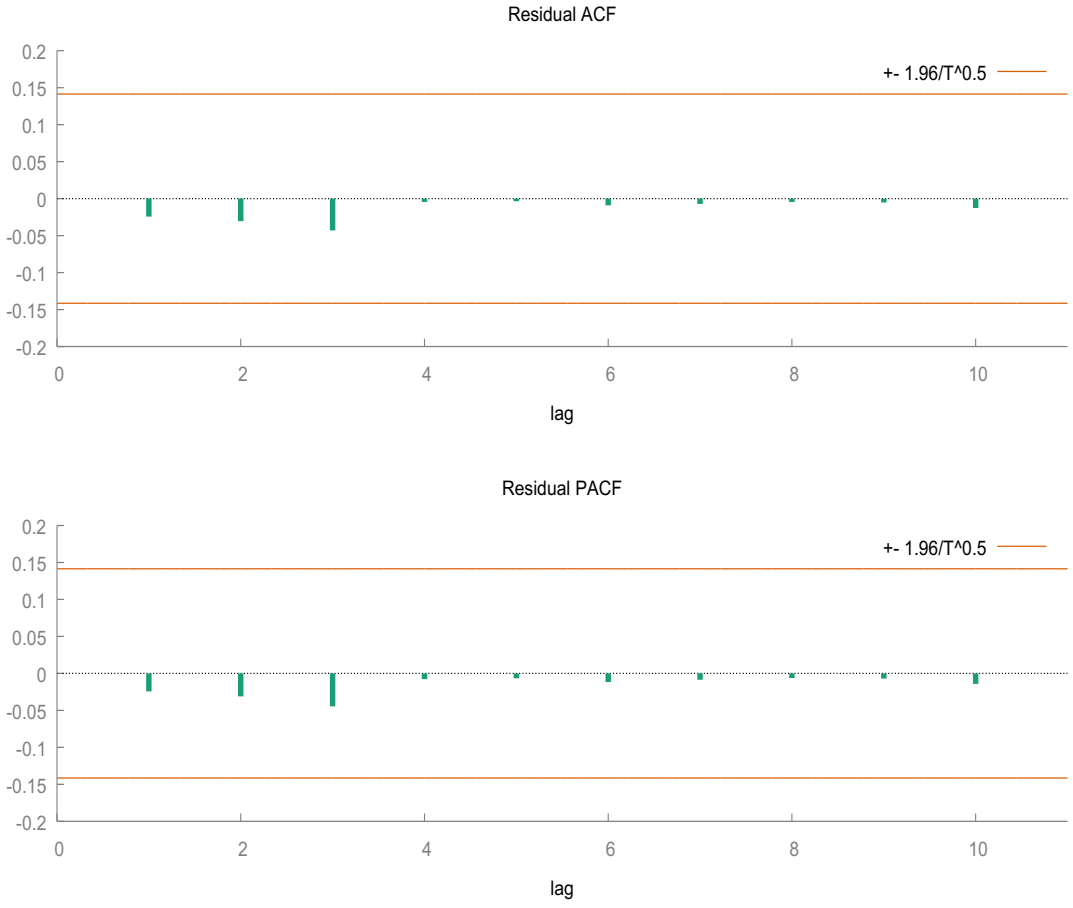

Fig. 5 Correlogram of the linear regression model.

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3.4.2. Homoscedasticity Diagnostic Testing

The Breusch pagan test was utilized to test for heteroscedasticity in the model's residuals. Table 4 uncovers that the assessed consequence of p-esteem (0.0851) for the test measurement (0.909862) was more than the 0.05 significance level, supporting the model's absence of heteroscedasticity. Therefore, the supposition of homoscedasticity is not penetrated.

Table 4. Breusch-Pagan Result for Heteroscedasticity Test

Heteros. Test	Breusch-Pagan Result		
	Calculated Values	***D.F***	***Prob.***
F Statistics	14.8417	F(2,32)	0.0000
Observed R^2	0.90986	Chi-Square (2)	0.0851

Source: Researcher's Computation in Eviews (2022)

3.4.3. Model Diagnostic for the Residual's Normality

In Fig. 6, the p-value (0.5815) relating to the Jarque-Bera test (4.0470) was more prominent than customary worth of level of importance, which is alluring because the errors are normally distributed and the presumption of ordinariness of the error is not abused.

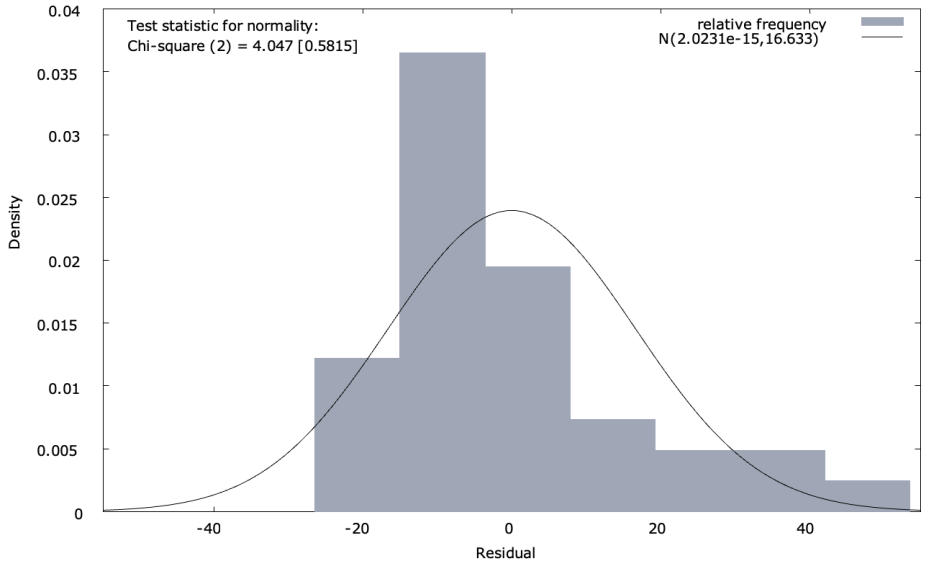

Fig. 6 Jarque-Bera histogram normality test.

According to the findings of our analysis, the price of PMS and the exchange rate have a statistically significant impact on Nigeria's inflation rate.

Table 5. Diagnostics Tests

Diagnostic Test	Test Tool	Prob.	Fulfilled
Outliers	Plots	-	No
Linearity	Plots	-	Yes
Homoscedasticity	F Statistics	-	Yes
Normality	Breusch-Pagan/Plot	0.0000	Yes
Observed R^2	Value of R^2	0.88	Yes
Serial correlation/Multicollinearity	ACF & PACF Plots	< 0.005	No
Goodness of fit	Chi-Square Test	0.000013	Yes

Source: Researcher's Computation & Plots (2022)

Table 5 shows model diagnostic examination results which indicated a validated inflation prediction model using PMS and exchange rate as exogenous variables. Diagnostic techniques were

used to assess the model's performance and underlying assumptions. Through meticulous analysis of residuals, verification of normality and homoscedasticity, identification of multicollinearity, homoscedasticity detection of outliers, and assessment of model fit, the validity and reliability of the inflation modelled regression model were ascertained. The trends of PMS pricing and exchange rates in Nigeria, as well as graphs and percentages were used to analyze PMS prices and exchange rates. It was established that PMS prices in Nigeria significantly increased from 1985 to 2020, while the value of the Naira depreciated considerably against the US Dollar throughout this timeframe. The analysis uncovered a significant positive correlation between the price of PMS and inflation. It implies that an increase in the price of PMS leads to an increase in inflation. PMS is seen as pervasive since almost everyone benefits from its use. Individuals who use public transportation and turn on the generator will see a change in the PMS price. When the price of a product rises, so do transportation charges, resulting in higher inflation as market women shift the burden of higher transportation costs to end users. Furthermore, the study found that exchange rates positively affected inflation. Increases in the exchange rate, such as those seen recently, lead to higher prices for goods and services, which significantly impacts the Nigerian economy since the country imports almost everything made to the point that Nigeria currently imports toothpicks. Since our staple items, such as rice, are primarily imported, an increase in the exchange rate will harm the Nigerian people.

4. Conclusion

The study indicated that PMS price rises benefited the Nigerian economy's inflation rate. PMS has a cascading impact on the prices of other goods and services in the nation. Between 1985 and 2020, the usage of PMS was more than doubled. This research study employed a model diagnostic approach to comprehensively analyze the relationship between exchange rates, PMS prices, and inflation in Nigeria. The findings contribute to a deeper understanding of the dynamics and offer valuable economic policy formulation and decision-making insights. The model's remarkable accuracy of 88% demonstrates its robustness and potential for a wide range of uses and its diagnostic strength as it passed almost all test sets for this purpose. This result revealed that Nigeria's currency rate was a significant predictor of inflation. Since Nigeria is an importer, Nigeria's fluctuation influences the country's economy. This country's industrial sector also relies heavily on imports. Nigerians spend significant money on imported items, particularly technological devices such as phones. The exchange rate fluctuation destabilizes this country's economy. It has resulted in a considerable increase in domestic use of PMS, which has now exceeded supply by a wide margin. The four local refineries are not operating at full capacity due to factors such as product smuggling to neighboring countries and intentional hoarding. These factors have led to an increase in product prices, which in turn has caused a rise in the prices of other goods and services despite government subsidies in the prices of some of these products. Future work might concentrate on bolstering its resilience against real-world noise, testing its adaptability to various datasets, and investigating methods of optimizations to enhance the model's cross-domain practical usefulness.

The following recommendations are made considering the study's findings. Since the price of PMS influences the cost of other goods and services in the nation, the government should continue subsidizing their prices as it will stabilize the cost of other products and services and lower Nigeria's inflation rate. Not only will it reduce the initial expenses of exporting the goods, but it will also provide more job opportunities domestically. The government should ensure that current refineries operate at maximum capacity and construct new ones; this will enable existing refineries to fulfill Nigerians' domestic PMS demands while producing some excess for export and strategic reserve product needs. It is achievable when the nation's refineries' turn-around maintenance processes are centralized and transparent. In addition, the government should establish a rigid and strict policy that penalizes persons who smuggle, hoard, and create artificial scarcity of petroleum goods, as well as black marketers of petroleum products, to earn abnormal profits at the expense of the entire country. To avoid an avoidable crisis, the government should always communicate with labor unions, trade

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unions, and the business sector before increasing the price of petroleum products, which are crucial to the cost of production and the well-being of the country's citizens. On the other hand, alternative Renewable energy sources should be developed and deployed. Additionally, more significant research should be encouraged in Nigeria and throughout Africa since this may decrease the price of PMS and lower inflation. Increased agricultural investment, or, better yet, diversification of the Nigerian economy, is essential to containing the Nigerian currency rate's volatility. It will result in an increase in exports and a strengthening of our balance of payments. Future studies can align with the energy transition and efficiency in African countries.

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