

Crude Oil Importation and Exportation in Nigeria: An Exploratory and Comparative Study

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Abstract—Nigeria is an oil producing country and crude oil is an important asset to its economy. This research focuses on the analysis of importation and exportation of crude oil products (measured in million barrels). Comparisons between the total importation and exportation were made and descriptive analysis was performed on the crude oil components. Poisson regression was used to establish the relationship between total importation and the importation of the petroleum products under consideration. The results show that Nigeria makes more importation than exportation of these products.

Keywords—crude oil; exploratory data analysis; exportation; importation; Nigeria

I. INTRODUCTION

Crude oil, often called unrefined petroleum, is a natural product. Just like other mineral resources, petroleum is found through drilling. Crude oil is processed through distillation and produces several other components. Table I shows the various components of petroleum and their boiling point [1]. These components are useful as transportation fuel, road tarring materials, paints, cosmetics and so on. Various works on crude oil production especially in Nigeria are contained in [2-4].

TABLE I. CRUDE OIL COMPONENTS [1]

Components	Boiling Point
Fuel gas, LPG, refinery gas	Below 25°C
Gasoline-petrol	25°C-75°C
Naphtha	75°C-190°C
Paraffin, kerosene	190°C-250°C
Diesel oil, gas oil	250°C-350°C
Residue (fuel oil, lubricating oil, waxes)	>350°C
Bitumen	500°C-700°C

This research makes comparison between the importation and exportation of these products in Nigeria. Crude oil is found in several countries, but Nigeria is one of the countries that

extract light and sweet oil, otherwise known as brent crude oil.

II. MATERIALS AND METHDOS

The data presented in this article represent the amount of imports and exports of crude oil products in Nigeria from 1986 to 2010. Total importation and exportation of crude oil, importation and exportation of kerosene, motor gas, jet fuel, distillate fuel and liquefied petroleum gasses were taken into consideration. The data was obtained from [5]. Descriptive analysis was performed and Poisson regression model was fitted to the importation datasets. Total importation was the dependent variable while importation of kerosene, motor gasoline, jet fuel, distillate fuel oil and liquefied petroleum gasses were the independent variables. The software used in dataset analyzing was Minitab 17. The Poisson regression model is of the form:

$$E(Y) = t \exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k) \quad (1)$$

where β_0 is a constant and $\beta_1, \beta_2, \dots, \beta_k$ are the regression coefficients. For the present study, Y is the total importation, X_1, X_2, X_3, X_4 and X_5 are the importation of kerosene, motor gasoline, jet fuel, distillate fuel oil and liquefied petroleum gasses respectively. Analysis contained in [6-8] can be used to analyze the dataset.

III. RESULTS

The summary of the data used is provided in Tables II and III. It is clear that Nigeria imports more than what it exports. Specifically, the highest importation regards motor gasoline while the highest exportation is for distillate fuel oil (among the considered variables). The lowest importation is for liquefied petroleum gasses while the lowest exportation is for kerosene.

TABLE II. CRUDE OIL IMPORTATION, 1986-2010 (MILLION BARRELS)

Variable	Sum	Mean	Standard Deviation	Skewness	Kurtosis
Total Importation	2190.4	87.6	66.0	0.27	-1.50
Kerosene	243.60	9.74	8.74	1.14	0.92
Motor gasoline	1588.9	63.6	51.7	0.27	-1.69
Jet fuel	101.630	4.065	4.951	1.01	0.11
Distillate fuel oil	153.51	6.14	8.66	1.44	0.64
Liquefied petroleum gasses	5.60	0.224	0.2886	1.05	0.01

TABLE III. CRUDE OIL EXPORTATION, 1986-2010 (MILLION BARRELS)

Variable	Sum	Mean	Standard Deviation	Skewness	Kurtosis
Total Exportation	591.66	23.67	17.79	0.64	0.13
Kerosene	9.841	0.394	1.145	4.76	23.28
Motor gasoline	14.192	0.568	1.413	4.01	17.33
Jet fuel	15.309	0.612	1.832	4.31	19.75
Distillate fuel oil	99.00	3.96	5.80	2.92	10.66
Liquefied petroleum gasses	23.429	0.937	1.669	1.95	3.11

The comparison between total importation and total exportation between 1986 and 2010 is provided in Figure 1. The comparisons between importation and exportation of kerosene, motor gasoline, jet fuel, distillate fuel oil, and liquefied petroleum gasses for the period under study are presented in Figures 2, 3, 4, 5, and 6 respectively.

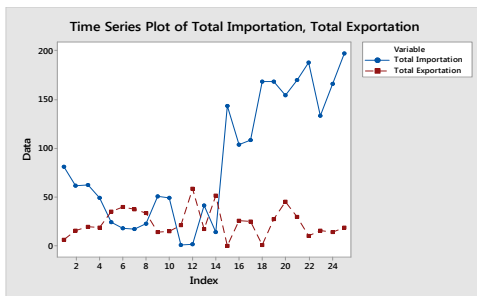


Fig. 1. Comparison between total importation and exportation of crude oil

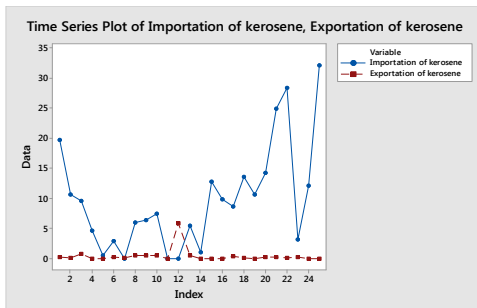


Fig. 2. Comparison between importation and exportation of kerosene

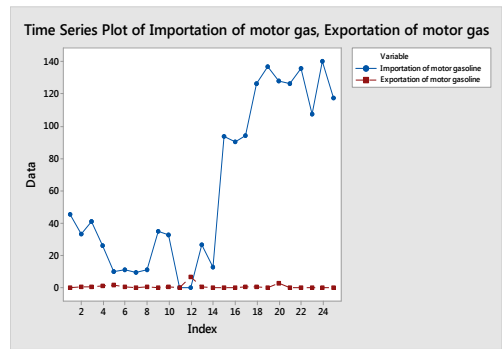


Fig. 3. Comparison between importation and exportation of motor gasoline

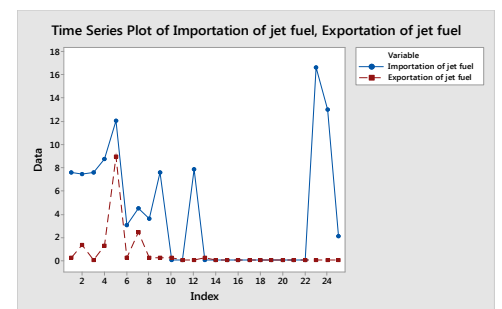


Fig. 4. Comparison between importation and exportation of jet fuel

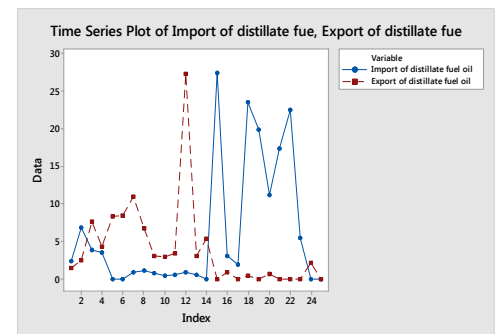


Fig. 5. Comparison between importation and exportation of distillate fuel oil

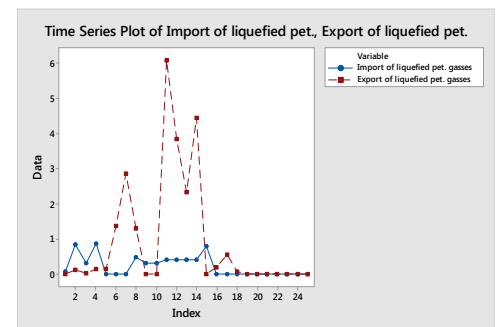


Fig. 6. Comparison between importation and exportation of liquefied petroleum gasses

- Poisson Regression Analysis

The Poisson regression equation is obtained as:

$$Y' = 1.124 + 0.02239X_1 - 0.01535X_2 - 0.0214X_3 - 0.0044X_4 + 0.067X_5 \quad (2)$$

where, Total importation equals $e^{(Y')}$. The coefficients with the associated standard errors are presented in Table IV. The result for the deviance is provided in Table V and the model summary for the deviance is provided in Table VI. The results for the goodness of fit test are provided in Table VII.

TABLE IV. REGRESSION COEFFICIENTS

Terms	Coefficient	Standard Error	VIF
Constant	1.124	0.225	
Importation of kerosene	0.02239	0.00381	13.15
Importation of motor gasoline	-0.01535	0.00605	17.98
Importation of jet fuel	-0.0214	0.0169	1.40
Importation of distillate fuel oil	-0.0044	0.0100	2.50
Importation of liquefied pet. gasses	0.067	0.347	2.22

TABLE V. DEVIANCE TABLE

Source	DF	Adj. Deviation	Adj. Mean	Chi-Square	P-Value
Regression	5	136.049	27.2099	136.05	0.000
Importation of kerosene	1	34.209	34.2095	34.21	0.000
Importation of motor gasoline	1	6.589	6.5888	6.59	0.010
Importation of jet fuel	1	1.643	1.6430	1.64	0.200
Importation of distillate fuel oil	1	0.189	0.1889	0.19	0.664
Importation of liquefied pet. gasses	1	0.038	0.0375	0.04	0.846
Error	19	56.831	2.9911		
Total	24	192.881			

TABLE VI. MODEL SUMMARY FOR DEVIANCE

R-square	Adj. R-square	AIC
70.54%	67.94%	155.17

TABLE VII. GOODNESS OF FIT

Test	DF	Estimate	Mean	Chi-Square	P-Value
Deviance	19	56.83119	2.99112	56.83	0.000
Pearson	19	50.22589	2.64347	50.23	0.000

IV. CONCLUSIONS

Datasets on importation and exportation of petroleum products have been studied in this paper. The conclusion was that the amount of total importation was greater than the respective amount of total exportation in Nigeria. The bulk of the importation is on motor gasoline while the bulk of the exportation is on distillate fuel oil. There is a negative linear relationship between total importation and variables X_2 , X_3 , and X_4 (importation of motor gasoline, importation of jet fuel and importation of distillate fuel oil respectively). The results of the Poisson regression provided regarded only importation

of petroleum products, further research can include analysis on the exportation of these products.

ACKNOWLEDGMENT

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