INTERNATIONAL CRUDE OIL PRICE VOLATILITY AND THE PERFORMANCE OF THE NIGERIAN NATIONAL PETROLEUM CORPORATION OF NIGERIA

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ABSTRACT

This work evaluated the international crude oil price volatility and the performance of the Nigerian National Petroleum Corporation of Nigeria. The specific objectives were to evaluate the extent of the effects of world crude oil supply, world crude oil demand, domestic Premium Motor Spirit (PMS) prices, and International Crude Oil Price volatility on the performance of the Nigerian National Petroleum Corporation. The study adopted an ex post facto research design. The data employed in this research work consist mainly of secondary data relevant to the study and were sourced from published sources. The research work was a census study, using the NNPC companies selected as the basis for making inferences about the population. Secondary data collected were analysed using Descriptive Statistics and Correlation Analysis. The posited hypotheses were tested for significance using Logistic Regression, linear regression with a single univariate variable, Multivariate regression analyses, Correlation analyses, T-Tests, and logistic regression. The findings showed that all proxies of the independent variable (World Crude Oil Supply, World Crude Oil Demand, International Crude Oil Price, and Domestic PMS Prices) had significant effects on the performance of the Nigerian National Petroleum Corporation, proxied by profitability. World Crude Oil Demand and Domestic PMS Prices had the highest significance on the profitability of NNPC. The study recommended, amongst others, that NNPC should ensure that the quality of Nigeria's crude oil is of premium quality and the official selling price should be market-reflective to attract enough demand and that the deregulation of the PMS market already announced by the Government should be fully implemented to ensure that the market forces determine the accurate domestic price of PMS and eventually eliminate all the issues surrounding subsidies and under-recoveries.

Keywords: Oil price volatility, Performance, NNPC, Crude oil

INTRODUCTION

Crude oil is perhaps one of the most important internationally traded commodities, given its influential role in the world economy, especially its ability to provide energy to homes, industries, hospitals, schools, etc., and its significant effects on other sectors of national economies. Crude oil is a mixture of hydrocarbons that exists in the liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. Crude oil is a naturally occurring fossil fuel that comes from the remains of dead organisms.

Since the 1970s, oil price volatility has also spurred interest among academics, policymakers, and practitioners in studying its relationship with economic activity. The term "price volatility" refers to the fluctuations in the price of a commodity. Therefore, high levels of volatility reflect extraordinary characteristics of supply and/or demand. Oil price volatility depends on the combined effects of both invariant and variable factors. Invariant factors include feedstock prices, exploration costs, drilling costs, the chemical composition of oil, production costs, distribution costs, marketing costs, and packaging and storage costs. In contrast, the variable factors include global economic activity, production levels, consumption levels, the US Dollar exchange rate ($), current supply and demand, geopolitical factors, weather-related developments, and political events. Supply factors have played a more critical role than demand factors in driving the 50% decline in oil prices between mid-2014 and early 2015.

The Nigerian National Petroleum Corporation (NNPC) is Nigeria's national oil company (NOC), established in 1977 with the sole objective of monitoring the stake of the oil-producing companies in the exploitation of its resources (NNPC Act). Subsequently, multinational Oil Companies were mandated to operate under Joint Operating Agreements (JOA), which specified the respective stakes of the companies and the Nigerian Government. It was also set up to participate directly in all aspects of the petroleum industry through equity holdings in oil companies and the acquisition of technology by indigenes. The NNPC was designed to be an 'expert' in the industry. The

NNPC supports the government in achieving its goals of rapid industrial and commercial development of the country.

The global oil and gas industry was hard hit by volatility in oil and gas prices, demand destruction, and a weak global economic outlook, significantly affected by the COVID-19 pandemic. The outbreak of the deadly pandemic marked the year 2020, Coronavirus (COVID-19). This led to fluctuations in both the prices of petroleum products and crude oil. The consequent high volatility in international oil prices had significant impacts on oil companies.

It was becoming apparent that Nigerian producers could not cope with the Saudis in the market. Investment in oil fields was becoming less attractive as companies could start to face liquidity problems, making production difficult. For many operators in the industry, crude oil prices were approaching the cost of production per barrel. This led to the Federal Government's decision to review the 2020 budget and the Medium-Term Expenditure Framework for 2020-2022. The revised budget with a new benchmark of $25 per oil barrel, a target production rate of 1.94 million barrels per day and then an exchange rate of N360 to $1, amounts to N10.5 trillion, a difference of about N71.5 billion when compared to the initial approved budget (Akinpelu, 2020).

Nigeria is highly vulnerable to internal and external oil price shocks in all aspects of the economy. The mono-product structure of the economy is heading Nigeria nowhere, particularly as the country's "sweet crude is turning sour". Furthermore, from the breakdown and critique above, it is evident that the impact of the volatility of the international crude oil prices will have far-reaching implications on the Nigeria economy as it will lead to job losses and layoffs, and if nothing is done quickly to bolster the sector will lead to more drastic loss of revenue and continuous cuts in our national budgets and which will increase more hardship on the populace.

The motivation for this study stems from the fact that, as Africa's largest economy and the continent's top crude oil producer, Nigeria is consistently the worst hit by crude oil price volatility in the international market. As crude oil plays a significant role in global economic activity, understanding its price volatility is of paramount importance. For

risk managers, oil price volatility affects hedging and the assessment of projects whose cash flows are influenced by the expected commodity price. Long-term uncertainty in future oil prices can alter the incentives to develop new oil fields in producing countries. This can also hinder the implementation of alternative energy policies in consuming countries. The significance of addressing these gaps underscores the need for this research.

Objectives of the Study

The main objective of this study is to determine the effect of the international crude oil price volatility on the performance of the Nigerian National Petroleum Corporation of Nigeria from 2015 to 2020.

The specific objectives are to:

- **Evaluate** the extent of the effect of the world crude oil supply on the performance of the Nigerian National Petroleum Corporation in Nigeria.
- **Investigate** the extent to which global crude oil demand affects the performance of the Nigerian National Petroleum Corporation.
- **Analyse** the effect of the domestic Premium Motor Spirit (PMS) prices on the performance of the Nigerian National Petroleum Corporation in Nigeria and
- **Evaluate** the effect of the International Crude Oil Price volatility on the performance of the Nigerian National Petroleum Corporation in Nigeria.

LITERATURE REVIEW

This section comprises conceptual, theoretical, and empirical reviews that expose the models used in related works.

Conceptual Review

Crude Oil Prices: Crude oil prices measure the price of various barrels of oil. The price of oil influences the costs of other production and manufacturing across economies. For example, there is a direct correlation between the cost of gasoline or aeroplane fuel and the price of transporting goods and people. A drop in fuel prices means lower transport costs and cheaper airline tickets. The volatility of oil prices is inherently tied to the low responsiveness or "inelasticity" of both supply and demand to price changes in the short run. Both oil production capacity and the equipment that uses petroleum products as its primary energy source are relatively fixed in the near term.

International Crude Oil Price Volatility: Volatility is the frequency and magnitude of price changes (Amadeo, K., 2021). It measures how wildly they swing and how often they move higher or lower. These can be the prices of just about anything. It refers to the degree to which prices fluctuate. It is not directly observable and is estimated from the price change. The term "price volatility" refers to the fluctuations in the price of a commodity. Volatility is measured by the day-to-day percentage difference in the commodity's price. The degree of variation, not the level of prices, defines a volatile market. Volatility provides a measure of price uncertainty in markets. When market prices change significantly over a relatively short period, the market is said to be highly volatile.

Organisational Performance: The traditional paradigm in performance evaluation emphasises financial measures as drivers of organisational performance. This paradigm has, of late, come under criticism from academics and practitioners for failing to capture essential aspects of corporate performance when wealth creation is associated with intangible and non-financial resources in dynamic markets. Critics of traditional measures advocate for performance indicators aligned with the company's strategy

(Elena-Iuliana, 2016). The emergent paradigm in performance evaluation emphasises combining financial and non-financial measures. Non-financial measures such as customer satisfaction, operating efficiency, productivity, and innovation are touted as the panacea for addressing some of the weaknesses of traditional measures. Non-financial measures are, by themselves, uncontroversial.

The content of this definition is found in the work of the author Matei, L. (2006) and is graphically represented in the following figure:

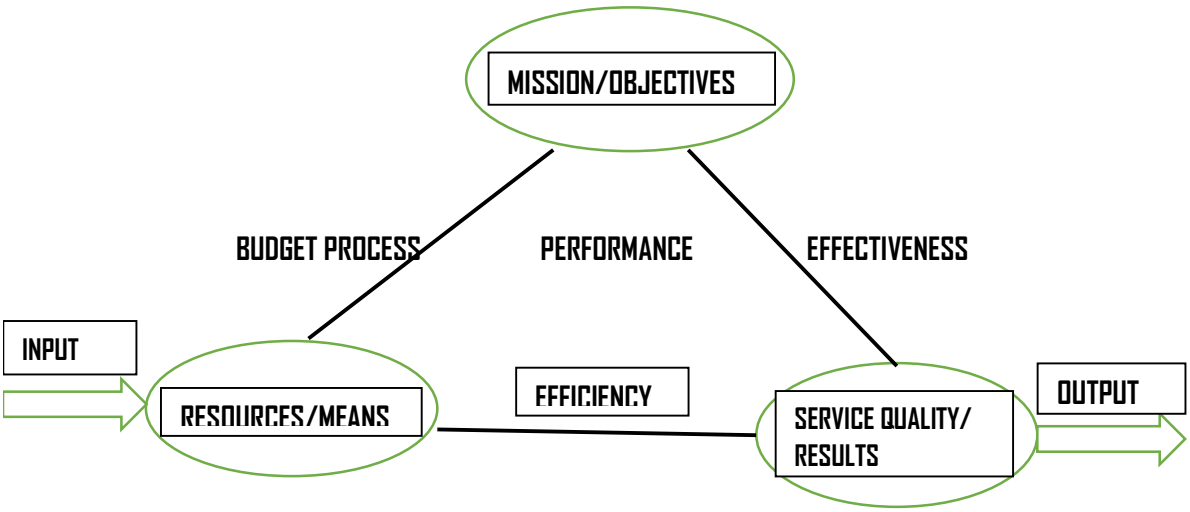


Figure 2.2 Definition of Performance

Source: Matei, L., Management public (Public Management) – Second Edition, Economic Publishing House, Bucharest, 2006, page 192.

Empirical Review

The Empirical review exposes the models used in earlier related empirical works. Shuddhasawtta et al. (2009) empirically examine the impact of oil price volatility on key macroeconomic indicators of Thailand. This followed the work of Andersen et al. (2004), which showed how oil price volatility is measured using realised volatility (RV). The impact of the oil price volatility is investigated using the vector autoregression (VAR) system. The Granger causality test, impulse response functions, and variance decomposition indicate that oil price volatility significantly affects macroeconomic

indicators, such as unemployment and investment, over the period from 1993Q1 to 2006Q4. The empirical results from the Granger causality test indicate that there is a unidirectional causal relationship running from oil price volatility to investment, the unemployment rate, the interest rate, and the trade balance over the entire data period. The study revealed that the relationship between oil price volatility and economic indicators is short-term. A VAR for the post-crisis period shows that the impact of oil price volatility is transmitted to the budget deficit. The floating exchange rate regime introduced after the crisis may be the key contributor to this new channel of impact.

Salisu and Fasanya (2013) conducted a study on Modelling oil price volatility with structural breaks across two prominent markets, namely West Texas Intermediate (WTI) and Brent. They analysed oil price volatility using the two recently developed unit root tests, namely the Narayan and Popp (2010) (NP) test and the Liu and Narayan (2010) (LN) test, both of which allow for two structural breaks in the data series while modifying the LN (2010) to account for leverage effects in oil price. They found two structural breaks reflecting a major global oil market crisis, with evidence of persistence and leverage effects in oil price volatility.

Yue-Jun (2013), in his study on Speculative trading and WTI crude oil futures price movement: An empirical analysis, empirically studied the influence of speculators' positions on WTI crude oil futures returns. The results indicate that, first, the instantaneous feedback of speculators' position changes on crude oil price returns is statistically significant and dominates the linear relationship between them during the sample period. However, speculation does not appear to be a significant driver of crude oil price movement in the lead-and-lag sense. Second, the contemporaneous influence of speculators' positions on oil price shows evident linearity but weak nonlinearity. Third, when oil prices have high (low) volatility, non-commercials' position changes may exert a significant (insignificant) linear shock on oil price returns. And whether crude oil price stays in high or low volatility, the nonlinear influence does not appear significant. Finally, the linear influence appears symmetric when crude oil prices rise and fall, but the nonlinear influence shows an asymmetric pattern; neither the linear

nor the nonlinear influence is symmetric when crude oil prices exhibit high and low volatility.

Salah (2016) researched the effects of oil price shocks on the economies of the Gulf Co-operation Council countries. The empirical method used is the nonlinear cointegrating autoregressive distributed lag (NARDL) model, in which short- and long-run nonlinearities are introduced via positive and negative partial sum decompositions of the explanatory variable(s). The results suggest asymmetries in all cases. The research found significant positive oil price changes in all cases, with the expected positive sign, implying that increases in oil prices led to increases in real GDP. Conversely, negative oil price changes are significant for only Kuwait and Qatar, with the expected positive sign suggesting that decreases in oil prices led to decreases in their real GDP. Further panel-data analysis showed that positive oil price changes increase real GDP, while negative changes decrease it. Overall, the results suggested that positive oil price changes have a considerably more significant impact on real GDP than negative changes.

Omo and Ismail (2017) examined the government's fiscal responsibility to oil price volatility in Nigeria during the period 1970-2013. The Researcher opined that this was because no study had analysed the government's peculiar fiscal behaviour, given the unpredictable nature of oil prices. Yet, government fiscal activities had significantly determined and shaped the economy's growth path. The multivariate vector Autoregression model was explored for the empirical analysis. The major findings of the study showed that real oil prices had driven government expenditure dynamics; a long-run relationship exists between real oil prices and government spending, non-oil growth, inflation, and the discount rate differential; and that oil price shocks have no asymmetric effect on government spending.

Adegbie et al. (2019) evaluated the effect of crude oil price volatility on Nigeria's economy and national income. The study adopted an ex post facto research design. The study covered a period of 22years from 1995 to 2017. Descriptive and inferential (regression) statistics were adopted for the study. The result showed that oil price

volatility has a significant combined effect on Nigeria's economy (Gross Domestic Product, Gross National Product and Per Capita Income). The study concluded that oil price volatility significantly affects national income and Nigeria's economy.

Theoretical Review

Arbitrage Pricing Theory

Stephen Ross proposed the arbitrage-pricing theory (APT) in 1976. An asset pricing theory states that the expected return of an investment or financial asset can be modelled as a linear function of various macroeconomic variables, with the degree of correlation with each variable represented by a beta coefficient. The model-derived rate of return will be used to correctly determine the asset's price or value.

The asset value should equal the expected end-of-period asset value or the discounted future cash flows implied by the model. If the asset value changes, arbitrage should bring it back to the line. APT agrees that, though many specific forces can influence the return of any individual stock, these effects tend to cancel out in large, well-diversified portfolios. This is the principle of diversification, and it influences the field of manufacturing. A manufacturing company has no way of knowing whether any individual will become sick or will be involved in an accident. Still, the company can accurately predict its losses on a large pool of such risks. Manufacturing companies are corporations, and macroeconomic policies can be interpreted as specific types of financial instruments or other variables; thus, it is natural to apply financial models to manufacturing. The theory assumes a positive relationship between risk and expected return. The APT model extends the CAPM by describing returns as a linear function of several variables rather than a single variable. Some of these variables are macroeconomic factors, and others are market indices (Sadiye, 2014). The model also attributes the expected return of a capital asset to multiple risk factors and, in the process, measures the risk premiums associated with each factor.

Market Power Theory

The argument for market power builds on Porter's (1980) view of positioning a company in its environment through a set of strategies that distinguish a firm's position among competitors. One strategy to overcome competition is diversification, which enables firms to build market power and gain access to conglomerate power (Barney, 2002). By entering other markets through diversification, firms can gain competitive power in the market, not because of their particular position in that market, but because of their positions in other markets. Gribbin (1976) argued that to attain conglomerate power, a firm must first have individual power in its market. This power propels the firm to enter new markets through predatory strategies supported by its position, resources, and strength in its current market. A multi-fund approach can give a firm diversification across many asset classes (Yves, 2008). This research work is anchored on the Market Power Theory.

METHODOLOGY

This section reviews the research design adopted in the study, the data sources, the model formulation, and the justification for the instruments used to analyse the data.

This study adopted the ex post facto research design because the events under study had already occurred, and the data were collected from secondary sources only. This design is also applicable to the study aimed at ascertaining the cause-and-effect relationship between the independent variable (crude oil price volatility) and the dependent variable (the performance of Oil Companies, with particular emphasis on NNPC in Nigeria). Determining cause-and-effect relationships among the selected variables is a major aim of most research studies (Onwumere, Onodugo & Ibe, 2013).

The entire data available from the companies over the five years was used for the analyses. The published sources included data on the world supply of oil, World Crude Oil Demand, historical prices of PMS, data from the published accounts of the Nigerian National Petroleum Corporation, and materials from the Crude Oil Marketing Division, Petroleum Products Marketing Company Ltd, NNPC Retail Ltd. Data from the Central Bank of Nigeria (CBN), especially their Statistical Bulletin of various editions, were also used. Other secondary data sources included: OPEC, oil companies' annual reports, journals, textbooks, articles in reputable journals, conference and seminar papers, and internet academic materials.

Population, Sample, and Sampling Techniques

The study focuses primarily on NNPC and some of its selected companies. The research work is, therefore, a census study, using the companies chosen as the basis for making inferences about the population.

Techniques of Data Analysis

Secondary data collected were analysed using Descriptive Statistics and Correlation Analysis. The posited hypotheses were tested using Logistic Regression, univariate linear regression, Multivariate regression analyses, Correlation analyses, T-tests, and logistic regression.

The Test Statistic and Decision

A test statistic is used to determine this likelihood. Specifically, a test statistic tells how far, or how many standard deviations, a sample mean is from the population mean. The larger the value of the test statistic, the further the distance or the number of standard deviations a sample mean is from the population mean stated in the null hypothesis. The value of the test statistic is used to make a decision in Step 4.

When the p-value is less than 1% ($p < 0.01$), the null hypothesis is rejected. $P < 0.01$ is referred to as the criterion for deciding to reject the null hypothesis, although note that when $p = 0.01$, the decision is also to reject the null hypothesis. When the p-value is greater than 1% ($p > 0.01$), the null hypothesis is retained. The decision to reject or retain the null hypothesis is called the significance level. When the p-value is less than 0.01, significance is reached; the decision is to reject the null hypothesis. When the p-value is greater than 0.01, the null hypothesis is retained; significance is not reached.

Model Specification

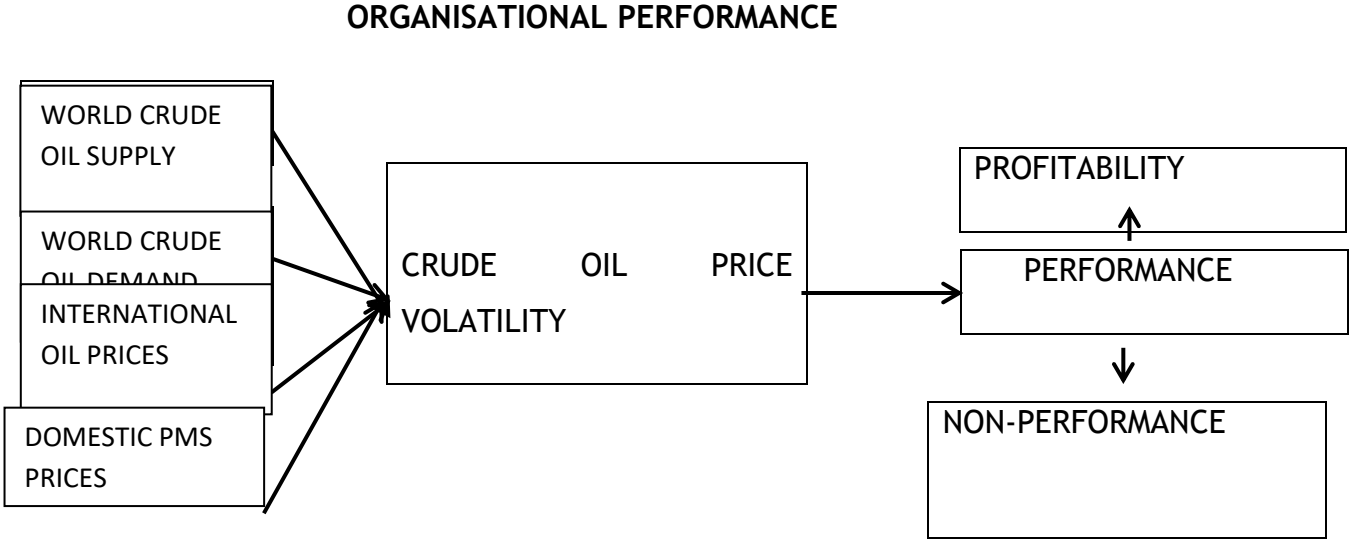
This statistical model is presented below to examine the extent to which Crude Oil Price Volatility affects the Organisational Performance of oil companies, with particular reference to the Nigerian National Petroleum Corporation. Based on the study, the linear regression analysis technique was used.

To achieve this, the correlation between the dependent variable and each of the four independent variables was calculated. While the dependent variable was proxied by Profitability as a performance measure, the independent variables were: International crude oil prices (ICP), World Supply of Crude Oil (WOS), World Demand of Crude Oil (WOD), and Domestic PMS Price (DPP).

The data used for the empirical analysis, covering the period 2015 to 2020, were collected from secondary sources.

Model Formulation

The Structural model of the relationship between Crude Oil Price Volatility and organisational performance in NNPC is shown below:



Validity and Reliability of Research Instrument

This research employed Linear Regression (One Variable), Multivariate Regression (multiple variables), Correlation Analysis, Logistic Regression, and T-Test analysis to test for significance, with p-values < 0.05.

Using the data, the Researcher examined the relationship between the dependent variable (PRO) and one of the independent variables (ICP, WOS, WOD, or DPP). Multivariate regression is used when there are two or more dependent variables that are to be predicted from two or more independent variables. In this study, the Researcher used the data to predict Profitability (PRO) from ICP, WOS, WOD, and DPP.

A correlation is useful to see the relationship between two (or more) normally distributed interval variables. For example, using NNPC's data, it was observed that there was a correlation between two continuous variables: ICP and DPP, or WOS and WOD.

Multiple logistic regression is like simple logistic regression, except that there are two or more predictors. The predictors can be interval or dummy variables, but not

categorical variables. If there are categorical predictors, they should be coded into one or more dummy variables. In this study, **PRO** is the outcome variable, and **ICP, WOS, WOD**, and **DPP serve as** the predictor variables.

The data are presented to examine the impact of International Crude Oil Prices (ICP), World Crude Oil Supply (WOS), World Crude Oil Demand (WOD), and Domestic PMS Price (DPP) on the Nigerian National Petroleum Corporation (NNPC). The data proxied by Profitability was collected from 2015 to 2020, as shown in the table below:

Year	ICP	WOS	WOD	DPP	PRO
2015	51	97	96	88	-88523
2016	44	98	97	122	204679
2017	54	98	99	144	725287
2018	71	101	100	143	600551
2019	64	101	101	143	714035
2020	42	94	92	143	98838

Table 4.1: The Price Data

Source: NNPC

International Crude Oil Prices (ICP): Thompson Reuters (Platts)

World Crude Oil Demand (WOD): Thomson Reuters

World Crude Oil Supply (WOS): Thomson Reuters

Domestic PMS Price (DPP): NNPC Retail Ltd (pump price)

Profitability (PRO): NNPC Audited Financial Statements (2020 as a draft)

The four (4) main variables below were the independent variables:

I. International Crude Oil Prices (ICP)
II. World Crude Oil Supply (WOS)
III. World Crude Oil Demand (WOD)
IV. Domestic PMS Price (DPP)

while performance proxied by Profitability (PRO) is considered as the dependent variable for this study.

DATA ANALYSIS AND RESULTS

Descriptive analysis of each variable was calculated for the observations. Then the correlation between the dependent variable (PRO) with all four independent variables - International Crude Oil Prices (ICP), World Crude Oil Supply (WOS), World Crude Oil Demand (WOD), and Domestic PMS Price (DPP) are calculated. A multiple regression model was developed with Profitability (PRO) as the dependent variable and International Crude Oil Prices (ICP), World Crude Oil Supply (WOS), World Crude Oil Demand (WOD), and Domestic PMS Price (DPP) as independent variables using Microsoft Excel. Now, to determine the significant difference between World Crude Oil Supply (WOS) and World Crude Oil Demand (WOD), and between International Crude Oil Prices (ICP) and Domestic PMS Price (DPP), a paired-samples t-test was conducted.

Descriptive Statistics

The descriptive analysis of all variables is shown below.

	ICP	WOS	WOD	DPP	PRO
Minimum	42	94	92	88	- 88523
Maximum	71	101	101	144	725287
Mean	54.33	98.17	97.50	130.50	375811.17
Standard deviation	11.33	2.64	3.27	22.49	348896.34

Table 4.2: Descriptive Analyses

Source: Generated(2021)

The mean and standard deviation of the performance proxy, profitability (PRO, dependent variable), are 375811.17 ± 348896.34. The minimum and maximum values are –88523 and 725287, respectively. The mean with standard deviation values of (independent variables) ICP, WOS, WOD, and DPP are 54.33 ± 11.33, 98.17 ± 2.64, 97.50

± 3.27, and 130.50 ± 22.49, respectively. The minimum values of ICP, WOS, WOD, and DPP are 42, 94, 92, and 88, respectively. Also, the maximum values of ICP, WOS, WOD, and DPP are 71, 101, 101, and 144, respectively.

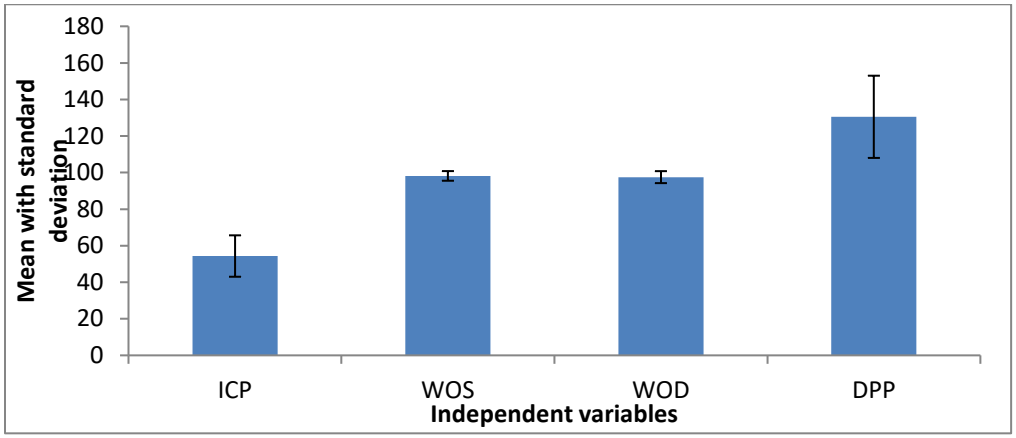


Figure 4.1: Independent Variables

Source: Generated(2021)

The figure above shows that the Domestic PMS Price (DPP) has the greatest impact, while the International Crude Oil Prices (ICP) have the least. There was no considerable variance between the World Crude Oil Supply (WOS) and the World Crude Oil Demand (WOD).

4.5.2. Correlation Analysis

The correlation between Profitability and the World Crude Oil Supply (WOS), World Crude Oil Demand (WOD), International Price of Crude (ICP), and Domestic PMS price (DPP) is shown on the graph below with a colour coding:

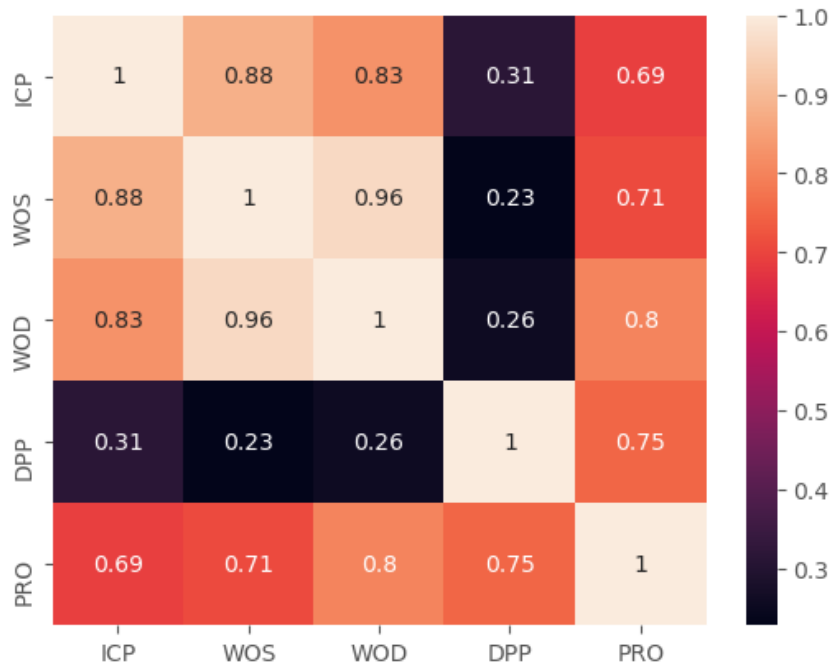


Figure 4.1: Correlation between the Dependent and Independent variables

Source: Generated

The chart above shows the correlation analysis between the dependent variables (organisational performance), which were proxied by profitability (PRO), and the independent variables (international crude oil prices - ICP), which are determined by World Crude Oil Supply (WOS), World Crude Oil Demand (WOD) and Domestic PMS Price (DPP) from 2015 to 2020. It shows clearly that World Crude Oil Demand (WOD) has the highest correlation of 0.8 with organisational performance (PRO).

We also saw that World Crude Oil Supply (WOS) and World Crude Oil Demand (WOD) have the strongest positive correlation of 0.96, suggesting that Oil price volatility is mostly caused by demand and supply. Furthermore, there exists a strong positive correlation of 0.83 between international crude oil prices (ICP) and World Crude Oil Demand (WOD). This implies that low Oil demand will force the price of crude to fall. Likewise, an increase in demand would cause an increase in prices. This was seen in 2020, when oil demand was low due to COVID-19 restrictions, and the price of crude fell to a historic low. As the lockdown began to ease in 2021, with travel bans lifted

and economies reopening, demand for Oil increased, and oil prices recovered from a historic low to a high of about $78/bbl. This relationship has a significant impact on organisational performance (PRO). The same strong positive correlation applies between International Crude Oil Prices (ICP) and World Crude Oil Supply (WOS).

LINEAR REGRESSION ANALYSIS – UNIVARIATE (ONE VARIABLE)

Linear regression analysis was conducted to show the significance of the variables to the profitability of the Nigerian National Petroleum Corporation in this section. We started with a simple linear regression model with only one covariate (single variable). The results of the univariate linear regression model and summaries are shown below.

Profitability (PRO) vs International Crude Oil Prices (ICP)

The relation between International Crude Oil Prices (ICP) and Profitability (PRO) is shown as follows:

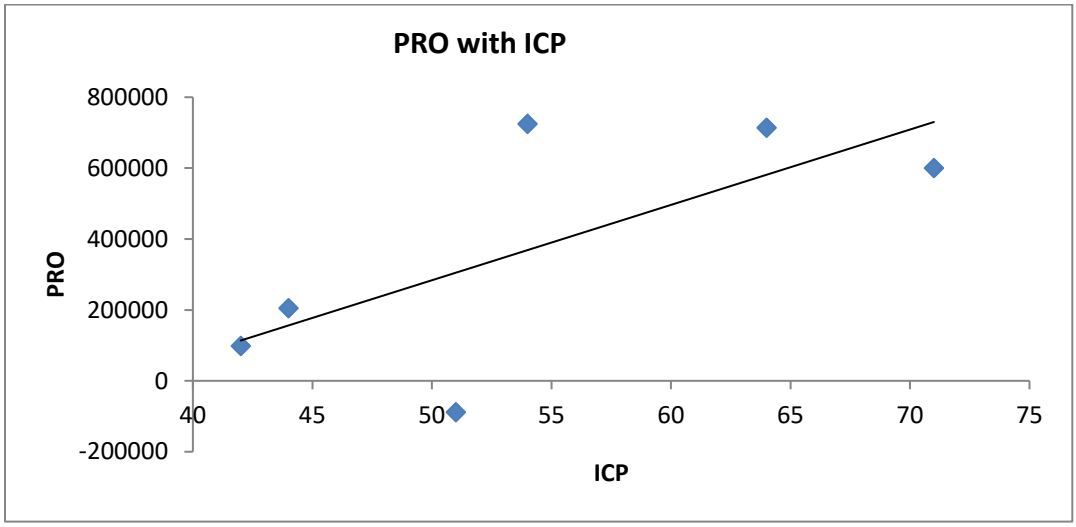


Figure 4.2: Oil Price vs Profitability

Source: Generated

The relationship line between International Crude Oil Prices (ICP) and Profitability (PRO) shows that as ICP increases, PRO increases, and as ICP decreases, PRO decreases. The correlation coefficient between ICP and PRO is 0.69, which is high. So, the null hypothesis H01 is rejected, and there is a strong positive correlation between International Crude Oil Prices (ICP) and Profitability (PRO).

MULTIVARIATE REGRESSION ANALYSIS

Multivariate linear regression was used to estimate the relationship between ICP, WOS, WOD, and DPP independent variables and one dependent variable.

It was observed that there is a strong positive correlation between Profitability (PRO) and International Crude Oil Prices (ICP), World Crude Oil Supply (WOS), World Crude Oil Demand (WOD), and Domestic PMS Price (DPP).

The output of multiple linear regression (MLR) between the variables (International Crude Oil Prices (ICP), World Crude Oil Supply (WOS), World Crude Oil Demand (WOD) and Domestic PMS Price (DPP)) and Organisational Performance (Profitability) is shown below:

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.9999998
R Square	0.9999996
Adjusted R-Square	0.9999980
Standard Error	495.1625
Observations	6

Table 4.3: Summary Output Table

Source: Generated(2021)

ANOVA	*df*	*SS*	*MS*	*F*	*Significance F*
Regression	4	6.09E+11	1.52E+11	620593.3	0.000952
Residual	1	245185.9	245185.9		
Total	5	6.09E+11			

Table 4.4: ANOVA table

Source: Generated

	Coefficients	*Standard Error*	*t- Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-4113524.79	17451.57	-235.71	0.0027	-4335268.05	-3891781.52
ICP	4352.32	43.55	99.95	0.0064	3799.02	4905.62
WOS	-111608.67	376.73	-296.26	0.0021	-116395.47	-106821.87
WOD	144554.08	253.68	569.82	0.0011	141330.71	147777.44
DPP	8544.74	10.63	804.02	0.0008	8409.71	8679.78

Table 4.5: Coefficients Analyses

Source: Generated(2021)

The multiple regression model of the performance is as follows.

$$\boldsymbol{BoldPRO} = -\mathbf{4113524.79} + \mathbf{4352.32} * \boldsymbol{ICP} - \mathbf{111608.67} * \boldsymbol{WOS} + \mathbf{144554.08} * \boldsymbol{WOD} + \mathbf{8544.74} * \boldsymbol{DPP}$$

The coefficient of WOS is – 111608.67, which is negative. So, with increased WOS, PRO value performance decreases, and with decreased WOS, PRO value performance increases. The t-statistic for WOS is 296.26 (p = 0.0021). So, the hypothesis H01 is rejected (since the p-value is less than 0.05), and it may be concluded that the Current International Supply of Crude Oil (WOS) has a significant effect on the organisational performance, proxied by Profitability (PRO), of the Nigerian National Petroleum Corporation in Nigeria.

The coefficient of WOD is 144554.08, which is positive. So, with an increase in WOD, PRO value performance increases, and with a decrease in WOD, PRO value performance decreases. The t-statistic for WOD is 569.82 (p = 0.0011). So, the hypothesis H02 is rejected (since the p-value is less than 0.05), and it may be concluded that World Crude Oil Demand (WOS) has a significant effect on the organisational performance, Proxied by Profitability (PRO), of the Nigerian National Petroleum Corporation in Nigeria.

The coefficient of DPP is 8544.74, which is positive. So, with increasing DPP, PRO value performance increases, and with decreasing DPP, it decreases. The t-statistic for DPP is 804.02 (p=0.0008). So, the hypothesis H03 is rejected (since the p-value is less than 0.05), and it may be concluded that the Domestic PMS Price (DPP) has a significant effect on the organisational performance, proxied by Profitability (PRO), of the Nigerian National Petroleum Corporation in Nigeria.

The ICP coefficient is 4352.32, which is positive. So, with increasing ICP, the performance of PRO value increases, and with decreasing ICP, it decreases. The t-statistic for ICP is 99.95 (p=0.0064). So, the hypothesis H04 is rejected (since the p-value is less than 0.05), and it may be concluded that the International Crude oil Price (ICP) has a significant effect on the organisational performance, proxied by Profitability (PRO), of the Nigerian National Petroleum Corporation in Nigeria.

From the ANOVA table, the F value is 620593.3 at the significance level of 0.00095. The developed multiple regression model is significant at the 0.01 level.

From the Summary Output table, the R-Square value is 0.9999996. So, 99.99% of organisational performance (dependent variable), proxied by Profitability (PRO), is explained by the independent variables International Crude Oil Prices (ICP), World Crude Oil Supply (WOS), World Crude Oil Demand (WOD), and Domestic PMS Price (DPP).

T-TEST

A t-test is a statistical test used to compare the means of two groups. It is often used in hypothesis testing to determine whether a process or treatment affects the population of interest or whether two groups differ.

World Crude Oil Supply (WOS) vs World Crude Oil Demand (WOD)

To determine the significant difference between World Crude Oil Supply (WOS) and World Crude Oil Demand (WOD), a paired sample t-Test was conducted, and the result is shown as follows:

t-Test: Paired Two Sample for Means		
	WOS	***WOD***
Mean	98.1667	97.5
Variance	6.9667	10.7
Observations	6	6
Pearson Correlation	0.9613	
Hypothesised Mean Difference	0	
Df	5	

t Stat	1.5811	
P(T<=t) one-tail	0.0873	
t Critical one-tail	2.0150	
P(T<=t) two-tail	0.1747	
t Critical two-tail	2.5706	

Table 4.7: T-Test

Source: Generated (2021)

From the above table, the calculated t-statistic value of World Crude Oil Supply (WOS) and World Crude Oil Demand (WOD) is 1.5811 (p 0.1747), which is less than the t-Critical two-tail value of 2.5706. So, it may be concluded that there is no significant variance between World Crude Oil Supply (WOS) and World Crude Oil Demand (WOD) for the period of the 5 years, except for February 2016 and April 2020.

International Crude Oil Prices (ICP) and Domestic PMS Price (DPP)

To determine the significant difference between International Crude Oil Prices (ICP) and Domestic PMS Price (DPP), a paired-samples t-test was conducted, and the results are shown below.

t-Test: Paired Two Sample for Means		
	ICP	*DPP*
Mean	54.3333	130.5
Variance	128.2667	505.9
Observations	6	6
Pearson Correlation	0.3141	

t-Test: Paired Two Sample for Means		
	ICP	*DPP*
Hypothesised Mean Difference	0	
Df	5	
t Stat	-8.5679	
P(T<=t) one-tail	0.0002	
t Critical one-tail	2.0150	
P(T<=t) two-tail	0.0004	
t Critical two-tail	2.5706	

Table 4.8: T-Test

Source: Generated (2021)

From the above table, the calculated t-statistic value of International Crude Oil Prices (ICP) and Domestic PMS Price (DPP) is 8.5679 (p 0.0002), which is greater than the t-Critical two-tail value of 2.5706. So, it may be concluded that there is a significant difference between International Crude Oil Prices (ICP) and Domestic PMS Price (DPP) over the entire 5-year period. It was also found that an increase in ICP resulted in a significant increase in DPP.

DISCUSSION OF RESULTS

International Crude Oil Prices (ICP) vs Domestic PMS Price (DPP)

From the results, it has been observed that International Crude Oil Prices (ICP) have the highest p-value (0.06) and are the least significant. At the same time, Domestic PMS Price (DPP) has the lowest p-value of 0.0011, indicating the coefficient with the highest significance. The higher the International Crude Oil Price, the higher the

Domestic PMS Price and vice versa. With international prices low during the pandemic, the domestic price of PMS also crashed. The Nigerian Government utilised that opportunity to deregulate the PMS market. Nigerians enjoyed cheap PMS, but that was short-lived because, as crude oil prices began to rise with the recovery from the COVID pandemic, the domestic PMS price also started rising, and Nigerians reacted negatively to the deregulation. The labour unions and the organised activists are still in discussion with the Government on the implementation of the deregulation policy. During the period of increasing PMS prices, NNPC, in a bid to sustain the corporation and prevent the Nigerian economy from collapsing:

- Introduced various non-fuel revenue sources at their Retail stations, including lube bays, Restaurants, supermarkets, tyre services, etc.
- Introduced various brands of NNPC lubricants to the Nigerian market
- Introduced various incentives to the station dealers
- Ensured that most of their mega fuel stations were opened 24 hours a day to provide services to motorists even during the movement-restricted era

All these helped calm Nigerians' nerves as prices were rising.

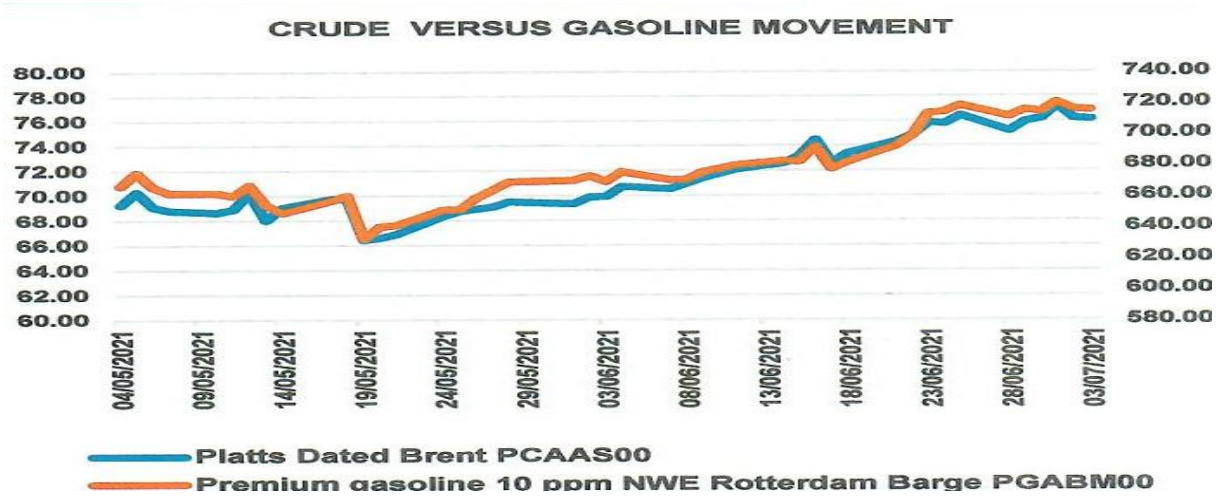


Figure 4.7: Crude Oil vs Gasoline price movement

World Crude Oil Supply (WOS), World Crude Oil Demand (WOD)

From the results, it was seen that the p-values for World Crude Oil Supply (WOS) and World Crude Oil Demand (WOD) were 0.0021 and 0.0011, respectively, indicating very high significance for the profitability of an organisation.

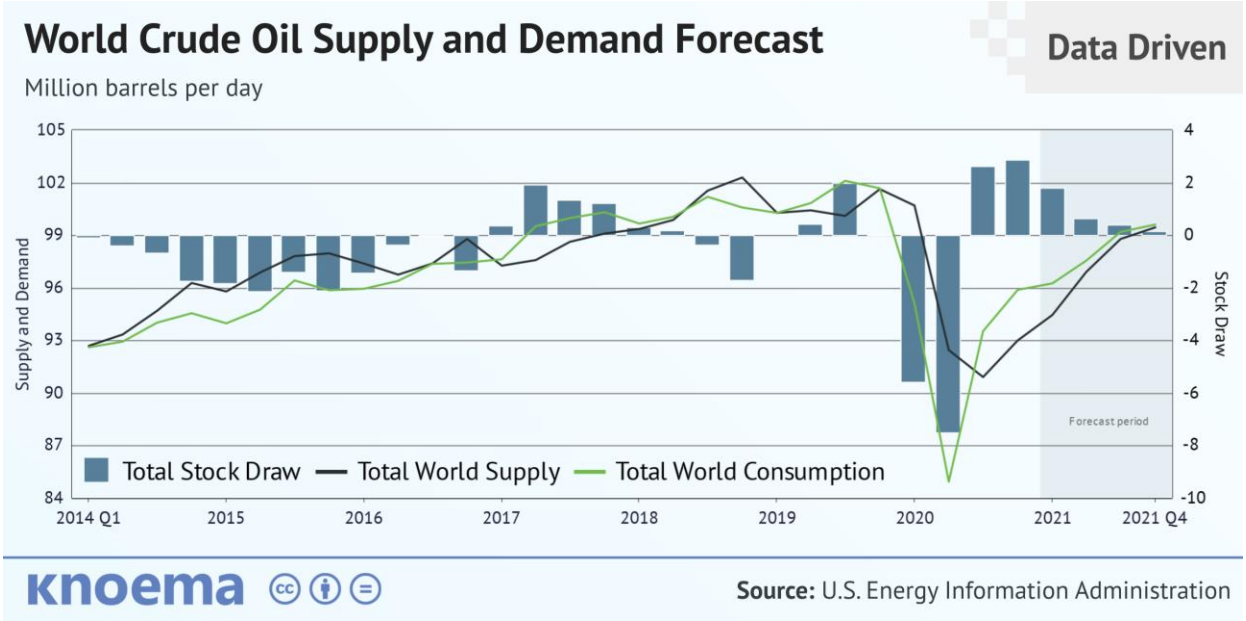


Figure 4.8: World Crude Oil Supply and Demand Forecast

Global demand for crude oil (including biofuels) in 2020 fell below 90 million barrels per day and gradually increased above 95 million barrels per day in 2021. The decrease in 2020 was due to the economic and mobility impacts of the coronavirus pandemic, including widespread shutdowns worldwide. This is because the economics of demand and supply mainly drive oil prices.

The decrease in demand forced Oil futures markets to hit a historical anomaly in April 2020, when the May WTI Crude futures contract fell to a negative $37.00. This contributed negatively to NNPC's revenues.

Organisational Performance (Profitability) - PRO

The actual organisational performance for NNPC's Audited Financial Statements from 2015 to 2020 (2020 Financial Statement not fully concluded as at the time of this report) is shown below:

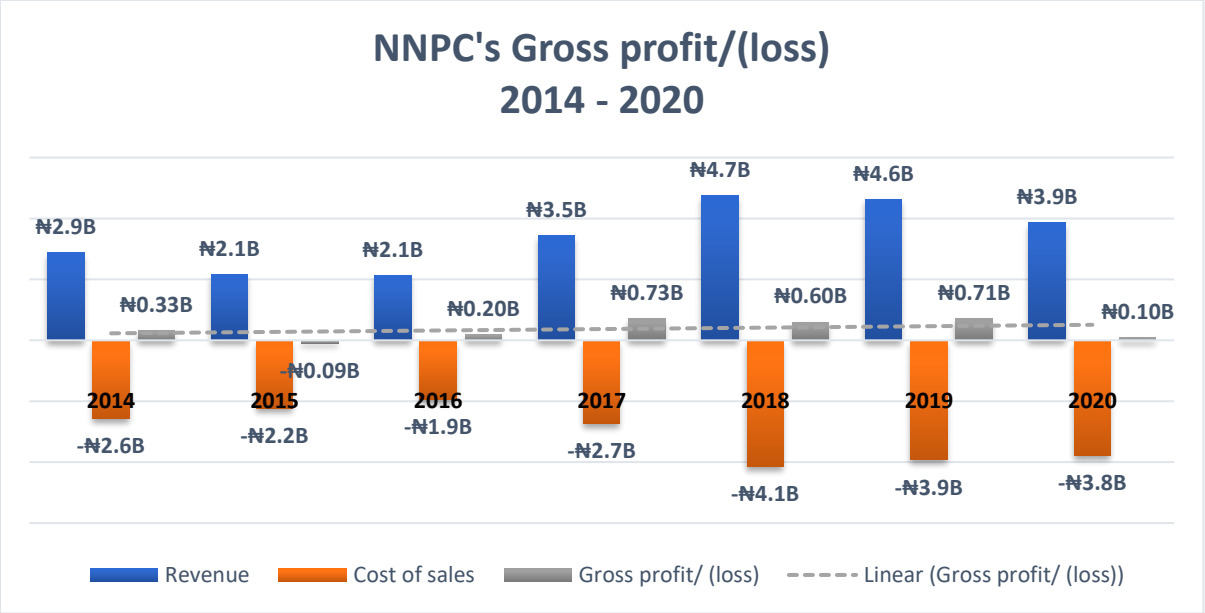


Figure 4.8: NNPC Profit/Loss on crude sales

Source: Generated

From the figure above, NNPC's performance on purely crude sales revenue and cost of sales was poor in 2016 and 2020 compared to other years. This is because 2016 and 2020 experienced the worst drop in International Crude Oil Prices (ICP). This shows that Oil Price Volatility has a significant impact on the performance of NNPC, as shown above.

FINDINGS, CONCLUSION AND RECOMMENDATIONS

FINDINGS

This study on the effect of international crude oil price volatility on the performance of the Nigerian National Petroleum Corporation has established a new dimension of facts regarding the effects of International Crude Oil price volatility and oil company performance. It has clearly shown that all proxies of the independent variable have significant effects on the performance of the Nigerian National Petroleum Corporation.

1. World Crude Oil Supply had a significant effect on the performance of the Nigerian National Petroleum Corporation of Nigeria. The findings from the hypothesis indicated that the p-value for World Crude Oil Supply (WOS) was 0.0021, which implied a very high significance on the profitability of an organisation.
2. World Crude Oil Demand had a significant effect on the performance of the Nigerian National Petroleum Corporation of Nigeria. The findings from the hypothesis indicated that the p-value for World Crude Oil Demand (WOD) was 0.0011, which implied a very high significance on the profitability of an organisation.
3. The Domestic PMS Price had a significant effect on the performance of the Nigerian National Petroleum Corporation of Nigeria. Domestic PMS Price (DPP) has the lowest p-value of 0.0011, indicating the coefficient with the highest significance for the profitability of NNPC.
4. The International Crude Oil Price had a significant effect on the performance of the Nigerian National Petroleum Corporation of Nigeria. From the results, it was seen that International Crude Oil Prices (ICP) had the highest p-value of 0.06 and therefore had the least significance on the profitability of NNPC.

CONCLUSION

The importance of international crude oil price volatility and its effect on oil companies' performance cannot be overemphasised. The new dimension of strong effect is the proactive posture of major oil companies operating in the Nigerian economy. All

independent variables have a significant effect on the performance of the Nigerian National Petroleum Corporation, as proxied by profitability.

From the above results and discussion, it is observed that there is a strong positive correlation between organisational performance, proxied by Profitability (PRO), and International Crude Oil Prices (ICP), World Crude Oil Supply (WOS), World Crude Oil Demand (WOD), and Domestic PMS Price (DPP).

It may be concluded from the result that International Crude Oil Prices (ICP), World Crude Oil Supply (WOS), World Crude Oil Demand (WOD), and Domestic PMS Price (DPP) have significant effects on the organisational performance proxied by Profitability (PRO) of the Nigerian National Petroleum Corporation of Nigeria. The result also shows a strong correlation between the World Crude Oil Supply (WOS) and World Crude Oil Demand (WOD), and that they, in turn, affect International Crude Oil Prices (ICP), which then impacts Profitability. Also, there is a significant correlation between International Crude Oil Prices (ICP) and Domestic PMS Price (DPP): an increase in ICP raises DPP, with a significant impact on organisational performance, as shown in the analysis.

RECOMMENDATIONS

i. Based on the findings that World Crude Oil Supply has a significant effect on the performance of the Nigerian National Petroleum Corporation of Nigeria, it is hereby recommended that NNPC should ensure that the production and supply of Nigeria's crude oil should be at the minimum meet the OPEC quota for the country. As of September 2021, production was at 1.2mbd against the OPEC quota of 1.6mbd, which was more than 20% underperformance. The adduced reasons included oil theft, pipeline vandalism, valve shutdowns during COVID, and operational maintenance problems. Anything short of the quota is short-changing the country and will adversely affect the corporation's performance and the nation's economy.

ii. Based on the findings that World Crude Oil Demand has a significant effect on the performance of the Nigerian National Petroleum Corporation (NNPC), NNPC should ensure that Nigeria's crude oil is of premium quality and that the official selling price is market-reflective to attract sufficient demand. Both quality and

price are significant determinants of demand for Nigeria's crude oil in the international market.

iii. Based on the findings that the Domestic PMS Price has a significant effect on the performance of the Nigerian National Petroleum Corporation, it is hereby recommended that the deregulation of the PMS market already announced by the Government should be fully implemented. This will ensure that market forces determine the accurate domestic price of PMS and, eventually, eliminate all issues surrounding subsidies and under-recoveries.

iv. Based on the findings that the International Crude Oil Price has a significant effect on the performance of the Nigerian National Petroleum Corporation, it is hereby recommended that Nigeria should continue to support OPEC in controlling oil supply to the international market to stabilise prices. Without this control, the price may crash below production costs, which would be disastrous for the industry.

v. Crises like COVID-19 disrupt the international oil and gas market and, by extension, the global economy; therefore, professional marketing is the solution to reviving the global economy.

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