

An Empirical Investigation into the Effect of Global Oil Price on Nigeria Gross Domestic Product from (2000-2019)

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Abstract

Nigeria is one of the largest oil producing countries in the world, its revenue is largely dependent on crude oil sales. The country vulnerability to crude oil price fluctuations is a phenomenon that has been a reoccurring event. Thus; this study aims to examine the impact of Global crude oil prices on Nigeria gross domestic product (GDP) and the economy at large. The study relied deeply on secondary data obtained from the Central bank of Nigeria (CBN). The data were subjected to simple regression analysis, Pearson Product Moment Correlation to determine the effect and relationship between oil price (Independent Variable) and Nigeria GDP (dependent variables). And time series analysis was also used to examine the trend in the data set and fit a more parsimonious model that would aid forecasting of future crude oil price and GDP. The study found that Global crude oil price have a significant correlation with Nigeria gross domestic product, %58.1 of variation in Nigeria gross domestic product is attributed to fluctuation in Global crude oil price and Nigeria GDP will increase by ₦4.21bn per unit increase in crude oil price. The study thus conclude that global crude oil price has a significant impact on Nigeria GDP and its economy at large. The study among others recommend diversification of the Nigerian economy is most imperative given the economic recession in the country now and the impending take-over of the transportation industry by electric vehicles.

Keywords: Oil price, Gross domestic product, Economy, Price shock, Exchange rate, Nigeria.

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1.1 Introduction

Crude oil is an important natural resource found under porous rock formations scattered around the world, once refined products such as the premium motor spirit, gasoline, diesel and other forms of petrochemical can be extracted from it, so its presence in any country constitute serious economic importance. The top oil producing countries such as Saudi-Arabia, United states, and china derive huge revenue from crude oil sales so fluctuations in its price is of utmost importance to policy makers in these countries. Nigeria is the leading oil producing country in Africa. It holds the largest natural gas reserves on the continent and was the world's fifth-largest exporter of liquefied natural gas in 2018. (BP 2019 Statistical Review of World Energy). Although Nigeria is the leading crude oil producer in Africa, production is affected by sporadic supply disruptions. It is also home to the second-largest proven oil reserves in Africa. Nigeria's petroleum and natural gas resources are the mainstay of the country's economy so fluctuation in global oil price would always have its effect on the country gross domestic product which is a macro-economic indicator used by economist to understand the economic projection of a country. Leslie Kramer (2020) defines GDP is the monetary value of all the finished goods and services produced within a country's borders in a specific time. It is primarily used to assess the performance of a country's economy. The overall performance could be measured as a flow of final products or as a flow of cost. This implies that Gross Domestic Product takes into consideration the market price of every good or service instead of adding up the quantities of the products and services directly.

Because Nigeria heavily depends on oil revenue, its economy is noticeably affected by petroleum price changes. Over the years, revenue generated from crude oil sale has been used for major importation of product into the country and financing of government expenditures. Specifically, on the average, 75% of state revenues come from oil export (Nweke and Edame, 2016). As such, the budget is occasionally affected by sudden negative or positive shocks to the oil prices. Crude oil shock can be described as a sudden and unexpected change in oil price or production (Chuku, Akpan, Sam & Effiong, 2011; Effiong, 2014; Akpan, 2009). Persistent oil price fluctuation has had extensive effects on the macro economies of both crude oil exporting and crude oil importing countries over the past forty years (Olomola, 2006), thus inducing challenges in both fiscal and monetary policy making. Success Ikechi & Anthony (2020) in their work conclude that while oil price shocks have direct impact on short term economic growth in Nigeria, the long-term impact may be difficult to deduce due to inadequate data. However, Lyu (2020) argues that the impact of oil price shocks on the economy has been on the decline since the mid-1980s due to what researcher terms the "endogeneity" of oil price changes and the increasingly lower contribution of oil to the world's energy needs. While Lyu's position may be applicable to established economies it is debatable if that is applicable to a mono-cultural economy such as Nigeria.

1.2 Statement of Problem

An increase or decline in oil price in the international market may have its effect on business activities in Nigeria and economies around the world irrespective of whether a nation is an oil producing or exporting country, but the level of effect would depend on the diversification of such economy, if the economy is not diversified and is largely dependent on crude oil sales, then economic activities would highly be affected by fluctuation in crude oil price at the international market. Major economies around the world are driven by oil price, as crude oil has been shown to be a catalyst that drives major manufacturing and production industries. Nigeria a country that derives huge revenue from its crude oil sales, any fluctuation in its price is likely to have an effect on the nation's GDP which in turn affects the economy at large, but the degree at which fluctuations affect the nation's GDP is what this research intends to unravel.

Studying petroleum subsidy removal and the Nigeria economy Henry E.I(2019) concludes that the policy to remove subsidy from crude oil price allowing international market to determine price of premium motor spirit in the country has led to an increase in transport fare; increase in transport fare subsequently led to increase in price of other products owing to the degree of interdependency among the various sectors. This shows relationship between crude oil price and economic activities in the country, but what level of relationship exists between crude oil price and Nigeria GDP? To what extent (degree) do the fluctuations in crude oil price affect nations GDP? What percent change in the nation's GDP is actually explained by changes in international crude oil price, answers to these questions are what this research work unravels.

1.3 Objectives of the study

The study aims to examine the impact of Global crude oil price on Nigerian Gross domestic product, while the specific objectives include;

- i. To assess the degree of relationship between Global crude oil prices and Nigeria GDP
- ii. To examine the level of change in Nigeria GDP explained by Fluctuation in oil price

1.4 Research Questions

The following research questions were raised and answered:

- i. What degree of relationship exists between Global crude oil prices and Nigeria GDP?
- ii. What percent change in Nigeria GDP is explained by fluctuations in international oil price?

1.5 Research Hypothesis

- i. **H₀₁**: There is no significant correlation between International crude oil price and Nigeria GDP.
- ii. **H₀₂**: Global crude oil price does not contribute significantly to changes in Nigeria GDP?

Literature Reviews

Nigeria is a country blessed with abundant natural resources like iron ore, limestone, natural gas etc. before the exploration of crude oil, the country largely depends on exportation of agricultural products like groundnut, cocoa, rubber etc. for its revenue. Then a large part of the populace earns their living through farming, the composition of the GDP by economic activities shows that the agricultural sector accounting for 64.1% and 47.6% of the GDP in 1960-1970 respectively. Since the exploration of crude oil in the 1970's the relative share of agriculture has declined. In 1980's there was a shift in the nation's dependency on agricultural produce to production and exportation of petroleum products. Since then, the nation has continued to derive huge revenue from export of crude oil that such revenue has been used to finance governmental activities in the country.

Crude oil price fluctuation is believed to have a significant impact on business and economies of oil exporting countries given the relative importance of the crude oil sector in production and export of goods and services and the uncertainty surrounding the crude oil market (Behbudi et al., 2010; Mehrara, 2008). Crude oil production accounts for a considerable share of the Gross domestic product (GDP) of oil-exporting countries like Nigeria, such that an increase in crude oil price directly increases the country's revenues vice versa. However, the overall effect of fluctuation in crude oil price on businesses and economic performance largely depends on government management of its past and present revenue incurred. When there is an increase in crude oil price, it significantly increases real national income of that country through high export earnings (Kornonen and Juurikkala, 2007). It is believed that the business and its economy at large is largely dependent on crude oil revenues as it is shown by (IMF, Country Reports) that about "15% of its GDP originates from the crude oil sector during the period 2000 to 2009. Moreover, about 50% of the government's revenues and 70-75% of exports are derived from the oil sector". (Mehrara et al., 2010). Oriakhi and Iyoha (2013) state that in 2008 "crude oil price fell from a peak of \$147 to about \$37.81 per barrel" this drop has a significant effect on the budget as the budget witnessed a significant cut in its budgeted revenue and expenditure. These cuts affected almost all aspects of the business in the country and the economy.

According to BudgIT (2014), the story of Nigeria's economy since the 1970s is incomplete without recounting

the swings in crude oil prices. They have been huge revenue earned from crude oil and gas sales over the years but lack of investment in infrastructure and sustainable project have resulted to a backdrop in the development of its economy and the country at large. Currently, recurrent items are being financed through revenue derived from crude oil while capital expenditure is financed through debt acquired from other nations. Aliyu (2009) demonstrated that “the global financial meltdown in 2009 left Nigeria’s oil revenue sliding to ₦4.84tn, representing a 39% reduction in revenues at the end of the year. This only demonstrates the fragility of the Nigerian economy but the fault lines were not very visible, due to strengthen savings in previous Excess Crude Account”. In 2010, the global economy recovered so as crude oil price resulting in an increase in government revenue from ₦7.3tn to ₦11.1tn in 2011 respectively. It is believed that continuous dependent on revenue derived from crude oil and gas is unsustainable, due to variability in its price. As an oil exporter and importer of refined petroleum product, any volatility or fluctuations in the oil prices will adversely affect the Nigerian economy either positively or negatively. Several empirical studies have been undertaken to investigate the effect of oil price volatility on macroeconomic variables in different economies, but very few have been able to examine the degree of effect in which these volatility has on Nigeria economy and other nations that depend on its oil exportation for revenue generation.

2.2 Theoretical Framework

In the course of these research various economic theories like the consumption smoothing theory, natural resource rent theory and the rent seeking theory were examine, the Dutch Disease Theory was considered the most suitable theories for the study as the theory explains how higher oil prices; generally, change the industrial structure of the oil-exporting country making it more concentrated on oil industry and non-traded sectors. The theory also explains how higher oil revenues lead to the appreciation of local currency, which consequently causes the increase of imports of consumer goods. Thus, the high concentration on imports tends to reduce the competitiveness of the local producers. Based on Dutch disease theory, it is understood that an increase in oil prices is not a beneficial situation for the economy of an oil exporting country. (Mieiro and Ramos, 2010) One of the impacts of oil price shocks on economic growth and performance of an oil exporting countries like Nigeria is the Dutch Disease Syndrome. Windfalls from sharp surge in oil price cannot sweep through a developing economy that is yet to be diversified and large enough to absorb the inflow without causing inflation. Resource pull effect and spending effect result when large inflow from oil export hits a less diversified economy.

2.3 Empirical Reviews

This section reviews similar research carried out by other scholars:

Alley et al., (2014) x-rayed the effects of oil price fluctuations on economic growth in Nigeria. Employing the generalized method of moment (GMM) econometric technique as well as macroeconomic data between 1981 and 2012, Alley, et al (2014) showed that rises in the oil price positively impact on economic growth. The study supports that of Nwanna and Eyedayi (2016) as against others, thus suggesting that a periodic increase in the oil prices will affect the economy positively in the long run. Ijirshar (2015) study the relationship between oil revenue and industrial growth in Nigeria, the evidence show that oil revenue has a positive significant impact on industrial growth and the economy in the long run despite the mismanagement of oil revenue as identified in literature evidenced by its insignificant relationship with industrial growth in the short run. In the quest to establish the relationships between oil revenue, public spending and business growth.

The study of oil price fluctuation & aggregate output performance in Nigeria by Ibrahim. T (2018) uses two-stage least square estimation technique and conclude that oil price impacted positively on aggregate output but negatively on manufacturing, agriculture and service sector, suggesting that fluctuation in oil price create doubt in the production capacity of production sector and also undermine the effectiveness of state fiscal management of crude oil revenue. In assessment of how oil price shock affect macroeconomic performance in Nigeria Omisakin(2008) used the Vector Auto Regressive (VAR) approach and found that oil price shock significantly contributed to the variability of oil revenue and output, Thus, oil price shock does not have substantial effects on money supply, price level and government expenditure in Nigeria over the period covered by the study.

The impact of oil price volatility on business activity in Nigeria has also been examined by Apere and Ijeoma (2013) finds a unidirectional relationship between interest rate, exchange rate and oil prices. However there seems to be no significant relationship between fluctuation in oil price and Real GDP. The paper concludes that oil price volatility is an important determinant of real exchange rates and in the long run, while exchange rate rather than oil price volatility affects output growth in Nigeria. Oriakhi and Osaze (2013) also examined the consequences of oil price volatility on the growth of the Nigerian economy within the period 1970 to 2010 using quarterly data and employing the Vector Auto regression (VAR) methodology. They found that oil price volatility impacted directly on real government expenditure, real exchange rate and real import, while real government expenditure impact on real GDP, real money supply and inflation. By implication, oil price changes determine government expenditure level, which in turn determine the growth of the economy thereby reflecting

the dominant role of government in Nigeria.

3.0 Methodology: This section focuses on the procedures and methods employed in collecting data used for the study.

3.1 Sources of Data and Methods of Analysis:

This study was carried out to investigate the level of relationship and the impact of Global crude oil price on Nigeria GDP. For successful investigation, this research work is based on correlational research design. Correlational research design technique helps researchers establish a relationship between two closely connected variables. This design was selected because it would help explain the degree of relationship between the two variables in the study and the impact of one variable on another. The data used for the study are secondary data which include Global crude oil price (2000-2019), and Nigeria Gross domestic product (2000-2019). The data were sourced from Central Bank of Nigeria (CBN). In analysis of data collected, Time series analysis was used to study the trend in the dataset and to fit a model that would in turn be used to make future projection of Nigeria GDP and Global crude oil price. The information criterion (Akaike and Bayesian) was used to examine parameter estimate of various model to help select the best fit model for the data set. Correlation and regression analysis were employed to determine the relationship and impact of international crude oil price on Nigeria GDP. Correlation was used to assess the strength of relationship between the variables under study, regression was used to established functional relationship to determine the impact of the predictor variable on the independent variables and hypothesis testing was carried out to check the result significance at $\alpha = 5\%$. All parameter estimation was carried out using Minitab and Gretl statistical package.

4.0 Analysis of Data and Interpretation of Results:

This section deals with presentation and analysis of the data aiming at providing answers to the research questions and testing the set hypotheses.

4.1 Data Presentation and Analysis

Table 1. Correlation analysis of Global Crude Oil Price and GDP

Correlations		GDP	Yearly Oil Price
GDP	Pearson Correlation	1	0.762**
	Sig. (2-tailed)		0.000
	N	20	20
Yearly Oil Price	Pearson Correlation	0.762**	1
	Sig. (2-tailed)	0.000	
	N	20	20

** . Correlation is significant at the 0.01 level (2-tailed).

Table 1. shows the results of the computed correlation coefficient between Global crude oil price and Nigeria gross domestic product (GDP). The Pearson correlation coefficient is an indicator of the strength of relationship between continuous variables. From the table above, the Pearson correlation coefficient between yearly oil price and gross domestic product (GDP) is 0.762 ($r=0.762$). This coefficient indicates a high positive correlation between the two variables (76.2%); this means there is a strong linear relationship between International Crude Oil Price and Nigerian GDP. This finding proves that Global Crude Oil Price has high association with Nigeria GDP. In testing of Hypothesis 1,

Hypothesis 1

H₀: There is no significant correlation between Global crude oil prices and Nigeria GDP

H₁: There is significant correlation between Global crude oil prices and Nigeria GDP

$\alpha = 5\%$

Computation:

Table 4.1 presents the significance value of the Pearson correlation coefficient for Global oil price and GDP. From the table the significance value is 0.000.

The **decision rule** is to reject H₀ if significant value $< \alpha$. Since our estimated significant value (0.000) $< \alpha$ (0.05), we reject the research null hypothesis (H₀) and accept the alternative hypothesis (H₁). Therefore, we can conclude that, there is significant correlation between Global crude oil prices and Nigeria GDP.

4.2 Regression Analysis: GDP versus Crude Oil price

The regression equation is

$$GDP = 48.8 + 4.21 \text{ Crude Oil price}$$

Predictor	Coef	SE Coef	T	P
Constant	48.83	57.65	0.85	0.408
Crude Oil price	4.2137	0.8436	4.99	0.000

S = 105.234 R-Sq = 58.1% R-Sq(adj) = 55.8%

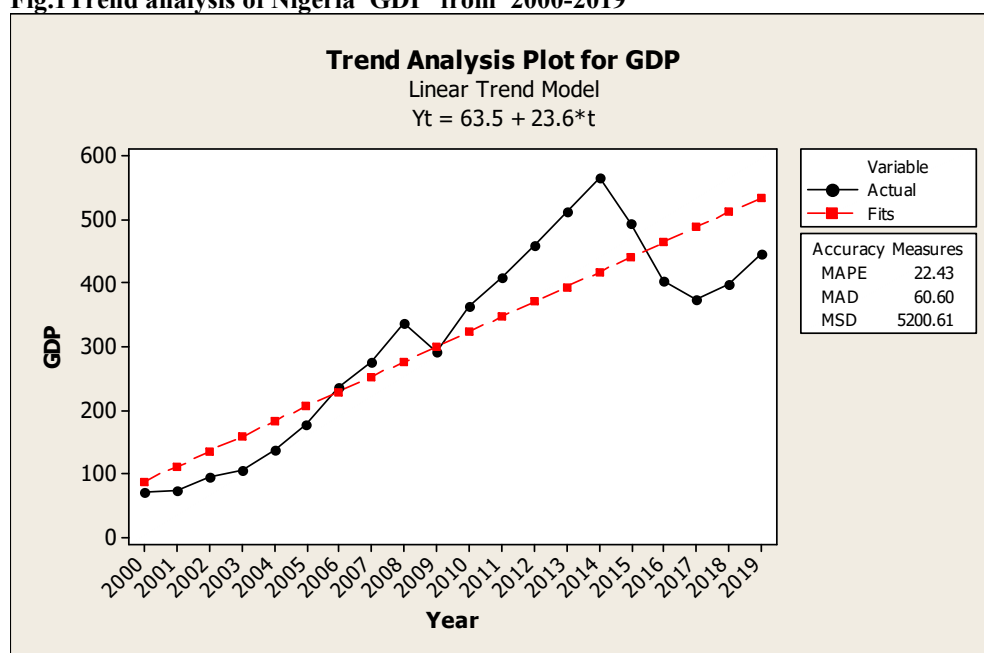
Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	276298	276298	24.95	0.000
Residual Error	18	199335	11074		
Total	19	475632			

From the analysis above, the constant coefficient is 48.83 ($\alpha = 48.83$) and the slope coefficient is 4.2137 (i.e. $\beta = 4.2137$), this means that gross domestic product (GDP) increases on average by #4.2137bn per unit increase in crude oil price. The coefficient of determination is 0.581 ($R^2 = 58.1\%$), this indicate that crude oil price accounted for 58.1% of the variation that occurs in gross domestic product. In testing the second hypothesis, Since the significance values ($0.00 < \alpha (0.05)$), this is an indication that the slope coefficients s significant in the model. This means crude oil price has a significant contribution on the changes in gross domestic product (GDP).

4.3 Time Series Analysis of Global Crude Oil Price and Nigeria Gross Domestic Product from 2000-2019

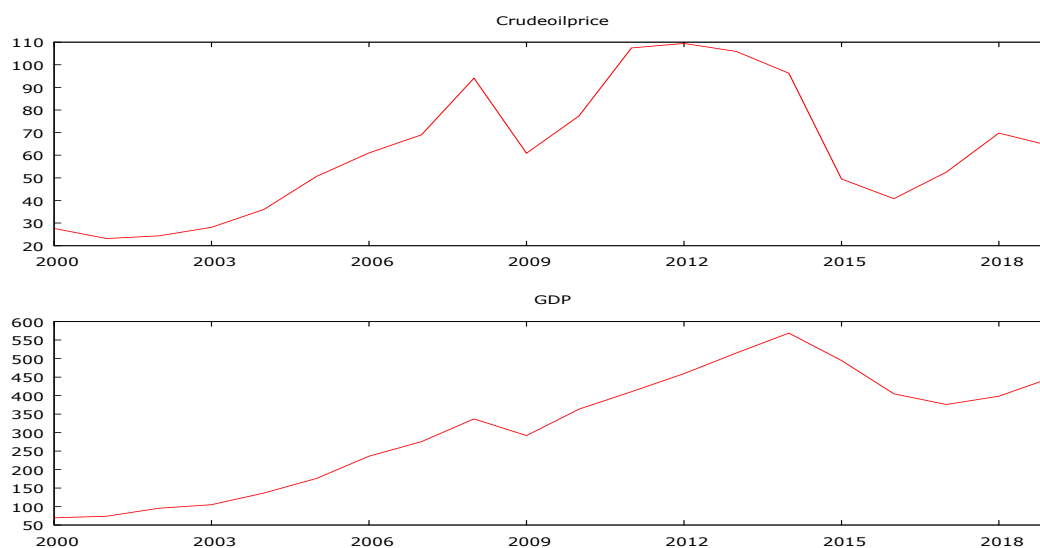
Fig.1 Trend analysis of Nigeria GDP from 2000-2019



Source: Central Bank of Nigeria

Fig 1 shows the trend analysis plot of Nigeria Annual Gross domestic product from year 2000 to 2019. Generally the plot show an increasing trend in Nigeria Gross domestic product from 2000-2019, further scrutiny of the plot shows decrease in GDP was recorded in 2009 and a significant dip from 2014-2016, this dip resulted in the country going into recession. With growth figures showing the economy contracted by 2.06% between April and June 2016 this is as a result of oil industry been hit by weaker global price (NBS)

Fig 4.2 Time Series plot for Global crude oil price and Nigeria GDP from 2000-2019



The time series plot above for Global crude oil price and Nigeria GDP indicate presence of a trend, both variable are shown to exhibit same pattern, an increase in Crude oil price indicate increase in GDP and in years where there a drop in crude oil price, there is also a decrease in the value of GDP indicating significant relationship between both variables. The presence of trend in the data indicate the above data is not stationary therefore there is need for the data to be differenced for it to be stationary.

4.3.1 SELECTION OF BEST FIT TIME SERIES MODEL

In selection of the best model ARIMA model for Crude oil price and Nigeria GDP, the Information criterion was used in model selection. Information criterion is a measure of the quality of a statistical model. It takes into account how well the model fits the data.

Table.1 Parameter estimate and diagnostic of model for Crude oil price

P,d,q	Log likelihood	AIC	BIC
1,1,1	-81.65833	171.3167	175.0944
1,1,2	-80.87111	171.7422	176.4644
2,1,1	-80.90921	171.8184	176.5406
1,1,0	-81.82277	169.6455	172.4789
0,1,1***	-81.78749	169.5750	172.4083
2,1,2	-80.85685	173.7137	179.3803
0,1,2	-81.47314	170.9496	174.7240
2,1,0	-81.53712	171.0742	174.8520

Table.2 Parameter estimate and diagnostic of model for Nigeria GDP

P,d,q	Log likelihood	AIC	BIC
1,1,1	-98.41648	204.8330	208.6107
1,1,2	-97.71615	205.4323	210.1545
2,1,1	-97.05728	204.1146	208.8368
1,1,0***	-98.45420	202.9084	205.7417
0,1,1	-98.53776	203.0755	205.9088
2,1,2	-96.66326	205.3265	210.9931
0,1,2	-98.21620	204.4324	208.2102
2,1,0	-98.35317	204.7063	208.4841

The Akaike Information Criterion and Bayesian Information criterion for each model diagnostic is presented in the table above, the idea of selection is to select the model with the least value of AIC and BIC, and from the table above it can be concluded that the ARIMA (0, 1, 1) and ARIMA (1, 1, 0) is the best model for forecasting Global crude oil price and Nigeria GDP.

4.3.2 FORECAST OF GLOBAL CRUDE OIL PRICE AND NIGERIA GDP USING THE BEST FIT MODEL.

YEAR	CRUDE OIL PRICE. ARIMA(0,0,1)	NIGERIA GDP ARIMA(1,1,0)
2020	\$64.67	₦478.14
2021	\$66.49	₦501.63
2022	\$68.30	₦522.96
2023	\$70.12	₦543.60
2024	\$71.93	₦564.00

4.4 Discussion of Findings

The study aim to examine the impact of global oil price on Nigeria GDP and to fit a time series model to aid forecast of future Global crude oil prices and GDP. In the assessment of the level of relationship between Global crude oil price and Nigeria GDP the correlation coefficient, $r = 0.762$, this indicates that a strong positive linear relationship exists between Global crude oil price and Nigeria GDP. And the p-value 0.000 indicates that at 5% level of significance, there is significant relationship between international crude oil price and Nigeria GDP. This supports the findings of Nwanna and Eyedayi (2016) that there is a positive and significant relationship between oil price and economic growth. The study concluded that oil price fluctuation does not impact positively on the economy

In assessment of the impact of Global crude oil price on Nigeria GDP, the fitted regression model where Global crude oil price (Predictor variable) and GDP as the dependent variable was given as $GDP = 48.8 + 4.21$ Crude Oil price with coefficient of determination $R-Sq = 58.1\%$ this indicate that Global crude oil price account for 58.1% variation in Nigeria GDP and from the fitted model the constant coefficient is 48.8 ($\alpha = 48.8$) and the slope coefficient is 4.21 (i.e. $\beta = 4.21$), this means that gross domestic product (GDP) increases on average by ₦4.210bn per unit increase in crude oil price. in testing of stated hypothesis, Since the significance values (0.00) $< \alpha$ (0.05), this is an indication that the slope coefficients is significant in the model. This means crude oil price has a significant contribution on the changes in gross domestic product (GDP). Therefore, we can conclude that there is significant relationship between Global crude oil price and Nigeria GDP and economic activities in Nigeria s determined by fluctuation in Global crude oil price. This also support the findings of Ibrahim.TM(2018) that oil price impacted positively on aggregate output but negatively on agricultural, manufacturing and service sector suggesting that fluctuation in oil price create uncertainty in the production capacity of the productive sectors and it also undermines the effectiveness of the government fiscal management of crude oil revenue. Success Ikechi & Anthony (2020) in their work ‘Global oil price and its effect on economic growth’ also conclude that oil price shocks have direct impact on short term economic growth in Nigeria, but the long term impact may be difficult to deduce due to inadequate data.

The times series analysis carried out shows the presence of an increasing trend indicating a non-stationary data, the data was difference and the unit root test was carried out to determine the stationarity of data. The information criterion was employed in selected of the most parsimonious model for forecasting future Global crude oil price and Nigeria GDP and from the analysis carried out ARIMA(0,1,1) and ARIMA(1,1,0) is the best model for forecasting Global crude oil price and Nigeria GDP.

5.1 Conclusion

This study empirically investigated the effect of Global crude oil prices on Nigerian Gross domestic product. It is evident that the Nigerian GDP which explains the market value of all officially recognized final goods and services produced in the country is largely affected by fluctuations in Global oil price. From the analysis carried out it can be concluded that Global crude oil price have a significant correlation with Nigeria gross domestic product, %58.1 of variation in Nigeria gross domestic product is attributed to fluctuation in Global crude oil price and Nigeria GDP will increase by ₦4.21bn per unit increase in crude oil price. And finally, it was ascertained from the fitted models that both Global crude oil price and Nigeria gross domestic product will continue on an increasing trend from 2020-2024.

5.2 Recommendation

In view of the findings in this study, the following recommendations are made:

- i. Diversification of Nigerian economy is most imperative given the impact of Covid-19 on economic activities within the country. To ensure that the country closes the gap between shrinking revenue and expenditure, policy makers must diversify the economy and cuts waste in governance.
- ii. Government should also make improvement to the oil sectors in every aspect that will increase the daily production of crude oil such as building more refineries, improving employee’s welfare
- iii. It is also recommended that government should allocate more funds to capital expenditure. It is a usual trend in Nigeria that recurrent expenditure takes a chunk of the budget which goes into salaries and

allowances.

- iv. Government should also formulate effective policies to ensure increase of crude oil and natural gas reserves as well as development of local skills and technology to enable Nigeria derive the most from the industry while producing within its OPEC allocated quota.

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