Analyzing the impact of crude oil and Natural gas price fluctuations on Nigeria's economy: A time series Approach

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ABSTRACT: This study applies Time series analysis techniques to examine the trends and patterns in Nigeria economic indicators, specifically Gross Domestic Product (GDP), crude oil and Natural gas price from 2010 to 2023. Using data from the Central Bank of Nigeria and National Bureau of Statistics, I employ techniques such as Least square regression (LSR)Autoregressive Integrated Moving Average (ARIMA), Exponential Smoothing (ES), Autocorrelation and a Sequential Chart (SC)to model and forecast these economic variables. My results reveal significant trends and seasonality, and volatility in crude oil production and prices, with oil shocks having a profound impact on Nigeria economics performance. The study identifies long run equilibrium relationships between crude oil production, prices, and economic indicators, and detects structural breaks in the time series. The findings have implications for Nigeria economics policy, energy sector management, and investment decisions. This research contributes to the existing literature by providing a comprehensive time series analysis of the complex relationships between crude oil and Nigeria economy, offering insights for sustainable economic development and energy policy formulation. My findings through my analysis, there is up and down movement in the prices from 2010-2019, while there is spike in the price for the year 2020-2023 and later move with up and down for the year 2022-2023. With the linear regression result above. The sig level result .633 is greater than the P value 0.05, which indicate the typical threshold for statistically significance and fail to reject the null hypothesis of a non-significance result. The stationary R-square I moderate with .486(48.6%) which shows that there is moderate relationship between the variables. R-square value which indicates 58.7% of the variation I depend in variable data been explained.

1.0 Introduction

Studying economic growth rates is crucial as they serve as key indicators of a nation's overall economic health and development. Economic growth rates reflect the expansion or contraction of a country's output over time, providing insights into its prosperity, standard of living, and potential for investment. Analyzing these rates helps policymakers, businesses, and researchers understand the dynamics of an economy, formulate effective strategies, and identify areas for improvement or intervention. A robust understanding of economic growth rates is essential for making informed decisions that contribute to sustainable development and improved living standards. The Gross Domestic Product (GDP) of a country at the market price is defined as final goods and services produced within a country in a given period of time. Crude oil is an abundant natural resource that is extracted for commercial purposes by a limited number of countries, and the global economy is highly dependent on it as a source of energy since its discovery in the 19th century (Jahangir Amuzegar, 1983; Griffiths et al., 2022). It is widely recognized as a crucial commodity in all areas of production and services, exerting a substantial influence on the industrial and transportation sectors (Shwe Sin Htay & Jatta, 2021). According to the Corporate Financial Institution (2019), crude oil holds significant importance as a source of fuel and it traditionally accounts for more than one-third of the world's energy consumption. It is an important energy source that plays a crucial role in enabling growth in society and supporting daily operations through the utilization of its various derivatives. These derivatives serve diverse purposes in our lives, including the fuel that propels our vehicles and the plastics that impact our global

environment. It is one of the most important energy sources for both exporting and importing nations (Ukemenam et al., 2018). It is also a significant source of foreign exchange revenues and, more crucially, the main source of income for the governments of the oil exporting countries and also a crucial chemical as raw material with several uses for oil-importing countries. Despite the ongoing debate regarding the significance of alternative renewable energy sources such as water, solar, and nuclear power, it is evident that oil continues to play a significant role in the energy consumption of many countries around the globe, and its significance in bolstering a nation's economy cannot be overstated (Abdelsalam 2020).

the aim of this research is to analyze the economic trends in Nigeria, focusing on the factors causing fluctuations in economic sector and with the following objectives: to examine the relationship between GDP, inflation, and unemployment rates and knowing the impact of oil price fluctuations on Nigeria's economy, to assess the effectiveness of monetary and fiscal policies and identify key drivers of economic growth and development, to identify areas of economic vulnerability and opportunities for growth and evaluate the effectiveness of economic policies in achieving desire outcomes and to examine the trend and seasonality of Nigeria economic indicator GDP and develop the forecasting model to protect future economic trend and pattern. This study covers crude oil sector of Nigeria's economy. The analysis will incorporate historical data on some factors of crude oil trade that are assumed to have impact on Nigeria's economy. The data for this study was secondary data sourced from relevant government agencies and intergovernmental organizations with a timeframe covering 2010 to 2023.

Nigeria serves as a prominent illustration of a significant economy that is dependent on crude oil. This is attributed to the country's relies on oil revenues to finance capital public projects and cover significant overhead expenses. The predominant dependence on oil is also evident in the significant contribution of the oil sector to Nigeria's Gross Domestic Product (GDP). Nigeria is one of the major oil-producing and oil-exporting countries in Africa (Kamer, 2023), and it is widely recognized as a significant global contributor to the production of oil and a big competitor in the global oil market. These activities of exploring, producing, and exporting crude oil have had a pivotal impact on the economy of Nigeria, which has a substantial effect on several sectors and aspects of the nation's overall development. The primary markets for Nigerian crude oil are Europe and Asia, and in terms of value, Nigeria stands as the world's 9th biggest exporter of crude oil in 2021 (Statista, 2022). During the second quarter of 2021, crude oil exports to Europe and Asia in value are approximately N1.48 trillion and N1.46 trillion respectively. This translates to roughly 90% of the country's exporting earnings coming from crude oil (Statista, 2022). According to Kamer (2023), research published by Statista revealed that the country exported around 1.6 million barrels of oil per day to the global market in the year 2021. Odularu (2008) revealed that in 2000, oil and gas export revenues made up over 98% of total export earnings. The export income of Nigeria saw a notable surge as a result of the sharp rise in oil prices in the early 1970s, which coincided with the onset of the oil boom in the country (Odularu, 2008). The economic well-being of the country is closely tied to its large crude oil reserves and crude oil exports, which provide a larger share of its foreign exchange earnings and government expenditures and it also strengthens its local currency. Thus, countries participate in crude oil trade, in order to secure a consistent and reliable source of oil for their respective industrial sectors and the public in general. The discovery of crude oil established Nigeria as one of the world's oil-rich countries that were recorded between 1971 and 2005 (Sani & Nwoye, 2023). Its petroleum sector constitutes around 6.33% of Nigeria's Gross Domestic Product (GDP) and contributes over 90% of the total export value (Statista, 2022). That is, the sector contributes a significant role in generating foreign exchange earnings and overall revenue, which are crucial for the socio-economic and political development of Nigeria (Bediako E et al., 2018). It is pertinent to know that Nigeria generated over US$390 billion in tax revenue from the oil industry, and in 2013 she had a Gross Domestic Product (GDP) of US $522.6 billion as Africa's largest economy (Sani & Nwoye, 2023). Hence, the adverse fluctuations in global crude oil trade would have significant repercussions on Nigeria's economy, leading to a downturn in several sectors such as production, manufacturing, and transportation. The crude oil trade is significantly impacted by the acts of prominent oil-producing nations, with some of these nations being a member of the Organization of the Petroleum Exporting Countries (OPEC, 2019). The trading of crude oil is subject to a multitude of factors, including the interplay of supply and demand dynamics, as well as geopolitical events (Song et al., 2022). Therefore, any change from these factors will have a positive or Negative impact on Nigeria's economy. However, it is crucial to analyze the impact of crude oil trade on the economy of Nigeria.

2. Literature Review

It is pertinent to say that energy is crucial for the sustainability of the global economy and plays a crucial role in promoting economic development.

Hence, the availability of long-term energy sources that are accessible, inexpensive, and friendly to the environment will have a significant impact on future economic growth (Periwal, 2023). Nwanna & Eyedayi (2016), agreed that the significance of oil has escalated to the point where the absence of oil in the global context would result in the failure of major distribution systems, thereby causing a collapse of the world economy. Therefore, this chapter intends to review statements and findings of previous researchers on topics that are related to the study. 2.1 History of Crude Oil in Nigeria . The discovery of crude oil in Nigeria occurred in 1956 at Oloibiri, located in the present-day Bayelsa State, following a century-long quest for its presence (Arinze, 2011). Prior to this discovery, the main source of revenue for Nigeria was derived from the exploitation of primary commodities, including cocoa, groundnuts, cotton, lumber, and palm goods (Asekunowo & Olaiya, 2012). They reveal that export profits in Nigeria had a significant increase during the early 1970s due to the emergence of the oil boom. Since the post-colonial era, the Nigerian economy has undergone a number of modifications and structural changes.

The first shipment of Nigeria's crude oil was transported to Rotterdam in 1958 (Steyn, 2009). This discovery established Nigeria as one of the oil-richest countries in Africa making it the giant of Africa. The incorporation of crude oil into the Nigerian economy throughout the latter part of the 1950s resulted in a substantial transformation and advancement within the nation's economic sphere (Asekunowo & Olaiya, 2012). Nigeria joined the Organization of the Petroleum Exporting Countries (OPEC) in 1971, an international organization that holds responsibility for around 78% of the global oil reserves and approximately 42% of the global oil production (Squalli, 2007). Also, the Nigerian National Petroleum Company (NNPC) was established in 1977 with a mandate to regulate and be actively involved in the nation's oil companies, which includes major firms like Chevron, Exxon Mobil, and Shell (Statista 2023). Nigeria, as the tenth biggest global oil producer, operated a total of 18 pipelines and had an average daily output of around 1.8 million barrels in the year 2020 (Statista 2023). During the period of 2011 to 2012, it is noteworthy that the leading 10 oil exporters in the sub-Saharan African region collectively produced a substantial amount of over USD 250 billion from the sales of oil and revenue accounted for almost 56% of their combined government income (Gillies et al., 2014). However, in the year 2014-2016, Nigeria experienced a decline in its status as the leading oil-producing nation in Africa, as Angola overtook her (Omolade et al., 2019). This shift was a result of a decrease in crude oil production by a quantity of 67,000 barrels per day. Nevertheless, reclamation of this position to Nigeria occurred in the latter part of 2016 (Omolade et al., 2019).

Crude Oil Production

Oil production levels vary across different countries, with many countries frequently faced with a situation where their demand for energy needs surpasses their local supply (Kamyk et al., 2021). Over the past few decades, there has been a significant surge in global oil production. However, as the energy requirements of countries continue to rise as a result of industrialization couple with the absence of sufficient alternatives to oil, there is a corresponding increase in global demand and production of oil (Tsirimokos, 2011). According to Ayhan Demirbas (2016), one barrel of crude oil (42 gallons or 159 litres) can vary greatly in cost, depending on its quality which takes into account factors like specific gravity, sulfur content, viscosity, including its geographical source. The production levels of crude oil are influenced by OPEC's quotas, impacting both short-term and long-term periods. OPEC exerts market power through the implementation of quotas that have a direct impact on production levels and pricing dynamics, and the escalation of oil prices stimulates the production levels of individual member states within OPEC, rather than exerting a suppressive effect on production (Kaufmann et al., 2008).OPEC's oil production is subject to various factors, including the price of oil, market conditions, such as the worldwide demand for oil, and the production activities of nonOPEC oil producers (Barros et al., 2011). Geopolitical events also play a role in influencing OPEC's oil production. The OPEC has demonstrated a consistent track record of effectively employing production cuts to mitigate price falls, while simultaneously counterbalancing supply disruptions and escalating oil prices through increased production (Barros et al., 2011). The production of hydrocarbons is the primary contributor to Nigeria's economy as the country's principal source of foreign earnings is generated from the sale of oil and natural gas. Thus, any shift in the price of crude oil has a noticeable effect on the country's financial statue According to Odularu, (2008), as of mid-2001, its daily crude oil production stood at an average of 2.2 million barrels and the estimated quantity of Nigeria's confirmed oil reserves is approximately 35 billion barrels, while its natural gas reserves exceed 100 trillion cubic feet (2,800 cubic kilometers).In recent years, oil Nigeria's oil production has faced setbacks with unforeseen disruption resulting to supply shortages. According to Energy Information Administration (2023), the production of crude oil has experienced a severe drop as a result of unanticipated

disruptions and a reduction in investments made in upstream development since 2020. This is due to large and lengthy disruptions brought on by crude oil theft and pipeline vandalism in the third quarter of 2022, Nigeria's crude oil production momentarily fell below one million barrels per day (EIA, 2023). Due to oil theft in the Niger Delta, Nigeria has been unable to reach its OPEC quota of 1.83 million barrels per day for the past year (Akintayo, 2023). These lead to a decrease in the production of crude oil from Nigeria's key crude oil grades, including Bonny Light, Brass River, and Forcados (EIA, 2023). This has directly affected the crude oil trade, making the country not have enough to sell to its consumers. Although Nigeria's crude oil output has fully restored to average levels by the first quarter of 2023, disruptions continue to pose a serious and persistent threat to the country's overall production (EIA, 2023).

Crude Oil Transportation

Crude oil is one of the world's most important commodities transported via sea routes due to its economic importance. Although there are alternative means for transporting this crude oil from its source to consumers, transporting it by sea is cost-effective because of the large quantities involved. The transportation of crude oil is primarily driven by refineries that process oil to produce diverse petroleum-based products. (Hennig et al., 2012). According to Statista (2022) in 2021, around 1.83 billion metric tons of crude oil were transported globally via sea. Given the global growing demand for energy and crude oil being the major source, transportation services become important factor in facilitating crude oil trade, driving economic growth, and ensuring national security for any country (Fei et al., 2020). Hence, the disparity between the supply and demand for crude oil, according to Shi et al. (2013), underscores the need for transportation services. Maritime transportation of crude oil began in the late 19th century and the volume of crude oil transported over water has consistently increased over time (Shwe Sin Htay & Jatta, 2021). There are diverse types of crude carriers such as the Ultra Large Crude Carriers (ULCCs) and Very Large Crude Carriers (VLCCs) which represent the largest vessels in the global tanker fleet. These vessels transport cargoes with 200,000 deadweight tonnage (dwt) or above (Merikas et al., 2013). The Suezmax and Aframax vessels are commonly classified as mid-size tankers, Suezmax tankers transport cargo of 120,000 to 200,000dwt, and Aframax vessels transport cargo of 80,000 to 120,000dwt (Merikas et al., 2013). Oil prices have the potential to affect the tanker shipping industry. For instance, the oil embargo that the Organization of Arab Petroleum Exporting Countries (OAPEC) imposed in

1973 as a response to the involvement of the United States in the ArabIsraeli War (Shwe Sin Htay & Jatta, 2021). Another recent one is the European Union's2.4 Crude Oil and the Economy An article titled "Oil Rules Nigeria" written by Damu and Bacon (1996) is evident in Nigeria's heavy reliance on crude oil sales for revenue generation. Crude oil constitutes over 33% of the worldwide primary energy supply and is responsible for over 95% of energy consumption in the transportation sector (Miller & Sorrell, 2013). It is a significant commodity that functions as the predominant energy source for numerous industries and global transportation. Consequently, the trade of oil assumes a crucial role in the global economy, involving multiple key stakeholders. It is commonly held that a country's wealth in crude oil would help its economy grow (Benramdane0, 2017). Leading development economists maintained that countries' endowments in natural resources would help them make the transition from being underdeveloped to industrialization, just as it had happened for some developed nations like the United States, Australia, China, and the United Kingdom (Benramdane, 2017

Research Gap

Existing literatures reveal that the economies of countries involved in crude oil production, export, and import are influenced by elements related to crude oil trade. However, there is no consensus among researchers on this. The diversities of previous findings may be attributed to the various variables and methods used and also the time frames within which the studies were carried out. Notably, most prior studies emphasized the impact of crude oil prices on GDP, not considering other crude oil trade-related factors.

3.0 Methodology

Time series utilize approach to analyze the impact of crude oil trade on Nigeria's economy. In order to conduct this research, the empirical data will consist of a time series dataset with an annual frequency from 2010 to 2023 with a sample size of the data to be used are secondary data that are sourced from central Bank of Nigeria bulletin (CBN) Comprise of price per kg for the year range (2015-2022) Per quarter in Nigeria.

Model of Time Series

The most applicable two models of Time Series Data are:

Multiplication model

$Y(t) = T(t) \times S(t) \times E(t)$

Addition model

$Y(t) = T(t) \times S(t) \times E(t)$

Mixed models

Different assumptions lead to different combinations of additive and multiplicative models as

$Y_t = T_t + S_t + C_t + R_t$

In this study, an OLS regression model will be utilized with time series approach to analyze the impact of crude oil trade on Nigeria's economy. In order to conduct this research, the empirical data will consist of a time series dataset with an annual frequency from 1995 to 2021 with a sample size of 26. The data to be used are secondary data that are sourced from the Clark so Shipping Intelligence Network, the World Bank, and the UN Comtrade.

Using a unit root test on the Y and Xs variables, we can determine whether or not the data are

stable or stationary. The existence of a unit root inside a sequence is indicative of instability in the data being analyzed. A criterion of 0.1 (10%) is commonly used to evaluate the consistency of such data sets (Lv et al., 2022). To determine whether or not the variables in question are stationary, the research will use the ADF (Dickey and Fuller, 1981) and PP (Phillips and Perron, 1988) tests. This theory proposes that;

H0 = the variable is non-stationary
H1 = the variable is Stationary
We accept H0 (the null hypothesis) when P > 0.1 significance level. If the P-value is < 0.1 significance level, we accept H1 (Alternative hypothesis)

ARIMA Model
The most useful linear model for stationary time series is provided by ARMA models. The ARMA model improves the weakly stable stochastic time series by including two polynomials, moving average (MA) and autoregressive (AR). The ARMA model incorporates an additional component into the data-driven model in order to generate the ultimate prediction (Baptista et al., 2018).The past value that can affect the present value of the dependent variables (lag of Y) is handled by the AR model which can be represented as Yt = Y1Yt-1 +Y2Yt-2 +Y3Yt

The past error that can affect the present error of the dependent variables (lag of μ) is done by the MA model which can be represented as Yt = Y1μt-1 +Y2μt-2 +Y3μt-3.

Autoregressive Integrity Moving Average (ARIMA)

$$X_t = \alpha + \emptyset_1 X_{t-1} + \emptyset_2 X_{t-2} + ... + \emptyset_p X_{t-P} + \in_t + \emptyset_1 \in_{t-1} + \emptyset_2 \in_{t-2} + ... + \emptyset_q \in_{t-q} + \in_t$$

$-X_t$ = value of the series at time t

$-\alpha$ = constant term

$-\emptyset_1, \emptyset_2 ... \emptyset_p$ = Autoregressive parameter of order p

$-\emptyset_1, \emptyset_2 ... \emptyset_q$ = Moving average parameter of order q

$-\in_t$ = white noise or error term at time t

4. Analysis and Result
This section presents the analysis and the regression result of the data gathered on the impact of crude oil trade on Nigeria's economy.

Table1: Showing Real Price of Crude-Oil and Natural Gas per Annual (#Billion)

YEARLY	Qtr1	Qtr2	Qtr3	Qtr4	TOTAL
2010	1,937.63	1,983.89	2,092.03	2,389.12	8,402.67
2011	2,406.68	2,193.57	2,022.20	1,976.19	8,598.64
2012	2,207.30	1,970.22	2,221.02	1,774.72	8,173.26
2013	1,955.89	1,646.66	1,894.18	1,608.67	7,105.28
2014	1,826.67	1,731.38	1,826.08	1,627.68	7,011.81
2015	1,677.85	1,613.75	1,845.39	1,492.97	6,692.96
2016	1,597.16	1,426.08	1,420.27	1,228.69	5,672.21
2017	1,347.99	1,476.40	1,747.41	1,366.25	5,938.05
2018	1,537.04	1,418.07	1,696.61	1,344.16	5,995.88
2019	1,514.64	1,519.80	1,806.75	1,429.67	6,270.86
2020	1,591.25	1,419.04	1,555.77	1,147.14	5,713.20
2021	1,556.07	1,239.46	1,388.80	1,054.72	5,239.05
2022	1,150.85	1,093.61	1,073.90	913.55	4,231.90
2023	1,102.44	946.74	1,064.78	1,024.21	4,138.16

Source: Central Bank of Nigeria

4.1 TABLE 2: Descriptive Statistics Analysis of the Data

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
YEAR	22	2002	2023	2012.50	6.494
AMOUNT	22	4138.16	9294.05	7144.6600	1578.31114
Valid N (listwise)	22				

4.2 TABLE 3: Using the Total Quarter of Each Year to Analyze the Moving Average

YEAR	PRODUCT PRICE	MOVING AVERAGE
2010	8,402.67	
2011	8,598.64	
2012	8,173.26	7,959.06
2013	7,105.28	7,430.12
2014	7,011.81	6,936.68
2015	6,692.96	6,458.99
2016	5,672.21	6,101.07
2017	5,938.05	5,868.71
2018	5,995.88	6,068.26
2019	6,270.86	5,993.31
2020	5,713.20	5,741.04
2021	5,239.05	5,061.38
2022	4,231.90	4,536.37
2023	4,138.16	

4.3 SEQUENTIAL CHART FOR THE PRODUCT

Transforms: natural logarithm, difference(1)
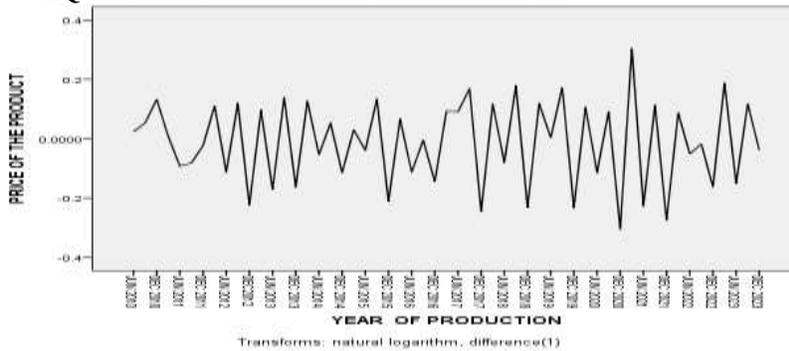
Figure 1: Showing the sequential chart having up and down movement in the prices from 2010 -2019 while there is a spike in the price for the year 2020-2021 and later move with up and down for year 2022-2023.
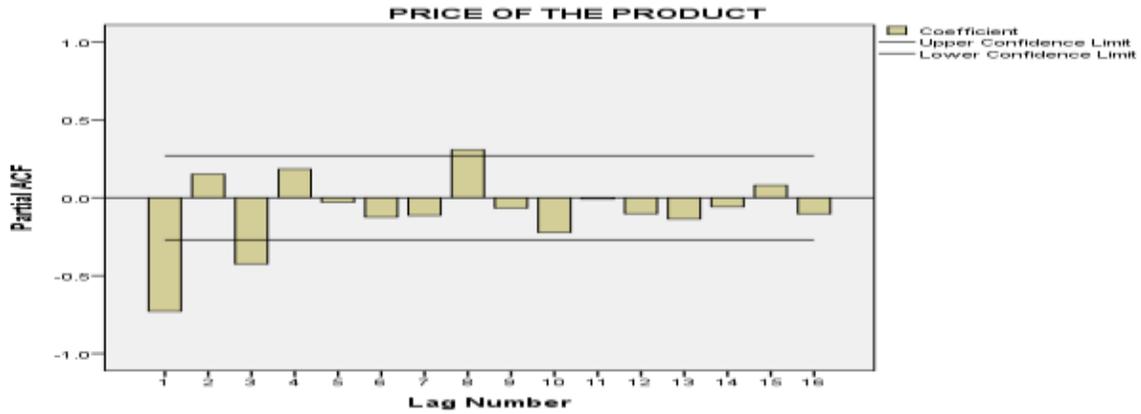**Autocorrelation**
Partial Autocorrelation Function

Figure 2: Showing the partial Auto correlation Function Price of the product [S-Diff-1]
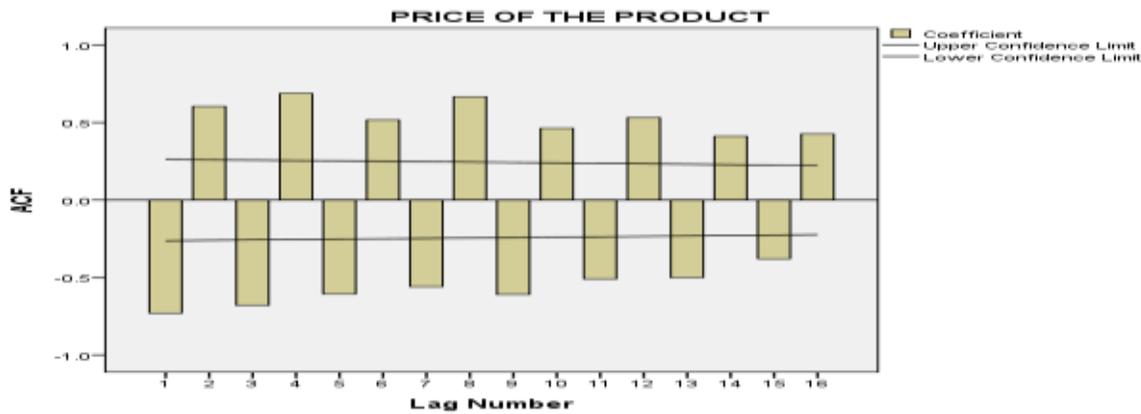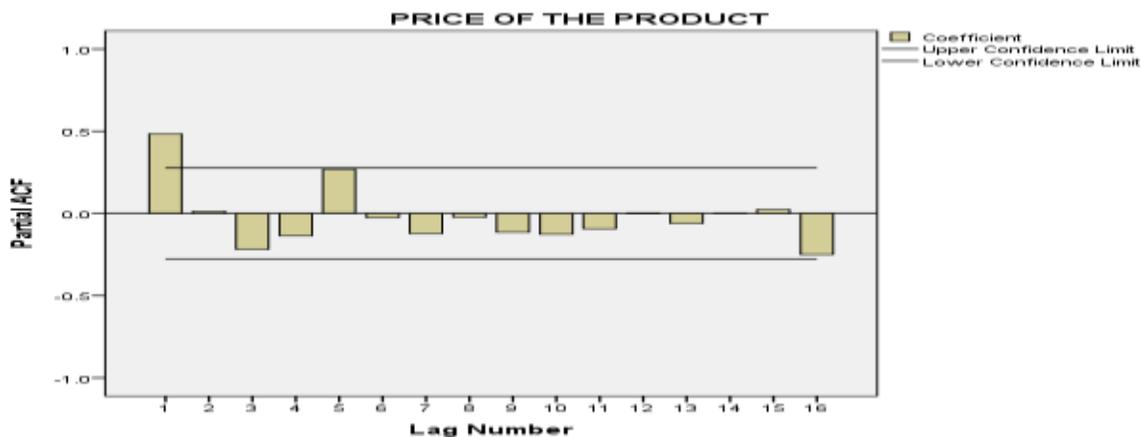**Autocorrelation Function**

FIGURE 3: Showing the Auto correlation Function Price of the product [S-Diff-1]
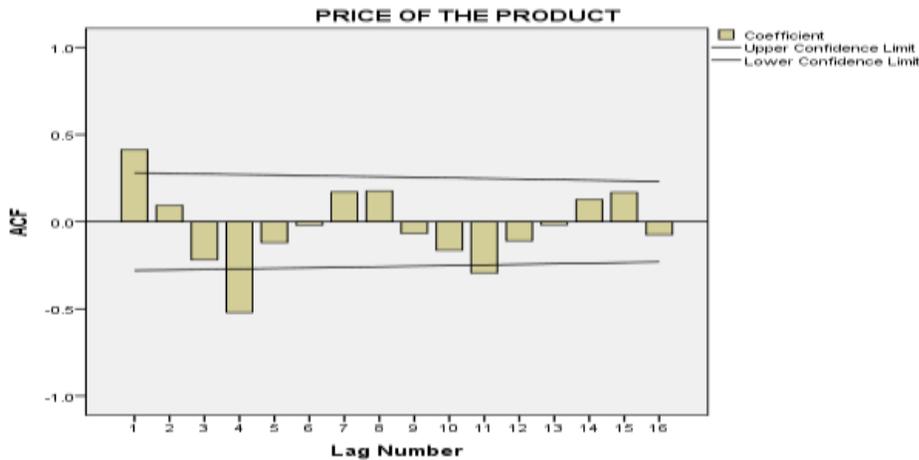
Partial Autocorrelation Function

Figure 4: Showing the partial Auto correlation Function Price of the product [S-Diff-2]

AUTOCORRELATION FUNCTION

Figure 5: Showing the Auto correlation Function Price of the product [S-Diff-2]
Interpretation for PACF and ACF
The autocorrelation PACF and ACF shows that there is a strong short-term autocorrelation which shows there is strong positive autocorrelation between the adjacent time period, the rapid decrease in autocorrelation coefficients for higher lags indicates that the autocorrelation decays quickly as the time gap increases while the smaller or negative values for higher lags suggest that there is little to no correlation between time periods farther apart.
 The coefficient of PACF with two lags up shows that the model been used is Autoregressive 2 and has a significant direct relationship with no indirect relationship.
The coefficient of PACF with two lags up shows that the model been used is Autoregressive 3 and has a significant direct relationship with different strength of relationships.

TABLE 4: Autoregressive Integrity Moving Average (ARIMA)

Model Statistics						
Model	**Number of Predictors**	**Model Fit statistics**	**Ljung-Box Q (18)**			**Number of Outliers**
		Stationary R-squared	**Statistics**	**DF**	**Sig.**	
PRICE OF THE PRODUCT-Model_1	1	0.486	10.739	13	0.633	0

TABLE 5: Model Summary for Autoregressive Integrity Moving Average (ARIMA)

Fit Statistic	Mean
Stationary R-squared	0.486
R-squared	0.587
RMSE	216.337
MAPE	9.885
MaxAPE	30.090
MAE	153.287
MaxAE	664.171

Interpretation: With the linear regression result above. The sig level result .093 is greater than the p value of 0.05, which indicate the typical threshold for statistically significance and fail to reject the null hypothesis of a non-significant result. The Stationary R-square is moderate with .486 (48.6%) shows that there is moderate relationship between the variables. R-square value which indicates 58.7% of the variation is depend in variable data been explain by the independent variable. While the remaining 216.3% of the variation id due to the random errors. The mean

absolute percentage error 9.89% is average different from the actual values. The maximum absolute percentage error 30.09% measure the error predicted and actual values of the
data.

Trend Chart of the Autoregressive Integrated Moving Average
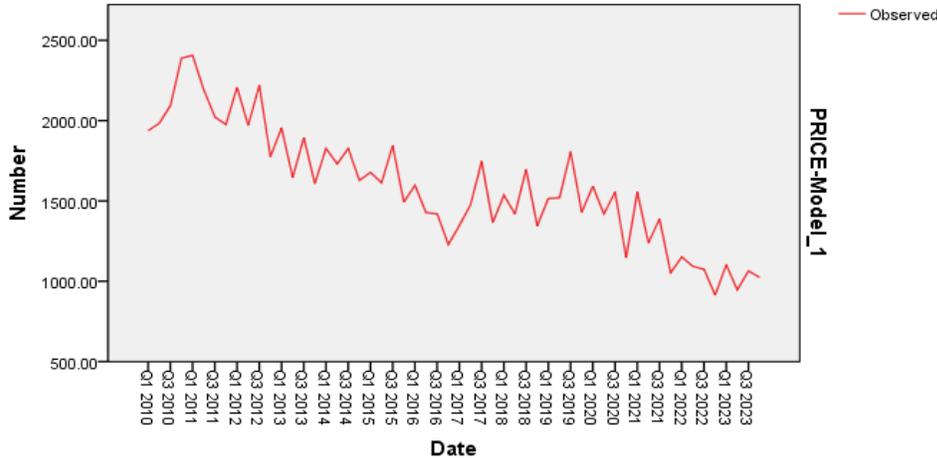
Figure 6: Showing that the trend of production dropped right from year 2010-2016, while is still spike up as at 2017-2019 and later dropped down again from 2020-2023.

TABLE 6: Exponential Smoothing
**Model summary for the exponential smoothing**

Fit Statistic	Mean
Stationary R-squared	**0.827**
R-squared	**0.787**
RMSE	**172.432**
MAPE	**8.874**
MaxAPE	**27.368**
MAE	**137.307**
MaxAE	**382.322**
Normalized BIC	**10.444**

TABLE 7: Model Statistic for The Exponential Smoothing Model Statistics

Model	Number of Predictors	Model Fit statistics				Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	Normalized BIC	Statistics	DF	Sig.	
PRICE OF THE PRODUCT-Model_1	0	0.827	0.787	172.432	10.444	101.798	16	0.000	0

Interpretation: With the linear regression result above. The sig level result .000 is less than the p value of 0.05, which indicate that the model is statistically not significance and the probability of obtaining the result by chance is extremely low (less than 0.1%) . The Stationary R-square is moderate with .827 (82.7%) shows that their strong relationship between the variables. R-square value which indicates 78.7% of the variation is depend in variable data been explain by the independent variable. While the remaining 172.4% of the variation id due to the random errors. The mean absolute percentage error 8.87% is average different from the actual values. The maximum absolute percentage error 27.37% measure the error predicted and actual values of the data. A Bayesian information criterion value of 10.444 indicates that the model is relatively good, but not perfect. The model is accepted, but there might be room for improvement.

Trend Chart for the Exponential Smoothing
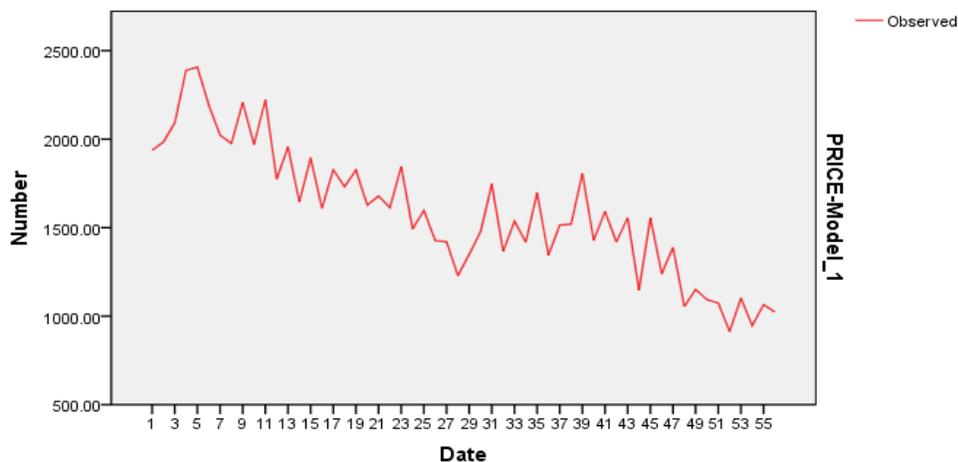
Figure 7: showing that the production dropped right from year 2016 to2018, while is still spike up as at 20119 before dropping down again from 2020 to 2023.

Finding: there is up and down movement in the prices from 2010-2019, while there is spike in the price for the year 2020-2023 and later move with up and down for the year 2022-2023. With the linear regression result above. The sig level result .633 is greater than the P value 0.05, which indicate the typical threshold for statistically significance and fail to reject the null hypothesis of a non- significance result. The stationary R-square I moderate with .486(48.6%) which shows that there is moderate relationship between the variables. R-square value which indicates 58.7% of the variation I depend in variable data been explained.

5. Conclusion

An article titled "Oil Rules Nigeria" written by Damu and Bacon (1996) is evident in Nigeria's heavy reliance on crude oil sales for revenue generation. Consequently, the trade of crude oil plays significant role in shaping the economic dynamics of Nigeria as a major source of the country's foreign earnings. By applying linear regression methodology on time series data, the study identified factors of crude oil trade that affect Nigeria's GDP per capita, revealing the nature and magnitude of their impacts. The empirical results derived from this model, identified Brent crude oil price, VLCC freight rates, and India crude oil import as factors of crude oil trade that are statistically significant to Nigeria's GDP. This shows that crude oil price is an important factor that is significant to the economy of Nigeria, contributing up to by 28.6% for every 1% increase in crude oil price. Additionally, crude oil price is the only variable that has a long-term relationship (cointegrated) with the GDP of Nigeria, indicating that if the crude oil price increase globally, Nigeria's crude oil imports from Nigerians in 2022 amounted to US$7.37 billion. (Trading Economics, 2023). the impacts of factors of crude oil trade that affect Nigeria's economy. Oil-producing and exporting nations such as Nigeria are confronted with volatilities and uncertainties of these factors, hence, the findings of this study hold considerable implications for crude oil trade policies and strategy in Nigeria.

6. Recommendation

Based on the results of this study, the government of Nigeria and other relevant institutions and organizations should prioritize the following policy recommendations. First, the Nigerian government needs an oil price monitoring tool to ensure that oil prices are being tracked in an efficient and effective manner. In order to effectively oversee oil price dynamics, legal frameworks should be crafted to allow for the prudent management of oil output, even during periods of low crude oil prices. Second, the government needs to establish policies and foster a culture that priorities the development, maintenance, and security of oil infrastructure and transportation systems. These policies will play a crucial role in promoting and stimulating economic expansion, as well as facilitating the influx of international investments and improving infrastructure that can yield benefits for industries other than the oil industry. Third, it is crucial to emphasize the critical nature of establishing mutually beneficial bilateral agreements between Nigeria and its partners in the crude oil trade, particularly India. Initiatives that strengthen diplomatic ties and trade agreements with India should be sustained. Engaging in strategic initiatives of this nature would play a crucial role in reinforcing

demand stability and ensuring a consistent and dependable source of revenue. It is important that these trade agreements should be transparent, accountable and workable.

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