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ASSESSING THE IMPACT OF OIL PRICE AND EXCHANGE RATE DYNAMICS IN NIGERIA: EVIDENCE FROM A DYNAMIC ORDINARY LEAST SQUARE APPROACH

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ABSTRACT

The Nigerian economy has suffered from economic crises in recent times. Hence, Crude oil is the source of essential petroleum products. Primarily, Nigeria exports crude oil and imports petroleum products, and this has a link with the unfavourable exchange rate of the Nigerian currency vis-à-vis the US dollar over the years. Thus, there is no significant relationship between oil price and exchange in Nigeria. This study investigates the impact of oil price and exchange rate dynamics in Nigeria from 1980 to 2022 using a Dynamic Ordinary Least Square Approach. The findings reveal that interest rate impacted positively on exchange rate while oil price and inflation rate, impacted negatively on exchange rate thereby reducing the rate of price in the long-run. The result of granger causality shows that there is no directional causality between oil price and exchange rate. Recommendations include: Government should focus more on the effective use of monetary policy to reduce inflation and to control the value of naira in the country. Thereby enhance the appreciation of naira in an economy also diversify the economy to reduce so much dependency on oil thereby reduce oil price.

Keywords: Oil Price; Exchange rate; Dynamic OLS; KPSS; Granger Causality
Jel Classification: N1, Q34, Q43

1.0 Introduction

The Nigerian economy has suffered from economic crises in recent times. Therefore, the relationship between oil price and exchange rate markets is important because the US dollar (USD) is the main billing and payment currency in international oil markets. Therefore, fluctuations in the USD exchange rate will affect oil traders, oil-exporting and oil-importing countries (Azeez & Kolapo 2022). This indicates that a fragile USD will raise the purchasing power of all oil-importing countries and reduce that of all oil-exporting countries, implying a negative affect. Likewise, an overvalued USD will negatively affect oil-importing countries, which will bring about declining demand leading to demand shock that will eventually affect oil-exporting countries. Thus, Crude oil is the source of essential petroleum products. Primarily, Nigeria exports crude oil and imports petroleum products, and this has a link with the unfavourable exchange rate of the Nigerian currency vis-à-vis the US dollar over the years (Loku, A. & Deda, 2019). The changes in oil price increase exchange rate and thereby causes inflation which in turn lead to higher interest rate which will consequently reduce investment. Thus, the dynamic of oil price and exchange rate is a major source of macroeconomic uncertainty affecting firms (Adekola, P.O., & Allen, A.A., 2022). Also, Nigeria's exchange rate and oil prices have been liberalized extensively since 1980's. Indeed, the country adopted a

flexible exchange rate system in adherence to the Bretton Woods Agreement (Ademola, A.S. & Badiru, A. 2020). A flexible exchange rate system is one with which the exchange rate at any time is determined by the interaction of the market forces of demand and supply for foreign exchange. Proponents of the flexible exchange rate regime argued that it permits a continuous response to changes in The Nigerian Stock Exchange which often provides avenue for corporate entities to raise long-term finance has exhibited oscillation of movements that have culminated in the decline of returns and capital depreciations across all sectors in the country (Ajayi, et al. 2021). Market participants have attributed the trend to fright trading.

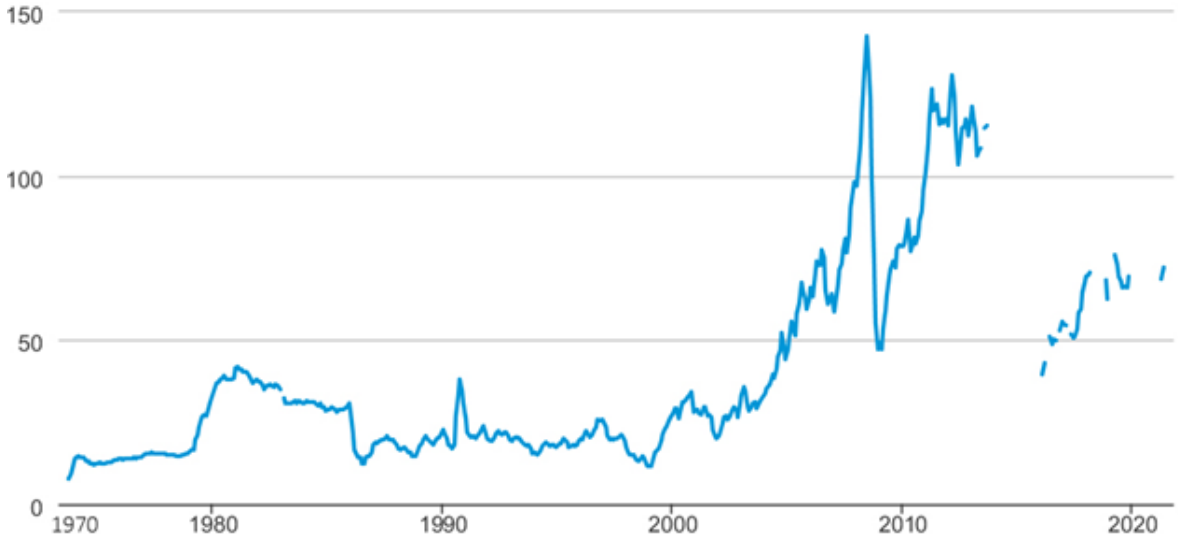

Figure 1: The Trend of Oil Price and Exchange Rate 1980 to 2024

Source: Information and Energy Administration 2024

The spot crude oil price and exchange rate movement above have a high-frequency data that show the variability of the series, oil, started with an initial low price, which is relatively stable over a long period of time from approximately 1970 to 1980. This period, exchange rate was stable. It witnessed a sharp decline in 1989 but picked up thereafter. It continued to increase over time to reach a peak between 2001 and 2009 and a sharp decline in 2010. However, it picked up again and witnessed continuous fluctuation until 2019. The spike that occurred is due to the occurrence of the global financial crisis, and the hike in oil price. Additionally, there was a significant fall in the price of crude oil around April 2020 due to the outbreak of the COVID-19 pandemic that led to the shortage in demand for crude oil. Another factor that led to the oil price plunge is the Saudi Arabia and Russia oil production cut war in 2020. This hike continues until 2024 which subsequently devaluate naira currency as a result of oil price increase. Hence, the nominal and the real exchange rates were depreciated so as to align them to their equilibrium levels (Obadan, 2020).The exchange rate continued to depreciate until 2024. The 2024 global financial crisis characterized by subsidy removal which in turn causes changes in the oil price and unexpected ebb and flow in exchange rates has brought to the fore, the need to further investigate the relationship between exchange rate and oil prices (Anuolam, et al.).The attention of researchers has focused increasingly on the mechanics of the prices-exchange rate nexus as world economies become more integrated. This is of particular importance for the far less researched developing countries that equally felt the impact of the world-wide dreary economic tidal wave. Firms operating in the country are affected by these hostile economic conditions as they faced higher business risk and foreign exchange risk.

It is on this note, this study seeks to answer whether oil prices have impacted on exchange rate in Nigeria and also, seek to answer whether there is a causal relationship between oil price and exchange rate in Nigeria. As a result, this study focuses on the impact of oil price and exchange rate dynamics in Nigeria and covered the period of 1980 to 2022. The rationale of using this study period is to take cognizance of the period of oil price regime that occurred in the global economy and the availability of data for the variables adopted in the study. Also, The DOLS model is employed due to its ability to capture Fully Modified Ordinary Least Squares (FMOLS) and Canonical Co-integration Regression (CCR) which will serve as robustness checks. The method was selected based on the sample size of the observation and it is applicable to estimating I(0) and I(1) variables or combination of the two since the dependent variable is integrated of order I(0). Dynamic Ordinary least Squares (DOLS) has advantages over the ordinary least squares these include: the ability to eliminate endogeneity problem, ability to correct autocorrelation problem, ability to eliminate simultaneity bias and lastly ability to tackle sample size bias.

Hence, empirical investigations of the relationship between oil price and exchange rate in the past had been the concern of many researchers especially in the developing countries of the world. The tests conducted in order to unveil the relationship between exchange rate dynamic and the response of oil prices, however, the arrow of causation still remains vague in both theory and empirics. Hence, the empirical consensus is still indecisive. Therefore, this study examines oil price and exchange rate dynamics in Nigeria.

2.0 Literature Review

2.1 Conceptual Literature

2.1.1 The Concept of Oil Prices

Great importance has been attached to crude oil so much so that Hathaway (2009) said a world without crude oil will collapse. Crude oil price are determined by its grade and attributes such as specific gravity, amount of sulfur content, originating location (closeness to tidewater and refineries). Hamilton (2009) described four factors that determines crude oil price. These are demand and supply, Organization of the Petroleum Exporting Countries (OPEC) countries and speculation.

2.1.2 The Concept of Exchange Rate

Exchange rate is the price of a nation's currency in terms of another foreign currency, implying comparing the domestic currency with a foreign currency. The exchange rate fluctuations which affect firms 'values via changes in competitiveness and changes in the value of firms' assets and liabilities, dominated in foreign currency, there by affecting firms' profits and therefore the value of equity (Gavin, 2020). This is due to its importance to relative oil price that connects domestic and world market commodities and assets which also signals the competitive power of a country's exchange rate vis-à-vis the global market.

2.1.3 The Concept of Oil Prices and Exchange Rate

Hossain (2022) agreed that exchange rate helps to connect oil price systems of two different countries by making it possible for international trade and also effects on the volume of imports and exports, as well as country's balance of payments position. The dynamic responses of exchange rates to oil price shocks co-move from a time-varying perspective (Gavin, 2020). The unexpected oil price shocks could have a greater influence on the exchange rate in various markets over time, on the effect occurring only when extreme market situations and unexpected oil price shocks appear simultaneously. In addition, there is observable convergence among regional markets in the countries. For oil price-macroeconomic

fundamentals connection, there is existence of signal explored the oil price-macroeconomic fundamentals connection for emerging market economies

2.2 Theoretical literature

Two theoretical frameworks for establishing a relationship between oil price and exchange rate are; Portfolio approach and Stock-oriented economic theory. The Portfolio approach introduced by; (Branson, 1983; Frankel, 1983) postulates that changes in oil prices influence movements in exchange rates through portfolio adjustments (inflows/outflows of foreign capital). The approach believes that an inflow in oil price rises as upward trend in prices is recorded. However, a decrease in oil prices would induce a reduction in domestic investor's wealth, leading to a fall in the demand for money and lower rates, causing capital outflows and consequently currency depreciation. The depreciation of the local currency makes exporting goods attractive, increases foreign demand and hence revenue for the firm and its value appreciates thus prices increases. Conversely, appreciation of local currency reduces the profit for an exporting firm and thereby affect it value of stock price negatively (Jorion, 2021). The stock-oriented economic theory introduced by; (Dornbusch & Fischer, 1980) postulates a negative relationship between oil prices and exchange rates. The crux of the theory is that a decrease in domestic oil prices would attract capital flows, which increase the demand for domestic currency and cause exchange rate to appreciate. In flow oriented models, and stock-oriented or 'portfolio balance theory postulate that movements in oil prices has no influence in exchange rate and don't Granger-cause movements in the exchange rate via capital account transactions(Branson et. al, 2021). The degree to which stock oriented models explain currency movements is a function of stock market liquidity. Accordingly, while the flow theory holds that exchange rate has a negative impact on oil prices, the stock theory states that oil price and exchange rates are determined by market mechanism. In other words, oil price is expected to affect exchange rate with a negative correlation since a decrease in oil prices increase demand and investment and reduce inflation which lead to decrease in interest rate.

2.3 Empirical Literature Review

Empirical studies investigating the relationship between oil prices and exchange rate have increased in folds over the past few decades. Aggarwal (2020) explored OLS and Granger causality to examine the relationship between the dynamics of dollar exchange rates and oil prices in Nigeria from 1990 to 2019. The results presented a positive relationship. The Granger causality result shows the direction of association between the variables. The latter investigations into the enquiry concluded that the observed mixed outcomes from the earlier studies might be from the non-stationary of the financial variables that were used. Similarly, Bahmani-Oskooee and Sohrabian (2021) conducted study in Ghana from 1990 to 2019, using Granger causality and cointegration techniques. Their results found bidirectional causality relationship between the oil price and exchange rate markets only in the short-run; and that there is no long-run relationship between the two variables using cointegration analysis. Subsequent studies relied on the methodology of Bahmani-Oskooee and Sohrabian (2021); interestingly, those studies were also characterized with mixed and diverse results. While some found positive and bidirectional relationship between exchange rate and oil prices (for example, Yu, 2017; Granger, Huang and Yang, 2016; & Husam, 2012), others opined that a negative and unidirectional causality exist, though pronged in different directions. On the other hand, studies that concluded that the direction flows from oil prices to exchange rate (see for example, Ajayi et al. 2008; Nagayasu, 2001; Ramasay and Yeung 2001; and Tabak, 2006), whilst on the other hand are those who hold strongly (and significantly) that the reverse is the case especially during financial crises (see for instance, Pan et al 2020). Pan et. al. (2020) probed the relationship between exchange rate and oil prices in seven Asian countries between 1990 and 2019 using DOLS and Granger causality techniques. They found significant

and causal relationship flowing from exchange rate to oil prices and that the extent of the link was reported to be intense in all but one country (Malaysia), during and after the financial crisis in 1997. This result was further supported by Beer and Hebein (2019) who found positive spillover from exchange rate to oil price markets for Canada, Japan, the USA and India using cointegration and multivariate exponential ARCH modeling. Thus, several studies (e.g., Pan et al. (2020) have examined relationship between exchange rate and oil prices, few have utilized the DOLS model to assess the dynamic effects, particularly over the extended period from 1980-2022.

Also, some studies found positive and negative results and could not ascertain the direction of causality because of inconsistent relationship between the variables. Ajayi et al. (2019) oil price has implication for exchange rate in Japan also hinted that the relationship is inconsistent in the case of emerging economies. The third argument further garnered support from Stavarek (2019), who examined the nexus between exchange rate and oil prices in EU and the USA over the period 1990 and 2018. The result showed insignificant and negative results and that direction of causality is not uniform across countries except for the UK and the USA that suggested a unidirectional causality from stock prices to exchange rate. Therefore, the study concluded that oil price cannot be efficiently implemented into exchange rate forecasting and as such the monetary authorities of the new Central European EU-member countries are not obliged to take oil price into accounting realization of their exchange rate policy. Lin and Su (2024) studied how oil prices affect the exchange rates of Brazil, Russia, India, China and South Africa (BRICS). The results obtained showed that two oil price shocks produced different effects on net oil-importing countries and net oil-exporting countries. It was also observed that the exchange rate will have a significant response to oil shock, primarily at high frequencies. China in this study is a typical case in which its oil price shock was insignificant to other countries. Similarly, there is a significant relationship between oil shocks and exchange rate prices for all BRICS countries in the short run but not always exist in the long run.

A number of authors have examined the relationship between exchange rate and oil prices in Nigeria with diverse outcomes. Deploying nonlinear autoregressive distributed lag (NLARDL) framework, Okwu, et al. (2023) examined the asymmetric effects of oil export revenue and exchange rates on household consumption expenditures in Nigeria. The short-run analysis showed negative shocks to the exchange rate, while the long-run exhibited positive and negative shocks to the exchange rate and oil export earnings, respectively. Adebayo (2024) studied how oil prices influence exchange rates in Nigeria. The study focused on the period between January 2007 and March 2023. To buttress the result, OLS and Toda Yamamoto causality tests were conducted. He reported that oil prices and exchange rates were vulnerable in some identified periods. There was negative co-movement between the exchange rate and oil for some identified periods.

Aliyu (2021) found a weak long run relationship with the Johansen cointegration approach and no cointegration with the Engle Granger. Bidirectional causality between the variables was found. Other subsequent researchers, who are segmented into two, found unidirectional causality in varying directions. The first set of authors established that the direction runs from exchange rate to oil prices. Adjasi, A., and Biekpeand O. (2011) found that exchange rate shocks reduce oil price returns in Nigeria among other countries using the VAR cointegration and impulse response analysis. This position was further supported by Orumie, U.C. (2016). Osagie A. (2012). Who examined the impact of six macroeconomic variables including exchange rate on oil prices between 1990 and 2008 and concluded that exchange rates are positively related to oil market in the short run but negative in the long run. Mbutor A. (2010) used the VAR methodology and impulse response from 1990 to 2008 to investigate exchange

rate volatility and oil price fluctuations and the influence of lending behaviour in Nigeria. Oil prices were found to lead to exchange rate depreciation.

Similarly, Adebiyi et al., (2010), examined the role of oil price shocks and exchange rate on the behavior of stock market using the VAR methodology and Granger causality from 1991 to 2009. They found no long run relationship among the variables, but the results of the Grange causality suggested a unidirectional causality running from stock prices to exchange rate. Other authors also found similar outcome (see for example, Adaramola, 2012; and Okpara and Odionye, 2012). Both authors employed quarterly data to examine the nexus. Hossain (2002) agreed that exchange rate helps to connect the oil price systems of two different countries by making it possible for international trade and also effects on the volume of imports and exports, as well as country's balance of payments position. Rogoffs and Reinharti (2004) also opined that developing countries are relatively better off in the choice of flexible exchange rate regimes. Okpara and Odionye (2012) used the VAR test and found long run relationship and strong unidirectional causality from oil prices to exchange rate the more recent studies tends to show series of methodological explorations and applications in deciphering the nature of the relationship between the two variables, which had thus far, been embalmed with mixed outcomes from the earlier studies. The special note are studies that have considered different methods of examining long run relationship between variables as well as the short run through the use of various types of generalized autoregressive conditional Heteroscedasticity (GARCH),which was popularized by Bollerslev (2016) and had since been used to estimate relationship between financial variables.

2.3.1 Summary of Previous Finding and Research Gaps

This section examines the limitation of various studies previously carried out on the oil price and exchange rate dynamic in Nigeria. The conclusion from the above studies unarguably suggests the existence of a substantial interest on the dynamics of oil price and exchange rate in Nigeria with the use of different methodologies and data sets. Since the collapse of the Nigerian Stock market in mid-2009, the market had remained laggard and if oil prices and exchange rates are related and the causation runs from exchange rates to oil prices then crises in the markets can be prevented by controlling the exchange rates. If on the other hand, the causation runs from market to exchange rates. Then authorities can tweak domestic economic policies to stabilize the market.

Thus, a very limited numbers of studies exist on oil price and exchange rate dynamics in Nigeria. Therefore, several studies (e.g., Pan et al. (2020) have examined relationship between exchange rate and oil prices, few have utilized the DOLS model to assess the dynamic effects, particularly over the extended period from 1980-2022. Hence, this study adds value to the previous studies by; adopting Dynamic Ordinary Least Square used to determine the relationship between variables. The DOLS model is employed due to its ability to capture Fully Modified Ordinary Least Squares (FMOLS) and Canonical Co-integration Regression (CCR) which will serve as robustness checks. The method was selected based on the sample size of the observation and it is applicable to estimating I(0) and I(1) variables or combination of the two since the dependent variable is integrated of order I(0). Dynamic Ordinary least Squares (DOLS) has advantages over the ordinary least squares it includes the ability to eliminate endogeneity problem, ability to correct autocorrelation problem, ability to eliminate simultaneity bias and lastly ability to tackle sample size bias. Hence, this study incorporated variable such as; inflation and interest rate. The previous studies mostly used commodity price, exchange rate and money supply to examine their relationship. Inflation and interest rate are believed to capture the dynamics of oil price and exchange rate in Nigeria. Thus, this study added value to the previous study, by conducting an anatomy of study on oil price and exchange rate dynamics in Nigeria.

3.0 Research Methodology

3.1 Sources of data

This study used secondary data; a time series data from 1980 – 2022. The data are sourced from the Central Bank of Nigeria Statistical bulletin and World Bank Development Database, to examine oil price and exchange rate dynamics in Nigeria.

3.2 Variables and Measurement

The dependent variable is exchange rate which is expressed in Nigeria Naira per U.S dollar price the rest of the data are independent variables; oil price is expressed as the bonny price of crude oil at international market, interest rate, is measured as inflation rate.

3.3 Model Specification

This study adopts Aliyu, et al. (2009). To examine oil price and exchange rate in Nigeria. The model specify as:

$$InEXCR= = \beta_0 + \beta_1 INFL+OIP+\beta_2 EXCR + \beta_2 INTR + \varepsilon_1 \quad 1$$

$$InEXCR = \beta_0 + \beta_1 InINFL+InOIP+ \beta_2 InINTR + \varepsilon_1 \quad 2$$

Where InEXCR is natural logarithms of exchange rate, InINFR is natural logarithm of inflation rate, InOIP is a natural logarithm of oil price, InINTR is natural logarithm of interest rate, and εi is stochastic variable or error term (random walks).

3.3 Tools of Analysis

3.3.1 Descriptive Statistics

It examines the trend relationship among the variables adopted in this study. The equation is as follows:

$$EXCR = \beta o + \beta 1t+ \varepsilon t \quad 3$$

ß0 is the intercept (EXCR-intercept) when t =0. ß1 is the slope coefficient of the trend. T is the time period (TYM). EXCR is the estimated value for time t based on the model. εt Is the random error of the time trend.

3.3.2 Unit root test

There are different methods for accomplishing stationary test. This study adopted KPSS to assess the order of stationarity of the series and for the justification of the application of Dynamic OLS (Yakub, et al. 2009).

3.3.3 Dynamics OLS

The study adopted the Dynamic Ordinary Least Squares (DOLS). The DOLS model is employed due to its ability to capture Fully Modified Ordinary Least Squares (FMOLS) and Canonical Co-integration Regression (CCR) which will serve as robustness checks. The method was selected based on the sample size of the observation and it is applicable to estimating I(0) and I(1) variables or combination of the two since the dependent variable is integrated of order I(0). Dynamic Ordinary least Squares (DOLS) has advantages over the ordinary least squares it includes the ability to eliminate endogeneity problem, ability to correct autocorrelation problem, ability to eliminate simultaneity bias and lastly ability to tackle sample size bias. (Yakub, et al. 2009). Also, these estimators are good for robustness

check of long-run estimates. FMOLS and CCR have been advanced by Philips and Moon (1999) and Park (1992) to address the problems of serial correlation and sample size bias attributed to OLS estimator.

3.3.4. Granger Causality

Causality Test

The study explores the causality between oil price and exchange rate, in order to examine their causal relationship between variables. The model is specifying as:

$$EXCR=\sum \beta_1 EXCR_{t-1}+\sum \beta_2 INFR_{t-1}+OIP\sum \beta 3_{t-1}+\sum \beta_4 INTR_{t-1}+\mu_{t1} \quad 4$$

$$INFR=\sum \varphi_1 INFR_{t-1}+\sum \varphi_2 INFL_{t-1}+\sum \varphi_3 OIP+\sum \varphi_4 INTR_{t-1}+\sum \beta_{5t-1}\mu_{t2} \quad 5$$

$$OIP=\sum \varphi_1 OIP_{t-1}+\sum \beta_2 INFR_{t-1}+OIP\sum \beta_{3t-1}+\sum \beta_4 INTR_{t-1}+\mu_{t1} \quad 6$$

$$INTR=+\sum \alpha_1 INFR_{t-1}+\sum \alpha_2 INFR_{t-1}+\sum \alpha_3 INTR_{t-1}+\sum \alpha_4 OIP_{t-1}\mu_{t3} \quad 7$$

4.0 Data Analysis and Presentation

4.1 Descriptive Statistics Results

Table 1: Summary of Descriptive Statistics (1980-2022)

Variable	INFR	OIP	EXCR	INTR
Mean	97.774	42.364	1.321	0.076
Median	101.596	31.670	4.564	0.786
Maximum	379.500	133.930	135.173	54.562
Minimum	0.530	11.280	15.427	54.562
Std. Dev.	99.531	26.970	8.576	56.813
Skewness	0.956	1.092	11.912	9.325
Kurtosis	3.160	3.240	167.928	15.871
Jacque-Bera	75.424	99.029	57.623	14.893
Probability	0.245	0.000	0.563	0.453
Observations	42	42	42	42

Authors' Computation Using Eview 10

From Table 1 show the result of descriptive analysis of the series, there is an average rate representing the mean value of 1.321 and 0.076 for exchange rate and oil price, respectively, followed by the median of 4.564 for exchange rate, 101.596 for inflation rate, 0.786 for interest rate and 31.670 for oil price. The minimum values of the series are inflation rate having the value of 0.530 respectively. Similarly, the maximum value is 379. 500 for inflation rate this signify variety across time in the data. The standard deviation shows that inflation rate has the highest standard deviation from the sample mean (99.531) are likely to change frequently over time. Finally, the Jarque-Bera statistics, which combine the results of the skewness and kurtosis tests, show that only oil price (prob. Value of 0.000) is not normally distributed based on this evidence, the study rejection of the null hypothesis of normality. The kurtosis values of 3.160 and 3.240 measure the peakness or flatness of the data and show that both data have normal distributions and are therefore mesokurtic in nature. The skewness (measure of the degree of asymmetry of the series) shows that series of the variables are positively skewed, with a long right tail and higher values. The Jarque-Bera statistics of 75.424 and 99.028, with 0.245 and 0.0000 p values, show that the time series values of the variables are of oil price is not normally distributed over time. Our findings that; oil price negatively influence exchange rate and has no causal relationship between oil price and exchange rate is consistent with the

results of Adebayo (2020), but contradict those of Pan et al. (2022), who found significant and causal relationship flowing from exchange rate to oil prices. To examine the property of the data before conducting the estimation of the log-run model, the following are required. In the first step, we examine the non-stationarity or integration properties of the time series, using the Kwiatkowski Philips-Schmidt-Shin unit root test result (KPSS).

Table 2: Kwiatkowski Philips-Schmidt-Shin Unit Root Test Result (KPSS)

	Level Values		First Difference		
Variables	Constant	Constant & Trend	Constant	Constant & Trend	Order of Integration
InINFLR	0.283***(0.739)	0.1313***(0.216)	----------	----------	I(0)
InOIP	0.784 (0.739)	0.204***(0.216)	----------	----------	I(1)
InEXCR	0.762***(0.739)	0.159***(0.216)	----------	----------	I(0)
InINTR	0.706***(0.739)	0.124***(0.216)	----------	----------	I(1)

Sources: Authors' Computation Using Eviews 10; Note: Values in parentheses are the Asymptotic Critical-values and *** represents statistically significant at 1% level.

The Kwiatkowski Philips-Schmidt-Shin unit root test result (KPSS) shows that all the variables which include; oil price, and interest rate are stationary at first difference except for inflation rate and exchange rate that are stationary at level. For The Optimum Lag Selection Criteria results of the unrestricted vector auto regressive the maximum lag used in this study is lag 2. Hence, we lagged the variables 2 times in order not to lose the degree of freedom.

4.3 The Cointegration Test Result

The co-integration results based on the maximum eigenvalue and trace statistics, to determine the co-integration rank; we estimated the maximum eigenvalue statistics and the trace statistics for the model are estimated in Table 3 below:

Table 3: Cointegration Test Result

Maximum rank	parms	LL	eigenvalue	Trace Statistics	5%Critical value
0	30	1627.9068	0.14053	76.8798	68.52
1	39	1648.7325	0.16968	35.2285*	47.21
2	46	1655.6398	0.05981	21.4138	29.68
3	51	1660.2153	21.4138	12.2629	15.41
4	54	1663.5251	12.2629	5.6431	3.76

Source: Authors' Computation using E-views 10; Note: *denotes the rejection of null hypothesis at 5% level of significance.

From the test results of Table 3, the null hypothesis that the cointegration rank is equal to zero is flatly rejected at the 5% level of statistical significance. However, the null hypothesis that the cointegration rank is at most one is not rejected. The study thus conclude that there is cointegration (long run equilibrium) relationship among the variables with maximum rank level of significance based on the trace test statistics as well as the maximum Eigen value test. This means the variables in the sample show some long run equilibrium relationship among themselves. Our findings; show that oil price negatively influence exchange rate and there is

no causal relationship between oil price and exchange rate. This is consistent with the results of Adebayo (2020), but contradicts those of Pan et al. (2022), who found significant and causal relationship flowing from exchange rate to oil prices.

Table 4: Estimated Result for the Oil Price and Exchange Rate Dynamics Using DOLS

Dependent Variable= Exchange Rate				
Variables	**Coefficient**	**Std. Error**	**t-Statistics**	**Prob.**
INFR	-0.154***	0.038	-3.000	0.923
OIP	-0.577***	0.397	-6.482	0.670
INTR	0.411	0.037	1.827	0.002
C	-43.712	7.114	-6.144	0.000
R-square	0.87			

Source: Authors' Computation Using R-Software; Note: *** &* represents statistically significant at 1%, 5% & 10% levels of DOLS.

As a robustness check to the Dynamic Ordinary least Squares result, we have employed fully Modified Ordinary Least squares (FMOLS) and Canonical Cointegration Regression (CCR), and their results are reported in table 5 below. Both FMOLS and CCR indicate that inflation and oil price have negative relationship with exchange rate, whereas interest rate indicates a positive relationship with the exchange rate. This finding substantiates the long-run results of the Dynamic Ordinary least squares (DOLS), where interest rate is the only positive and significant determinant of exchange rate while inflation and oil price have impacted negatively on exchange rate in Nigeria. Our findings; show that oil price negatively influence exchange rate and there is no causal relationship between oil price and exchange rate. This is consistent with the results of Adebayo (2020), but contradicts those of Pan et al. (2022), who found significant and causal relationship flowing from exchange rate to oil prices.

Table 5: FMOLS and CCR Test Results for Robustness Check

Dependent Variable =Exchange Rate				
Fully Modified OLS			**Canonical Cointegration Regression**	
Variables	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**
INFR	-0.144	0.053	-0.179***	0.490
	(-2.697)		(-3.350)	
OIP	-2.731	0.361	-2.973***	0.490
	(-7.554)		(-6.061)	
INTR	46.324	0.049	0.069	0.053
	(7.152)		(1.609)	
C	-46.324***	6.476	-50.639***	8.751
	(-7.152)		(-5.786)	
R-Squared				

Source: Authors' Computation Using R-Software; Note: Values in parentheses are the t-statistic and ***, ** & * represents statistically significant at 1%, 5% & 10% levels. FMOLS; Fully Modify Ordinary Least Squares and **CCR**; Canonical Co-integrating Regression.

Table 6: Granger Causality Result

Pairwise Granger Causality Tests

Date: 09/14/24 Time: 09:49

Sample: 1980 2022

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INFR does not Granger Cause EXCR	40	0.48100	0.6222
EXCR does not Granger Cause INFR		0.65691	0.1430
OIP does not Granger Cause EXCR	40	0.78628	0.9175
EXCR does not Granger Cause OIP		0.83194	0.4436
INTR does not Granger Cause EXCR	40	0.07862	0.08372
EXCR does not Granger Cause INTR		0.01172	0.09884
OIP does not Granger Cause INFR	40	0.00945	0.0878
INFR does not Granger Cause OIP		0.00800	0.0724
INTR does not Granger Cause INFR	40	0.06828	0.0552
INFR does not Granger Cause INTR		0.04797	0.0833
INTR does not Granger Cause OIP	40	0.43587	0.2524
OIP does not Granger Cause INTR		0.92116	0.8116

Authors' Computation Using Eview 10

Table 6 result above indicate no causation between Inflation and exchange rate, exchange rate and inflation, oil price and exchange rate, exchange rate and oil price. This means no connection between them. There is bidirectional causation between interest rate and exchange rate and oil price and inflation and interest rate and inflation. There is a unidirectional causation between interest rate and oil price. Finally, the hypothesis of the study is tested based on the result of the causality test for the time period. Thus, there is no direction of causality between oil prices and exchange rates in Nigeria. Our findings; show that oil price negatively influence exchange rate and there is no causal relationship between oil price and exchange rate. This is consistent with the results of Adebayo (2020), but contradicts those of Pan et al. (2022), who found significant and causal relationship flowing from exchange rate to oil prices.

5.0 Summary, Conclusion and Recommendation

This study examines oil price and exchange rate dynamics in Nigeria with annual data from 1980 to 2022 using Dynamic Ordinary Least Squares (DOLS). Fully Modify Ordinary Least

Squares (FMOLS) and Canonical Co-integration Regression (CCR) testing techniques were used as robustness check in the process of estimating the model and Granger causality test.

Thus, , this study seeks to answer whether oil prices have impacted on exchange rate in Nigeria and also, seek to answer whether there is a causal relationship between oil price and exchange rate in Nigeria. The first research question this study answered shows evidence of long-run association among the considered variables. The results of DOLS revealed that oil price and exchange rate negatively influence exchange rate while interest rate influence exchange rate positively. Thus, increase in oil price and inflation has a negative effect on exchange rate. This means that Macroeconomics variables help to reduce the naira depreciation. The second research question this study answered is the granger causality result which shows no causation between Inflation and exchange rate, exchange rate and inflation, oil price and exchange rate, exchange rate and oil price. This means no connection between them. There is bidirectional causation between interest rate and exchange rate and oil price and inflation and interest rate and inflation. There is a unidirectional causation between interest rate and oil price. Conclusively, the hypothesis of the study is tested based on the result of the DOLS and causality test for the time period. Thus, there is no direction of causality between oil prices and exchange rates in Nigeria. Our findings; show that oil price negatively influence exchange rate and there is no causal relationship between oil price and exchange rate. This is consistent with the results of Adebayo (2020), but contradicts those of Pan et al. (2022), who found significant and causal relationship flowing from exchange rate to oil prices.

Based on the finding of oil price and exchange rates dynamic in Nigeria, this study proffer the following recommendations:

1. The government policies and initiatives should be directed towards diversifying Nigeria's economy so as to enhance the capacity and competitiveness of non-oil industries, such as agriculture, manufacturing and services, to sustain and boost their contributions this would enhance export production in other sectors of the economy, reduce overdependence on oil and, ultimately, stabilize the exchange rate of the naira via-a-via the US dollar and reduce oil price.

2. The monetary authorities should adopt the Mundell–Fleming model of fixed exchange rates to reduce exchange rate fluctuations induced by oil price shocks. For instance, a fixed exchange rate policy that is export-friendly would be appropriate to stimulate export production and reduce exchange fluctuation. This will make it possible to maintain a fair swing in external financial activities as well as trade fluctuations and oil-related products, especially in periods of oil price crises.

3. The government should pursue measures that will help to reduce inflation in the economy by stabilizing effective monetary policy measure consequently led to the reduction in the rate of Inflation and high oil price

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