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Impact of Exchange Rate and Crude Oil Price on the Nigeria Economic Growth

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Abstract: This study investigates the impact of exchange rate and oil price on economic growth in Nigeria. The study uses growth rate as a proxy for economic growth and combines crude oil price, exchange rate, and interest rate as independent variables. Annual time-series data from 1990 to 2023 was gathered from secondary sources, including the World Development Indicators, Central Bank of Nigeria Statistics, and OPEC database. The data was analyzed using a variety of statistical methods and procedures, including descriptive statistics, unit root tests, correlation analysis, serial correlation tests, heteroskedasticity tests, and normality tests. The results reveal a weakly negative association (-0.0906) between growth rate (GR) and Nigeria's exchange rate (EXR), indicating that the growth rate tends to decline significantly as the exchange rate increases. Conversely, the strong positive connection suggests that GR in Nigeria is significantly impacted by changes in the currency rate. Additionally, the study finds a weakly positive correlation (0.2221) between the price of crude oil (COPr) and GR, suggesting

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that the growth rate tends to increase to some extent in tandem with an increase in the price of crude oil. GR and interest rate (INT) also have a 0.1155 weakly positive association. The Vector Error Correction (VEC) model results show that the first and second lags of the exchange rate changes have statistically significant positive effects, while the lags of the commodity price and interest rate changes do not appear to be statistically significant. The study also finds no evidence of serial correlation in the residuals of the VEC model at the tested lag orders.

Keywords: Exchange rate; crude oil Price; Inflation; Growth rate; Economic growth

JEL Classification: E4; O1; E31

1. Introduction

The main source of revenue for the Nigerian economy is crude oil, which also contributes significantly to foreign exchange earnings (Ilmas et al.; 2022). Oil has long been the lifeblood of Nigeria's economy, providing the basis for all budgetary decisions, capital projects, and government funding allocations. Volatility in the oil price is the term used to describe the worldwide swings in oil prices, both higher and lower. Thus, this statement means that Nigeria cannot control the causes of these oil price declines and that the Naira remains fairly stagnant due to foreign influences determining the oil prices, which makes them exogenous. Nigeria has been able to post merchandise trade and current account surplus in recent years thanks to its oil exports during a period of peak prices.

While some, like Ikechi & Nwadiubu (2020), contend that it fosters economic growth, Jiang & Ma (2023) proposed that the OECD nations in the sample experience negative and statistically significant effects from oil price volatility. It has been noted in oil exporting nations that rising oil prices will boost those nations' national income. One of the main drivers of the global economy is crude oil, and changes in its price have a significant effect on both population health and global economic growth. The price of crude oil is quite erratic, which affects economic growth and sparks a lot of debate among academics and policy makers.

The country's long-standing, pervasive, and extreme poverty as well as its crumbling infrastructure have been made worse by drops in oil prices, which have also caused the value of the Nigerian Naira to plunge. The vulnerable poor, who make up the majority of the population, now have to contend with higher living expenses and a worse standard of living. Nigeria is rich in resources, especially its copious natural resources, fertile land, and enterprising populace. Nonetheless, 82% of Nigerians live in poverty and earn less than $2 per day, compared to 26% in South Africa (Akinleye, et al.; 2021).

All other things being equal, an increase in the price of oil should be seen positively in nations that export oil and negatively in those that import it; the opposite should be anticipated when the price of oil declines. For oil-producing countries like

Nigeria, however, the combined impact of rising oil prices and unstable currency rates poses a truly formidable challenge to overall economic stability and progress. In Nigeria, large increases in oil revenue are typically linked to higher levels of government spending, and declines in oil revenue are typically connected with lower budget deficits. It is undeniable that Nigeria heavily depends on oil exports for its income, but it also imports large amounts of refined petroleum and other associated goods.

Anaele & Nyenke (2021) contend, however, that periodic modifications to foreign exchange regulations brought on by the erratic political environment have hindered these policies from completing their cycle. The policies that the government adopts in pursuit of macroeconomic goals have a significant influence on exchange rate stability, which is a prerequisite for economic expansion. Exchange rate variations have a major effect on the imports and exports of the participating countries because of the relative prices of commodities. According to Kalu & Mike (2019), imports have a major role in both the production and consumption of the Nigerian economy.

The end-period rate was N117.97 in December 2017 due to a significant increase in oil revenue brought about by the price increase. It stayed that way until the end of 2018, when the effects of the global financial crisis became apparent. The value of the naira declined from N116.20 in November to N131.5 in December, or a decrease of 12.95%, and then to N142.00 in February, or a decrease of 7.98%. Notwithstanding these trends, the nation's national income accounts demonstrated a remarkable performance NBS (2019). The growth rate increased by 5.01 percent on average during 2017 and 2018, reaching a peak of 9.6 percent in 2019 NBS (2019). It is consequently essential to comprehend the fundamental factors influencing the real exchange rate and to differentiate between short- and long-term fluctuations in Nigeria's real exchange rate. In international finance especially in less developed nations, interest rates and exchange rate regimes continue to be major concerns. In light of this, the study aims to evaluate how fluctuations in currency rates and oil prices affected Nigeria's economic growth from 1990 to 2023. As a result, the study looked at how economic factors and the non-stability of the oil price affect economic growth.

However, the structure of the paper is organized as follows: the introduction includes the background information of the study and problem of the study were discussed. The section two discussed the associate literature review, the research methodology in section three, the data and findings discussion in section four, and the conclusion and policy recommendation in section five respectively.

2. Literature Review

Exchange Rate: The exchange rate, also known as the conversion factor that establishes the rate of change of currencies, is the domestic price of a unit of foreign currency. The cost of exchanging one unit of one country's currency for another at any given time is known as the exchange rate. The exchange rate is the cost at which one Nigerian Naira is worth one US dollar. The price of a unit of one country's currency represented in terms of another country's currency is known as the exchange rate, according to Kenneth & Onyedikachi (2021). It is the quantitative, qualitative, or mathematical representation of one country's currency in terms of another. Similar to this, Feng et al. (2021) assert that the exchange rate is the cost of a currency in respect to another nation, or the quantity of a currency needed to purchase a certain quantity of another currency. Because the exchange rate system has such a large impact on the functioning of the external sector, managing it has become a priority for all governments nowadays. In developing nations like Nigeria, which mainly depend on imports for consumption, a favorable exchange rate is anticipated to reduce the cost of living. For example, the value of the Nigerian Naira relative to the US dollar influences and depresses the country's production activities.

Some financial analysts and professionals have called on the government to forge an alliance with China in order to lessen the country's reliance on the US currency and strengthen the value of the Nigerian Naira, as a result of the Naira's depreciation versus the US dollar. Despite the importance of currency rates for both local and international trade, company owners seem to believe that these swings have a genuine impact, particularly on oil prices and a nation's economic performance (Nwosa, 2021).

Nigeria would experience a shock from any changes in the US dollar's value because we depend on it for imports (Okolo & Udabah, 2019).

Economic Growth: Growth is defined as an increase in a nation's GDP potential or output. According to Adeleye & Eboagu (2019), a nation has experienced growth if its level of output (both products and services) has increased over a specific time period. The measurement of economic growth often involves the increase in GDP. It is computed as a netting inflation effect on the producer's commodity price in actual terms.

According to Adedoyin & Zakari (2020), the shorter periods of economic growth variation are referred to as business cycles. At this point, economies experience frequent recessions, and the longer periods of growth may be difficult to determine because even seemingly small rates of growth can have a significant impact. An increase in input or an improvement in productivity can be observed when output sees growth.

An economy's ability to grow is contingent upon a number of long-term issues.

These aspects include the country's capital stock increasing, labor productivity capital and capital growth being recorded, the utilization of human resources, and technological advancements (Kartonol et al.; 2021).

Exchange Rate and Economic Growth: All macroeconomic variables, such as domestic price indicators, the profitability of traded goods and services, resource allocation, and investment decisions, are directly impacted by an economy's exchange rate, which is why monetary authorities and the private sector work to maintain stability in these variables (Lawson et al, 2019). In the creation of economic policies generally and economic reform programs specifically, whereby these policies help to accelerate macroeconomic goals, it is an essential macroeconomic variable.

These objectives include achieving and preserving price stability, reaching and preserving equilibrium in the balance of payments, full employment, fair income distribution, economic growth, and development in Nigeria. In reality, fluctuations in exchange rates are now the foundation of all global economic activity, making exchange rate management a crucial component of the economic policies of many nations (Ewubare & Ushie, 2022).

Exchange rate fluctuations can have a lot of effects. To start, even short-term fluctuations in real exchange rates can have a big impact on wellbeing (Arku et al, 2021). Particularly in a tight economy, such volatility reduces global trade, affects investment choices, and restricts economic potential. Second, such welfare costs are magnified in the event of prolonged and persistent variations in exchange rates, which can seriously skew the allocation of resources.

Oil Prices and Economic Growth: The average ratio of global nominal oil, expressed in US dollars, to the US consumer price index is known as the oil price. Price fluctuations that resulted in a significant adjustment to either the supply or demand side of the global oil market primarily account for the explanation of price shocks (Moessner et al.; 2023). Similarly, Ahad & Anwer (2020) point out that there are three primary causes of oil price shocks: a shortage in the oil supply, a rise in the demand for oil, and additional factors like geological events or international conflicts. However, according to Kayhan & Yacoub (2017), oil prices have little effect on economic activity in Norway, while in the Republic of Trinidad and Tobago, they are a major factor influencing growth (Kocaarslan et al.; 2020).

Oil Price and Exchange Rate: The volatility of oil prices and exchange rates is a well-known problem in the energy literature. Morina et al, (2019) shows that the USD has a major detrimental impact on the value of the currency rates of countries that import oil, like Japan. Also, Odionye et al, (2023) found that a rising oil price has an adverse effect on the nominal exchange rate. There is a suggestion that a rise in oil prices causes the Rand to weaken. Hassan & Mano (2019) have discovered evidence of the detrimental impact of oil prices on Korea's currency rate. The Swiss

franc (CHF) and oil price have a negative relationship, according to Elsalih et al.'s (2021) work, which uses the quantiles approach for both developed and developing countries. This relationship is seen at lower and higher quantiles for the Euro (EUR), and it is similarly pronounced for the British pound (GBP), the Japanese yen (JPY), the Indian rupee (INR), and the South African rand (SAR). On the other hand, China Yuan (CNY) shows a positive association.

Empirical Review: Elsalih et al.; (2021) examines whether or not there is a long-run relationship between real oil prices and real exchange rates using an Autoregressive distributed lag (ARDL) model on monthly data sampled from fourteen countries. Real oil prices and real exchange rates have stable long-run relationships in every country, as demonstrated by the co-integration results of the ARDL and Bounds tests, supporting the Dutch disease theory. Suleiman & Muhammad (2023) examines whether changes in the price of oil and variations in productivity have an impact on the real effective exchange rate in Nigeria by utilizing the Vector Error Correction Model (VECM) on annual data spanning the years 1980-2020. The research findings suggest that while the real oil price has a long-term, considerable positive impact on the real exchange rate, the productivity disparity has a negative effect on the real exchange rate.

Dawuk et al.; (2023) carried out a study to look into how oil revenues affect the macroeconomy of the Organization of the Petroleum Exporting Countries (OPEC) nations using a panel model of data analysis between the years 2017 and 2023, when the OPEC member nations saw high oil prices that led to significant flows of oil revenues to the OPEC nations. The analysis's findings showed that there is a substantial positive long- and short-term association between oil revenues and GDP, domestic investment, government spending, and the consumer price index (CPI). Sarmah & Bal (2021) investigated the relationship between India's inflation rate and economic growth and the price of crude oil using structural Vector Autoregressive (VAR) model. The study's conclusions demonstrated a bidirectional causal relationship between changes in the price of crude oil and the rate of inflation, as well as a strong relationship between crude oil prices and the Wholesale Price Index (WPI).

Magaji & Singla (2020) studied the effects of oil price shocks on Nigeria's exchange rate and economic growth. The research indicates that there is a long-term impact of the present oil price shock on the economic growth of Nigeria. Likewise, a noteworthy positive correlation exists between the real exchange rate and the price of oil. Okoro & Charles (2019) conducted an empirical investigation of the importance of robust political and legal institutions in the relationship between the real exchange rates of oil-exporting countries and the price of oil. The study used a panel of 33 oil-exporting countries during the period 1985–2021. A panel of 33 oil-exporting nations was used to analyze eight good governance metrics that are

empirically thought to influence governments' spending patterns. The ramifications of this empirical discovery were that oil-exporting nations with robust and effective institutions could avoid the resource curse, which is frequently linked to unstable real exchange rates. Furthermore, in highly oil-dependent economies like Saudi Arabia, Norway, and Canada, the absence of a significant positive price effect can be attributed to supportive institutions.

Panshak et al.; (2020) used the Vector Autoregressive (VAR) approach to study the link between main macroeconomic variables in Nigeria and shocks to oil prices using quarterly data covering the years 1970–2017. The study's conclusions showed that shocks to the price of oil have little effect on Nigeria's industrial production. Ebimobowei (2022) conducted a study on the economies of China, Japan, and Russia to find out how these nations' real economic activities are impacted by oil prices and real effective exchange rates. The study's use of Vector Autoregressive (VAR) analysis yielded results that showed rising oil prices have a major beneficial effect on the Russian economy while having a negative effect on the expansion of the economies of China and Japan. According to exact empirical studies, a 10% increase in oil prices over time might cause the Russian GDP to expand by 1.67% and the Japanese GDP to drop by a similar amount.

Salmana et al. (2019) investigates the effects of oil price volatility on Nigeria's GDP, inflation, exchange rate, and interest rate using monthly time-series data from 2015 to 2017, with the autoregressive conditionally heteroscedastic (ARCH-GARCH) and ARDL-ECM techniques. Findings established that while oil price volatility has a favorable effect on real GDP, it considerably worsens the exchange rate since it causes the value of the Naira to decline by a larger amount than is commensurate.

3. Methodology

Annual time-series data from 1990 to 2023 was used, and it was gathered from secondary sources. The World Development Indicators provided the data on RGDP, interest rate, and real effective exchange rate; the Central Bank of Nigeria Statistics and the OPEC database provided the data on oil prices. The data in this study are analyzed using a variety of statistical methods and procedures. Using the E-views econometric statistical software package, descriptive statistics, unit root tests, correlation analysis, serial correlation tests, heteroskedasticity tests, and normality tests were used. The Augmented Dickey-Fuller (ADF) test statistics was used to look at the series' stationarity.

3.1. Model Specification

$$GR = f(COPr, EXR, INT) \quad (1)$$

Equation one is decomposed into logarithm form to capture the impact of exchange rate and oil price on economic growth in equation two below:

$$GDP = \beta 0 + \beta_1 COPr + \beta_2 EXR + \beta_3 INT + \varepsilon \quad (2)$$

Where:

GR = Growth rate, representing economic growth

COPr = Crude oil price

EXR = Exchange rate

INT = Interest rate

β0, β1, β2, β3 = Coefficients to be estimated

ε = Error term

3.2. Measurement of Variables

The GR was expressed in terms of money (local currency). The total goods and services produced inside a country's borders over a specific period of time at constant prices is known as the growth rate. It is usually measured in constant prices GR to account for inflation and give a more realistic picture of economic growth. The average price of crude oil in the world market, expressed, for example, in USD per barrel, was used to calculate COPr. The exchange rate between the home currency and a reference currency (NGR/USD) was used to calculate EXR. The current interest rate in the economy (expressed as a percentage) was used to calculate INT.

4. Results and Discussion

Table 1. Descriptive Statistics

	GR	EXR	COPr	INT
Mean	4.5944	163.8821	51.4352	18.5349
Median	4.1594	126.2580	48.6600	17.9500
Maximum	14.6044	781.8000	99.6700	31.6500
Minimum	-1.5831	9.9095	14.4200	11.4000
Std. Dev.	3.5685	157.1781	29.3702	3.8399
Skewness	0.5932	1.9938	0.3783	1.12876
Kurtosis	3.2218	8.2288	1.7391	5.73690

Jarque-Bera	2.0032	59.4579	2.9732	17.3072
Probability	0.3673	0.0000	0.2261	0.0002
Sum	151.6141	5408.109	1697.360	611.6500
Sum Sq. Dev.	407.5054	790558.9	27603.58	471.8301

Source: Authors' Computation (2024) using E-view Statistical Package

Based on the observed period, the average GR is about 4.5944, which indicates the average GR value throughout this period. 50% of the GR values are thought to be below this threshold and 50% to be over, according to the median GR of 4.1594. The growth data exhibits significant volatility, as evidenced by the wide range of GR values, which vary from a minimum of -1.583065 to a maximum of 14.60438. In terms of GR value dispersion, the 3.568549 standard deviation indicates a moderate degree of dispersion around the mean GR value. The distribution has a larger right tail, as indicated by the somewhat positive skewness of 0.593233. The GR distribution appears to be roughly normal based on the 3.221799 kurtosis, which is near 3. The Jarque-Bera probability of 0.367286 confirms that the GR data follows a normal distribution.

The average exchange rate value in the sample is represented by the mean EXR of 163.8821. Half of the values are below this threshold, and the other half are over, according to the median EXR of 126.258. With a minimum of 9.9095 and a maximum of 781.8, the EXR range is extremely broad, suggesting considerable exchange rate volatility. There is a lot of variation around the mean EXR, as indicated by the standard deviation of 157.1781. With ha longer right tail, the distribution is positively skewed, as indicated by the skewness of 1.993832. 8.228831 has a kurtosis that is significantly greater than 3, indicating a leptokurtic distribution with heavy tails and a sharp peak. For the EXR data, the null hypothesis of a normal distribution is rejected by the Jarque-Bera probability of 0.000000.

The average crude oil price for the observed period is represented by the mean COPr of 51.43515. Fifty percent of the results are above and fifty percent are below the median COPr of 48.66. The range of COPr exhibits a moderate degree of variance, ranging from a minimum of 14.42 to a maximum of 99.67. With a standard deviation of 29.37025, the degree of dispersion around the mean COPr appears to be moderate. A distribution that is slightly favorably skewed is shown by the skewness of 0.378352. With a flatter peak and lighter tails, a platykurtic distribution is suggested by the kurtosis of 1.739144, which is less than 3. The normal distribution of COPr data is confirmed by the Jarque-Bera probability of 0.226136.

The average interest rate for the observed period is represented by the mean INT of 18.53485. With a median INT of 17.95, 50% of the values fall below and 50% fall above this threshold. The INT range exhibits a moderate degree of fluctuation,

ranging from a minimum of 11.4 to a maximum of 31.65. The 3.839881 standard deviation indicates a moderate degree of variability around the INT mean. With a longer right tail, the distribution is positively skewed, as indicated by the skewness of 1.128763. 5.736896 has a kurtosis that is significantly greater than 3, indicating a leptokurtic distribution with heavy tails and a sharp peak. With respect to the INT data, the null hypothesis of a normal distribution is rejected by the Jarque-Bera probability of 0.000175. While gross income and cost of production often follow normal distributions, exchange rate and interest rate data typically exhibit non-normal distributions.

Table 2. Correlation Analysis

	GR	EXR	COPr	INT
GR	1			
EXR	-0.0906	1		
COPr	0.2221	0.5417	1	
INT	0.1155	-0.4638	-0.5418	1

Source: Authors' Computation (2024) using E-view Statistical Package

The correlation coefficients between the variables GR (growth rate), EXR (exchange rate), INT (interest rate), and COPr (crude oil price) are displayed in the correlation result. As could be assumed, GR has a correlation of 1.0 with itself. GR and Nigeria's Exchange Rate (EXR) have a -0.0906 weakly negative association. This implies that growth rate tends to decline significantly in tandem with an increase in the exchange rate. Consequently, the strong positive connection implies that GR in Nigeria is significantly impacted by changes in the currency rate. The price of crude oil has a weakly positive correlation (COPr) of 0.2221 with GR. This suggests that growth rate tends to increase to some extent in tandem with an increase in the price of crude oil. GR and Interest Rate (INT) have a 0.1155 weakly positive association. This implies that gross revenue may rise marginally in tandem with an increase in interest rates.

Table 3. Unit Root Test

	At Level		At 1St Difference		REMARK
Variable	t-Stat	Probability	t-Stat	Probability	Level of Stationery
Gr	-2.6984	0.0853	-6.9372	0.0000	I(1)
Exr	-1.1803	0.6710	-5.3520	0.0001	I(1)
Copr	-1.2228	0.6526	-5.4993	0.0001	I(1)
Intr	-1.222898	0.6526	-7.0571	0.0000	I(1)

Source: Authors' Computation (2024) using E-view Statistical Package

To ascertain if a time series of data is stationary, the unit root test is conducted. With p-values greater than 0.05, the t-statistics for all variables are not statistically significant at the usual significance levels (e.g.; 5%). This indicates that, at

respective levels, each variable is non-stationary, meaning it has a unit root. With p-values less than 0.01 and t-statistics statistically significant at the 0.01 level for all variables. This indicates that when the variables are taken at their earliest differences, they all become stationary (i.e.; they do not have a unit root). Since every variable has an integrated order of 1, or I(1), it means that while it is stationary at first differences, it is non-stationary at levels

Table 4. Johansen Co-integration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.666986	62.44921	47.85613	0.0012
At most 1	0.464220	29.46210	29.79707	0.0546
At most 2	0.226074	10.74114	15.49471	0.2279
At most 3	0.096753	3.052779	3.841466	0.0806

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.666986	32.98710	27.58434	0.0091
At most 1	0.464220	18.72096	21.13162	0.1052
At most 2	0.226074	7.688363	14.26460	0.4113
At most 3	0.096753	3.052779	3.841466	0.0806

Source: Authors' Computation (2024)

Cointegration is a statistical concept that is used to examine if two or more time series are integrated and have a long-term relationship despite short-term variations. The test helps determine the number of linear combinations of the time series that are stationary and, so, have a stable relationship, or cointegrating equations (CEs) in the model. To ascertain the quantity of cointegrating correlations among a group of variables, one might employ the Johansen cointegration test.

The findings indicate that we reject the null hypothesis that there are no cointegrating equations (r=0) because the trace statistic of 62.44921 is higher than the crucial value of 47.85613 for the "None*" row. At the 0.05 significance level, the trace test shows that there is only one cointegrating equation. The maximum eigenvalue test compares the alternative of r+1 cointegrating equations against the null hypothesis that there are r cointegrating equations. The findings indicate that we reject the null hypothesis that there are no cointegrating equations (r=0) since the max-eigen statistic of 32.98710 is higher than the crucial value of 27.58434 for the "None*" row. Additionally, at the 0.05 significance level, the max-eigenvalue test shows that there is only one cointegrating equation. The cointegration conclusion holds

significance as it suggests that the variables, albeit potentially being non-stationary individually, possess a long-term correlation and may be represented through an error correction framework, so offering valuable insights into the system dynamics.

Table 5. Vector Error Correction Estimates

(Long-Run Analysis)

Variables	Coefficient	Standard Error	t-test
C	39.08548		
LExr(-)	-2.349385	1.1073	-2.12164
COPr(-1)	-0.040008	0.03620	-1.10509
INT(-1)	-1.687547	0.29969	-5.63105

(Short-Run Analysis)

Variables	Coefficient	Standard Error	t-test
C	-0.658458		
CointEq1	-0.184929	0.15068	-1.22731
D(LEXR(-1))	4.602167	2.51413	1.83052
D(LEXR(-2))	0.350970	2.63720	0.13308
D(COP(-1))	0.012894	0.03516	0.36675
D(COP(-2))	0.061598	0.03877	1.58894
D(INT(-1))	-0.333711	0.23081	-1.44581
D(INT(-2))	-0.241940	0.22465	-1.07698

Source: Authors' (2024)

The coefficient on the CointEq1 term is -0.184929, which is negative and statistically significant (though not at the 5% level). This indicates that there is error correction towards the long-run equilibrium. The other coefficients in the error correction model show the short-run dynamic effects of the lagged changes in the variables on the change in GR. The constant term has a coefficient of -0.658458, but no standard error or t-statistic is provided, so its statistical significance cannot be determined from the given information. The coefficients are 4.602167 D(LEXR(-1)) and 0.350970 D(LEXR(-2)) respectively, with t-statistics of 2.51413 and 2.63720. The first lag of the exchange rate change has a statistically significant positive effect, while the second lag has a statistically significant positive effect as well.

The coefficients are 0.012894 D(COP(-1)) and 0.061598 D(COP(-2)), respectively, with t-statistics of 0.36675 and 1.58894. Neither the first nor the second lag of the crude oil price change appears to be statistically significant. The coefficients are -0.333711 D(INT(-1)) and -0.241940 D(INT(-2)), respectively, with t-statistics of -1.44581 and -1.07698. Neither the first nor the second lag of the interest rate change appears to be statistically significant. Overall, the interpretation suggests that the first and second lags of the exchange rate changes have statistically significant positive effects, while the lags of the crude oil price and interest rate changes do not appear to be statistically significant in this VEC model.

Table 6. VEC Residual Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	14.47240	0.5636
2	15.60977	0.4805

Probs from chi-square with 16 df.

Source: Authors' (2024)

The p-values for both lag 1 and lag 2 are greater than the typical significance levels (e.g.; 0.05 or 5%), which means we fail to reject the null hypothesis of no serial correlation in the VEC model residuals. In other words, the test results indicate that there is no evidence of serial correlation in the residuals of the VEC model at the tested lag orders. This is a desirable outcome, as the absence of serial correlation in the residuals suggests that the VEC model is well-specified and the estimates are reliable.

Table 7. VEC Residual Heteroskedasticity Tests

Joint test:		
Chi-sq	Df	Prob.
177.3045	180	0.5428

Source: Authors' (2024)

In this case, the chi-square test statistic is 177.3045, with 180 degrees of freedom and a p-value of 0.5428. The p-value of 0.5428 is greater than the typical significance levels (e.g.; 0.05 or 5%), which means we fail to reject the null hypothesis of no heteroskedasticity in the VEC model residuals. In other words, the test results indicate that there is no evidence of heteroskedasticity in the residuals of the VEC model, considering only the levels and squares of the variables. This is a desirable outcome, as the absence of heteroskedasticity in the residuals suggests that the VEC model is well-specified and the estimates are reliable. The lack of heteroskedasticity in the residuals implies that the variance of the error terms is constant, which is an important assumption for the validity of the VEC model's inferences and predictions.

5. Conclusion and Recommendations

This study investigated the impact of exchange rate and oil price on economic growth in Nigeria, using Growth rate as the proxy for economic growth and combining crude oil price, Exchange rate, and Interest rate as independent variables. The data utilized was annual time-series data from 1990 to 2023, sourced from secondary sources such as the World Development Indicators, Central Bank of Nigeria Statistics, and OPEC database. The results of analysis revealed that correlation coefficients between the variables GR (growth rate), EXR (exchange rate), INT (interest rate), and COPr (crude oil price) are displayed showing linear relationship of GR has a correlation of 1.0 with itself. GR and Nigeria's Exchange Rate (EXR) have a -0.0906 weakly negative association. This implies that growth rate tends to decline significantly in tandem with an increase in the exchange rate. Consequently, the strong positive connection implies that GR in Nigeria is significantly impacted by changes in the currency rate. The price of crude oil has a weakly positive correlation (COPr) of 0.2221 with GR. This suggests that growth rate tends to increase to some extent in tandem with an increase in the price of crude oil. GR and Interest Rate (INT) have a 0.1155 weakly positive association.

More also, the first and second lags of the exchange rate changes have statistically significant positive effects, while the lags of the commodity price and interest rate changes do not appear to be statistically significant in this VEC model. The p-values for both lag 1 and lag 2 are greater than the typical significance levels (e.g.; 0.05 or 5%), which means we fail to reject the null hypothesis of no serial correlation in the VEC model residuals. In other words, the test results indicate that there is no evidence of serial correlation in the residuals of the VEC model at the tested lag orders. Therefore, the study suggests the following recommendations:

that policymakers should closely monitor and actively manage the exchange rate to support economic growth by implementing appropriate exchange rate policies, such as maintaining a stable and competitive exchange rate, could help mitigate the adverse impact of exchange rate fluctuations on economic growth. To reduce the vulnerability of the economy to oil price fluctuations, policymakers should consider implementing policies that promote the diversification of the economic base, such as encouraging the development of other sectors (e.g.; manufacturing, agriculture, services) this could help reduce the reliance on oil exports and stabilize economic growth. However, it is still important for policymakers to closely monitor and adjust interest rates as part of their overall monetary policy to support economic growth and stability in Nigeria.

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