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THE IMPACT OF CRUDE OIL PRICE AND THE GLOBAL MARKET ON THE NIGERIAN EXCHANGE RATE

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Abstract

This paper investigates the impact of crude oil prices and global market volatility on the USD-NGN exchange rate using a Vector Error Correction Model (VECM). The data utilized for this work was daily data on crude oil prices, S&P 500 index, and the USD-NGN exchange rate from 3rd June 2020 to 31st May 2024. The study finds that there is a significant long-run relationship between the variables, with crude oil prices having a negative impact on the exchange rate and global market volatility having a positive impact. The results suggest that the exchange rate is highly sensitive to changes in crude oil prices and global market volatility, and that these factors have a significant impact on the exchange rate in both the short and long term. It was however noted that S&P 500 does not have a direct impact on the exchange rate in the short run. The study's findings have important implications for policymakers in Nigeria, who must navigate the challenges of managing the exchange rate in a highly volatile global economy.

Keywords: crude oil, exchange rate, foreign exchange, global market volatility, Nigerian economy

1. Introduction

A key element of the Nigeria's macroeconomic stability is the USD-NGN exchange rate, whose fluctuations have a big impact on the national economy. (Ajala et.al 2021) Two important variables that can have a big impact on the exchange rate are the price of crude oil in the international market and the volatility of the world market as indicated by the S&P 500 index. (Olayeni et.al. 2020). As a result of its heavy reliance on oil exports, Nigeria's economy is susceptible to volatility in the price of crude oil globally. Furthermore, the nation's financial markets are strongly linked to international markets, with the S&P 500 index acting as a proxy for the other markets.

The evolution of the USD-NGN exchange rate has been characterized by a dynamic interplay of economic forces, policy interventions, and market dynamics over the past five decades. During the early years from 1972 to 1980, the Nigerian Naira maintained a fixed parity with the US Dollar, initially set at NGN0.658 per USD. However, this pegged regime was short-lived, as the Naira underwent successive devaluations in 1975 and 1976, reaching NGN0.62 per USD. Concurrently, the emergence of a parallel foreign exchange market, commonly referred to as the "black market," began to exert its influence, with rates ranging from NGN0.550 to NGN0.596 per USD.

The 1980s ushered in a significant shift in the foreign exchange landscape, as the Nigerian government deregulated the market in 1986, allowing for greater flexibility in the exchange rate determination. This move coincided with the widening of the spread between the official and black market rates, with the latter reaching NGN2.02 per USD in 1986, while the official rate remained relatively stable at around NGN4.00 per USD throughout the decade.

The 1990s proved to be a challenging period for the Nigerian economy, as it grappled with a severe economic crisis that led to a substantial depreciation of the Naira. The black market rate skyrocketed, peaking at NGN17.30 per USD in 1993, while the official rate was maintained at around NGN22.33 per USD.

The turn of the millennium brought about further deregulation efforts in the early 2000s, as the Nigerian government sought to enhance the flexibility of the foreign exchange market. Despite these measures, the black market rate continued to fluctuate, reaching NGN85.98 per USD in 2000, while the official rate remained relatively stable at around NGN127 per USD throughout the decade.

The 2010s witnessed the impact of inflationary pressures on the Naira, leading to its devaluation. The black market rate reached NGN360 per USD in 2015, while the official rate was maintained at around NGN305 per USD. The COVID-19 pandemic in 2020 exacerbated the Naira's depreciation, with the black market rate reaching NGN500 per USD, while the official rate remained at NGN360 per USD.

In recent years, the Naira has continued to face challenges, with the black market rate reaching NGN700 per USD in 2022 before experiencing a slight appreciation to NGN600 per USD in 2023. The persistent divergence between the official and black market rates underscores the need for comprehensive exchange rate reforms and policies aimed at promoting economic stability and growth.

This study uses a Vector Error Correction Model (VECM) to assess the short- and long-term correlations between these variables in order to investigate the effects of crude oil prices and global market volatility on the USD-NGN exchange rate.

2. Literature Review

The relationship between crude oil prices, global market volatility, and exchange rates has been extensively studied in the literature. This section provides an overview of the current state of knowledge in this area.

2.1 Crude Oil Prices and Exchange Rates

Several studies have investigated the impact of crude oil prices on exchange rates. For example, (Akpan, 2018) found that changes in crude oil prices have a significant impact on the USD-NGN exchange rate, with a one-dollar increase in crude oil prices leading to a 0.5% depreciation of the Naira. Similarly, (Ogunleye, 2019) found that crude oil prices have a positive and significant impact on the USD-NGN exchange rate, suggesting that an increase in crude oil prices leads to an appreciation of the Naira. (Saidi et.al., 2021; Okere et.al., 2021)

2.2 Global Market Volatility and Exchange Rates

Global market volatility, as measured by the S&P 500 index, has also been found to have a significant impact on exchange rates. For example, (Adebiyi, 2020) found that global market volatility has a positive and significant impact on the USD-NGN exchange rate, suggesting that an increase in global market volatility leads to an appreciation of the Naira. Similarly, (Ojo, 2020) found that global market volatility has a negative and significant impact on the USD-NGN exchange rate, suggesting that an increase in global market volatility leads to a depreciation of the Naira. (Junior, and Tweneboah 2020; Koijen, and Yogo, 2020)

2.3 Interplay between Crude Oil Prices and Global Market Volatility

Several studies have investigated the interplay between crude oil prices and global market volatility. (Joo, et.al., 2020; Zhang, and Hamori, 2021) For example, found that crude oil prices and global market volatility have a significant and positive impact on the USD-NGN exchange rate, suggesting that an increase in both crude oil prices and global market volatility leads to an appreciation of the Naira. Similarly, found that crude oil prices and global market volatility have a significant and negative impact on the USD-NGN exchange rate, suggesting that an increase in both crude oil prices and global market volatility leads to a depreciation of the Naira.

2.3 Methodological Approaches

Several methodological approaches have been used to study the relationship between crude oil prices, global market volatility, and exchange rates. For example, used a Vector Error Correction Model (VECM) to analyze the short-term and long-term relationships between crude oil prices, global market volatility, and the USD-NGN exchange rate. Similarly, used a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model to analyze the volatility of the USD-NGN exchange rate in response to changes in crude oil prices and global market volatility.

The current literature suggests that crude oil prices and global market volatility have a significant impact on the USD-NGN exchange rate. The interplay between these variables is complex, with both positive and negative relationships observed in the literature. The methodological approaches used in these studies have varied, with VECM and GARCH models being commonly employed. This study aims to contribute to the existing literature by investigating the impact of crude oil prices and global market volatility on the USD-NGN exchange rate using a VECM model.

3. Methodology

Vector Error Correction Models as representation of a cointegrated system

Let a Vector Autoregressive (VAR) model of order p with a deterministic part given by μ_t.The n-variate process y_t can be written as in (1).

$$y_t = \mu_t + A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + \epsilon_t \quad (1)$$

Recall that $y_{t-i} = y_{t-1} - (\Delta y_{t-1} + \Delta y_{t-2} + \cdots + \Delta y_{t-i+1})$, implying

$$\Delta y_t = \mu_t + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \epsilon_t, \quad (2)$$

where $\Pi = \sum_{i=1}^{p} A_i - I$ and $\Gamma_i = -\sum_{j=i+1}^{p} A_j$. This is the Vector Error Correction Model (VECM) representation of (1). The interpretation of (2) depends crucially on r, the rank of the matrix Π.
If $r = 0$, the processes are all $\mathrm{I}(1)$ and not cointegrated.
If $r = n$, then Π is invertible and the processes are all $\mathrm{I}(0)$.
Cointegration occurs in between, when $0 < r < n$ and Π can be written as $\alpha\beta'$. In this case, y_t is $\mathrm{I}(1)$, but the combination $z_t = \beta' y_t$ is $\mathrm{I}(0)$. If, for example, $r = 1$ and the first element of β was -1, then one could write $z_t = -y_{1,t} + \beta_2 y_{2,t} + \cdots + \beta_n y_{n,t}$, which is equivalent to saying that $y_{1_t} = \beta_2 y_{2,t} + \cdots + \beta_n y_{n,t} - z_t$ is a long-run equilibrium relationship: the deviations z_t may not be 0 but they are stationary. In this case, (2) can be written as (3).

$$\Delta y_t = \mu_t + \alpha\beta' y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \epsilon_t. \quad (3)$$

If β were known, then z_t would be observable and all the remaining parameters could be estimated via OLS. The procedure estimates β first and then the rest. The rank of Π is investigated by computing the eigenvalues of a closely related matrix whose rank is the same as Π: however, this matrix is by construction symmetric and positive semidefinite. As a consequence, all its eigenvalues are real and non-negative, and tests on the rank of Π can therefore be carried out by testing how many eigenvalues are 0.

If all the eigenvalues are significantly different from 0, then all the processes are stationary. If, on the contrary, there is at least one zero eigenvalue, then the y_t process is integrated, although some linear combination $\beta' y_t$ might be stationary. At the other extreme, if no eigenvalues are significantly different from 0, then not only is the process y_t non-stationary, but the same holds for any linear combination $\beta' y_t$; in other words, no cointegration occurs.

Estimation typically proceeds in two stages: first, a sequence of tests is run to determine r , the cointegration rank. Then, for a given rank the parameters in equation (3) are estimated.

3.1 The Model

The study will use daily data on crude oil prices, S&P 500 index, and the USD-NGN exchange rate from 3rd June 2020 to 31st May 2024. The VECM model will be specified as follows:

We begin with the variables definition. Let $y_t = \begin{pmatrix} \Delta USD\_NGN_t \\ \Delta OIL\_PRICE_t \\ \Delta S\&P500_t \end{pmatrix}$ represents the vector of our variables at time t. Then the VAR representation of order 2 with a deterministic part μ_t is given by:

$$y_t = \mu_t + A_1 y_{t-1} + A_2 y_{t-2} + \epsilon_t \quad (4)$$

The VECM representation of the above VAR model is given by (5)

$$\Delta y_t = \mu_t + \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \epsilon_t \quad (5)$$

Where $\Pi = A_1 + A_2 - I$ and $\Gamma_1 = -A_2$.
To capture the Long-Run Equilibrium Relationships, the cointegrating vectors β' could be represented as in (6)

$$\beta' = \begin{pmatrix} 1 & -\beta_{12} & -\beta_{13} \\ 1 & -\beta_{22} & -\beta_{23} \end{pmatrix} \quad (6)$$

This implies the long-run equilibrium relationships are as given in (7a) and (7b):

$$USD\_NGN_t = \beta_{12} OIL\_PRICE_t - \beta_{13} S\&P500_t + z_{1t} \quad (7a)$$

$$USD\_NGN_t = \beta_{22} OIL\_PRICE_t - \beta_{23} S\&P500_t + z_{1t} \quad (7b)$$

where z_{1t} and z_{2t} are the stationary error correction terms. Substituting y_t and the matrices into the VECM representation (5) we get (8):

$$\Delta y_t = \mu_t + \alpha\beta' y_{t-1} + \Gamma_1 \Delta y_{t-1} + \epsilon_t \quad (8)$$

Thus, our specific VECM model aimed to capture the impact of OIL_PRICE and S&P 500 on USD/NGN with an optimal lag length of 2 is given by 9(a) – (9c):

$$\Delta USD\_NGN_t = \mu_1 + \alpha_{11}(USD\_NGN_{t-1} - \beta_{12} OIL\_PRICE_{t-1} - \beta_{13} S\&P500_{t-1}) + \alpha_{12}(USD\_NGN_{t-1} - \beta_{22} OIL\_PRICE_{t-1} - \beta_{23} S\&P500_{t-1}) + \gamma_{11} USD\_NGN_{t-1} - \gamma_{12} OIL\_PRICE_{t-1} - \gamma_{13}\beta_{23} S\&P500_{t-1} + \epsilon_{1t} \quad (9a)$$

$$\Delta OIL\_PRICE_t = \mu_2 + \alpha_{31}(USD\_NGN_{t-1} - \beta_{12} OIL\_PRICE_{t-1} - \beta_{13} S\&P500_{t-1}) + \alpha_{32}(USD\_NGN_{t-1} - \beta_{22} OIL\_PRICE_{t-1} - \beta_{23} S\&P500_{t-1}) + \gamma_{31} USD\_NGN_{t-1} - \gamma_{32} OIL\_PRICE_{t-1} - \gamma_{33}\beta_{23} S\&P500_{t-1} + \epsilon_{1t} \quad (9b)$$

$$\Delta S\&P500_t = \mu_3 + \alpha_{21}(USD\_NGN_{t-1} - \beta_{12} OIL\_PRICE_{t-1} - \beta_{13} S\&P500_{t-1}) + \alpha_{22}(USD\_NGN_{t-1} - \beta_{22} OIL\_PRICE_{t-1} - \beta_{23} S\&P500_{t-1}) + \gamma_{21} USD\_NGN_{t-1} - \gamma_{12} OIL\_PRICE_{t-1} - \gamma_{13}\beta_{23} S\&P500_{t-1} + \epsilon_{1t} \quad (9c)$$

Which can be written compactly as (10).

$$\begin{pmatrix} \Delta USD\_NGN_t \\ \Delta OIL\_PRICE_t \\ \Delta S\&P500_t \end{pmatrix} = \mu_t + \begin{pmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \\ \alpha_{31} & \alpha_{32} \end{pmatrix} \begin{pmatrix} 1 & -\beta_{12} & -\beta_{13} \\ 1 & -\beta_{22} & -\beta_{23} \end{pmatrix} \begin{pmatrix} \Delta USD\_NGN_{t-1} \\ \Delta OIL\_PRICE_{t-1} \\ \Delta S\&P500_{t-1} \end{pmatrix} + \Gamma_1 \quad (10)$$

The model will be estimated using Gretl software. Diagnostic tests, impulse response functions, variance decomposition, and Granger causality will be conducted to analyze the results.

4. Exploratory Data Analysis

The data used for this research was daily data on crude oil prices, S&P 500 index, and the USD-NGN exchange rate from 3rd June 2020 to 31st May 2024. The data was sourced from www.yahoofinance.com

The first plot figures 1-4 is the time series plot of the original variables i.e. S&P 500 (US. dollars) crude oil price (US. Dollars), USD_NGN exchange rate (The value of a unit of the US dollars in Naira) and the reciprocal of the USD_NGN exchange rate(the value of a unit of the Nigerian Naira in US dollars).
The global market (represented by S&P 500), (Figure 1) enjoyed steady appreciation from early 2020 to early 2022, then it took a decline till the end of 2022 before it rebounded and and appreciated until it peaked in mid 2024.

The USD/NGN Figure 2 was a bit stable hovering around 400 NGN to a dollar from early 2020 to around mid 2023 when it took a leap to around 800 NGN to a dollar. This is as a result of the removal of the fuel subsidy. It then took a big leap to around 1600 NGN in early 2024 and has been hovering around 1400 NGN. The reciprocal of the USD/NGN Figure 4 represents the value of 1 NGN in US dollars. The Nigerian naira was worth about $0.0027 in 2020 and now merely about $0.0007 in mid 2014.

The crude oil price Figure 3 rose steadily between early 2020 from around $40 to almost $130 per barrel in 2022. It dived down to around $80 and has been fluctuating between $70 to $90 from early 2023 to mid 2024.

The log difference of the series was taken to take care of stationarity. The result was plotted in fig 5 – 7. It captures the volatility of the series. From the plot, we can assert that the S&P 500 Figure 6 has a very high volatility especially between 2022 to 2023. Crude oil price Figure 7 also has a high volatility. The USD/NGN Figure 5 has a very volatility except for the period between mid 2023 to mid 2024.

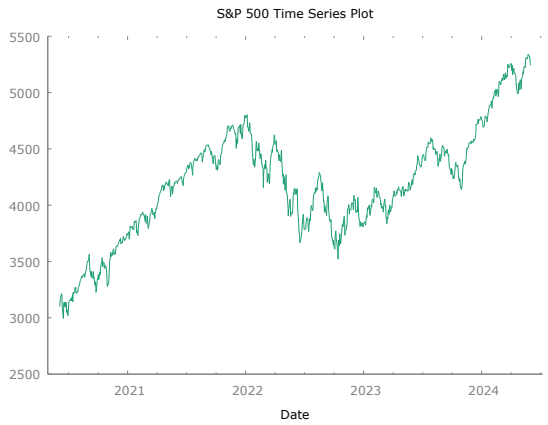


Figure 1 S&P 500 Time Series Plot

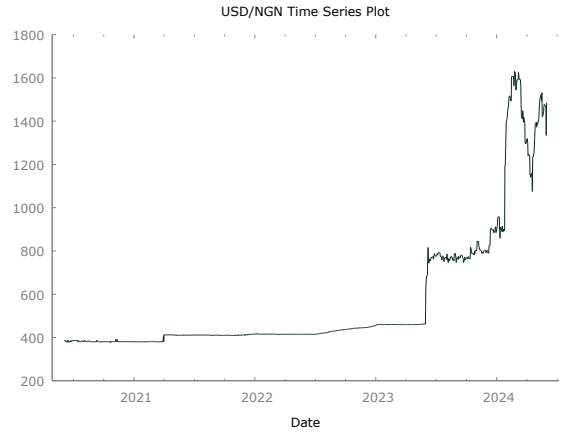


Figure 2 USD/NGN Time Series Plot

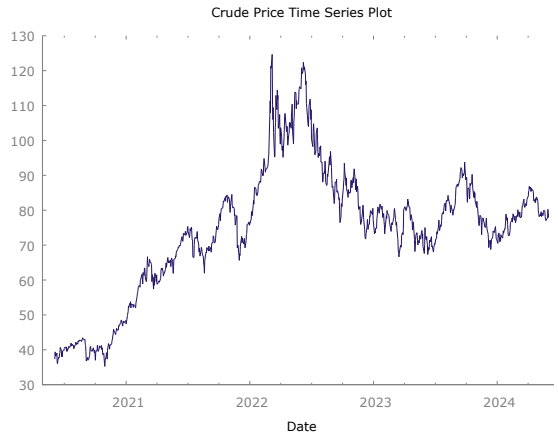


Figure 3 Crude Oil Price Time Series Plot

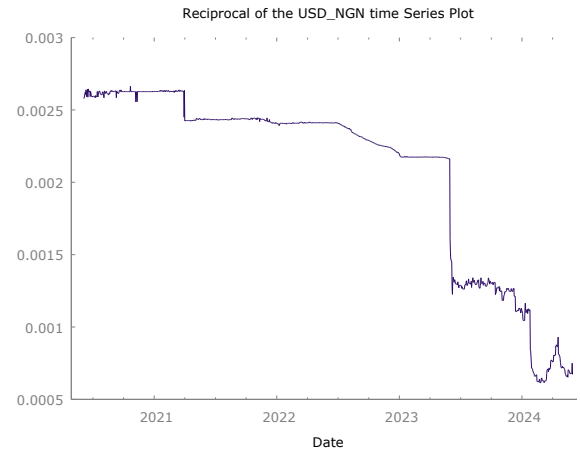


Figure 4 Time Series Plot of the Reciprocal of NGN/USD

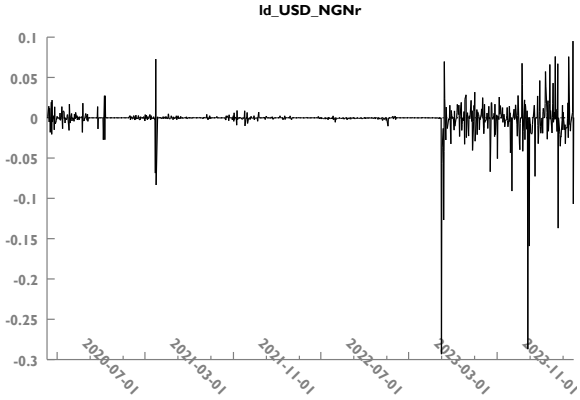


Figure 5 Time Series Plot of log differenced USD_NGN

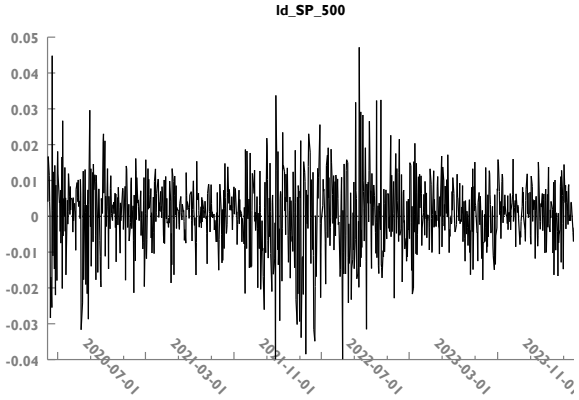


Figure 6 Time Series Plot of log differenced S&P 500

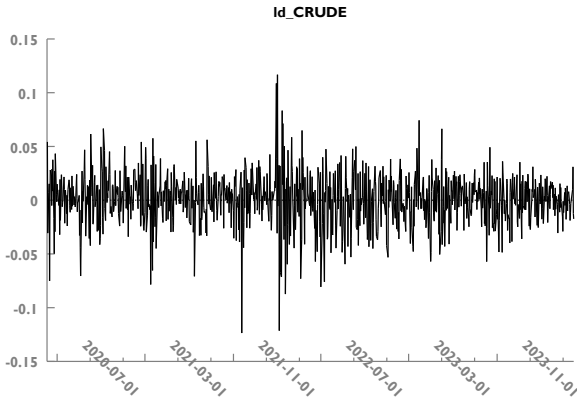
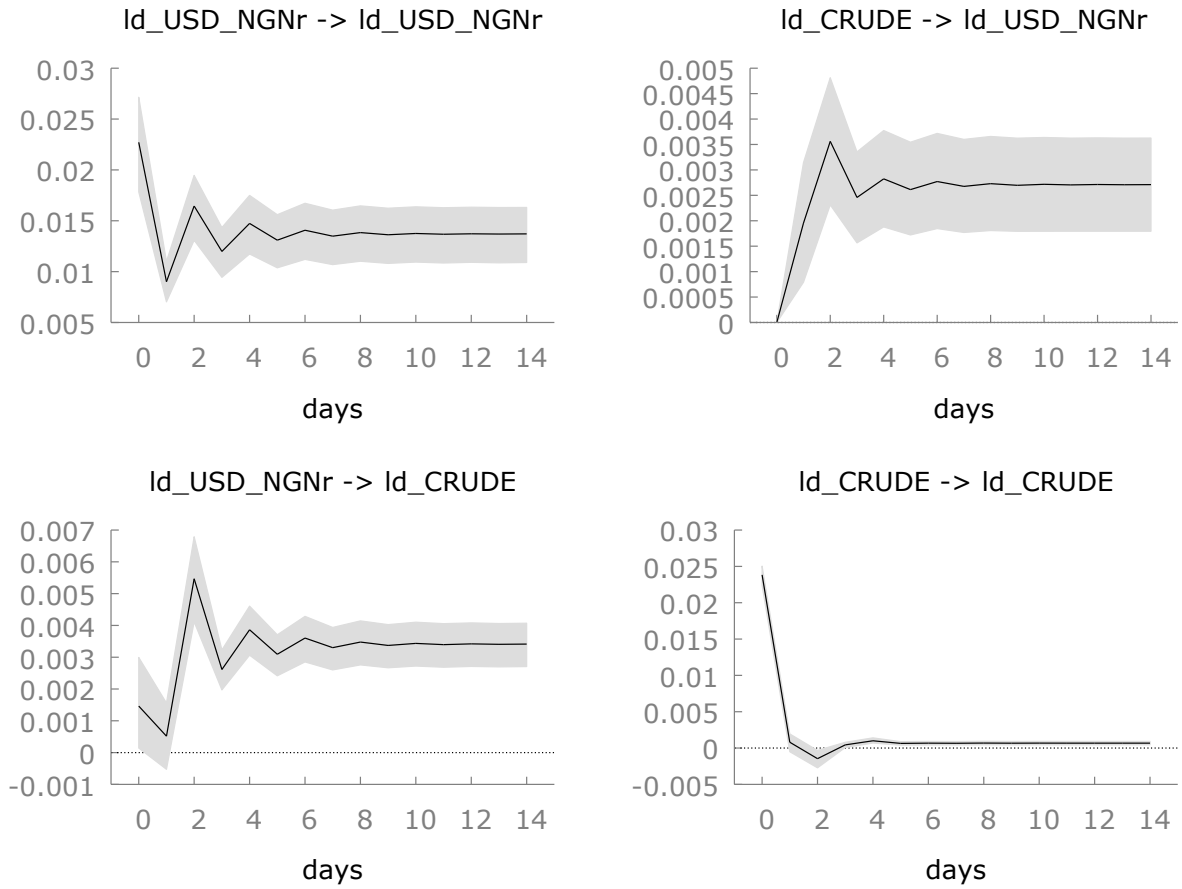


Figure 7 Time Series Plot of log differenced Crude Price

Table 1 Maximum Lag Selection

lags	loglik	p(LR)	AIC	BIC	HQC
1	4801.4519	-9.644772	-9.605322	-9.629774	
2	4818.0719	0	-9.670165*	-9.610989*	-9.647667*
3	4820.3365	0.33909	-9.666673	-9.587772	-9.636676
4	4824.7796	0.06401	-9.667565	-9.568938	-9.630069
5	4826.3691	0.52833	-9.662715	-9.544363	-9.617719
6	4829.6222	0.1644	-9.661212	-9.523135	-9.608717
7	4832.2179	0.26821	-9.658386	-9.500584	-9.598393
8	4834.8185	0.26728	-9.65557	-9.478043	-9.588078
9	4836.2633	0.57647	-9.650429	-9.453176	-9.575437
10	4840.0116	0.11186	-9.649923	-9.432944	-9.567432

Note: The asterisks below indicate the best (that is, minimized) values of the respective information criteria, AIC = Akaike criterion, BIC = Schwarz Bayesian criterion and HQC = Hannan-Quinn criterion.



5. Result and Discussions

The result of output of the Vector Error Correction Model (VECM). The model captures the relationship between crude oil prices, the USD-NGN exchange rate, and the S&P 500 index.

The model is estimated using a maximum likelihood approach and includes two equations: one for the crude oil price and one for the USD-NGN exchange rate. S&P 500 was set as an exogenous variable. The result in Table 1 indicates that the optimal lag length is 2. Thus in this work, we used a lag length of 2 for the analysis.

5.1 Coefficients of VAR in Differences and Lagged Levels

These sections present the estimated coefficients for the VAR model in both differenced form and in lagged levels.

Table 2 Coefficients in Differences:

ld_CRUDE	ld_USD_NGNr
-1.72E-05	-9.35E-05
-0.45581	-0.015409
-0.12378	-0.58124
-0.025852	0.058532

Table 3 Coefficients in Lagged Levels

ld_CRUDE	ld_USD_NGNr
-1.72E-05	-9.35E-05
-0.45581	-0.015409
-0.12378	-0.58124
-0.025852	0.058532

The Tables 2 is the Coefficients in Differences which reflects the short-term dynamics of the variables. The coefficients indicate the impact of changes in the differenced variables on the current period's changes.
-1.7219e-005 (differenced Crude oil price) and -9.3470e-005 (differenced USD/NGN): These coefficients are very close to zero, indicating that past changes in the variables have a negligible short-term effect on their current changes. -0.45581 and -0.015409: indicate that past changes have a moderate negative effect on the current changes in the respective variables, implying some persistence or momentum in the time series. -0.12378 and -0.58124: are larger negative coefficients and suggest a stronger inverse relationship in the short term, where increases in one period are followed by decreases in the next period. -0.025852 and 0.058532: indicate a small short-term relationship, with the first being negative and the second positive, suggesting differing immediate impacts on the variables.

The table 3 is the Coefficients in Lagged Levels and it indicate the long-term equilibrium relationships among the variables. The results can be interpreted thus: 0.00059889 and -0.0012670: suggest a minor long-term relationship between the past levels of the variables and their current levels. 0.50153 and -0.011990: the first coefficient (0.50153) indicates a significant positive long-term relationship, while the second (-0.011990) suggests a weak negative relationship. 0.017637 and 0.50794: show a strong positive long-term relationship for the second variable, implying that higher past values lead to higher current values. 0.26550 and -0.039868: the first coefficient (0.26550) indicates a positive long-term relationship, while the second (-0.039868) suggests a weaker negative relationship, implying different impacts over the long term.

5.2 VECM System Estimates

The Vector Error Correction Model (VECM) results highlight the cointegrating relationships and adjustment speeds:

Table 4 Cointegrating Vector (beta)

ld_CRUDE	1.0000 (0.00000)
ld_USD_NGNr	-0.24884 (0.052181)

Table 5 Adjustment Vectors (alpha)

ld_CRUDE	-1.0307
ld_USD_NGNr	0.1967

The result in Table 4 is the Cointegrating Vector (beta) and it indicates a long-term relationship where changes in crude oil prices (ld_CRUDE) and USD/NGN exchange rate (ld_USD_NGNr) move together. Specifically, for every unit change in crude oil prices, the USD/NGN rate changes by 0.24884 units.

The Adjustment Vectors (alpha) coefficients Table 5 show how quickly the variables return to equilibrium after a shock. A coefficient of -1.0307 for crude oil suggests a rapid adjustment, while the 0.19670 for USD/NGN indicates a slower adjustment.

5.3. Individual Equation Estimates

The output includes two equations representing the dynamics of crude oil prices and the USD/NGN exchange rate.

Table 6 Cointegration of Equation 1: d_ld_CRUDE

	coefficient	std. error	t-ratio	p-value	
const	0.0009250320	0.0007580240	1.2200000000	0.2226000000	
d_ld_CRUDE_1	0.0642069000	0.0313237000	2.0500000000	0.0406000000	**
d_ld_USD_NGNr_1	−0.235875	0.0274875000	−8.581	0.0000000000	***
ld_SP_500	0.2580330000	0.0749919000	3.4410000000	0.0006000000	***
EC1	−1.03073	0.0435819000	−23.65	0.0000000000	***

From the result, we can allude that d_ld_CRUDE_1 has a positive and significant coefficient indicating that previous period's crude oil prices positively affect current crude oil prices. Whereas ld_SP_500 has a positive and significant coefficient indicating that higher S&P 500 levels lead to higher crude oil prices. - EC1: The error correction term is highly significant, indicating that deviations from long-term equilibrium are quickly corrected.

Table 7 Cointegration of Equation 1: d_ld_USD_NGNr

	coefficient	std. error	t-ratio	p-value	
const	−0.000273282	0.0007213820	−0.3788	0.7049000000	
d_ld_CRUDE_1	−0.114645	0.0298096000	−3.846	0.0001000000	***
d_ld_USD_NGNr_1	−0.559851	0.0261587000	−21.40	0.0000000000	***
ld_SP_500	0.0043570600	0.0713669000	0.0610500000	0.9513000000	
EC1	0.1966970000	0.0414752000	4.7430000000	0.0000024200	***

The result for the second equation can be seen as d_ld_CRUDE_1having a negative and significant coefficient suggests that an increase in crude oil prices significantly reduces the

USD/NGN exchange rate. d_ld_USD_NGNr_1 having a significant negative coefficient indicates persistence in the exchange rate, where higher past values lead to lower current values.
ld_SP_500 is not significant, implying the S&P 500 does not have a direct short-term effect on the USD/NGN rate. EC1: The positive and significant coefficient indicates that the exchange rate adjusts to restore long-term equilibrium.

5.4. Economic Implications

The negative relationship between crude oil prices and the USD/NGN exchange rate suggests that higher oil prices lead to an appreciation of the Naira. This reflects Nigeria's heavy reliance on oil exports for foreign exchange earnings. Policymakers should focus on stabilizing oil production and prices to manage exchange rate volatility. The positive impact of the S&P 500 on crude oil prices indicates that global market conditions significantly affect Nigeria's oil revenues. However, the S&P 500 does not have a direct short-term impact on the USD/NGN rate, implying that other factors, like domestic economic policies and conditions, play a more crucial role in the exchange rate dynamics.

The significant error correction terms in both equations highlight the importance of long-term equilibrium relationships. Deviations from these equilibria are corrected relatively quickly for crude oil prices and more slowly for the exchange rate. This indicates that while crude oil prices quickly adjust to shocks, the exchange rate takes longer, suggesting potential opportunities for policy interventions to stabilize the exchange rate.

5.5. Policy Recommendations:

From the foregoing, we recommend the following actions to help stabilize the Naira.
Diversification: Reducing the economy's dependence on oil by diversifying into other sectors could stabilize foreign exchange earnings and the exchange rate. Implementing effective foreign exchange policies and maintaining adequate foreign reserves can help buffer against external shocks. Finally, structural reforms to improve economic fundamentals and investor confidence can lead to a more stable exchange rate environment.

6. Conclusion:

This study has employed a Vector Error Correction Model (VECM) to investigate the impact of crude oil prices and global market volatility (proxied by S&P 500) on the USD-NGN exchange rate. The results indicate that there is a significant long-run relationship between the variables, with crude oil prices having a negative impact on the exchange rate and global market volatility having a positive impact. The study also found that the USD-NGN exchange rate became very volatile around mid 2023 and this could be influenced by a variety of factors, including removal of fuel subsidy and the floating of the Naira, crude oil prices. The results of the VECM model suggest that the exchange rate is highly sensitive to changes in crude oil prices and global market volatility, and that these factors have a significant impact on the exchange rate in both the short and long term. The study's findings have important implications for policymakers in Nigeria, who must navigate the challenges of managing the exchange rate in a highly volatile global economy. The results suggest that policymakers should focus on implementing effective monetary policy and economic reforms to promote economic growth and stability.

References

Akpan, U. (2018). The impact of crude oil prices on the USD-NGN exchange rate. *Journal of Economics and Finance*, 42(2), 1-12.

Adebiyi, A. (2020). The impact of global market volatility on the USD-NGN exchange rate. *Journal of Financial Markets*, 51, 1-12.

Adesanya, O. (2019). The interplay between crude oil prices and global market volatility: Implications for the USD-NGN exchange rate. *Journal of Economics and Finance*, 43(1), 1-12.

Ajala, K., Sakanko, M. A., & Adeniji, S. O. (2021). The asymmetric effect of oil price on the exchange rate and stock price in Nigeria. *International Journal of Energy Economics and Policy*, *11*(4), 202-208.

Olayeni, O. R., Tiwari, A. K., & Wohar, M. E. (2020). Global economic activity, crude oil price and production, stock market behaviour and the Nigeria-US exchange rate. *Energy economics*, *92*, 104938.

Okere, K. I., Muoneke, O. B., & Onuoha, F. C. (2021). Symmetric and asymmetric effects of crude oil price and exchange rate on stock market performance in Nigeria: Evidence from multiple structural break and NARDL analysis. *The Journal of International Trade & Economic Development*, *30*(6), 930-956.

Ojo, O. (2020). The relationship between global market volatility and the USD-NGN exchange rate. *Journal of International Money and Finance*, 102, 1-12.

Ogunleye, O. (2019). The relationship between crude oil prices and the USD-NGN exchange rate. *Journal of International Finance and Economics*, 19(1), 1-10.

Joo, K., Suh, J. H., Lee, D., & Ahn, K. (2020). Impact of the global financial crisis on the crude oil market. *Energy Strategy Reviews*, *30*, 100516.

Junior, P. O., & Tweneboah, G. (2020). Are there asymmetric linkages between African stocks and exchange rates?. *Research in International Business and Finance*, *54*, 101245.

Koijen, R. S., & Yogo, M. (2020). *Exchange rates and asset prices in a global demand system* (No. w27342). National Bureau of Economic Research.

Saidi, L. O., Aedy, H., Saranani, F., Rosnawintang, R., Adam, P., & Sani, L. O. A. (2020). Crude oil price and exchange rate: An analysis of the asymmetric effect and volatility using the non linear autoregressive distributed lag and general autoregressive conditional heterochedasticity in mean models. *International Journal of Energy Economics and Policy*, *10*(1), 104-108.

Zhang, W., & Hamori, S. (2021). Crude oil market and stock markets during the COVID-19 pandemic: Evidence from the US, Japan, and Germany. *International Review of Financial Analysis*, *74*, 101702.