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Research Paper

Oil Price Dynamics, Exchange Rate and Stock Market Returns in Net Oil Exporting African Countries Before and After Global Financial Crises

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ABSTRACT
This study examined the relationship among oil price, exchange rates and stock market returns before [1990-2008] and after [2009-2023] global financial crisis in the net oil exporting African countries. Data for the study were sourced from Energy Information online database, International Monetary Fund [IMF] online database and World Bank development indicator online database. Data sourced were estimated by non-linear Autoregressive Distributed Model, ARCH and GARCH, Vector Autoregressive Model and Panel Granger Causality Tests. Results from unit root test showed that variables of interests were integrated of mixed orders 1[0] and 1[1]. The result from NARDL revealed that there is co-integration and non-linear long run connection among oil price, exchange rates and stock market returns in net oil exporting African Countries. The results from panel NARDL further showed that exchange rate appreciate significantly during positive oil price but depreciate mildly during negative oil price. Also, empirical result further revealed that positive oil price did not impact stock market returns significantly while negative oil price has significant negative influence on stock market returns during the study period. The result from panel pairwise granger causality revealed that causality running from oil price to exchange rate and stock market returns but causality did not run from exchange rate and stock market. However, the study found that the effect of negative oil price on exchange rate and stock market returns after global financial crises was more pronounced. That is, negative oil price had more adverse effect on both exchange rate and stock market return during the study period.Based on these findings, the study concludes that both stock market returns and exchange rate are sensitive to the behavior of oil price at international oil market. The study recommends that investors and monetary authority should monitor the behavior of oil price at international oil market when designing their policies.

Keywords: *Oil price Dynamics, Exchange rate, Stock market Returns and Nonlinear ARDL.*

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I. INTRODUCTION

It is not controversial that the contributions of the stock exchange market to the process of economic growth across countries cannot be overemphasised. The stock exchange market contributes to the process of economic growth in several ways. For instance, it serves as a source of raising funds for investments, corporate social responsibility, the creation of employment opportunities, and financial intermediation by mobilising resources from the surplus sector of the economy for the benefit of the deficit sector (Oke, 2023). The stock exchange market has also been identified as one of the important driving forces towards growth in the financial sector of every economy. Following the submission of Ariyo and Adelegan (2005), where it was established that if resources traded within a capital market are well channelled, it will enhance their contributions to the process of economic growth in an economy where the government policy is directed toward efficient allocation of financial resources. In most of the industrialised nations, the stock exchange market serves as one of the veritable sources of mobilising funds for the enhancement of the economy and also as a means of transferring resources to the economy.

Globalisation has brought in several global links throughout the world, connecting every country to each other, and, in fact, the modern world is seen as a single global village. The current wave of globalisation has not only expanded the market for products and economic integration but also the global integration of

financial institutions and financial markets (Yung, 2023). Just like the growth of an economy is strongly related to its domestic financial markets, where much of the capital for investments is derived from the national stock market, the global financial system with which the domestic financial market is linked through FIIS is also a critical factor in a nation achieving economic growth (Muktadir-Al-Mukit, 2012), as cited by Lakshmanasamy (2021).

Rapidly increasing international equity flows create a higher demand for and supply of currencies in which international equity prices are dominated, leading to some degree of interdependencies between the stock market and exchange rate. A byproduct of such global integration of financial markets is that the vulnerability of the global financial institutions increases not only with global economic fluctuations but also with the national economies. The national economies are also highly vulnerable to the volatilities in the international financial markets, as noted by Karunanayake, Valadkhani and Obrie (2010). The changes in the global financial market also influence exchange rates. The fluctuations of which have repercussions on economies throughout the world. In market economies, the exchange rate fluctuations are ameliorated to some extent through a free-floating or managed floating exchange rate (Karoui, 2006).

Instabilities in international oil markets and exchange rates can significantly affect domestic stock prices and returns, thereby causing stock market volatility. Stock returns volatility is one of the most common measures of financial volatility, frequently employed in asset pricing, hedging, and portfolio selection strategies (Tagajeevan, 2012). In today's global economy, crude oil is a crucial input in the production of almost every good. Therefore, variations in crude oil prices can influence economic growth either positively or negatively. According to VOL (2011), rising oil prices can increase production costs, leading to inflation, which negatively affects economic growth. Noor and Dutta (2017) also argued that oil price instability can adversely impact stock market performance.

Clinear (2015) observed that oil prices can affect stock returns in either direction, depending on how they influence economic fundamentals. For example, oil prices can impact the present value of future cash flows and the discount rate applied to stock valuations via inflation effects. Bour (2015) similarly argued that increases in oil prices may positively or negatively affect company share prices. In particular, oil-exporting countries may experience revenue booms when prices rise, thereby influencing their stock markets.

In Africa, many countries are endowed with abundant natural resources, which, if properly harnessed, could significantly drive economic growth. However, the economies of most African nations remain fragile and vulnerable to both internal and external shocks. As Omolade (2020) highlighted, such macroeconomic instability can affect investment returns in African markets. The global financial crisis of 2008 demonstrated the dynamic linkages not only between domestic stock prices and exchange rates but also in terms of their respective volatilities. During the crisis, emerging markets suffered major setbacks due to significant currency depreciations (relative to the USD) and plummeting stock prices—not due to trade flow shifts, but rather large cross-border portfolio movements (Lakshmanasamy, 2021).

Given the global importance of oil and its price fluctuations over the past three decades, a substantial body of empirical research has investigated the relationship between oil prices, stock markets, and exchange rates. Notable among these are studies by Kang et al, (2017), Marashdeh and Afandi (2017), Degiannakis, Filis, and Floros (2013), Ikechukwu and Omotayo (2019), Abhyankar, Xu, and Wang (2013), and Ciner (2013). These studies underscore that oil, being a fundamental production input, significantly affects macroeconomic variables. According to Vom (2011), oil price increases raise production costs and potentially trigger inflation, which can hinder economic growth. Hoque and Noor (2017) further asserted that inflation induced by rising oil prices adversely affects economic performance.

Moreover, fluctuations in oil prices not only influence stock market returns but also affect exchange rate behaviours. Ciner (2013) emphasised that oil price changes can sway currency markets, impacting investor decisions. Over the last forty years, both oil-importing and oil-exporting African nations have witnessed improvements in stock market performance, evidenced by increased capital inflows from developed economies. Investors have been exposed to broader investment opportunities. Nevertheless, recent years—especially the period following the global financial crisis—have seen erratic performance in these markets. This unpredictability has been partly attributed to exchange rate fluctuations and oil price volatility.

The influence of oil prices on exchange rates and stock markets remains an ongoing empirical debate. The strength and direction of the causal relationships among these variables are not yet definitively established. More crucially, the impact of exchange rate and oil price volatility on international equity returns lacks consistent empirical evidence (Mishra, 2020; Solnik, 2021; Zubair, 2023). From an asset pricing perspective, the relationship between exchange rates and equity returns is driven by the covariance between returns and associated risks. According to Hall and Rey (2006), due to the portfolio rebalancing effect, there is a tendency for returns in foreign exchange and equity markets to be negatively related. As a foreign country's stock market outperforms the domestic market, investors may rebalance their portfolios by selling foreign equities, thereby affecting currency demand.

The broad objective of this paper is to investigate the asymmetric effect of oil prices on exchange rates and stock market returns in African oil-producing countries before and after the global financial crisis. The remainder of the paper is structured as follows: Section Two reviews relevant literature; Section Three presents the methodology; Section Four focuses on results and discussion; and Section Five concludes the paper.

II. LITERATURE REVIEW

Quite a number of studies have examined the dynamic relationships among stock market performance, economic growth, oil price shocks, and monetary variables across various economies. These studies have employed a range of econometric techniques to explore both linear and non-linear interactions, and have produced varying results depending on the country context, time period, and methodological approach. For instance, Yon and Woiles (2022) employed panel co-integration techniques to investigate the interactions among stock market returns, economic growth, and money supply in selected developed nations. Their findings revealed that stock market returns and output growth are connected both in the short and long run. However, while stock market returns were linked to money supply in the long run, no such relationship was found in the short run.Similarly, Emmanuel and Stonees (2022) examined the relationship between stock market performance and economic growth in the United Kingdom using a structural Vector Autoregressive (VAR) model as the estimation technique. Their study revealed that economic growth responds positively and significantly to shocks from stock market returns.

Latin and Yahomas (2012) studied the impact of financial crises on stock market returns in selected developed countries using co-integration and error correction models. The findings indicated that financial crises had a significantly negative effect on stock market returns in the selected countries during the study period. In a related study, Woole and Harmony (2022) assessed both the long-run and short-run impacts of financial crises on the economies of selected advanced countries using panel co-integration techniques. Their results corroborated earlier findings, indicating that financial crises had significant negative effects on the selected economies in both the long and short run. Omyma (2021) used a non-linear Autoregressive Distributed Lag (ARDL) model to examine the relationship between stock market returns and economic growth in Germany from 1990 to 2018. The study found that positive stock market returns had a positive and significant influence on economic growth, while negative returns had a correspondingly negative and significant effect on the economy.In the realm of oil price dynamics, Khan, Teng, and Khan (2019) investigated the asymmetric impact of oil price shocks on stock returns in the Shanghai Stock Exchange between the first quarter of 2008 and the fourth quarter of 2018. Utilizing an asymmetric ARDL model, the study revealed a long-run co-movement between oil prices and stock returns. The results showed that an increase in oil prices negatively affected stock returns both in the short and long run, while a decrease in oil prices had a positive impact.

In a similar vein, Chunyan, Xinheny, and Bin (2017) explored the asymmetric relationship between oil price shocks and the stock market in China using both Structural VAR and Non-linear ARDL models. Their empirical findings showed that demand-side oil price shocks had a strong, direct, and significant effect on the Chinese stock market in both the short and long term. However, supply-side shocks were found to have no significant influence. Furthermore, the study noted that neither supply nor demand shocks exhibited an asymmetric effect on stock market performance.

Abderrazak, Stephen, and Khaled (2018) studied the interaction between oil price shocks and stock market returns in a sample of oil-importing and oil-exporting countries. Employing a non-linear ARDL model, the study found that the relationship between oil price shocks and macroeconomic fundamentals was asymmetric during the study period.Expanding the literature, Halil and Kassouri (2018) examined the asymmetric responses of stock prices to monetary shocks in Turkey, employing a non-linear ARDL model. Their results showed evidence of asymmetric co-integration among money supply, oil prices, and stock prices. The Turkish stock market was found to react asymmetrically to oil price and money supply shocks. In the long run, oil prices had a significant negative effect on stock prices, while stock prices responded positively to both negative and positive shocks in money supply.

Awolaja and Musa (2019) analyzed the effects of asymmetric oil price shocks on stock prices in Nigeria between 2009 and 2016, using a non-linear ARDL model. Their findings indicated that the effect of oil price shocks on Nigerian stock returns was symmetric in both the short and long run, and that the impact was fully transmitted.Similarly, Danggyu and Jungbo (2018) investigated the relationship between stock prices and renewable energy using a non-linear ARDL model. The results revealed that oil price changes had a significant and positive short-run asymmetric effect on renewable energy investments; however, this effect did not persist into the long run.

Despite the growing number of empirical studies exploring the interrelationships among oil price changes, exchange rates, and stock market returns across the globe, many of these studies did not consider the distinction between periods before and after the global financial crisis. Additionally, several studies did not decompose oil price movements into positive and negative regimes. It is important to recognize that the

relationships among oil prices, exchange rates, and stock market returns may differ significantly before and after the global financial crisis. Furthermore, the effects of positive and negative oil price shocks on exchange rates and stock market returns may not be symmetrical, suggesting a need for more nuanced empirical investigations in this domain.

III. METHODOLOGY

Arbitrage Pricing Theory (APT)

Theories relating to oil prices, exchange rates, and stock market returns have been extensively discussed in the theoretical literature. However, this study adopts the Arbitrage Pricing Theory (APT) as the foundational framework for developing its model, as it is considered the most relevant and closely aligned theory to the objectives of this study.The Arbitrage Pricing Theory was developed by Ross (1976). It is a one-period model in which every investor assumes that the stochastic properties of capital asset returns are consistent with a factor structure. Ross posits that if equilibrium prices do not allow for arbitrage opportunities across static portfolios of assets, then the expected returns on these assets are approximately linearly related to their factor sensitivities (or loadings). His heuristic argument is based on the principle of arbitrage-free pricing.A formal proof of the theory demonstrates that a linear pricing relationship is a necessary condition for equilibrium in markets where agents maximize certain types of utility functions. The APT model asserts that the expected return on a financial asset is a linear function of various macroeconomic factors, thereby providing a practical tool for estimating asset prices (Ross, 1976).

Model Specification

To establish relationship among oil price, exchange rate, and stock market returns in the African oil producing countries, models in equation 3.1 to 3.10 is presented.

$API_t \propto_1 + OP+_t + \propto_2 REER_t + \propto_3 CPI_t + \propto_4 RIR_t + \propto_5 GFCF_t + G\alpha_6 RGDP_t + U_t$ *3.1*

when oil price is now decomposed to positive and negative sum, equation 3.2 is presented

$$API_t = \propto_1 OP_t^{+} + \propto_2 OP_t^{-} + \propto_3 REER_t + \propto_4 MS_t^{-} + \propto_5 CPI_t + \propto_6 CFF_t + \propto_7 RGDPt + u_t \quad 3.2$$

To test for oil price volatility, equation 3.3 is presented.

$$Y_t = \mu + A^1 y_t + \beta^1(L) y_{t-1} + (\mu + A^2 y_t + B^2(L) y_{t-1}) I_t(C_t - d \geq) + u_t \quad 3.3$$

For the causal link among oil price, exchange rate and stock market returns, equation 3.4 to 3.9 is presented

$$OP_t = \sum_{t=1}^{n} \partial_t OP_{t-i} + \sum_{j=1}^{n} \theta_j API_{t-1} + u_t \quad 3.4$$

$$API_t = \sum_{e=1}^{n} \partial_t OP_{t-e} + \sum_{m=1}^{n} API_m OP_{t-m} + u_t \quad 3.5$$

Model for causal relationship between oil price and real effective exchange rate

$$OP_t = \sum_{t=1}^{n} \partial_i P_{t-1} + \sum_{j=1}^{n} \theta_j REER_{t-1} + u_t \quad 3.6$$

$$REER = \sum_{e=1}^{n} \varphi OP_{t-1} + \sum_{m=1}^{n} REER_{t-m} + u_t \quad 3.7$$

Model for causal relationship between real effective exchange rate

All share price index

$$REER_t = \sum_{t=1}^{n} \sigma REER_{t-1} + \sum_{j=1}^{n} \theta_j API_{t-j} + u_t \quad 3.8$$

$$API_t = \sum_{e=1}^{n} \mu_e API_e + \sum_{m=1}^{n} REER_{t-m} + u_{it} \quad 3.9$$

Where

OP = stands for world oil price

OP^+ = represents positive oil price

OP^- = stands for negative oil price

API = represents all share index

REER= stands for real effective exchange rate

CPI = Composite consumer price index (Inflation rate)

RIR = Represents real interest rate

GFCF = Stands for gross fixed capital formation.

RGDP= Stand for real output growth rate

IV. RESULTS AND DISCUSSION

Descriptive Statistics

This section provides information about the normality and variability of the data employed in the study. Descriptive analysis is conducted to investigate the distribution properties of the variables under considerations. From Tables 4.1a and 4.1b, it is observed that all the variables, except for the exchange rate, are not normally distributed, as indicated by the Jarque-Bera test. This conclusion is based on the rejection of the null hypothesis

of normality at the 5% significance level. Inflation is both skewed and platykurtic, which contributes to its non-normality. Output growth is leptokurtic and negatively skewed, which also accounts for its deviation from normality, as shown by the Jarque-Bera statistic.Oil price, along with its positive and negative partial sums, is platykurtic and negatively skewed, suggesting that oil prices have experienced more frequent negative changes than positive ones. The exchange rate is also platykurtic but positively skewed, implying that it has undergone more positive changes than negative ones. The divergence of these variables from the mean, and their departure from normality in terms of skewness and kurtosis, reflect the inherent non-normality in their distribution. This non-normality has implications for the stability of the variables and may affect the stationarity of the series due to their distributional characteristics.

Table 4.1a: Descriptive Statistics of Variables of Interest before Global Financial Crisis

	LOILP	LOILP*	LOILP**	LEXHR	RGDP	GFCF	API	RIR	CPI
Mean	3.9715	4.3418	-2.894	4.9160	0.6289	-0.167	-1.063	90.950	91.477
Median	4.0811	4.4698	-2.490	4.8892	0.5363	-0.175	0.4184	77.779	78.394
Maximum	4.8973	7.8788	-0.038	5.6955	1.5291	0	20.89	233.78	204.23
Minimum	2.4857	0	-6.603	4.4543	0	-0.298	-36.11	10.482	29.264
Std. Dev.	0.5412	2.2368	1.8508	0.1944	0.2914	0.1083	9.6282	48.90	47.924
Skewness	-0.363	-0.176	-0.175	0.2820	0.0716	0.0898	-1.116	0.4829	0.4965
Kurtosis	2.0384	1.6861	1.9002	3.6943	2.4998	1.4207	5.2852	2.3862	2.0812
Jarque-Bera	12.696	16.189	11.656	7.0011	2.3688	22.107	89.307	11.459	16.018
Probability	0.0018	0.0003	0.0029	0.0302	0.3059	0.0000	0.0000	0.00032	0.003
Obs.	210	210	210	210	210	210	210	210	210

Table 1.b: Descriptive Statistics of Variables Interest after Global Financial Crisis

	LOILP	LOILP*	LOILP**	LEXHR	RGDP	GFCF	API	RIR	CPI
Mean	4.9814	3.2317	-1.783	3.8150	0.5178	-0.156	-1.052	80.840	81.366
Median	3.0711	3.3587	-1.380	3.7781	0.4252	-0.164	0.3173	66.668	87.283
Maximum	3.7862	6.7677	-0.027	4.5844	1.4180	0	10.78	122.67	103.12
Minimum	1.3746	0	-5.702	3.3432	0	-0.187	-25.11	10.371	18.153
Std. Dev.	0.4311	1.1257	1.7407	0.1833	0.1813	0.1072	8.5171	37.80	36.813
Skewness	-0.252	-0.165	-0.164	0.1710	0.0615	0.0787	-1.115	0.3718	0.3854
Kurtosis	1.0273	1.5750	1.8001	2.5832	1.3887	1.3206	4.1741	1.2751	1.0701
Jarque-Bera	11.585	15.178	11.545	6.0011	1.2577	11.106	78.206	11.348	15.017
Probability	0.0017	0.0002	0.0018	0.0201	0.2048	0.0000	0.0000	0.00021	0.002
Obs.	110	110	110	110	110	110	110	110	110

1. Panel Unit Root Test

Results from the panel unit root tests suggest the presence of mixed stationarity among the variables, with some being stationary at levels and others at first difference. All the unit root tests employed at the 5% significance level consistently indicate that the inflation rate is non-stationary at level but becomes stationary after first differencing. This implies that the inflation rate is integrated of order one, I(1).The real interest rate is found to be stationary at level, I(0), as indicated by the Zivot and Andrews test when using an intercept alone, before proceeding to the model with both trend and intercept. Similarly, the ADF and PP tests also support stationarity at levels with trend and intercept specifications.Real output growth is found to be stationary at the 5% level based on the ADF and PP tests, while the Zivot and Andrews test confirms stationarity at the 10% level. The exchange rate is unambiguously I(1) across all the unit root tests applied. Oil price is also clearly integrated of order one, I(1).Meanwhile, the partial sum of positive oil price changes is found to be stationary at levels with trend and intercept, according to the Zivot and Andrews test. In contrast, the partial sum of negative changes is stationary only after first differencing.

Table 2a: Panel Unit Root test for Variables of Interest before Global Financial Crises

	LOLLP	**LOLLP -**	**LOILP -**	**LREER**	**RGDP**	**GFCF**	**API**	**RIR**	**CPI**
		-		Level/ Intercept					
ADF	-2.85	-2.64	0.45	0.84	0.95	0.93	-3.59	-0.41	4.51
PP	-2.66	-2.54	0.68	0.95	0.75	-0.88	-3.71**	0.08	6.11
ZA	-3.65	-3.40	-3.51	-1.23	-1.50	-4.23	-4.67**	-5.46	-0.87
				Level /trend and intercept					
ADF	-2.36	-1.74	-2.61	-0.48	-1.36	-1.38	-3.54**	-4.19	0.84
PP	-1.96	-1.80	-2.34	-0.27	-0.81	-1.38	-3.70**	-3.30*	1.74
ZA	-4.39	-6.07***	-3.78	-2.39	-2.82	-5.20**	-4.76*	-5.74	-1.63
				1st Difference /intercept					
ADF	-10.6**	-13.3	-9.39	-9.71	-9.65	-10.7	-5.17	-10.6**	-9.26*
PP	-10.6**	-13.3**	-9.40**	-8.03***	-7.95**	-10.7**	-3.38**	-10.0	-9.33
ZA	-10.0	-6.33	-9.66	-6.09	-7.65	-10.0	-11.1	-8.37	-11.2
				1st Differences /Trend & Intercept					
ADF	-10.8**	-13.5	-9.42	-9.78	-9.73	-10.7	-5.16	-10.6	-10.6
PP	-10.8*	13.6	-9.42	-8.04	-7.93	-10.7	-3.41	-10.0	-10.6
ZA	-11.3*	NA	-9.64	-6.81	-8.27	-11.1	-11.4	-8.39	-11.2

Source: Author's Computation, 2025

Table .2b: Panel Unit Root test after Global Financial Crises

	LOLLP	**LOLLP + -**	**LOILP -**	**LREER**	**RGDP**	**GFCF**	**API**	**RIR**	**CPI**
				Level/ Intercept					
ADF	-1.74	-1.53	0.34	0.73	0.84	0.82	-2.48	-0.31	3.41
PP	-1.55	-1.43	0.57	0.84	0.64	-0.77	-2.61**	0.07	5.11
ZA	-2.54	-2.30	-2.41	-1.12	-1.40	-3.12	-3.56**	-4.35	-0.76
				Level / Trend and Intercept					
ADF	-1.25	-1.63	-1.51	-0.37	-1.25	-1.27	-2.43**	-3.18	0.73
PP	-1.85	-1.70	-1.23	-0.16	-0.71	-1.27	-2.60**	-2.20*	1.63
ZA	-3.28	-5.06***	-2.67	-1.28	-1.71	-4.10**	-3.65*	-4.63	-1.52
				1st Difference /intercept					
ADF	-10.5**	-12.2	-8.28	-8.61	-8.54	-10.6	-4.16	-10.5**	-8.15*
PP	-10.5**	-12.2**	-8.30**	-7.02***	-6.84**	-10.6**	-2.27**	-10.0	-8.22
ZA	-10.0	-5.22	-8.55	-5.08	-6.54	-10.0	-11.1	-7.26	-11.1
				1st Differences /Trend & Intercept					
ADF	-10.7**	-12.4	-8.31	-8.67	-8.62	-10.6	-4.15	-10.5	-10.5
PP	-10.7*	12.5	-8.31	-7.03	-6.82	-10.6	-2.31	-10.0	-10.5
ZA	-11.2*	NA	-8.53	-5.71	-7.16	-11.1	-11.3	-7.28	-11.1

Heteroskedesticity Test ARCH

F-Statistics	34.88641	Prob. F	1.33	0.0000
Obs R-Square	17.98628	Prob. Chi-square	(1)	0.0000

Variables	Coefficient	Std. Error	t-Statistics	Prob
C	260.0491	192.2567	1.352614	0.1854
$RESD^2$2(-1)	0.716189	0.121255	5.906471	0.0000

Author's computation, 2025

Table 1 shows the result of the ARCH test. The result reveals that the null hypothesis of no ARCH effect is respected at 5% critical value of 0.000. This implies there is problem of ARCH effect in the residual.

Table 4.2: Heteroskedasticity Test ARCH

F- Statistic	**G-**
Obs. R-Squared	17.8361

Variable	Coefficient	Std. Error	Statst	Prob
C	261.0562	191.621	1.36261	0.1762
RESID'2(-1)	0.72453	0.131423	5034162	0.0000

Author's Computation, 2025

Results in table 4.4 revealed that the null-hypothesis of no arch effect rejected at 5% critical value with the probability value of 0.0000. This shows that there is problem of ARCH effect the residual.

Table 4.3

	AIC	**SIC**	**LOGLIKELIHOOD**
ARCH (5, 0)	7.62	8.07	-128.4330
GARCH (1, 1)	7.31	7.62	-125.40631
TARCH	7.37	7.62	-126.7741
EGARCH	7.36	7.68	-126.46

Author's Computation, 2025

After comparing ARCH(5,0) GARCH (1,1) EGARCH, , TARCH, the result in table 4.4, shows that GARCH (1,1) is most suitable model because it is the one with the lowest Akaike information criteria (AIC) and schewalz information criteria (SIC).

Table 4.4: Summary of GARCH Result

Variable	**Coefficient**	**Standard error**	**Statistic**	**Prob**
C	12754.44	22433.18	0.63456	0.562
$Resid(-1)^2$	-723.1057	1397.850	-0.61456	0.6040
Garch (-1)	1,2184406	0.077345	16.767341	0.0000
C	35.17866	7.234687	4.963456	0.0000
AR(1)	0.9506721	0.046245	21.4734	0.0000

Author's Computation, 2025

In summary, the implication of these results is that oil price is volatile and its volatility has influence on both exchange rate in stock market returns.

Long-Run Ardl Relationship Among Oil Price, Stock Market Returns And Exchange Rate

Table 4.4: ARDL Bounds test

Before Global Financial crises			After Global Financial crises		
Test Statistics	Value	K	Test Statistics	Value	K
F-Statistics	15.6214	2	F-Statistics	74.6312	2

Table 4.5: Critical Bound value

Significant	I(0)	I(1)
10%	3.23	4.16
5%	3.83	4.92
2.5%	4.52	5.68
1%	6.14	6.43

Table 4.4 presents the results of the ARDL bounds testing approach, which is commonly employed to determine the existence of long-run relationships among variables. At the 5% significance level, the critical values for the lower bound [I(0)] and upper bound [I(1)] are 3.88 and 4.92, respectively. The computed F-statistic values are 15.6214 for the pre-global financial crisis period and 74.6312 for the post-crisis period. Both values exceed the upper bound critical value of 4.92.This outcome provides strong evidence of a long-run co-movement among oil price, exchange rate, and stock market returns across both periods, thereby confirming the presence of long-run relationships among the variables.

Table 4.5: ARDL Long-run coefficients

Before global financial crises				After global financial crises		
Variables	Coefficients	Std. Error	Prob	Coefficient	Std. Error	Probs
OP^+	0.5214	0.1631	0.0731	0.06161	0.0062	0.1421
OP^-	0.6314	0.1462	0.0412	-0.1621	0.1461	0.0642

Table 4.6: Diagnostic Statistics for Long-run Coefficients

Adjusted R Square	0.734	0.632
Akaike Information criterion	-4.1631	-5.1441
Durbin-watson statistics	2.1432	1.8311
F-statistics	31.622	77.633

Table 4.6: ARDL short run coefficients

Before global financial crises				After global financial crises		
Variables	Coefficient	Std. Error	Prob	Coefficient	Std. Error	Prob
OP^+	0.4622	0.6142	0.0821	0.6214	0.1432	0.09111
P OP^+(-1)	0.14621	0.1311	0.0631	1.4621	0.4621	0.08311
ECT(-1)	-0.682	-	0.03412	-0.6361	0.6142	0.06341

Table 4.47: Diagnostic Statistics

Test	P-Value	Decision based on P-Value
Ramsey Reset Test	0.9241	Model is properly specified
Lm	0.3214	No serial correlation
Breuch-Pugan-Godfrey	0.3214	No Heteroscedasticity problem

Results from Table 4.5 show the long-run effect of oil price on stock market returns in African oil-producing countries. In the analysis, stock market returns and real effective exchange rate were used as dependent variables. Both before and after the global financial crisis, oil price had a positive and significant effect on both stock market returns and exchange rate, while negative oil price shocks had a negative and significant effect on both variables.

Table 4.6 presents the results of the short-run effects of oil price on stock market returns and exchange rate in the same countries. Consistent with the long-run findings, the results reveal that in the periods before and after the global financial crisis, positive oil price changes had a positive and significant effect on both stock market returns and exchange rate. Conversely, negative oil price changes had a negative and significant effect on both variables.

The diagnostic tests conducted during the analysis indicate that the model was well specified, with approximately 73% and 63% of the systematic variation in the dependent variables explained by the explanatory variables. Furthermore, the model did not suffer from serial correlation, as evidenced by the Durbin-Watson statistic. The conditions for the error correction model were met, with error correction terms being negative and statistically significant.

Analysis of Asymmetric Effect of Oil Price Shocks on Stock Market Returns

This sub-section presents an analysis of the asymmetric effects of oil price shocks on stock market returns. The oil price was decomposed into partial sums of positive and negative changes to investigate the asymmetric effects of oil price shocks on stock market returns and exchange rate. Impulse response functions and variance decomposition techniques were used to explain the dynamic relationships established in the model.

As shown in Figure 4.1, the direction of oil price movement plays a significant role in the behavior of stock market returns in the selected African oil-producing countries. A positive change in oil price initially has a negative impact on stock market returns during the first two months following the price increase. However, by the third month, stock market returns begin to rise, followed by a decline in the fourth month. Thereafter, stock

market returns steadily increase until the end of the year. This pattern suggests that an increase in oil price ultimately leads to an increase in stock market returns.

In contrast, negative changes in oil price initially cause a decline in stock market returns up to around the third month of the oil price fall. This initial drop could be attributed to reduced revenues and a consequent reduction in disposable funds for acquiring luxury goods. After the third month, stock market returns begin to rise until the fourth month, after which they stabilize at a lower level.

Table 4.9 presents the results of variance decomposition, which shows the contribution of each variable, including the dependent variable itself, to the variation in stock market returns. It is revealed that stock market returns in the selected African oil-producing countries are largely endogenously determined within the model, with approximately 88% of the variation attributable to the variables of interest.

Findings from Table 4.9 indicate that between the first and twentieth month, positive and negative changes in oil price account for approximately 4% and 3% of the variation in stock market returns, respectively. Although the contribution of asymmetric oil price changes is relatively small, it remains significant. This implies that the increases and decreases in stock market returns due to positive and negative oil price changes are important.Output growth remains an important factor only until the first month but becomes less significant thereafter, contributing around 1.5% to changes in stock market returns by the twentieth month. This suggests that output growth is a less important explanatory factor for stock market returns in the selected countries. Beyond output growth, inflation emerges as the major contributor to variations in stock market returns. Inflation accounts for over 92% of the variation in the first month and maintains an average contribution of 83% over the twenty-month period. Meanwhile, the stock market returns themselves explain about 11% of the variation. These results indicate that fluctuations in stock market returns in the selected countries are predominantly endogenously driven.

Exchange Rate Response to Oil Price Shocks

From the first to the second quarter, the exchange rate did not respond significantly to positive oil price changes. However, between the third and tenth quarters, the exchange rate's response to positive oil price shocks was positive and significant. In contrast, the exchange rate's response to negative oil price shocks was negative and significant throughout the entire period observed, from the first to the last quarter.

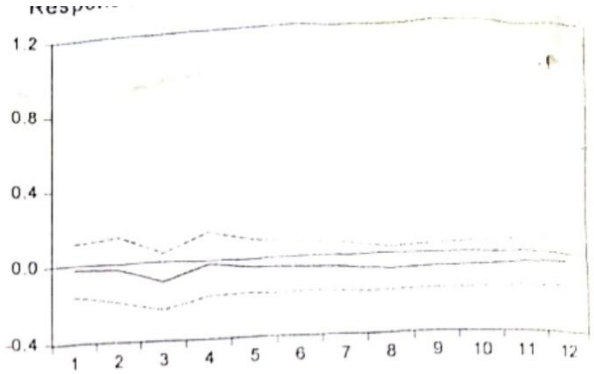

Figure 4.1: Response to Stock Market returns to exchange rate

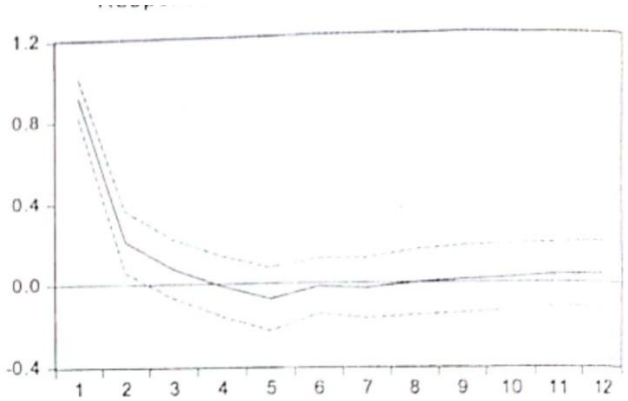

Fig 4.2: Response of stock market to positive oil price

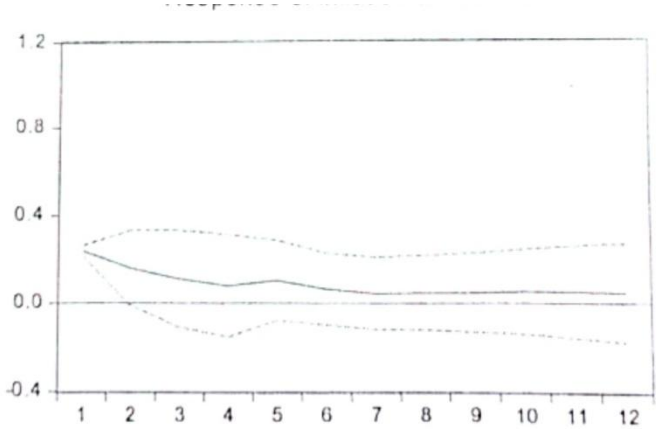

Fig 4.3: Response of stock market to negative oil price

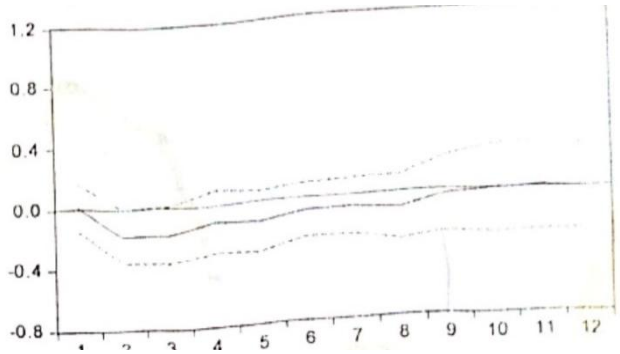

Figure 4.4: Response to Cholesky One Standard Deviation Innovations ± Two Standard Error
Source: Author's Computation, 2025

Table 4 Variance Decomposition of Asymmetric effect ofoil price on inflation

Period	LOILP+	LOILP-	RGPP	API	REER
		Relative	oI		
1	0.717597	t	D(NF)		6.358317
4	3.032061	1.148606	8.9E-06	92.85915	9.828920
8	3.462694	2.393078	6	8.70261	11.08201
12	3.920726	3.455746	1.630632	1	11.61317
16	4.170859	3.681729	1.739967	78.55503	11.85241
20	4.464270	3.786540	1.809715	77.95125	11.98822
		Relative	API		
1	3.669347	0.759925	0.960807	94.60992	0.000000
4	3.989726	2.192824	4.267588	89.11505	0.434810
8	5.02934	2.711215	5.235419	84.96532	2.058711
12	7.150847	2.456271	5.099162	81.51612	3.777602
16	10.40534	2.472792	4.948493	76.84878	5.324594
20	12.85477	2.664536	4.722458	73.42632	6.331915

Cholesky Ordering*: LOILP+API+REER*
Source:Author's Computation, 2025

Asymmetric Effect of Oil price on Stock Market: A Sub-Sample before theGlobal Financial Crisis January 1999-August 2008

This sub-section further investigates the rolling window analysis of the asymmetric effect of oil price shocks on stock market returns using sub-samples from periods prior to the global financial crisis. The analysis

spans from January 1999 to August 2008, capturing the period before the global financial crisis within the scope of our study. We divide our sample into periods before and after the global financial crisis to assess the potential impact of the crisis on stock market returns in African oil-producing countries. The results from the VAR analysis, including impulse response and variance decomposition, are presented below in Figure 4.2. The impulse response results show little difference compared to the whole sample analysis in Figure 4.1. Stock market returns exhibit an unstable movement in response to positive changes in oil price: the stock market fell during the first two periods, increased between the third and fourth periods, then declined sharply between the fourth and tenth periods before recovering. In response to negative changes in oil price, stock market returns show a relatively stable pattern, remaining stable up to the second period, falling towards the third period, and then stabilizing with an upward trend until the twelfth period.

The variance decomposition reveals a larger percentage of variation in stock market returns explained by both positive and negative changes in oil price compared to the whole sample. While real output growth and real effective exchange rate display similar patterns to those in the whole sample analysis, positive and negative oil price changes account for approximately 12% and 13% of the variation in stock market returns at periods eight and twenty, respectively. This contrasts with only 3% and 4% reported for the whole sample during the same periods. Additionally, the exchange rate explains nearly 12% of the variation at period eight and 16% at period twenty in the sub-sample prior to the global financial crisis.

Results from Table 4.10 indicate a unidirectional causality running from world oil price to stock market returns and exchange rate. However, a bi-directional causality is established between stock market returns and exchange rate. The implication of this finding is that oil price possesses predictive power over both stock market returns and domestic exchange rates. In other words, the behavior of oil prices in the international oil market significantly influences stock market returns and currency values in the selected African oil-producing countries.

Table 4.1: Panel Pairwise Granger Causality Test Result

	Null Hypothesis	**F-Stat**	**Prob.**
1.	LNOP does not granger caurse LNSTR	5.72452	0.0042
2.	LNSTR does not granger caurse LNOP	0.68145	0.6129
3.	LNOP does not granger caurse LNREER	1.6248	0.06242
4.	LNREER does not granger caurse LNOP	1.63422	0.02414
5.	LNSTR does not granger caurse REER	1.63422	0.02414
6.	LNREER does not granger caurse LNSTR	0.63222	0.063411

Source: Author's Computation 2025

In summary, the analysis indicated a positive relationship among positive world oil price, stock market returns, and exchange rate, while a negative relationship was established among negative world oil price, stock market returns, and real effective exchange rate. This finding aligns with those of Olomola (2006), Okeke (2023), Oloruntuyi (2024), and Stephen (2025), who similarly found that the responses of exchange rate and stock market returns were positive to positive oil price changes in the international oil market and negative to negative oil price changes.

The long-run relationship established through the ARDL approach supports the existence of long-run co-movement among the variables of interest in net oil-producing African countries. The results further revealed that exchange rate, real output growth rate, and gross fixed capital formation exhibited insignificant negative impacts on stock market returns, while other variables in the model showed significant negative relationships with stock market returns. This finding is consistent with that of Johnsy (2023) in a related study.

Moreover, the VAR impulse response functions, which examined the responses of selected African countries to common factors before and after the global financial crisis, revealed that a one standard deviation shock in both stock market returns and exchange rate had a positive and significant impact on each other, both prior to and following the crisis. This suggests evidence of portfolio diversification benefits in African stock markets. Additionally, the finding indicates significant evidence of wealth and credit-price effects in African stock markets, both before and after the global financial crisis.

According to the diagnostic tests performed on the GARCH(1,1) model, the null hypothesis of no heteroskedasticity was not rejected, the residuals were normally distributed, and there was no remaining ARCH effect in the residuals, as indicated by probability values exceeding critical values. Therefore, these diagnostic results validate the adequacy and fitness of the model. This outcome aligns with Iyoha (2024), who established that oil price is volatile and that its level of volatility affects macroeconomic variables.

Results from the ARCH and GARCH models, which were employed to test the volatility of world oil price, revealed that oil price is volatile, with its volatility levels determined by several factors, including global oil demand and supply. This finding concurs with that of Ogunsakin and Oloruntuyi (2015), who similarly

established the volatility of oil prices. Additionally, the panel pairwise Granger causality test revealed unidirectional causality running from oil price to stock market returns, while bi-directional causality was found between oil price and exchange rate. This result is consistent with Saliu (2020), who showed that exogenous factors such as world oil price and foreign interest rates predict the behavior of endogenous variables like stock market returns and domestic exchange rates.

V. SUMMARY AND CONCLUSION

In this study, the relationship among oil price, exchange rate, and stock market returns was examined. The motivation for this research is based on the fact that crude oil, being the most abundant resource in African oil-producing countries, is ordinarily expected to stimulate the economies of these nations positively. However, despite the significant revenue generated from oil, the macroeconomic performanceparticularly stock market returnsin many African net oil-producing countries has not reflected this wealth.Oil price movements are an important and interesting topic to investigate because increases in oil prices often signal inflationary pressures in the economy, which, in turn, could influence future interest rates and investment decisions across various sectors. Based on the various tests conducted in this study, it is concluded that the behavior of crude oil prices is a crucial determinant of stock market returns and exchange rates.

Given the findings of this study, it is recommended that investors closely monitor oil price behavior in the international oil market when making investment decisions, especially in stock markets. Furthermore, monetary authorities should carefully consider the dynamics of international oil prices when designing exchange rate policies.

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