ISSN: 2247-6172
Review of Applied Socio- Economic Research
(Volume 26, Issue 2 / 2023), pp. 109 - 119
URL: http://www.reaser.eu
e-mail: editors@reaser.eu

The Nexus Between Oil Price and Stock Returns from a Global Economic Perspective

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Abstract. *The connection between oil prices and stock returns in a developing economy was analyzed in the current study. Given the regular market turbulence that causes investors to lose money, it is unquestionably important to investigate the link between oil prices and stock returns in line with recent series. We demonstrate that the two variables (Price of oil and stock returns) have a short-run linear association using the Autoregressive Distributed Lag (ARDL) estimation technique. Overall, our finding emphasized the relevance of oil price in driving stock returns, which ultimately adds to the discourse of oil price and stock market literature by recognizing the worldwide nature of oil and financial markets. Investors and other players in the financial market could benefit from the findings of this study.*

Keywords: ARDL, Brent oil price, Developing economy, External shocks, Stock returns

JEL Codes: G1, G13, G17

1. Introduction

One of the most significant current discourses in the financial market is using stock returns to gauge economic upswing or downturn. The knowledge of variations in stock values is important for understanding the stock market as a financial mediator in any given economy. Numerous studies have investigated the connections between petroleum (oil) prices and stock returns as well as other macroeconomic factors. These research interests are not unconnected to the seminal work of Hamilton (1983). It is becoming increasingly difficult to ignore these ongoing debates, which have maintained an inconclusive outcome in the face of a unique economic quagmire. The current financial crisis, pandemics, policy uncertainty, and other issues have all substantially influenced the world's financial environment, making it exceedingly unstable owing to the growing level of financial market integration. This has affected the global financial market as well as the domestic stock market, which has equally received some negative ripple effects (Oluwasegun et al., 2021). This present research is inspired by the need to reflect on the recent situation in international finance and the regular market instability that causes the diminution of investors. It, therefore, becomes imperative to investigate the connection between the price of oil and the return on stock. This work is an effort to protect domestic financial conditions from shocks emanating from the global financial system during moments of crisis. According to the equity valuation hypothesis, rising stock prices lead to inflated discounted future returns, which in turn spur economic expansion, oil price, money supply, and interest rates. Recent research

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ISSN: 2247-6172
Review of Applied Socio- Economic Research
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into this seeks to serve as a stimulant for capital accumulation. Traditionally, stock market performance is often closely monitored by investors, portfolio managers, and policymakers. Owing to the sensitivity of the stock market, variables such as money supply, petroleum price, the exchange rate, and the interest rate impact how well it performs.

It has been suggested that monetary policies may impact the stock market's performance. As highlighted by Oluwasegun et.al. (2021), such policies stimulate changes directly or indirectly. For instance, if an economy's monetary authority lowers interest rates, such a move could attract international investors, which has been shown to boost stock market performance over the years. Previous findings add substantially to our understanding of the oil market in relation to stock returns. The oil market has increasingly become very important during the past few decades. This has consistently led to numerous discussions and arguments among researchers and academics all over the world, particularly with regard to the linkage between changes in petroleum prices and macroeconomic indices (Mukhtarov et al., 2020; Adekoya & Adebiyi, 2019 & Riza, Roman, Syed & Hussain, 2020). Prices of oil could have influenced financial variables in addition to having an impact on as well as aiding in the prediction of key macroeconomic variables. Essentially, the affected macroeconomic indices are trade balances, inflation rates, and exchange rates, among others. The above findings, however, contradict some evidence on the relationship between changes in petroleum prices and return on stock.

This paper is centered on the nexus between the cost of petroleum and returns on stock in Nigeria, as this serves as the study's central theme. The argument for Nigeria is provided by the fact that the Nigerian economy heavily depends on oil. In fact, more than 70% of Nigeria's income comes from energy. Therefore, the speculation that underlying fluctuations in accumulated demand account for the nexus between petroleum and stocks is examined in the current study. This study is imperative for a variety of reasons. One, the Nigerian stock market is still evolving and very adaptable. Nigeria is a developing nation with a very volatile economy. Consequently, the oil price may not be able to anticipate stock returns on its own accurately. As a result, we consider other macroeconomic factors including inflation, interest rate, and currency exchange. In current Nigeria, where inflation is at an all-time high, and the devaluation of the naira against the dollar is overwhelming, our study revisited the discussion on the connection between oil prices and stock returns. Therefore, it is crucial to investigate how oil prices and stock yield relate to the nation's current macroeconomic indices. To achieve this purpose, the rest of the study is structured thus: Section 2 reviews the literature related to the study. The research methodology is presented in section 3. The result of the study is presented in section 4, while the paper's conclusion is in section 5.

2. Literature Review

A careful analysis of the works of Hamilton's foundational study (1983), draws attention to the nexus between prices of oil and yield from stock. Recent studies on the connection between yield from stock and the prices of oil have a sectoral or industry focus. The effects of variations in returns from oil and volatility of returns from oil on excess stock returns were also investigated in related studies. For many years, experts' focus has been on the nature of the connection between the variations in oil price and yield from the stock market. Some academics have concluded that the price of oil significantly impacts the price of stock in a positive way, while others have concluded that oil prices have a significant negative impact on stock yield (Stavros et al., (2018). The findings of Emmanuel et al. (2022) and Russell & Paresh (2018) show that for African exporting countries, petroleum cannot provide a haven instrument for stock markets. Profound economic insight could be envisaged from their work as they prompted regulators towards firm strategies towards lessening adverse volatilities. These scholars also raised a concern, for instance, if oil prices and the stock market movement are in contrasting directions or not. Their findings made clear that aggregate stock market indices are a dominant determinant of causal impacts between oil and stock markets. Their work identifies key challenges and suggests an agenda for undertaking further investigations on the nexus between the price of oil, stock returns, and the financial sector for future research.

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Extant literature has extensively discussed stock markets and oil prices before the current global economic downturn, examining either their bivariate correlations or their associations with other economic variables such as exchange rates, interest rates, and inflation (Ousama & Khaled, 2022; Kashif et al., 2022 & Fenghua., Minzhi, Jihong & Wei, 2022).

Several studies have looked into multiple relationships between stock and other variables considering the most recent financial crisis (Monika & Chhavi, 2022; Chengying et al., 2022; Wolfgang et al., 2021). Khaled (2020) adopted a Structural VAR and time-varying parameter regression models to study the performances of stock prices, oil prices, and currency rates in countries that export oil. The study contributes to knowledge by reporting that returns from stock investments react more intensely than to supply shocks. According to the Granger causality test, the stock market can have a beneficial impact on the exchange rate market. This is supported by Asil (2020), who raised concerns about the risks and global rewards relating to the oil price. He found that the risk associated with oil price is not a significant pricing component when using factor-based asset pricing models. Their study investigated 23 developed financial markets.

Many researchers have argued that significant differences exist. Looking at the scope of the relationship found between petroleum exporting and petroleum importing countries, for instance, results on oil and stock prices were unclear. While some works present a positive association with oil-exporting countries, others report a negative relationship with oil-producing countries. In addition, a group of researchers focused their research on examining the nexus between crude and standard prices according to the degree of development of the countries involved, such as developed and developing/emerging economies (Jareño, González, López, & Ramos, 2021).

Paresh, Kumar, and Narayan (2019) investigated whether market returns may be predicted by outdated news about oil prices. Based on the research outcome, positive and negative news can both forecast returns from stock using time series data on news about oil prices. The results also show the discount rate and liquidity routes for oil to forecast returns. Oluwasegun et al. (2021) focused on increasing the certainty of stock returns using the oil price and the world financial cycle. They noted the necessity to identify variables capable of precisely projecting stock returns in defiance of periodic market volatility that causes diminution for investors. They found contradictory evidence in their research.

Jareno and Ramos (2021) investigated probable non-linear and asymmetric linkages between leading cryptocurrency returns in Spain and shocks in the price of crude oil. They adopted the NARDL estimation method using Spanish data for their review. The conclusion demonstrates a strong relationship between crude and cryptocurrencies in times of fiscal disruption like the global coronavirus pandemic. In a different study, Ziadat and McMillan (2022) found that while higher volatility lowers return, a favorable rise in the price of oil enhances stock returns.

The primary goal of Doko, Virginie, and Sean (2019) was to study the link between crude price shocks, stock yield, and market performance. They discover that impressive market performance for both crude exporting and importing economies triggers a remarkable increase in crude price, which accounts for a larger stock market return. Alamgir and Amin (2021) utilized a Non-linear Autoregressive Distributed Lag (NARDL) model from 1997–2018 and found a positive correlation between the global price of oil and the stock market index. They found that the stock market index has an unbalanced response to the disparities in oil prices, both positive and negative.

Satish (2019) investigates the connection between crude prices and securities market performance. The causal relation between crude prices, rate of exchange, and stock prices in the Indian circumstance captured his attention. The result reveals consistent variability of oil, rate of exchange, and stock prices from GARCH. NARDL test of the study confirms a lopsided effect of crude prices on exchange rates and stock prices.

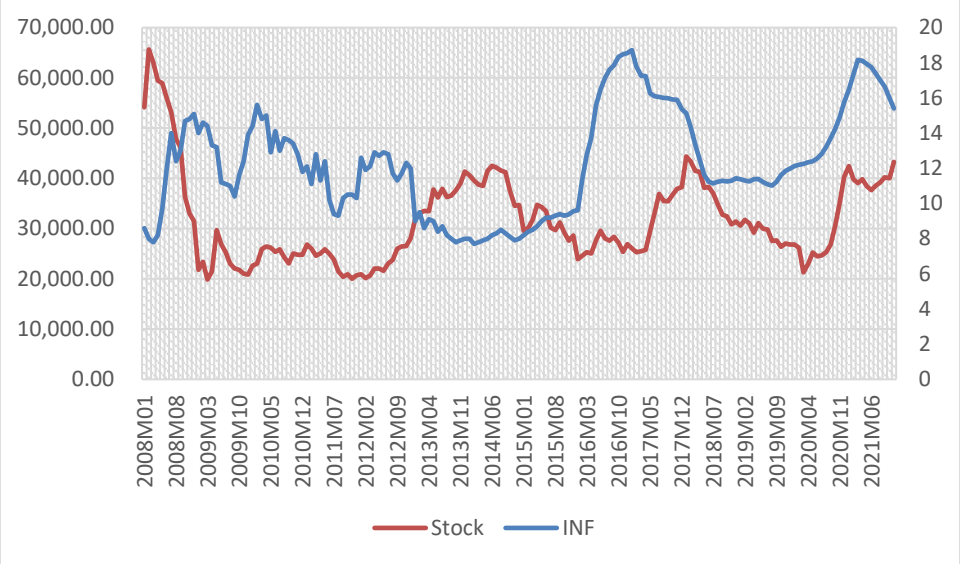
Hashmi, Chang, and Bhutto (2021) used data from a few oil-exporting nations (Russia, Mexico, Venezuela, and Norway) and oil-importing nations to implement the quantile ARDL model in Europe and Asia (India, China, Japan, and Norway). The quantile ARDL estimates show that, across all sampled nations, the short- and long-term effects of oil prices on stock prices are asymmetric.

An analysis of four South Asian nations was conducted by Alamgir & Amin (2021) using a Non-linear Autoregressive Distributed Lag (NARDL) model over the years 1997-2018. According to this study, higher

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crude prices on the worldwide market are thought to boost stock values, which found the linkage between the global price of oil and the securities market to be positive.
Despite the extant literature on the lasting relationship between oil and market prices, a gap still exists in knowledge, time frame as well and geography. While contributing to the existing body of knowledge, the high level of inflation and overwhelming exchange rate depreciation were all considered in investigating the controlling variables of that nature.

Figure 1: Stock return and Inflation



Source: Central Bank of Nigeria data, 2021

The theory of inflation expectation argues that the actual inflation rate and inflation expectation heighten the expected flow of future returns on stocks and economic agents, and this development leads to the upward revision of stock prices. Therefore, a surge in inflation forecasts and actual inflation rates should also increase the anticipated flow of future nominal dividend payments for stock. This will shoot up the prices of stock. Figure 2 is consistent with this economic theory from 2013 to 2021, except for the distortions in 2008 and 2014 due to stagflation, because of the negative effect of the global economic crises and the declining oil price, respectively.

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Figure 2: Stock return and oil price



Source: Central Bank of Nigeria data, 2021

This graph suggests a convergence between oil prices and stock prices. From periods 1 to 10, oil and stock prices maintained perfect convergence till period 19. Period 19 recorded divergence as an uptick in oil prices coincided with the decline in stock prices. The pattern evened out in period 64 as oil and stock prices converged. The variables sustained this trajectory for the rest of the period. The positive relationship between oil and stock price could be that both variables are reacting to a standard factor, which, in this case, could alleviate general aggregate demand that impairs both corporate profits and oil demand.

3. Research Methodology, Data and Econometric Model

In this work, we propose a simulation that uses the interconnectivity thriving among the dependent (Stock returns), independent (Brent price), and controllable variables (Exchange Rate, Inflation rate, Interest rate) in Nigeria. Data for this study was gathered from the statistics data source of the Central Bank of Nigeria. The data was compiled monthly from 2012 to 2021. This scope was guided by the availability of related and relevant data at the point of the study. The Central Bank Database is a well-known archive of national statistics. It is one of the most essential, dependable, and confirmed sources of secondary data for various types of research and other analyses. They have a regular time frequency, the data sets are essentially time series, and they are secondary quantitative data obtained from existing sources. Some log modification was applied to smoothen the data characteristics to bring in linearity and progress to elasticity measurement.

The variables of interest are the crude oil prices (monthly closing spot prices of the Brent USD/barrel), monthly stock prices, real rate of exchange, interest rate, and inflation rate. Oil is one of the most variable prices, according to empirical evidence, and has a considerable impact on the macroeconomic behavior of many industrialized and emerging nations. As a result, the reliance of Nigeria's economy on oil profits as a key source of revenue raises concerns about the effect of crude price volatility on stock values in the country. The study considers the major indices that researchers widely use. Brent is more extensively utilized since the prices generated using the Brent complex serve as the key price benchmarks on which 70% of international oil commerce is priced directly or indirectly. This study focuses on establishing a connection between crude price and stock price in Nigeria. The functional relationship used in capturing the general model among the variables under investigation is specified thus:

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$$Lnstock_{t=\partial_0+}\partial_1 L_n\, oil_t \;+\; \partial_2\, Intrst_t \;+\partial_3\, Exch_t \;+\partial_4\, INF_t \;+\mu_t$$

Equation 1

$$\Delta Lnstock_t = \partial_0 + \partial_1\, Lnstock_{t-1} + \partial_2\, Lnoil_{t-1} + \partial_3\, Intrst_{t-1} + \partial_4\, Exch_{t-1}\, \partial_5\, INF_{t-1} + \sum_{j=1}^{i} \tau 1j\ \Delta lnstock_{t-j} + \sum_{j=0}^{m} \tau 2j\ \Delta lnoil_{t-1} + \sum_{j=0}^{n} \tau 3j\ \Delta interst_{y-1} + \sum_{j=0}^{0} \tau 4j\ \Delta Exch_{t-1} + \sum_{j=0}^{0} \tau 5j\ \Delta INF_{t-1} + \mu_t$$

Equation 2

We adopted Schwarz information criteria (SIC) to ascertain the optimal lag for the variables in Equation (2). We used the F-statistics value of the bounds test to evaluate the presence of a long-run correlation among the variables. The study is unable to proceed to the estimation of the error correction mode since there was no long-run relationship.

The study employed the CUSUM, CUSUM-of-Squares (CUSUMSQ), for parameter consistency. The study also utilised diagnostic tests, which include the heteroscedasticity (ARCH) test, the Breusch-Godfrey (BG) test to determine serial correlation, and the Jarque–Bera test for normality.

4. Results

We present the descriptive findings in Table 1:

Table 1: Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Jarque-Bera	Observations
STOCK	2415.054	2177.482	4454.206	1300.578	761.5864	0.77	11.65	117
OIL_B	71.64	64.2119	124.928	23.33727	26.37006	0.46	9.74	117
INT	0.65	0.145	2.423	0.049	0.778781	1.15	25.83	117
INF	11.97	11.56	17.63	7.97	2.885184	0.41	6.51	117
REER	79.78	77.01	107.35	62.15	10.4746	0.79	12.38	117

Source: Authors Fieldwork.

The mean and the median, which are measures of the aggregative tendencies of stock market performance, and the studied macroeconomic variables across the period are shown. The spread and dispersion of these indicators are also shown by their respective standard deviation minimum and maximum measures. The Jarque-Bera statistics predispose us to a combined test for normality of the series with a skewness of 0 and kurtosis of 3. The Jarque-Bera statistics and related probability values (all 5%) indicate that the series are characteristically distributed, similar to economic and financial time series (Brooks, 2014). It is clear that the variables are correlated in both positive and negative ways. The price of oil has a substantial positive link with the price of stocks. It also has a negative linear relationship with the real interest rate and the rate of inflation. This shows that as interest rate and inflation rate rise, there is a tendency for stock activity to drop. The study's outcome is that the average stock price is considerably greater than the average oil price, implying that crude price volatility impacts the stock market. The median of 64.21 percent, maximum of 124.92 percent, and minimum of 23.33 percent suggest that the oil price was quite variable. Despite the fact that oil prices are thought to be an important predictor of the volatility of the stock market, there is no solid indication of a link

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between prices of crude and returns in the stock market. The volatility of both inflation and exchange rates may be seen plainly. Oil prices have a significant impact on stock indices and exchange rates.

Unit Root

Table 2 below presents our unit root result. This indicates that all variables are integrated of order one and zero, which fulfills the requirements of our model. The ARDL was chosen as the estimating method for this study. The advantages it has over numerous alternative cointegration strategies influence the decision. For starters, its efficacy in determining cointegration is unaffected by small or finite samples, and it may thus reject a false null hypothesis. It also accepts a variety of lag structures and combines variables with varying stationarity properties. This means that a linear combination of I(0) and I(1) variables is possible. Adapting the footsteps of Pesaran and Shin (2001), we proceed further with our analysis.

Table 2: Stationary Properties of the series

Variables	UNIT ROOT TEST TABLE (PP)		UNIT ROOT TEST TABLE (ADF)	
	Test Stat	Inference	Test Stat	Inference
STOCK	-10.06 (pv<0.05)	I(1)	-10.02 (pv<0.05)	I(1)
OIL_B	-8.18 (pv<0.05)	I(1)	-8.22 (pv<0.05)	I(1)
INT	-6.59 (pv<0.05)	I(1)	-6.71 (pv<0.05)	I(1)
INF	-2.00 (pv<0.05)	I(0)	-4.90 (pv<0.05)	I(0)
REER	-10.21 (pv<0.05)	I(1)	-10.17 (pv<0.05)	I(1)

Source: Authors Fieldwork

ARDL Results

Short-Run Estimation Results

This study examines the connection between crude prices and stock prices by employing the ARDL model. Stock prices are the dependent variable, while oil price is the independent variable. We start by providing short-run findings from the linear ARDL model to assess if short-run factors affect stock prices. The oil price impacts stock prices in the Nigerian market; both the first and second lag coefficients are considerable. It was discovered that a 1% change in crude price induces a 1% change in the price of stock in the short run. On the other hand, both interest rates and inflation impact stock prices positively. The impact of inflation is given as ΔINF; however, only the second lag of this variable is positive and equally statistically significant. The indication is that if consumer prices rise, stock prices will rise in the short term. The value of profits is eroding due to inflation. Similarly, increasing interest rates will trigger stock prices. This is shown by the positive coefficient of Interest rate in the first lag.

Table 3

	Dependent Variable: D(LOGSTOCK)
Variable (short run)	

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Constant	0.11**(0.04)
@TREND	0.0001*(9.46)
D(LOGOILB)	0.123**(0.028)
D(INT)	0.043**(0.010
D(INF(-1))	0.026628**(0.013)
REER**	0.00019(0.00)

Notes: *, **, *** means statistical significance level at 10%, 5% and 1% respectively.
The value in parentheses indicates the standard errors.

Source: Authors' Fieldwork

Long-Run Regression Results

Linear models are used to achieve long-run regression results. The null hypothesis (no cointegration relation) cannot be rejected by the F-test, which implies that no long-run relationship exists between stock prices and their causal factors. In other words, the variables only have a short-term effect on the prices of stock, but not in the long run. The result is shown below in Table 4.

Table 4

Model	F-statistics	Bound (lower -upper significance level			Conclusion
ARDL,2,2,0,2,2	2.15(K=4)	10% 3.03,4.06%	5% 4.57% 3.47,	1% 4.4,5.72%	Not accepted

Author's computation

Furthermore, we perform tests to establish the suitability of the regression model. Following that, we'll look at some tests to see if the regression model is adequate. Diagnostic tests of the model were also performed. This includes serial correlation, heteroskedasticity, functional form, and normal distribution tests.

Table 5
Results of the ARDL cointegration test

	ARDL Structure	**F-stat**	**Normality**	**BG LM** Statistics	**BPG** Heteroskedasticity	**Arch** Test
f(lnoil,int,inf,Reer)	2,2,0,2,2	6.899***	0.14	0.554	0.1889	0.5556

The result presented above is a cointegration test in line with the tested variables: log of oil (ln oil), Interest rate, (Int) Inflation (Inf) and real exchange rate (Reer).
Source: Authors' Fieldwork.

Diagnostic Test
R-squared = 0.91
Adjusted R-squared = 0.901
Prob (F-statistic) = 0

Given that the variables are Orders 1 and 0 combinations, there is sufficient rationale for using ARDL based on the ADF stat, and the findings reported in the Table below. The table shows the model's ARDL baseline

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estimations, which are conservative. The estimates reveal a wide range of associations between the dependent variables and the sets of independent variables. The R2, modified R2, and F-statistics are all joint statistics that confirm the baseline model's quality.

5. Discussion & Conclusions

This paper adds to the body of knowledge of how oil prices affect forecasting on stock returns. The study is unique in that it considers monthly time series. Fundamentally, when the price of crude oil rises, it affects the overall production costs. Profit margins decline as well, while firms' stock prices will go down. A drop in oil prices will have a positive effect. A spike in oil prices will once again raise input costs for most industries and push consumers to spend more money on energy, thereby reducing corporate profitability for other businesses. A drop in the price of oil is usually welcoming news for net importers.

The relationship between stock and oil returns swings between positive and negative values, making the relationship between the two extremely unpredictable. Presenting it differently, stock and oil prices sometimes move in the same direction. One strong explanation concerning the co-movement of stock and oil prices is that they are both reacting to the same factor, which is a slack in the general aggregate demand.

This study has established a positive connection between oil prices and stock returns. The findings indicate the same pattern of movement. Essentially, such a positive association between equities and oil prices may arise because both are responding to underlying swings in global demand. The idea is that commodity prices and long-term interest rates will be influenced by investors' views of global demand rather than fluctuations in oil supply. It demonstrates that both are primarily responding to a shared demand driver.

Another possible explanation for our findings is that recently, movements in the market is characterized by increased turbulence. Shocks to volatility may be an explanation for the observed propensity of prices of stocks and oil to move in a similar fashion if investors flee commodities and stocks in moments of high unpredictability and caution. Finally, Nigeria is not a place where stocks are driven by fundamentals.

Businesses and consumers will cut back on spending when interest rates rise. Earnings will suffer as a result, as will stock values. Consumers and corporations, on the other hand, will increase spending when interest rates decrease dramatically, causing stock prices to climb. Stock prices and interest rates have historically had an inverse relationship, according to historical data. To put it another way, as interest rates rise, stock prices tend to fall. In Nigeria, we established fresh evidence in response to fundamental shifts in global demand.

The main assumption here is that when there is an increase in the domestic stock market, investors assume that there is an improvement in the economy equally, resulting in increasing demand for domestic currency by foreign investors. However, when there is underperformance in the stock market, investors' confidence drops, and international investors will withdraw their money to their home countries. For the fact that forex and equities are two of the most heavily traded financial instruments, it becomes relevant to compare the two proxies. Their effects may aid in forecasting future price changes.

6. Policy Implications

Oil's impact on stock prices has several consequences for both domestic and international investors. As a result, we decided to investigate it. The constant is significant at the 1% level, implying that historical market returns have a considerable impact on returns from the current market for all the series. Findings from this study could have major consequences for investors, investment managers, and price regulators, as well as a better understanding of the impact of crude oil price pressures on the stock market.

It is also critical to raise awareness of crude oil's importance as a financial tool for managing risk and allocation of assets in various markets. Furthermore, in terms of risk management, our findings would be beneficial to investors and financial market participants. The risk exposure of an investor's portfolio can be adjusted. As a result of the interplay between crude prices and the stock market, regulators can use additional

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factors connected to oil markets, such as uncertainty in the price of crude, volatility, and oil-stock correlations, to enhance monitoring systems in the market as well as investment activity. As a result, the linkage between oil and stock could be a critical component, which can be combined with other factors to influence the interaction between stock markets in an oil-importing economy like Nigeria. The massive shortage of oil refineries in the country remains the major driver of excess oil importation of oil in Nigeria. Though crude oil is produced internally, to the very best, Nigeria is seen as an oil-importing economy.

Before making investment decisions, investors and managers must pay attention to the current findings of this paper. In other words, addressing these global elements in addition to home macroeconomic considerations like interest rates and inflation rates would be essential for assuring the highest possible returns on investments. Decision-makers should implement strong policies to lessen the vulnerability of the domestic financial markets to external shocks from the international financial environment and the crude oil market. These measures include strict regulatory control over capital flows, reduced reliance on crude oil, and changes to currency rates.

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Manuscript received: 02.05.2023

Manuscript received in revised form: 16.10.2023

Manuscript accepted: 23.10.2023