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Disaggregated crude oil prices and stock market behaviour in Nigeria: Evidence from sectorial analysis

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Abstract

Purpose — This study differs from previous studies by examining the impact of oil price components, namely oil demand, global oil supply, and oil market-specific demand, on the stock returns of five sectors (Banking, Consumer goods, Industrial, Insurance, and Oil and Gas) listed on the Nigerian Stock Exchange.

Design/Method/Approach — The study employs the Autoregressive Distributed Lag (ARDL) model on monthly data between January 2000 and December 2019.

Findings — The paper finds evidence of a long-run relationship between sectoral market returns and oil price changes in Nigeria. Further evidence from the study reveals that oil-specific demand and global oil demand have positive and significant effects on the aggregate stock returns and the returns of the sampled sectors. On the other hand, the impact of the global oil supply is inconsequential on the aggregate stock returns and sectoral returns except for the Oil and Gas sector, where the effect of global oil production is positive and significant.

Implication — The study concludes that stock market returns in Nigeria are sensitive and vulnerable to changes in demand-side components of oil price. The study also highlights important policy implications to enhance the performance of the Nigerian stock market.

Originality/Value — The paper examines the impact of disaggregated oil prices on sectoral returns of the five listed sectors on the Nigerian Stock Exchange, which has not been explored in the literature.

Keywords — All Share Index, sectoral returns, oil supply, oil demand, oil specific demand, and ARDL.

Introduction

The importance of crude oil to the global economy cannot be overemphasized. Crude oil is one of the most internationally traded commodities, and its significance is felt by all countries irrespective of their trading position on the global oil market. Hence, fluctuation in the crude oil price would produce a spiral effect on the global economy. The effect of changes in the oil price is particularly felt in an oil-dependent and oil-exporting country like Nigeria, where the bulk of revenue is derived from oil. Oil has dominated the Nigerian economy at all levels since its discovery in 1956. Before this period, Nigeria was an agrarian society in which agriculture contributed to over 65% of the GDP. By the early 1970s, crude oil exploration came into the limelight, and oil became the country's primary revenue source. The dramatic change in the structure of the Nigerian economy as an oil-based economy led to a rapid increase in the inflow of revenue from oil export following the oil

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boom of the 1970s and a subsequent reduction in the contribution of agriculture to GDP to about 33% between 1981 and 1982 (Abeng, 2016).

Presently, Nigeria is the largest oil producer in Africa (Olayeni et al., 2020) and ranks as the 6th largest oil producer globally, with average daily production of 2.0 million barrels per day in 2019. These facts underscore the importance of crude oil to the Nigerian economy and the world due to its use in the energy supply and have become a major indicator of economic activity. Meanwhile, scholarly works such as Odusami (2009), Ojeyinka and Yinusa (2021, 2023) argue that volatilities in oil prices have significant implications for different economic activities. Recently, the reduction in the international oil price in 2020 due to demand-supply imbalances caused by the Covid-19 pandemic led to the sale of crude oil at discounts which was not experienced even during the global financial meltdown of 2009. The immediate and direct impact of the oil crisis in Nigeria was the downward review of the 2020 annual budget. Specifically, the crude oil price benchmark plummeted to $28 per barrel from $57, while the expected revenue was reduced from N8.42 trillion to N5.84 trillion, suggesting a 31% reduction in oil revenue in 2020. In the same vein, the country's exchange rate depreciated from N305 to N360 due to the devaluation of the official exchange rate by the Central Bank of Nigeria (CBN), while Nigeria's economic growth nosedived from 2.5% in December 2019 to -6.1% in the second quarter of 2020 (Ojeyinka & Yinusa, 2021). Consequently, a fall in oil price has multiple effects on the fiscal position of the country and major economic indicators such as exchange rate, inflation, and economic growth, most significantly, on the stock market (Wang, Umar, Afshan, & Haouas, 2022).

The significance of the stock markets to economic development has attracted the attention of scholars to empirically investigate its nexus with the global oil price. Researchers such as (Ashamu, Adeniyi, & Kumeka, 2017) assert that the operations and activities of the stock market feed directly into the developmental aspiration of a country. Thus, the stock market is essential in developing the world economy, as no economy can outgrow its stock market (Adaramola, 2012; Ajala et al., 2021). Besides, some economists regarded the stock market as the barometer of the national economy due to its linkage to other macroeconomic variables such as interest rate and inflation (Hu et al., 2018). Recently, the connection between oil price changes and stock market performance has dominated academic and policy discussions. On the empirical front, the effect of oil price shocks has been widely investigated for both oil-importing and oil-exporting countries. There are avalanches of studies on the oil price shocks-macroeconomic performance nexus with a specific focus on the stock market (Ajala et al., 2021; Kelikume & Muritala, 2019; Kisswani & Elian, 2017; Olayungbo, 2021; Salisu et al., 2017; Wang et al., 2022). However, these studies have concentrated on the impact of oil price shocks on stock market performance at the aggregate level without considering its impact at the sector-based level (see Asafo-Adjei et al., 2021; Karim & Masih, 2021; Obi et al., 2018). Similarly, a handful number of studies that focus on the impact of oil price shocks on the sectorial performance in Nigeria ignore other components of oil price shocks such as the oil supply shock and unanticipated oil demand shock (Abeng, 2016; Ashamu et al., 2017; Ebechidi & Nduka, 2017; Okere et al., 2021; Oyinlola & Oloko, 2018; Uzo-Peters et al., 2018). Like any other commodity, the interaction of demand and supply significantly affects the price, particularly for a volatile commodity such as crude oil. Thus, any shocks to the oil prices will exert a significant effect on the economic activities of an oil-producing country like Nigeria. This implies that for any policy on the energy sector to produce a meaningful effect on the economy, both the demand and supply factors driven by the crude oil price must be considered.

Empirically, the literature is awash with studies on the nexus between oil price changes and the performance of the stock market in both developed and developing countries (Ajala et al., 2021; Akinlo, 2014; Alaali, 2017; Alamgir & Amin, 2021; Kang, Ratti, & Yoon, 2015; Kilian & Park, 2009; Olayungbo, 2021; Onyeke et al., 2020; Salisu et al., 2017; Uzo-Peters et al., 2018). However, only a few of them decompose oil price changes into different components to examine the demand and supply factors influencing the movement in oil price and its impact on the stock market. The premier study by Kilian and Park (2009) disentangles the effect of oil price into crude oil demand and supply. It analyzes its effect on the US stock market with the Vector Autoressive (VAR) method and finds that oil supply shock has no significant effect on stock market returns. In

contrast, the impact of oil demand significantly influences the US stock market over the study period. Following this, Caporale et al. (2015), Degiannakis et al. (2014), and Kang et al. (2015) investigate the impact of structural oil price shocks on the European countries, United States and Chinese economy. In addition, these authors follow the method of Kilian and Park (2009) and discover that positive shocks' effect on aggregate demand and oil-market-specific demand significantly drive stock market returns in all the countries investigated. Similarly, these studies validate the conclusion of Kilian and Park (2009) that that supply shock caused by disruptions in global oil production does not affect stock returns.

In Nigeria, Effiong (2014) first examines the disaggregated oil price shocks and Nigeria's stock market nexus between 1995:1–2011:12. The study, however, examines the effects of oil price shocks on the stock market using aggregate stock returns. The use of aggregate stock returns masks the effects of oil price shocks on individual sectors. Recently, Onyeke et al. (2020) analyzed the impact of oil price shocks on sectorial stock returns but failed to consider other components of oil prices such as global oil supply and oil demand. Thus, the present study fills this obvious gap in the literature by decomposing the historical oil prices into oil supply, oil demand, and oil-specific demand. Furthermore, most of the literature reviewed on Nigeria focuses on the impact of oil price shocks on aggregate stock market return using all share index (ASI) and market capitalization as proxies. The use of aggregate returns does not give adequate information on stock market dynamics because it may not reflect the individual sector-specific stock performance which ultimately is the focus of investors when considering investing in the stock market. Besides, sectoral performance of stock returns provides crucial information to economic agents as regards the sectors to invest to reduce the degree of risk and uncertainty in their investment portfolio. Analysis of sector-specific performance is crucial because the market aggregation index may hide various sector behaviors' characteristics and salient features.

Hence, this study extends the frontier of knowledge on the oil price-stock market performance nexus in the following ways. Firstly, the study examines the impact of the oil price by disaggregating the historical oil prices into global oil supply shocks, aggregate oil demand shocks, and oil-specific demand or precautionary oil demand shock. Secondly, the study departs from existing studies that employ All Share Index (as a proxy for the aggregate stock performance) by investigating the impact of oil price components on the stock performance of five listed sectors on the Nigerian stock exchange market (Nigerian Stock Exchange, 2020). This study considers five sectoral returns, which include Banking, Consumer Goods, Insurance, Oil/Gas, and Industrial indices. This will unveil the most vulnerable sector(s) to oil price changes to formulate sector-based policies to immune these sectors from unexpected and unanticipated changes from crude oil price swing. Thirdly, the study differs in the choice of control variables to account for other macroeconomic variables that influence the performance of the stock market return in Nigeria. Thus, the study employs exchange rate, inflation rate, and interest rate as control variables based on the economic theory and transmission channels of oil-price changes. Scholarly works have found that macroeconomic variables such as inflation, interest rate, and exchange rate play major roles in the transmission of oil prices to the stock market. Hence, any attempt to ignore these macroeconomic variables in the nexus between oil price and stock market performance might underestimate or overestimate the real impact of oil price on the performance of the stock exchange market. This is the major lacuna the present study intends to address in the literature. To our knowledge, this is the first time such a detailed and comprehensive analysis of the oil price-stock market nexus is empirically investigated using Nigerian data.

Methods

This study is premised on the Arbitrage pricing theory (APT) propounded by Ross (2013) and Ross et al. (1977). The APT argues that the expected return on investment depends on some individual macroeconomic factors and risk premium connected with each macroeconomic factor**.** The APT has been identified as the most prominent theoretical model to investigate the impact of shocks and risks on stock market returns and volatility in the finance literature. The attraction of the APT among scholars lies in its efficiency in accommodating additional macroeconomic factors which

affect the investors' returns on investment. The APT model states that the expected return on investment A is given by:

$$R_A = R_F + \beta_{F1}(R_{F1} - R_F) + \beta_{F2}(R_{F2} - R_F) + \cdots + \beta_{FN}(R_{FN}R_F) \quad (1)$$

Where: R_A = return on asset, β = beta factor, a measure of the relationship between asset and the market portfolio, F_1, $F_{2...}$ F_N are individual macroeconomic factors and N is the number of identified factors.

Based on the theoretical framework discussed above, the study adopts the APT model employed by Salisu and Isah (2017) and defines the evolution of stock market returns in the following process.

$$R_i = \alpha_i + \beta_i v + \varepsilon_i \quad (2)$$

Where R_i = the return on asset (stock returns), α captures the unconditional expected return v is a vector of risk factors, β_i represents a vector capturing the impact of each risk factor on return on asset (stock), ε_i is the error term for the residual effect of the returns in question.

However, many risk factors influence the performance of a particular asset, and the study focuses on the effects of oil price and three macroeconomic variables: exchange rate, inflation, and interest rate as control variables. Incorporating these variables into equation (2), we have

$$RTN_t = \alpha + \beta_1 OLP_t + \beta_2 EXR_t + \beta_3 INF_t + \beta_4 INR_t + \varepsilon_t \quad (3)$$

RTN_t = stock returns at time t, α = constant or intercept term, OLP_t is the oil price, EXR_t represents the exchange rate, INF_t is the inflation rate, INR_t is the interest rate, and ε_t captures the error term.

Again, the study follows the existing studies such as Degiannakis et al. (2014), Effiong (2014), Hamilton (2009), Kilian & Park (2009), and Onyeke et al. (2020) and decompose the oil price variable into oil demand, oil supply, and precautionary oil demand or oil-specific demand shocks. If the three components of oil price replace OP in equation (3), the estimable model to achieve the study objective becomes

$$RTN_t = \alpha + \beta_1 OSD_t + \beta_2 OSS_t + \beta_3 ODD_t + \beta_4 EXR_t + \beta_5 INF_t + \beta_6 INR_t + \varepsilon_t \quad 4)$$

Where OSD_t is oil-specific demand, OSS_t captures the global oil supply, and ODD_t represents the precautionary oil demand.

In terms of a priori expectation, we expect a positive relationship between oil price components and stock returns in an oil-exporting economy like Nigeria, while a negative relationship is expected between the macroeconomic variables (exchange rate, inflation, and interest rate) and stock market returns.

The study employs the Autoregressive Distributed Lag (ARDL) technique to address the study's objective based on the following advantages. Firstly, the ARDL approach helps to estimate both the long-run and short-run results at the same time. Secondly, the econometric methodology helps to handle variables of mixed order of integration. Since most financial and economic variables are known to be of different orders, it is imperative to adopt a technique that handles such attributes to have reliable and unbiased results. Thirdly, the ARDL model permits the incorporation of lag values of both the explained and explanatory variables, which are crucial, especially when studying the nexus between volatile series such as stock market return and oil price.

Following Pesaran et al. (2001), the ARDL version of equation (4) is as follows:

$$\begin{aligned}\Delta RTN_t = {} & \delta_0 + \sum_{i=1}^{p} \varphi_{1i} \Delta RTN_{t-1} + \sum_{i=0}^{p} \varphi_{2i} \Delta OSD_{t-1} + \sum_{i=0}^{p} \varphi_{3i} \Delta OSS_{t-1} + \\ & \sum_{i=0}^{p} \varphi_{4i} \Delta ODD_{t-1} + \sum_{i=0}^{p} \varphi_{5i} \Delta EXR_{t-1} + \sum_{i=0}^{p} \varphi_{6i} \Delta INF_{t-1} + \sum_{i=0}^{p} \varphi_{7i} \Delta INT_{t-1} + \\ & \gamma_1 RTN_{t-1} + \gamma_2 OSD_{t-1} + \gamma_3 OSS_{t-1} + \gamma_4 ODD_{t-1} + \gamma_5 EXR_{t-1} + \gamma_6 INF_{t-1} + \\ & \gamma_7 INT_{t-1} + \varepsilon_t \end{aligned} \quad (5)$$

Equation (5) show the unrestricted version of the ARDL specification of equation (4), where $\Delta\ is$ the difference operator, δ_0 is the intercept and ε_t captures the error term. The $\gamma_{i,}$ are the long-run coefficients associated with equations (5).

The optimal lag length is selected using the Akaike Information Criteria (AIC) in testing for the null hypothesis of no cointegration as proposed by Pesaran et al. (2001). The AIC is selected because the criterion is more consistent and robust in model selection than other information criteria (Pho et al., 2019). Besides, a lower value of AIC suggests the best-fitting model among other nested models (Akaike, 1998). The null hypothesis of no long-run relationship between stock market return and oil price changes in equation (5) $H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7$ is tested against the alternative hypothesis of the long-run relationship as $H_1: \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq \gamma_7$. The null hypothesis of no cointegration is rejected if the value of the computed F statistic is greater than the upper bound value of the Pesaran et al. (2001)'s critical values.
If the cointegration is established, the long run model presented in equation (5) is estimated:

$$RTN_{t=}\pi_0 + \sum_{i=1}^{m}\pi_{1i}RTN_{t-1} + \sum_{i=0}^{n}\pi_{2i}OSD_{t-1} + \sum_{i=0}^{o}\pi_{3i}\,OSS_{t-1} + \sum_{i=0}^{p}\pi_{4i}ODD_{t-1} + \sum_{i=0}^{q}\pi_{5i}EXR_{t-1} + \sum_{i=0}^{r}\pi_{6i}INF_{t-1} + \sum_{i=0}^{s}\pi_{7i}INT_{t-1} + \mu_t \quad (6)$$

Any of the aforementioned information criteria will select the optimum lag. Specifically, we select lag 6 as the optimum lag length. Once the long-run estimates have been estimated from equations (6), error correction models are required to estimate the short-run dynamic coefficients. The corresponding error correction models are presented below:

$$\Delta RTN_{t=}\delta_0 + \sum_{i=1}^{j}\delta_{1i}\Delta RTN_{t-1} + \sum_{i=0}^{k}\delta_{2i}\Delta OSD_{t-1} + \sum_{i=0}^{l}\delta_{3i}\,\Delta OSS_{t-1} + \sum_{i=0}^{m}\delta_{4i}\Delta ODD_{t-1} + \sum_{i=0}^{n}\delta_{5i}\Delta EXR_{t-1} + \sum_{i=0}^{o}\delta_{6i}\Delta INF_{t-1} + \sum_{i=0}^{p}\delta_{7i}\,\Delta INR_{t-1} + \gamma ECT_{t-1} \quad (7)$$

Where $\delta_{i,}$ are short-run dynamic coefficients. ECT_{t-1} is the error correction term that measures the speed of adjustment after a shock while γ is the parameter of one year lag of the error correction term.

Therefore, equations (6) and (7) are estimated to obtain the long-run and short-run estimates on the effect of oil price changes on stock market performance in Nigeria.

The study employs monthly data from January 2000 to December 2019. Data for sectoral returns vis Banking index, Consumer goods index, Insurance index, Oil/Gas index, Industrial goods index, and the All-Share Index (a proxy for the aggregate stock performance) come from the Nigerian Stock Exchange. Brent crude oil price (a proxy for precautionary or oil-specific demand shock) and global oil production (a proxy for global oil supply shock) are obtained from the US Energy Information Administration (EIA). Global real economic activities, also called Kilian Index (a proxy for aggregate demand oil price shocks) are sourced from Kilian's website. Lastly, data on the exchange rate, inflation rate, and real interest rate come from the Central Bank of Nigeria (CBN) and the World Development Indicator (WDI). The consumer price index measures the inflation rate, while the monetary policy rate measures the interest rate. The study measures the exchange rate using the nominal exchange rate. The nominal exchange rate defines the value of Naira to a US dollar. However, due to data availability on sectoral market return, we use different data scopes for the sectors considered in the study. Specifically, the study employs monthly data for the All-Share Index from 2000-2019; for banking, consumer goods, insurance, and oil & gas from 2009-2019; and for the industrial sector from 2012-2019. All the variables are expressed and used in their logarithm form except the Killian index (global real economic activities), which is used as a proxy for the global oil demand.

Results and Discussion

The study employs two conventional unit root tests, the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP), with intercept and trend options, to establish the series' stationarity properties. Table 1 presents the outcomes of the two tests. The outcomes suggest that variables in the study

are of a different order of integration, but none is integrated of order 2 or higher order. This, in turn, justifies the usage of the ARDL technique as the estimation method.

Table 1. Unit root Tests results (intercept and trend)

	ADF test			PP test		
Variables	Level	1st Diff	Order	Level	1st Diff	Order
LAST	-2.144	-13.062***	1(1)	-2.21	-13.047***	1(1)
LBNK	-2.886	-11.095***	1(1)	-2.985	-11.273***	1(1)
LCNS	-2.742	-11.458***	1(1)	-2.884	-11.450***	1(1)
LIND	-1.762	-10.879***	1(1)	-1.773	-10.758***	1(1)
LINSR	-3.989**	-	1(0)	-4.225***	-	1(0)
LO_G	-3.028	-10.558***	1(1)	-3.103	-10.670***	1(1)
LOSS	-1.203	-4.236***	1(1)	-2.809	-37.863***	1(1)
ODD	-3.372*	-	1(0)	-2.708	-10.897***	1(1)
LOSD	-2.021	-12.493***	1(1)	-1.900	-12.463***	1(1)
LEXR	-1.785	-3.976**	1(1)	-6.725***	-	1(0)
LINF	-2.68	-6.202***	1(1)	-3.312*	-	1(0)
LINR	-1.336	-14.920***	1(1)	-1.524	-15.002***	1(1)

Critical Value 1%= -3.998, 5%= -3.429, 10%= -3.138
Note: ***, **, * denote 1%, 5% and 10% level respectively
Source: Authors' Compilation (2022)

Based on the unit root test results, the study employs the Bound Test approach discussed in section 3 to examine whether there is a cointegrating relationship among the variables in the study. The Bound test results support a long-run relationship for all the models estimated as confirmed by the values of the F statistic, which are greater than the upper bound critical value at various conventional levels of significance. Thus, the study rejects the null hypothesis of no cointegration and confirms that the stock market return and other explanatory variables comove in the long run. Thus, the study estimates the long-run model in equation (6) for all the sectors and the aggregate stock market return. Table 2 presents the outcomes of the Bound test.

Table 2. Bound Test Cointegration Results

Dependent Variables	Model	F-statistic	Cointegration
All Share Index (ASI)	(ASI, OSD, ODD, OSS, EXR, INF, INR)	8.093***	Yes
Banking (BNK)	(BNK, OSD, ODD, OSS, EXR, INF, INR)	3.964**	Yes
Consumer Goods (CNS)	(CNS, OSD, ODD, OSS, EXR, INF, INR)	3.724**	Yes
Industrial (IND)	(IND, OSD, ODD, OSS, EXR, INF, INR)	4.588**	Yes
Insurance (INS)	(INS, OSD, ODD, OSS, EXR, INF, INR)	4.938***	Yes
Oil & Gas (O_G)	(O_G, OSD, ODD, OSS, EXR, INF, INR)	5.679***	Yes
Critical values		Upper bound	Lower bound
1%		3.15	4.43
5%		2.45	3.65
10%		2.12	3.23

Note: ***, ** and * indicate 1%, 5% and 10% level of significance respectively
Source: Authors' Compilation (2022)

Table 3 presents the outcomes of the long-run effect of oil price changes on stock market returns. However, before discussing the main results, we automatically select the optimal lag length by the e-views using the optimum lag of 6. The results of the lag length for each model are not presented for brevity's sake. The outcomes reveal that oil supply (LOSS) has a negative impact (although not significant) on the performance of the stock market in all the models estimated except for model 6 (oil and Gas sector), where the effects of oil supply are significant. The findings support the general findings from previous studies, including Killian and Park (2009) for the US stock market, Abhyankar et al. (2013) for the Japanese stock market, and Effiong (2014) for the Nigerian stock market. All these studies confirm that oil production does not affect the stock

market performance. Meanwhile, the impact of global oil supply has an enhancing effect on the oil & gas sector returns suggesting that an increase in oil production stimulates the sector's performance in the long run. This is not unexpected, as an increase in global oil production would lead to an increase in revenue inflow to an oil-exporting country such as Nigeria. The inflow from oil is expected to improve the performance of the oil and gas sector as more funds would be available for investment in the sector.

On the other hand, oil demand and oil-specific market demand have positive and significant impacts on stock market activity for all the specifications except for the insurance sector in model 5. The outcome implies that a percentage increase in the oil-specific demand (LOSD) increases the stock market's performance by 19%. In comparison, the aggregate stock market performance rises by approximately 1% given a unit increase in the oil demand (model 1). As expected, the results imply that an increase in oil prices and global economic activity leads to an increase in wealth transfer from oil-importing economies to oil-exporting countries, including Nigeria, which consequently stimulates the performance of the Nigerian stock market in the long run. The outcomes reiterated that an increase in global economic activity would stimulate demand for oil due to its importance in the production process. As demand for crude oil increases, more revenue and foreign exchange would flow to oil-exporting countries such as Nigeria. This result is in tandem with the findings of Effiong (2014), Okere et al. (2021), and Onyeke et al. (2020) for the Nigerian stock market, and Bastianin et al. (2016) for the G7 countries and Kisswani and Elian (2017) for Kuwait. The result also validates the findings of Karim and Masih (2021) for six oil-producing countries in Africa, including Nigeria and Asafo-Adjei et al. (2021), who affirm that expansion in the global economy stimulates the performance of the stock market. However, the study contrasts with the findings of Caporale et al. (2015) for the Chinese stock market. Again, China is one of the world's major oil-importing countries, and as such increase in the oil price is expected to have a decreasing effect on the stock market of an oil-importing country due to the wealth transfer in the global market.

Table 3. Estimated Long Run coefficient

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	ASI	BNK	CNS	IND	INSR	O_G
C	10.510	7.658	7.877	-3.031	9.329	-8.344
	(0.117)	(0.311)	(0.372)	(0.301)	(0.152)	(0.371)
LOSS	-0.624	0.305	0.203	-0.375	0.467	1.421*
	(0.394)	(0.585)	(0.597)	(0.224)	(0.789)	(0.073)
ODD	0.983***	0.073***	0.286***	0.474***	0.235***	0.745***
	(0.000)	(0.000)	(0.003)	(0.035)	(0.027)	(0.005)
LOSD	19.030***	0.216***	0.656**	0.798***	0.393	0.939***
	(0.000)	(0.018)	(0.059)	(0.000)	(0.538)	(0.036)
LEXR	0.977	0.218**	-0.173	-0.175**	-0.542	-0.039**
	(0.853)	(0.012)	(0.778)	(0.029)	(0.846)	(0.025)
LINF	0.572	-0.173	-0.545***	-0.676	-0.408	0.054***
	(0.416)	(0.327)	(0.001)	(0.503)	(0.735)	(0.065)
LINR	0.720***	0.252**	0.035	0.936***	0.299	1.075
	(0.002)	(0.021)	(0.217)	(0.017)	(0.672)	(0.371)

Note: (1) ***, ** and * denotes 1%, 5% and 10% level respectively.
(2) values in the bracket represent the probability values.
Source: Authors' Compilation (2022)

The effect of the exchange rate on the sectoral stock return is mixed, as evidenced in Table 3. For instance, its effect is significantly negative on the industrial and oil & gas sector, while a positive impact of the exchange rate is observed in the banking sector. The results imply that an increase in the exchange rate (devaluation) enhances the returns of the banking sector but depresses the performance of the industrial and oil and gas sector, while the exchange rate has no impact on the All-share index, insurance, and consumer goods sectors. The result confirms the earlier finding

of Abeng (2016) that the food, beverages and tobacco, and oil and gas sectors respond negatively to exchange rate fluctuation in Nigeria. This result espouses the debilitating effect of the depreciation of the domestic currency on the returns of the industrial and oil and gas sector sectors. One major implication of this is that the industrial sector relies more on importing capital goods. Hence, the devaluation or depreciation of Naira will increase the cost of these capital goods, which in the long run might discourage potential investors in the sector (Ojeyinka & Yinusa, 2021).

In the same way, the inflation rate negatively affects the consumer goods sector (model 3) but is positively related to the performance of the oil and gas sector (model 6). However, interest rate positively affects the All-Share index and banking and industrial sectors' returns (Models 1, 2 and 4). The plausible reason for this is connected with the fact that an increase in interest rate induces potential investors to invest in the domestic economy, which will subsequently enhance the performance of the stock market.

Table 4. Short-run and Error Correction Model Results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Variable	ASI	BNK	CNS	IND	INSR	O_G
D(LOSS)	-0.033	-0.041	-0.017	-0.118	-0.031	0.171***
	(0.368)	(0.584)	(0.789)	(0.181)	(0.580)	(0.027)
D(ODD)	0.457***	0.035	0.029***	0.321***	0.044	0.429***
	(0.007)	(0.742)	(0.005)	(0.025)	(0.287)	(0.001)
D(OSD)	0.846***	0.029	0.021***	0.054***	0.249***	0.247***
	(0.006)	(0.217)	(0.005)	(0.026)	(0.001)	(0.002)
D(LEXR)	-0.052*	-0.029***	-0.015*	-0.058***	-0.030***	-0.028***
	(0.074)	(0.022)	(0.074)	(0.053)	(0.037)	(0.044)
D(LINF)	-0.031**	-0.023**	-0.034***	-0.032	-0.041***	0.012
	(0.002)	(0.060)	(0.038)	(0.594)	(0.032)	(0.842)
D(LINR)	-0.319**	-0.034	-0.003	0.156***	-0.086	-0.029
	(0.002)	(0.360)	(0.563)	(0.000)	(0.419)	(0.337)
CointEq(-1)	-0.053***	-0.135***	-0.084***	-0.160***	-0.100***	-0.120***
	(0.000)	(0.015)	(0.022)	(0.000)	(0.001)	(0.003)

Note: (1) ***, ** and * represent 1%, 5% and 10% significance level respectively
(2) values in the bracket represent the probability values
Source: Authors' Compilation (2022)

Table 4 presents the outcomes from the short-run analysis. However, to ensure uniformity and comparison across the six models, we focus on the explanatory variables' contemporaneous (current) effect on the stock market performance. The output in Table 4 shows that the coefficient of the lag of the error correction term assumes the expected sign and is significant for all the models estimated. This further reiterates and confirms the evidence of the long-run relationship among the variables in the model. Following the outcomes from the long-run model (Table 3), the effect of oil supply is not significant except on the oil and gas sector where an increase in oil production significantly and positively promotes the performance of the sector. Again, the results of the short-run model mimic that of the long-run model for other components of the oil price shocks, where the oil demand exerts a positive effect on all sectors except banking and insurance returns. In the same vein, the effect of precautionary oil demand (oil-specific demand) is positive and significant on all sectors except for the banking sector's returns. Further, the exchange rate significantly and negatively affects all the sectors, including the aggregate stock performance, suggesting that the depreciation of the exchange rate discourages investors from investing in the domestic stock market. Similarly, the inflation rate exerts a significant negative effect on ASI, banking, and consumer goods. In the short run and long run, while inflation has a negative relationship with consumer goods, the interest rate is positively related to industrial returns.

It is important to note that the outcomes from the ARDL is sensitive to the optimal leg length selected. Hence, it becomes imperative to subject the lag length chosen to some diagnostic tests to ensure that the inference from the study is consistent and reliable for policy analysis and

prescription. The study conducts several post-estimation tests, as reported in Table 5, to validate the reliability of the selected lag and the estimated models. The results of the post-estimation tests suggest that all the models estimated pass all the tests. This further implies that the residual terms from all the estimated models are free from serial correlation and heteroscedasticity problems at 5% significance level. In the same way, the residual terms from all the models are normal, as confirmed by the probability value of the J-B test.

Table 5. Results of the Post Estimation Tests

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Tests	ASI	BNK	CNS	IND	INS	O_G
Serial Correlation LM	4.866	2.945	0.054	1.141	0.095	2.830
	(0.678)	(0.556)	(0.809)	(0.945)	(0.750)	(0.081)
ARCH	0.091	0.178	0.772	0.192	0.030	0.270
	(0.763)	(0.671)	(0.584)	(0.658)	(0.861)	(0.893)
Ramsey Reset	0.647	0.660	0.365	0.029	0.385	0.365
	(0.844)	(0.568)	(0.675)	(0.554)	(0.594)	(0.684)
J-B Test	186.640	89.031	40.018	22.902	52.564	54.964
	(0.087)	(0.059)	(0.074)	(0.064)	(0.066)	(0.068)

Note: Values in bracket represent the probability values
Source: Authors' Compilation (2022)

In addition, Appendix 1A to 1F reports the stability tests' results, using CUSUM and CUSUMSQ conducted on all the estimated models. It is evident from the tests that all the estimated models are stable and free from structural instability, as all the plots from the two stability tests fall within the 5% critical bound.

Conclusion

The prime objective of the study is to analyze the effects of the oil price on the sectoral returns of the Nigerian stock market. Unlike the previous study on the Nigerian stock market, the study decomposes the effects of the oil price into oil supply, oil demand, and precautionary oil (specific) demand. It examines their effects on aggregate stock returns (All Share Index) and sector-specific returns of five major sectors (banking, consumer goods, industrial, insurance, and oil & gas). The study finds convincing evidence that sectoral returns and oil price components cointegrate and comove in the long run. In more specific terms, the results from both the long run and short run overwhelmingly confirm that changes in global oil supply do not influence the aggregate stocks returns and the returns of all the sectors except the return of the Oil and Gas sector. However, the effect of oil demand and precautionary oil demand changes substantially enhance the performance of the aggregate stock returns and the sectoral returns of all the sectors except the insurance sector in the long run and the banking sector in the short run. In more general terms, empirical findings from the study reveal that sectoral returns in Nigeria respond more to changes in demand-driven factors than the supply-driven factor. Alternatively, this study identifies oil demand and oil-specific market demand as the key drivers of stock returns in Nigeria. One major implication of these findings is that changes in the components of oil price have heterogeneous effects on sectoral returns in Nigeria. Thus, it is important for policymakers and potential investors to carefully analyze the behavior of each sector of the Nigerian economy vis a vis their response to the three oil price components before any investment decision is made in any of these sectors. Besides, since Nigeria is an importer of petroleum products, an increase in oil prices might translate into a hike in the price of petroleum products, thereby putting an additional burden on the economy. Thus, for the Nigerian stock market to fully tap into the gain of increased oil prices, the government should design policies to reduce the economy's vulnerability to oil demand and oil-specific demand shocks. One major way to achieve this is by resuscitating the moribund refineries in the countries to refine crude oil into petroleum products, shying the country from an unanticipated increase in oil prices.

This study has achieved its aim by unveiling the response of sectoral returns to disaggregated oil price changes in Nigeria using monthly data. However, there is an instantaneous response of stock market participants to changes in macroeconomic fundamentals, especially the oil price. Daily data would have been more appropriate to examine the nexus between stock market behavior and oil price changes. Thus, one major limitation of this study is the nonavailability of high-frequency data, such as daily data on sectoral returns in Nigeria. As daily data become readily available, future studies might consider using daily data and re-examining the nexus between stock markets and oil price shocks in Nigeria.

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Not applicable in this section

Declaration of Competing Interest

The authors declare no potential conflict of interest in the publication of this article and that the manuscript is not concurrently being considered for publication elsewhere.

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Appendix: Figure 1A-1F

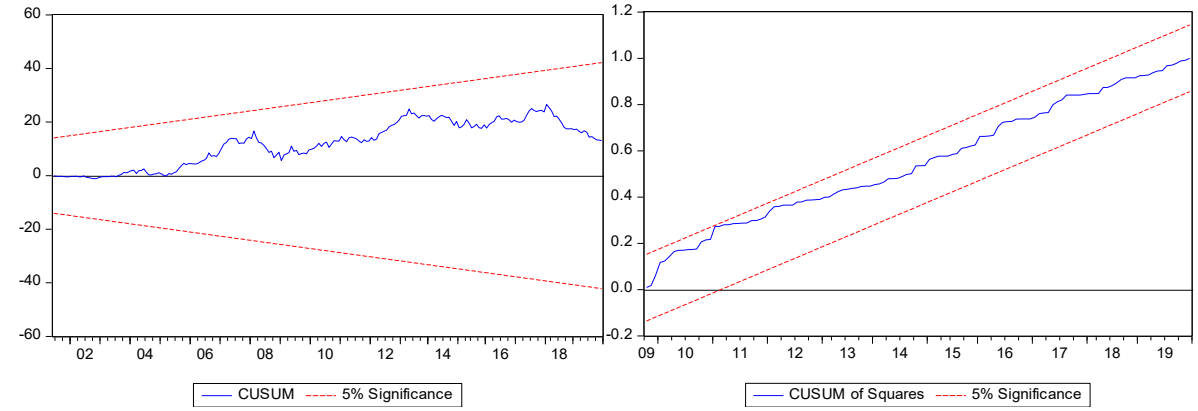

Figure 1A. CUSUM and CUM of Square Stability Test for the All-Share Index (Model 1)

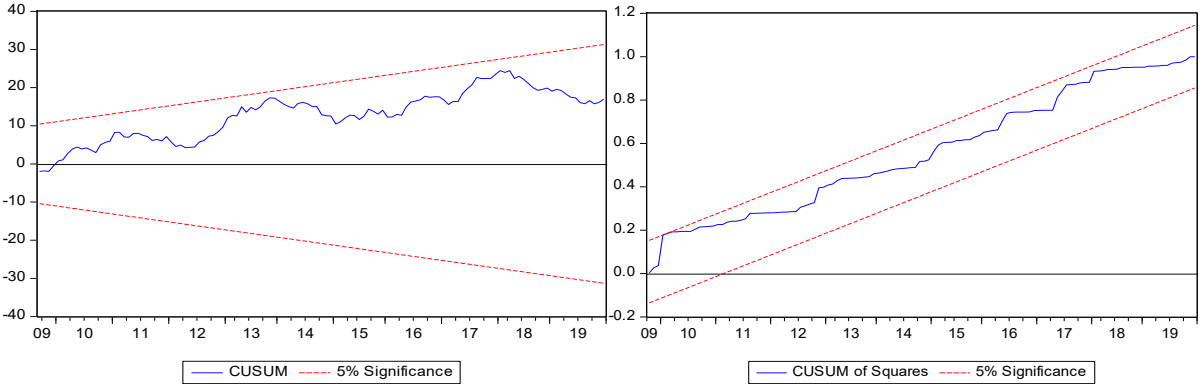

Figure 1B. CUSUM and CUM of Square Stability Test for the Bank sector (Model 2)

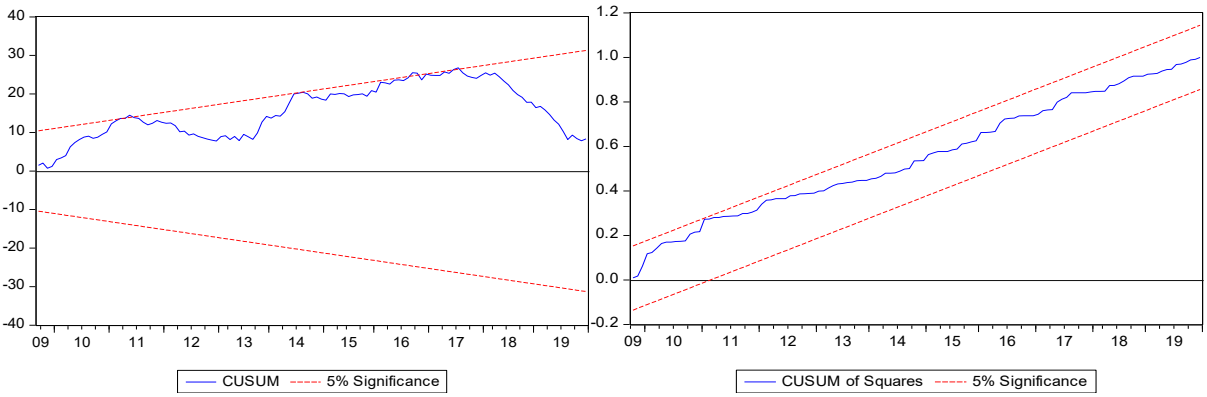

Figure 1C. CUSUM and CUM of Square Stability Test for the Consumer Goods sector (Model 3)

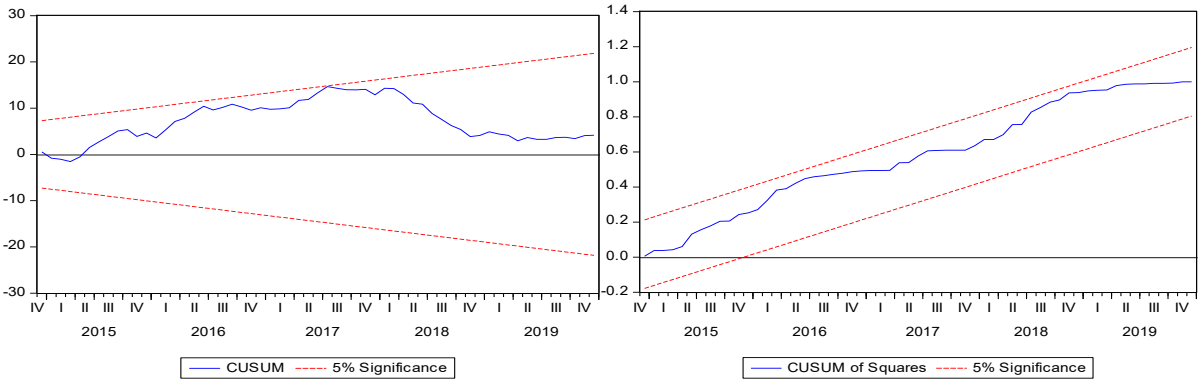

Figure 1D. CUSUM and CUM of Square Stability Test for the Industrial sector (Model 4)

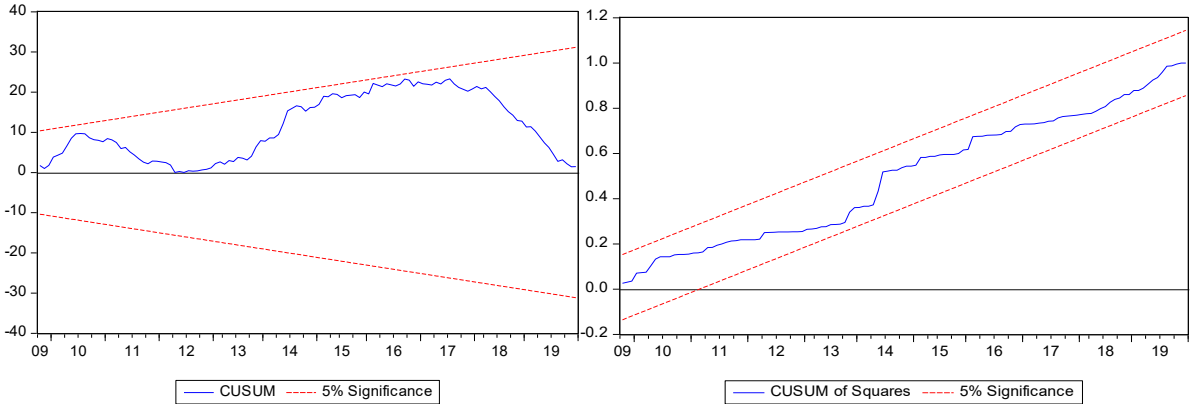

Figure 1E. CUSUM and CUM of Square Stability Test for the Insurance sector (Model 5)

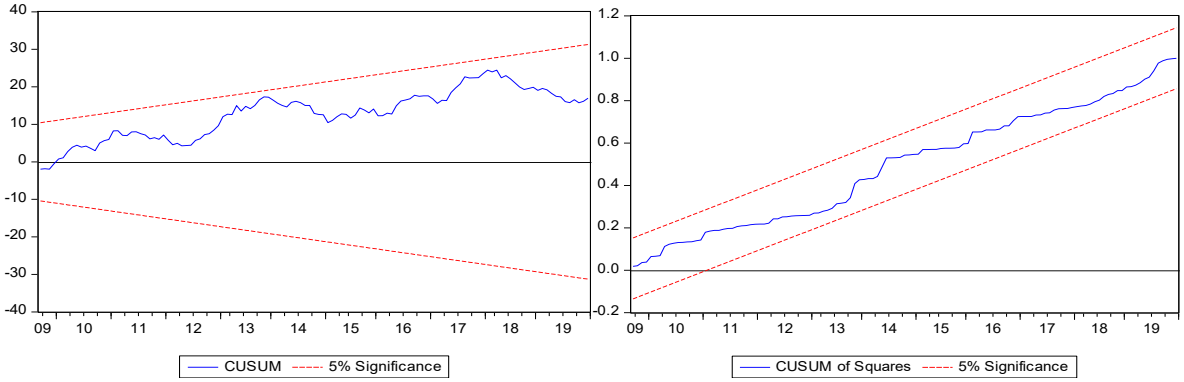

Figure 1F. CUSUM and CUM of Square Stability Test for the Oil & Gas sector (Model 6)