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## Article

# Is the influence of oil prices changes on oil and gas stock prices in Nigeria symmetric or asymmetric?

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## GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

# Is the influence of oil prices changes on oil and gas stock prices in Nigeria symmetric or asymmetric?

Dasauki Musa<sup>1\*</sup>, Oladapo Awolaja<sup>1</sup>, Kwarbai Jerry<sup>3,2</sup>, Iyabo Okedina<sup>1</sup>, Edy-Ewoh Uduakobong<sup>1</sup> and Ifayemi Olayinka<sup>3</sup>

**Abstract:** Overdependence on oil revenue has exposed the economy to shocks from oil price variations. In this paper, we investigated the relationship between oil price on the stock prices of oil and gas firms quoted in the Nigerian Stock Exchange market. In doing so, the ARDL and NARDL approach is applied to estimate quarterly data from 2009q1 to 2016q3. The result from the study showed that negative and positive oil price shocks have a positive long-run influence on stock prices (oil & gas). The evidence further showed that the long-run and short-run impact of an oil price increase on the oil and gas stock price index is similar to that of an oil price decrease. The oil and gas stock price responds positively to oil price shocks in the long run. Therefore, the portfolio managers, potential investors and policymakers in the oil-exporting countries should diversify investments to reduce exposure to risk and uncertainty that may arise to disruptions in the demand and supply for oil and gas or during periods of declining oil prices induced by negative global economic events.

**Subjects:** Economics; Finance; Corporate Finance

**Keywords:** oil & gas; stock price; NARDL; Energy; Portfolio; Diversification

**JEL classification:** C22; E37; G17; Q43

## 1. Introduction

Oil is one of the world's most widely traded commodities and both the importers and exporters of oil rely on it for energy (Charfeddine & Barkat, 2020; Kilian & Park, 2009). For most oil exporters, including Nigeria, oil production and exports are essential sources of revenue. Oil prices will have different effects on importers and exporters of oil. An oil price increase is "bad news" in an oil-importing country because scarce national resources are transferred to the oil-exporting countries. High oil prices are transmitted through production costs and the market price of the final output. Therefore, unstable oil prices are potential sources of financial uncertainty and risks that will lower investments, and cause delays in the consumption of capital, and consumer goods (Charfeddine & Barkat, 2020). On the other hand, a fall in oil prices is desirable and treated as "good news" in an oil-importing country. When oil price declines, little revenue is lost to the oil exporters when oil price declines and this will increase national savings, improve the trade balance, and lower the cost of production, leading to lower market prices. The reverse is true for oil-exporting countries.

There seems to be a downward trend in oil price accompanied by a corresponding decline of 50% in the oil and gas index in 2016 from its 2014 peak level. Thus, the oil and gas index appears

to respond to oil price shocks originating from socio-economic and macroeconomic events such as war, vandalism, terrorism, economic recession, and depression. Various empirical studies have indicated that the oil/gas industry responds positively to oil price changes (see, (Boyer & Filion, 2007; Faff & Brailsford, 1999). It therefore becomes imperative to investigate the effect of oil price on the oil/gas stock market index, having observed occasions of irregularity in their co-movement.

Previous studies have made many efforts to pinpoint how stock markets are affected by fluctuations in global oil prices (Charfeddine & Barkat, 2020; Emami & Adibpour, 2012; Hamilton, 1983; . However, their findings are different from one another with no coherent opinion. Fewer studies examine how fluctuations in the price of oil affect asset prices, such as the returns on oil and gas stocks (see, Babatunde et al., 2013). Investors desire a framework that explains how fluctuations in the price of oil impact stock prices or stock market returns.

In this study, we empirically evaluated whether there exist Symmetry or Asymmetry Influence of Oil Prices Changes on Oil and Gas Stock Prices in Nigeria. To achieve this, quarterly time series data from 2009 to 2016 were gathered from the website of the Central Bank of Nigeria (CBN) and the Nigeria Stock Exchange. We used both the symmetric Autoregressive Distributed Lag (ARDL) model and the Nonlinear Autoregressive Distributed Lag (NARDL) model. Hence, the main result finding of this paper revealed negative and positive oil price shocks have a positive long-run influence on stock prices of oil and gas. Implying that oil and gas stock prices are susceptible to the price of oil shocks. This can be deduced to mean that positive price of oil shocks (Good News) contributed positively and significantly to the oil and gas stock market index which is a desirable outcome for the listed oil/gas companies.

Our study is related to the work of Sadorsky ()—Asia; Kilian and Park (2009)—USA and Europe; Mukherjee and Naka (1995)—Japan; Malaysia; and Sadorsky (), and Apergis and Miller (2009)—Canada; which studied the effect of oil price on stock market. However, these studies were all from developed economies. Also, little is known for the exporters of oil (Babatunde et al., 2013; Charfeddine & Barkat, 2020; Salisu & Isah, 2017), especially for the oil and gas stock prices. Furthermore, few studies have examined asymmetric oil price shocks on the oil and gas stock price, amidst the studies lack a consensus on findings of extant literature (Ciner, 2001; Jones & Kaul, 1996; Sadorsky, 1999). Evidence has shown that oil price impact could be asymmetric and nonlinear while most studies in the literature were based on the presumption that oil price impact on the stock market is linear. Hence, very few studies have examined the effects of oil price on the oil/gas index despite its poor performance and the high integration of the Nigerian economy to oil. Hence, this study attempted to close these identified gaps by making the following unique contributions:

Firstly, we contribute to the strand of the literature by shifting focus from oil price impact on the composite stock market indices (such as the all share index) to focus on a specific sectoral stock price of oil/gas companies listed on the Nigeria stock exchange. This is important because a composite stock index will mute the idiosyncratic responses of specific sectoral performance to oil price shocks. Hence, making it difficult for policy makers and investor to take informed investment decision.

Secondly, this paper differs from previous studies by using both the symmetric Autoregressive Distributed Lag (ARDL) model and the Nonlinear Autoregressive Distributed Lag (NARDL) model. This is because the ARDL technique assumes that the influence of the oil price is strictly linear, and as a result, it is insufficient to capture potential asymmetrical or nonlinear relationships (Shin, Yu, & Greenwood-Nimmo, 2014). If a nonlinear connection is modelled using a linear approach, the model will be unable to account for the effects of both a rise and a reduction in the price of oil. The NARDL model can separate the effect of an oil price increase from an oil price decrease on the oil and gas stock price. It is based on the aforementioned that the NARDL approach is adopted in this study. Hence, this study formed the bedrock for recommendation to portfolio managers, potential investors, and, policymakers in oil-exporting countries by diversifying investments to reduce

exposure to risk and uncertainty. The remainder of the paper is as follows—the next section reviews existing literature. Section 3 describes the data and methodology. Section 4 details empirical results, and section 5 concludes the paper with policy implications.

## 2. Literature review and hypothesis development

The theoretical framework of this study is based on two main theories. The Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory are the two most popular theoretical models that relate energy prices to the stock market (APT). In the APT, the value of an asset may be explained by a number of risk variables, including the price of oil. The influence of the oil price on the macro-economy is transmitted through certain routes, according to the literature on energy economics. For countries that import oil, the transmission pathways are well known (Hamilton, 2015), but this is not the case for those that export oil (Charfeddine & Barkat, 2020; Emami & Adibpour, 2012; Hamilton, 2018; Nwodo, Ozor, Okekpa, & Agu, 2017). The Fiscal Channel comes first. It illustrates how a rise in the price of oil will cause a country that exports oil accrue a budget surplus. The high price of oil will enable the exporting country to increase petro-dollar generated revenue from oil production and exports. The accumulated revenue will be used to stimulate investment and economic growth through increased government spending (Emami and Adibpour, 2012).

On the other hand, an oil-exporting country will run into a deficit when the oil price falls (the negative price of oil). In a period of a budget deficit, oil-generated revenue is low and there is limited credit access which leads to a decrease in the importation of intermediary goods. The second channel is the exchange rate channel. A rise in energy costs will cause the nation that exports oil to appreciate in value against other currencies. A rising exchange rate has the effect of making oil exporters richer than oil importers. The trade balance of countries that buy oil will deteriorate, whilst the trade balance of those that export oil will improve. The most obvious effect of exchange rate appreciation is a decline in the oil exporting nation's trade competitiveness, whereas exchange rate depreciation results in an increase. One cannot overstate the importance of exchange rates. The influence of the oil price on stock price is communicated through the exchange rate. Therefore, we develop the following hypothesis

***H<sub>0</sub>. The Influence of Oil Prices Changes on Oil and Gas Stock Prices in Nigeria is symmetric.***

The link between the oil price and the stock market is covered in two literary streams. The initial body of literature used the broad stock market index, while others focused on sector-specific stock market indexes. The second thread is predicated on the idea that the impact of an oil price shock might either be symmetrical or asymmetrical. Aggregate stock markets index was used in studies by Adaramola (2011). The use of an overall or composite stock market index has been shown to suppress any information regarding how individual sectoral stock prices react to fluctuations in the price of oil. The several sector indexes of the stock market are unlikely to react to changes in the price of oil similarly. There is sparse literature on the price of oil's impact on the oil and gas industry index.

Regarding asymmetries, most studies assumed that both positive and negative oil prices would have an identical (symmetric) effect on the price of stocks (Adaramola, 2011.), but more recent research has revealed that this is not the case (Babatunde et al., 2013; Bouri, Awartani, & Maghyereh, 2016); Salisu & Isah. In light of the aforementioned, it is not apparent how the oil price and stock market are related; the link might either be linear/symmetric or nonlinear/asymmetric. According to Uche and Effiom (2021), the impact of oil price shocks on Nigeria's stock prices and exchange rate are shown to be heterogeneous and to vary dramatically across the quantile distributions of the foreign exchange and stock markets.

We applaud Babatunde et al. (2012), who conducted the first significant study to look at oil price shocks in Nigeria. The study looked at five NSE sectoral stock indexes, although it only looked at the immediate effects of oil price shocks. The study discovered evidence of a short-term oil price effect on Nigerian stock prices that is favourable but marginal. Additionally, the study didn't look at how changes in oil prices will affect the oil and gas index. Salisu and Isah (), on the other hand, used a composite stock market index to explore the asymmetric effects of the price of oil on oil exporters and importers (All-share index). There is a paucity of empirical studies that looked at the impact of oil prices on oil and gas stock prices as opposed to the traditional All share index (see, Table 1). Hence, the paper investigated how changes in the price of oil affect the value of the list of oil and gas companies in Nigeria.

### 3. Data and methodology

Quarterly time series data from 2009 to 2016 were gathered from the website of the Central Bank of Nigeria (CBN) and the Nigeria Stock Exchange. The dataset includes the NSE oil and gas index (O&G) of the Nigeria stock exchange, exchange rate (Exch) data and oil price (OP) is the international price of oil (Brent) in US dollars. The NSE Oil & gas stock price was purchased from the Nigerian Stock Exchange and it is composed of oil marketing companies operating in the downstream oil sector. They are mostly involved in the trading and distribution of oil products and lubricants and the export of oil. Most of the refined oil products are imported and marketed by oil marketing companies. Exchange rate was obtained from the Central Bank of Nigeria. Exchange rate is included because it is an important transmission channel through which oil price impacts on the stock market. Oil price was derived from the Energy Information Administration (EIA). The timeframe covered in the study is based on availability of data. Up-to-date oil/gas stock index is not publicly available consequently, future studies should fill this gap.

#### 3.1. Model specification

The Autoregressive Distributed Lags (ARDL) and Nonlinear Autoregressive Distributed Lags (NARDL) estimation method were used in the analysis. The NARDL estimation method has the ability to reveal nonlinear or hidden cointegration or relationships. Traditional cointegration techniques (ARDL) fall short and are unable to detect hidden cointegration and the nonlinearities that are present in the majority of time series data (Ibrahim, 2015). ARDL and NARDL are applicable to data sets with small sample size. When taking into account high-frequency data, such as daily frequency, the approach might, nevertheless, perform badly. It is for this reason that quarterly time series is utilized to avoid heteroskedasticity problem. We begin by specifying the original asymmetric specification of Sanusi et al. (2022).

$$sp_t = \alpha_0 + \alpha_1 exch_t + \alpha_2 OP_t^+ + \alpha_3 OP_t^- + e_t \quad (1)$$

Where SP is an  $I(1)$  variable, while  $exch$ ,  $OP_t^+$  and  $OP_t^-$  are explanatory variables. We further expand equation 1 into an asymmetric ARDL form proposed by Shin et al. (2014) as cited in Charfeddine and Barkat (2020) and Charfeddine and Barkat (2020), to suit our context. In equation 2, we provide asymmetric specification where oil price (OP) is not decomposed into its positive and negative forms.

$$\Delta IO\&G_t = \beta_0 + \beta_1 lo\&g_{t-1} + \beta_2 OP_{t-1} + \beta_3 Exc_{t-1} + \sum_{i=1}^p \alpha_1 \Delta IO\&G_{t-i} + \sum_{i=0}^q \alpha_2 OP_{t-i} + \sum_{i=0}^q \alpha_3 Exc_{t-i} + \mu_t \quad (2)$$

The absence of asymmetry would imply a reduction of the asymmetric model into its symmetric form in equation 2.

$$IO\&G_t = \sum_{j=1}^p \partial_j IO\&G_{t-j} + \sum_{i=0}^q (\theta_i^+ IOP_{t-i}^+ + \theta_i^- IOP_{t-i}^-) + \sum_{i=0}^q \delta_i Exc_{t-i} + \varepsilon_t \quad (3)$$

**Table 1. Literature summary**

Author	Period	Country	Model	Stock Market Proxy	Finding
(Raifu and Oshota, 2022)	Jan 1990-Dec 2018	Nigeria	Markov regime-switching	ASI	Oil price shock has a positive (negative) impact on the stock return in low volatility state (high volatility state).
Sanusi and Kapingura (2022)	Jan. 2003 to Aug. 2019	South Africa	DCC-GARCH, Multivariate Markov regime switching models	Market capitalization	Oil price had no effect on stock performance in regime 2 but the reverse is true.
(Okere, Muoneke and Onuoha, 2021)	Jan 1995-Dec. 2019	Nigeria	NARDL	ASI	Positive and negative oil price shock has a positive influence on stock market performance
(Obi, Oluseyi and Evans, 2018)	1986 to 2016	Nigeria	NARDL	ASI	Oil price impact on stock performance is asymmetric
(Olayeni, Tiwari and Wohar, 2020)		Nigeria	Single Equation based on threshold vector ADL	ASI	Longrun asymmetry is important for equilibrium.
(Nwosa, 2020)	1 Dec. 2019-31 May	Nigeria	VAR	All Share Index (ASI)	Oil price has significantly influenced the stock market performance
(Soyemi, Akingunola and Ogebc, 2019)	2007-2014	Nigeria	<b>Asymmetric</b> (Egarch)	Composite stock market index (ASI)	Oil shock positively impacts company stock returns. The price of oil impact is positive on stock market returns

(Continued)

**Table 1. (Continued)**

<b>Author</b>	<b>Period</b>	<b>Country</b>	<b>Model</b>	<b>Stock Market Proxy</b>	<b>Finding</b>
(Basher, Haug and Sadorisky, 2018)	2012–2014	Oil exporting countries	<b>SVAR Markov-Switching model</b>	Composite MSCI	Canada, Russia, Kuwait, and the UAE are impacted by speculative shocks while flow oil supply shocks are important for UK, Kuwait, and UAE. Mexico is not affected by oil market shocks.
(Ojikutu, Onolemhemen and Isehunwa, 2017)	1985–2014	Nigeria	<b>Symmetric (OLS)</b>	Composite All Share Index (ASI)	The positive long-run impact of oil price
(Salisu & Isah, 2017)	2000–2015	5 Oil exporting and 8 importing countries	<b>Asymmetric.</b> Panel ARDL using PMG and MG framework	Composite stock index	Oil exporting and importing countries respond negatively to price of oil shocks. The impact is stronger in oil-importing countries.
(Bouri et al., 2016)	2004–2010	ARAB	<b>Multivariate</b> ARMAX-(E)GARCH	Sectoral indices: Financials, Industrials, and Services	Oil returns significantly impact the financial and services sector but not significant for the industrial sector.
(Gupta, 2016)	1983–2014	70 Countries	<b>Symmetric</b>	Sectoral Oil & gas stock price (firm-level)	Firm-level return is positively impacted by price of oil. Firms located in the non-competitive market respond less to price of oil shocks than those in competitive markets.
(Asteriou, Dimitras, & Lendewig, 2013b)	1988–2008	Oil exporting and Importing Countries	Symmetric model (VECM)	MSCI	stronger oil impact on oil-importing countries than in exporting ones

(Continued)



Table 1. (Continued)					
Author	Period	Country	Model	Stock Market Proxy	Finding
(Babatunde, Adenikinju, & Adenikinju, 2013)	1995-2008	Nigeria	<b>Asymmetric</b> (multivariate VAR.)	<b>Sectoral index</b> (NSMCI). Financial, services, commercial and agriculture.	The impact of the price of the oil shock on the stock market is positive but statistically insignificant but becomes negative over time, depending on the nature of the price of oil shocks. There is no evidence of an asymmetric price of oil impact.
(Effiong, 2014)	1995-2011	Nigeria	<b>Symmetric</b> (SVAR)	Composite index ASI	Negative price impact on NSE stocks but not significant. Negative oil price impact on oil-related demand shocks.
(Park & Ratti, 2008)	1986-2005	USA and Europe	<b>Asymmetry Garch and VAR</b>	Composite Index	The impact of price of oil on stock returns is NOT asymmetric for all EU countries. Oil price increase depressed stock returns.
(Basher & Sadorsky, 2006)	1992-2005	Emerging economies	<b>CAPM</b>	Composite MSCI stock index	Price of oil risk impacts on stock markets of emerging economies
(Narayan and Sharma, 2011)	2000-2008	Vietnam	<b>DOLS, AND GARCH</b>	Composite	Price of oil positively impacts on the stock market

(Continued)

**Table 1. (Continued)**

<b>Author</b>	<b>Period</b>	<b>Country</b>	<b>Model</b>	<b>Stock Market Proxy</b>	<b>Finding</b>
(Jones and Kaul, 1996)		USA, Canada, Japan, and UK	<b>OLS</b>	Composite S&P 500	Price of oil impacts stock markets in the UK and Japan. Stock markets in the USA and Canada responded purely to price of oil shocks during the post-war era.
Hashmi et al., 2022	2000M01-2022M12	Pakistan	<b>Quantile ARDL</b>	Composite Stock price	there are differences in the effects of exchange rates and oil prices on stock prices under bullish, bearish, and normal market conditions.
(Omoke and Uche, 2021)	1990Q1- 2019Q4	OPEC	<b>Quantile ARDL</b>	Composite Stock price	Asymmetric short-term impacts were seen in Nigeria and the UAE. Additionally, data suggests that continuous oil price shocks cause purchasing power (PP) in Saudi Arabia, Nigeria, and Angola to rapidly drop.

Where  $\partial_j$  is an autoregressive parameter.  $\theta_i^+$  and  $\theta_i^-$  are the long-run asymmetric parameters (i.e. the impact of positive and negative oil prices). Where IO&G is oil and gas index in natural log form;  $LOP_t^+$  and  $LOP_t^-$  are the associated asymmetric long-run parameters derived by breaking oil price into its negative and positive oil prices.  $\varepsilon_t$  is the stochastic random error term that is independently and identically distributed (iid), zero mean and constant variance. A linear model within the ARDL framework will be obtained if  $\theta_i^+ = 0$ . We rewrite the asymmetric ARDL specification above into the following error correction form in equation 4.

$$LO\&G_t = \sigma LO\&G_{t-1} + \pi^+ LOP_{t-1}^+ + \pi^- LOP_{t-1}^- + \rho Exch_{t-1} + \sum_{j=1}^{p-1} \partial_j LO\&G_{t-j} + \sum_{i=0}^{q-1} (\theta_i^+ LOP_{t-i}^+ + \theta_i^- LOP_{t-i}^-) + \sum_{i=0}^{q-1} \delta_i Exch_{t-i} + \varepsilon_t \quad (4)$$

$$LO\&G_t = \omega_{t-1} + \sum_{j=1}^{p-1} \varphi_j \Delta LO\&G_{t-j} + \sum_{i=0}^{q-1} (\theta_i^+ LOP_{t-i}^+ + \theta_i^- LOP_{t-i}^-) + \sum_{i=0}^{q-1} \delta_i Exch_{t-i} + \varepsilon_t \quad (5)$$

Where:

$$W_{t-1} = \sigma LO\&G_{t-1} - \pi^+ LOP_{t-1}^+ - \pi^- LOP_{t-1}^- - \rho Exch_{t-1} \quad (6)$$

$W_{t-1}$  denotes a nonlinear error correction term;  $\pi^+ = -\frac{\theta^+}{\sigma}$  and  $\pi^- = -\frac{\theta^-}{\sigma}$  denotes the partial sum as defined previously.  $\delta = -\frac{\delta}{\sigma}$  is the long-run parameter for the variable exchange rate. The AIC is applied to choose the best lag length.

It is crucial to look at the sequence of integration of the variables before estimating the model. No matter whether variables are stationary in order one or order zero, the NARDL and ARDL technique is effective; nevertheless, when variables are integrated into order two, it is ineffective (Ibrahim, 2015). The sequence of integration is examined using the ADF and NG-Peron tests. It is crucial to determine if variables are cointegrating since the majority of time-series variables integrated of order one are cointegrated. Long-term partnerships were examined using the Bounds test.

#### 4. Results and discussion

The Jarque-bera statistics show that the variables are normally distributed and are all negatively skewed, except the exchange rate. All three variables platykurtic with kurtosis values less than 3 (see, Table 2).

The ADF and NG-Perron tests are presented in Table 3. Based on the ADF and NG-Peron tests, all of the variables are stationary at the first difference. Both the ARDL and NARDL F-Bound test estimate results, which are presented in Tables 4 and 5, show indications of long-run co-integration. Table 4 lists the ARDL (symmetric) model's long-run and short-run outcomes. Lagged Oil and gas stock price, and oil prices are not statistically significant. Although the lag oil and gas stock prices are positive, lagged oil price is negative in the short run. This implies that lag oil and gas prices do not affect current and future stock prices. Also, an increase in oil price may result to decrease in oil and gas stock price in the short. The Coefficient of determination showed that 77% changes in oils and gas stock price are caused by change in lagged oil and gas and oil price. However, the F-statistic indicated that in the short, lagged oil and gas and oil price jointly affect the stock price of Oil and Gas.

Table 5 presents the short-run NARDL result. The result shows the short-run response of oil and gas stock prices to the positive and negative price of oil price changes. Tables 5 shows that an oil price increase (decrease) by 1% will bring about an increase (decrease) of 0.85% on oil and gas stock price. The long run result in Table 5 shows that both negative and positive oil prices have positive coefficients 1.35 and 2.92 respectively. The coefficient for the negative oil price indicates

**Table 2. Descriptive statistics**

	LEXR	IOil&Gas	IOil price
Maximum	4.59	6.12	9.29
Mean	4.38	5.69	8.76
Median	4.35	5.78	8.924
Minimum	4.15	5.05	7.71
Skewness	0.13	−0.72	−0.94
Std. Dev.	0.13	0.30	0.40
Kurtosis	1.59	2.37	2.99
Jarque-Bera	2.72	3.15	3.25

Source: Author's computation.

that a 1% oil price decrease (increase) will decrease (increase) the oil and gas stock price by 1.35%. Also a 1% decrease (increase) in oil price will cause a decrease (increase) of 2.92% in the stock price (oil & gas). This result means that oil price increase and oil price decrease will increase the increase oil/gas stock prices. This is because of the effect of fuel subsidy and price control in country. Petrol price in Nigeria does not always move with international oil prices. Therefore, oil/gas companies have profited during high and low oil prices in the international market. Petrol pump prices are not determined by market forces but rather fixed by the government which could make prices rigid.

These long-run and short-run coefficients in Table 5 also give insight into elasticity or the extent of response of the oil and gas stock price to a small change in the price of oil. The result indicates a long-run positive and negative price of oil coefficient to be greater than 1, implying that the oil and gas stock price will increase (decrease) by more than a proportionate increase (decrease) in the positive and negative price of oil. The exchange rate also has a coefficient that is less than 1 (i.e. −3.17). This result implies that an increase (decrease) in the exchange rate by 1% caused a more than 1% decrease (increase) in oil and gas stock price. From the result, a decline (rise) in the exchange rate by 1% will lead to a rise (fall) of 3.17% in the oil/ gas index. The influence of the lags of the exchange rate is weak in the short run.

The short-run NARDL result in Table 5 shows that the oil and gas stock price is inelastic to the price of oil shocks. This implies that a decrease (increase) in oil price by 1% will bring about a less than proportionate decrease (increase) in the short run oil and gas stock prices. On the other hand, the long-run result is elastic implying that the oil and gas stock price will increase (decrease) by more than 1% if the price of oil should increase (decrease) by 1%. The NARDL short-run result shows that the oil and gas stock price is inelastic to negative oil price but elastic to positive shocks of oil price, while the long-run result indicates that the oil and gas stock price is elastic to both negative and positive oil price shocks in the long run. This result is explained by price control by the government, where petroleum pump prices are arbitrarily fixed. The degree of responsiveness of the stock prices to the short-run and long-run movements in oil price varies because Nigeria exhibits the characteristics of both an oil-exporting and oil by-product-importing country since oil is both input and output. There is a need to permanently fix the existing refineries or build new ones to ease the negative effect of the importation of oil by-products. In addition, the quota placed on Nigeria among other members of the organization of Petroleum Exporting Countries (OPEC) has limited the output, exports, profit and consequently the market price of the listed oil and gas companies.

The oil and gas stock price is found to be susceptible to the price of oil shocks (see, Table 5). Positive price of oil shocks (Good News) has contributed positively and significantly to the oil and gas stock market index which is a desirable outcome for the listed oil/gas companies. This is because a period of the positive or rising price of oil is accompanied by high profitability and

**Table 3. ADF and NG-perron unit root result.** In the long run, Oil price and exchange rate has a significant effect on oil and gas price. The long-term impact of oil prices (0.66) suggests that a 1% reduction (increase) in the price of oil results in a 0.66% decrease (increase) in the price of oil and gas stock (see, Table 4). This finding is statistically significant, indicating that the oil price had a significant impact on the price of oil and gas stocks. The exchange rate will have a detrimental long-term effect (-1.74). It suggests that a 1% change in the exchange rate will, on average, result in a 1.74% change in the oil and gas index. This outcome is consistent with Sadosky's findings from 2001 for Canada. The oil and gas stocks price is an index computed for few oil exploration and marketing firms listed on the Nigerian Stock Exchange. These firms sell and distribute refined oil (petrol) products, which are primarily imported, in addition to the exportation of crude oil. Refined oil for import into Nigeria becomes less costly due to an increase in the currency rate, while the production of indigenous oil and gas businesses becomes more expensive (less attractive to foreigners if exported). When the exchange rate increases, this may disrupt the oil and gas companies' cash flow and drive down the price of their stocks. "Where: () is t-Statistics; \*\*\*, \*\*, \* represents 1%, 5% and 10% respectively"

Panel A				Panel B			
ADF				NG-PERRON			
Series	Intercept	Trend	Conclusion	Series	Intercept	Trend	Conclusion
D (lprice of oil)	-4.51**	-4.97**	I(1)	D (lprice of oil)	-2.22**	-4.93**	I(1)
D(lOil&Gas)	-3.82**	-3.79**	I(1)	D(lOil&Gas)	-2.40**	-2.51	I(1)
D(EXR)	-4.14**	-3.52**	I(1)	D(EXR)	-2.03**	-2.05	I(1)
LEXR	-1.03	-2.15		LEXR	-0.32	-1.83	
lPrice of oil	-1.41	-1.76		lPrice of oil	-1.41	-1.76	
lOil&Gas	-1.77	-1.79		lOil&Gas	-1.62	-1.72	

**Table 4. ARDL estimates**

Variables	Lags ARDL(4, 3, 3)			
	0	1	2	3
D(IOil&Gas)	-	0.40 (1.69)	0.51 (1.91)	0.58 (1.78)
D(IPrice of oil)	-0.28 (-0.92)	0.45 (1.00)	-0.11 (-0.38)	
D(LEXC)	0.33 (0.30)	-0.37 (-0.19)	0.24 (0.15)	
ECT(-1)	-0.54 (2.74)			
R-Sqd	0.88			
Adj. R	0.77			
F-Stats	2.71**			
LM	0.02**	0.65		
ARCH	0.77	2.00		
JB	0.43	-		
Ramset-R	-	3.06	3.15	
F <sub>BOUND</sub>	4.43**			
LR Coefficients				
Variables	C	LEXCH	LOP	
	3.89** (-2.75)	-1.74** (2.16)	0.66** (-2.75)	

“Where: () is t-Statistics; \*\*\*, \*\*, \* represents 1%, 5% and 10% respectively”

revenue for oil-exporting firms and countries. The high oil revenue generated is used to finance the government’s expenditure and investment toward economic growth. The high profit and income generated by the oil-exporting firms increase the value of the firm and hence, an improvement in the oil and gas stock price. The oil and gas firms need to shield against the impact of a negative price of oil shocks by diversifying investment into other viable non-oil-related business opportunities. The long-run result showed that both negative and positive prices of oil exert a significant influence of the same magnitude on the oil and gas stock price. This out is true if the oil-exporting /oil-producing firms generated enough revenue or profit (during the period of the high price of oil), high enough to sustain the business in a period of the declining price of oil and revenue.

The Wald test was applied to test for asymmetry. There is no sufficient evidence to support the rejection of the null hypothesis of symmetry. Therefore, the result demonstrates that the size of a positive oil price has the same impact on the price of oil and gas stocks as a negative oil price does. This indicates that the effect of the oil price is symmetrical. In other words, both positive and negative changes in the price of oil have an equal impact on the price of oil and gas stocks. The Wald test supports this result (see, Table 5). The impact of an increase in oil prices on the price of oil and gas stocks is symmetrical since the government extensively subsidizes the primary oil by-products utilized in Nigeria. The subsidy lessens the effect of rising oil prices on consumer demand for oil-related goods. Since crude oil is a necessary component for the manufacturing of gasoline and PMS, a rise in the price of crude oil is anticipated to raise the cost of these fuels. In Nigeria, however, the price of gasoline and PMS has not fluctuated with the price of crude oil internationally for many years. The price of gasoline at the pump stays the same whether crude prices fall below \$40 or rise over \$100 per barrel, having an equal and opposite effect on the oil/gas stock index. Our results are consistent with those of Babatunde and Adenikinju (2013),

**Table 5. NARDL estimates**

Variables	Lags			
	0	1	2	3
ECT(−1)		−0.33** (−2.51)		
D(IPrice of oil <sup>+</sup> )	−1.76* (−4.48)	1.25 (−1.63)	0.09 (−0.19)	
D(IPrice of oil <sup>−</sup> )	0.855** (2.89)	0.98** (2.56)	−0.06 (−0.18)	
D(LOil&Gas)		0.199 (0.86)	0.39** (1.97)	0.59** (2.96)
D(LEXC)	−3.171* (−3.41)	−0.81 (−0.63)	0.85 (0.94)	
F-Statistics	4.43**			
R-Sqd	0.98			
Adj. R	0.92			
<b>Panel B: Diagnostics</b>				
LM	−	0.6	0.77	
ARCH	−	0.36	0.66	
JB	0.4	−	−	
Ramsey-Reset		0.3	0.36	
$WALD_F^{SR}$	0.01			
$WALD_F^{LR}$	−1.72			
$F_{BOUND}$	4.43**			
<b>Panel C: LR Coefficients</b>				
Variables	IPrice of oil <sup>+</sup>	IPrice of oil <sup>−</sup>	LEXC	C
	2.92** (2.26)	1.35** (2.67)	1.44 (−0.49)	14.48 (1.05)

Note: “Where: () is t-Statistics; \*\*\*, \*\*, \* represents 1%, 5% and 10% respectively”

Babatunde et al. (2013), Charfeddine and Barkat (2020), Ramos & Veiga (2011), Gupta (2016), and Salisu and Isah ()

The long-run exchange rate coefficient is 1.44, indicating that a 1% increase (decrease) in the exchange rate will cause a statistically insignificant increase (decrease) in the oil and gas stock price by 1.44%. In the short-run, the stock index is significantly impacted by the exchange rate. The coefficient of the exchange rate has altered from a negative sign in the symmetric-ARDL result to a positive coefficient in the asymmetric NARDL result. This reiterates the superiority of the NARDL over the ARDL model particularly in examining nonlinearities, hidden relationships and its indirect hints on market power and policies (Ibrahim, 2015). Additionally, the Nigerian market exhibits structural rigidities and imbalances; as a result, stock investments are favoured over keeping idle balances in order to reduce the risk of loss that might result from turbulence and uncertainty in the Nigerian State. Consumer preferences for imported or foreign items are quite persistent, necessitating the exchange of the Naira, the country of Nigeria’s official currency, for US dollars. The dollar was under strong pressure to depreciate due to the excessive demand compared to supply of foreign money, and the value of oil and gas stocks increased as a result of the naira’s devaluation. This outcome is consistent with the preferences of the majority of Nigerian investors and analysts who think that the naira is overvalued and that a fall of the currency will encourage more rapid growth in the Nigerian stock market.

## 5. Conclusion

The study investigated the connection between the price of oil and the oil and gas stock index of the Nigerian Stock Exchange. Between 2009 and 2016, quarterly data were used to apply the ARDL and

NARDL. Oil has a huge impact on Nigerian economic growth, and changes in the price of oil will have an impact on publicly traded companies. The oil/gas stock index (ASI) was compared to the traditional All share index, which is widely used in literature, as the stock index for the study. The ASI will not reveal the influence of oil price on specific sectoral indices like the oil/gas index, an important issue grossly disregarded in the literature. The evidence from the ARDL (symmetric) and NARDL (asymmetric) models showed that a negative price of oil will raise the stock index (oil & gas) in the long run. The impact is positive oil price shocks have a significant negative effect on the oil and gas index in the short term, while the effect of negative oil prices is positive. Oil price increases and decreases will have a symmetric impact on the oil and gas stock price. This means that positive and negative prices of oil will influence the oil and gas stock prices alike. Therefore, oil price will positively influence the Oil /Gas index of the NSE.

The price of oil and the oil and gas stock price have a strong linkage. A positive price of oil (good news) has the same impact as a negative price of oil (Bad News) on the NSE oil/gas stock prices. Therefore, list oil and gas companies will make gains as much as the losses they incurred during periods of economic boom and recession respectively. There is need to reduce reliance on oil since external influences and shocks that disrupt oil supply will reduce oil price and consequently depress the firm value. Organization of Petroleum Countries should increase Oil supply quota for Nigeria to enable oil companies increase production, exports and profit which will consequently increase the oil/gas stock value. A permanent solution should be provided to end the activities of the Niger Delta Militants involving the bombing of oil and gas pipelines and distorting the cash flow of oil companies in the region. Thus, the exposure of listed oil and gas companies to the oil sector should be closely monitored by the regulators and management. In cases where oil forms an important input in the production process, diversification becomes fundamental.

The study has data limitations. Finding current information on the oil and gas stock price was challenging. Future research should use sector-specific stock market data. Numerous events, such as the COVID-19 pandemic, a protracted economic shutdown, and restrictions on internal and foreign travel, have taken place between 2016 and 2022. Market data should be made accessible for research purposes at a low or free cost by the Nigerian stock exchange.

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#### References

- Adaramola, A. O. (2011). The Impact of Macroeconomic Indicators on Stock Prices in Nigeria. *Developing Country Studies*, 1, 1–14.
- Apergis, N., & Miller, S. M. (2009). Do structural oil-market shocks affect stock prices? *Energy Economics*, 31(4), 569–575. <https://doi.org/10.1016/J.ENERCO.2009.03.001>
- Asteriou, D., Dimitras, A., & Lendewig, A. (2013). The Influence of Oil Prices on Stock Market Returns: Empirical Evidence from Oil Exporting and Oil Importing Countries. *International Journal of Biometrics*, 8, 101.
- Babatunde, M. A., Adenikinju, O., & Adenikinju, A. F. (2013). Oil price shocks and stock market behaviour in Nigeria. *Journal of Economic Studies*, 40(2), 180–202. <https://doi.org/10.1108/01443581311283664>
- Basher, S. A., Haug, A. A., & Sadorsky, P. (2018). The impact of oil-market shocks on stock returns in major oil-exporting countries. *Journal of International Money and Finance*, 86, 264–280. <https://doi.org/10.1016/j.jimonfin.2018.05.003>
- El Bouri, AwartaniA Maghyereh, (2016) Crude oil prices and sectoral stock returns in Jordan around the Arab uprisings of 2010. *Energy Economics*, 56, 205–214 <http://dx.doi.org/10.1016/j.eneco.2016.03.021>
- Boyer, M. M., & Filion, D. (2007). Common and fundamental factors in stock returns of Canadian oil and gas companies. *Energy Economics*, 29(3), 428–453. <https://doi.org/10.1016/j.eneco.2005.12.003>
- Charfeddine, L., & Barkat, K. (2020). Short- and long-run asymmetric effect of oil prices and oil and gas revenues on the real GDP and economic diversification in oil-dependent economy. *Energy Economics*, 86, 104680. <https://doi.org/10.1016/j.eneco.2020.104680>
- Ciner, C. (2001). On the long run relationship between gold and silver prices A note. *Global Finance Journal*,



- 12(2), 299–303. [https://doi.org/10.1016/S1044-0283\(01\)00034-5](https://doi.org/10.1016/S1044-0283(01)00034-5)
- Effiong, E. L. (2014). Oil price shocks and Nigeria's stock market: What have we learned from crude oil market shocks? *OPEC Energy Review*, 38(1), 36–58. <https://doi.org/10.1111/opee.12027>
- Emami, Karim & Adibpour, Mehdi, (2012). Oil income shocks and economic growth in Iran. *Economic Modelling*, Elsevier, 29(5), 1774–1779
- Faff, R. W., & Brailsford, T. J. (1999). Oil price risk and the Australian stock market. *Journal of Energy Finance & Development*, 4(1), 69–87. [https://doi.org/10.1016/S1085-7443\(99\)00005-8](https://doi.org/10.1016/S1085-7443(99)00005-8)
- Gupta, K. (2016). Oil price shocks, competition, and oil & gas stock returns - Global evidence. *Energy Economics*, 57, 140–153. <https://doi.org/10.1016/j.eneco.2016.04.019>
- Hamilton, J. (1983) Oil and the Macroeconomy since World War II. *The Journal of Political Economy*, 91, 228–248. <https://doi.org/10.1086/261140>
- Ibrahim, M. H. (2015). Oil and food prices in Malaysia: A nonlinear ARDL analysis. *Agricultural and Food Economics*, 3(1). <https://doi.org/10.1186/s40100-014-0020-3>
- Jones, C. M., & Kaul, G. (1996). Oil and the stock markets. *The Journal of Finance*, 51(2), 463–491. <https://doi.org/10.1111/j.1540-6261.1996.tb02691.x>
- Jungwook Park, Ronald A. Ratti (2008). Oil price shocks and stock markets in the U.S. and 13 European countries. *Energy Economics* 30(5):2587–2608. DOI: [10.1016/j.eneco.2008.04.003](https://doi.org/10.1016/j.eneco.2008.04.003)
- Kilian, L., & Park, C. (2009). The impact of oil price shocks on the U.S. stock market. *International Economic Review*, 50(4), 1267–1287. <https://doi.org/10.1111/j.1468-2354.2009.00568.x>
- Maghyreh, A.I., Awartani, B., & Bouri, E. (2016). The directional volatility connectedness between crude oil and equity markets: New evidence from implied volatility indexes. *Energy Economics*, 57, 78–93.
- Mukherjee, T. K., & Naka, A. (1995). Dynamic relations between macroeconomic variables and the Japanese stock market: an application of a vector error correction model. *Journal of Financial Research*, 18(2), 223–237. <https://doi.org/10.1111/j.1475-6803.1995.tb00563.x>
- Narayan, P. K., & Sharma, S. S. (2011). New evidence on oil price and firm returns. *Journal of Banking and Finance*, 35(12), 3253–3262. <https://doi.org/10.1016/j.jbankfin.2011.05.010>
- Nwosa, P. I. (2020). Oil price, exchange rate and stock market performance during the COVID-19 pandemic: Implications for TNCs and FDI inflow in Nigeria. *Transnational Corporations Review*, 13(1), 125–137. <https://doi.org/10.1080/19186444.2020.1855957>
- Obi, B., Oluseyi, A. S., & Evans, O. (2018). Impact of oil price shocks on stock market prices volatility in Nigeria: new evidence from a non-linear ARDL Cointegration. *Journal of Global Economy*, 14(3), 173–190. <https://doi.org/10.1956/JGE.V14I3.501>
- Ojikutu, O. T., Onolemhemhen, R. U., & Isehunwa, S. O. (2017). International journal of energy economics and policy crude oil price volatility and its impact on Nigerian Stock Market Performance (1985-2014). 8 July 2020) *International Journal of Energy Economics and Policy*, 7(5), 302–311. <https://www.econjournals.com>
- Okere, K. I., Muoneke, O. B., & Onuoha, F. C. (2021). Symmetric and asymmetric effects of crude oil price and exchange rate on stock market performance in Nigeria: Evidence from multiple structural break and NARDL analysis. *The Journal of International Trade & Economic Development*, 30(6), 930–956. <https://doi.org/10.1080/09638199.2021.1918223>
- Olayeni, O. R., Tiwari, A. K., & Wohar, M. E. (2020). Global economic activity, crude oil price and production, stock market behaviour and the Nigeria-US exchange rate. *Energy Economics*, 92, 104938. <https://doi.org/10.1016/j.eneco.2020.104938>
- Omoke, P. C., & Uche, E. (2021). How does purchasing power in OPEC countries respond to oil price periodic shocks? Fresh evidence from Quantile ARDL specification. *OPEC Energy Review*, 45(4), 438–461. <https://doi.org/10.1111/OPEC.12216>
- Raifu, I. A., & Oshota, S. O. 2022. Re-examining oil price-stock market returns nexus in Nigeria using a two-stage Markov regime switching approach. *International Journal of Energy Sector Management*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/IJESM-07-2020-0026>
- Ramos, Sofia B. & Veiga, Helena, 2011. "Risk factors in oil and gas industry returns: International evidence," *Energy Economics*, Elsevier, vol. 33(3), pages 525–542, May.
- Sadorsky, P. (1999). Oil price shocks and stock market activity. *Energy Economics*, 21(5), 449–469. [https://doi.org/10.1016/S0140-9883\(99\)00020-1](https://doi.org/10.1016/S0140-9883(99)00020-1)
- Salisu, A. A., & Isah, K. O. (2017). Revisiting the oil price and stock market nexus: A nonlinear Panel ARDL approach. *Economic Modelling*, 66(July), 258–271. <https://doi.org/10.1016/j.econmod.2017.07.010>
- Sanusi K Abimbola, Kapingura F Mingiri and McMillan D. (2022). On the relationship between oil price, exchange rate and stock market performance in South Africa: Further evidence from time-varying and regime switching approaches. *Cogent Economics & Finance*, 10(1), [10.1080/23322039.2022.2106629](https://doi.org/10.1080/23322039.2022.2106629)
- Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modeling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework. In W. C. Horrace & R. C. Sickles (Eds.), *Festschrift in Honor of Peter Schmidt: Econometric Methods and Applications* (pp. 281–314). New York: Springer Science & Business Media. [https://doi.org/10.1007/978-1-4899-8008-3\\_9](https://doi.org/10.1007/978-1-4899-8008-3_9)
- Soyemi, K. A., Akingunola, R. O. O., & Ogebe, J. (2019). Effects of oil price shock on stock returns of energy firms in Nigeria. *Kasetsart Journal of Social Sciences*, 40(1), 24–31. <https://doi.org/10.1016/j.kjss.2017.09.004>
- Uche, E., & Effiom, L. (2021). Oil price, exchange rate and stock price in Nigeria: Fresh insights based on quantile ARDL model. *ECONOMICS AND POLICY OF ENERGY AND THE ENVIRONMENT*, 1(1), 59–79. <https://doi.org/10.3280/EFE2021-001004>



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