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# Linear and Nonlinear Response of Nigerian Stock Market Performance to Oil Price Volatility

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***Abstract***
*The work is motivated by the desire to investigate the effect of oil price volatility on stock market performance in Nigeria within the period of study. A sample size of 648 months covering 1970M1 – 2023M12 which captured different episodes of crude oil prices. The variables used are oil price volatility proxied by standard deviation of oil price as independent variable and dependent variables include market depth proxied by market capitalization and market liquidity/return proxied by all share index. Using Non-Linear Autoregressive Distributed Lag (NARDL) approach which generated the positive and negative partial sums in oil price changes as explanatory variables, the results show that positive changes in oil price produced a positively significant increase in market capitalisation and All share index. Negative changes in oil price produced a significant and positive effect on market capitalization and All share index while stock market performance symmetrically and asymmetrically adjusts to disequilibrium arising from oil price volatility. The study recommends that the interconnectedness of oil price fluctuations and stock market performance should be used to advance the development of the financial system in Nigeria and other oil-rich African countries.*
***Keywords***: *Positive Partial sums, Negative Patial Sums, Symmetry, Asymmetry, Oil Price Volatility, Stock Market Performance, Nigeria.*

## 1. INTRODUCTION

Two transmission channels offer possible explanation for the linkage between oil price fluctuation and stock market performance. Firstly, as the economic theory proposes that share valuation cost should be concomitant to its discounted future cash flow, such that anything that affects the future cash flows should significantly affect share prices.

Since the stock market serves as a reliable indicator of overall economic performance, it is unsurprising that a degree of interdependence exists between fluctuations in oil prices and stock price behavior. Given the heterogeneity among energy-producing and energy-consuming nations, the extent to which stock markets react to oil price shocks largely depends on the associated benefits, drawbacks, and broader economic influence on these countries. Consequently, any increase in oil prices leads to higher production costs, constraining corporate profits and, to a greater extent, diminishing shareholder value. As a result, an upward surge in oil prices is typically followed by a decline in stock prices (See, e.g., Apergis & Miller, 2009; Ciner, 2001; Filis, 2011; Sadorsky, 1999; Sukcharoen et al., 2014; Jones & Kaul, 1996; Rafailidis & Katrakilidis, 2014).

Oil remains a crucial energy source powering any modern economy. A key concern has always been "How does the economy react to fluctuations in oil prices?" Answering this question is essential for various decisions, including macroeconomic policy formulation. This underscores the importance of examining the factors influencing the prices and returns of assets of a financial nature, such as stocks. This analysis involves studying household and firm investment behavior, mitigating investment losses through hedging techniques, and managing assets in response to oil price dynamics. Although extensive literature explores the economic impact of oil price shocks, limited research has focused on oil price volatility's influence on stock markets, particularly from both linear and nonlinear perspectives.

Ever since the discovery of oil on the shores of Nigeria about sixty years ago and drilling of crude oil to refine into petroleum product, oil has been the mainstay of the Nigerians economy. Basically, oil yielded close to 90% of the overall foreign exchange earnings of Nigeria's economy. Revenue derived from oil forms greater percentage of the earnings of the economy of Nigeria. This places the country at a point where oil price movement can exert multiplier effect on various sectors of the economy including financial markets and market for trading of currencies. The degree and size of these effect may also be influence by whether a country exports such products or import from other countries of the world. Investment, consumption and other macroeconomic indicators would be affected based on the side of the divide the country finds itself. Fluctuation in oil price may exert more pressure on stock depending on

whether a country produces and sells or buys and uses oil (Ogbulu and Torbira, 2012).

Stock market serves as a dependable tool to ascertain an economy's performance because prices of stock respond to diverse kinds of factors which oil price upset is one of them (Aloui et,al, 2012). The effect of oil price fluctuation could be industry based and its endogenous peculiarities could vary over time. Therefore, investigating the effect of oil price swings on stock market performance is of significance to both local and foreign prospective investors. Gogineni (2010) collaborated with this fact by maintaining that fluctuation in the prices of oil and its influence on shares can be explained based on the dimension and depth of interaction of the economy with crude oil in the process of production. This interactive effect can spillover to a great extent on government spending, taxes, interest rates, economic growth and stock market performance (See Degiannakis & Filis, 2015).

On this basis, the study chose the major objective of investigating the impact of oil price volatility on stock market performance in Nigeria within the period, 1970M01 – 2022M12. Choice of the period for this research is premised on when oil was discovered in commercial quantity. It offers great insight into building precise asset models for pricing and forecasting of the earning return and the fluctuation caused by crude oil on stock markets. Portfolio managers and policy makers will be guided by the outcome of this study to adjust their actions to prevent risks transmission in the event of market crises. This study would stir up researchers to investigate deeper oil price shocks, volatility and fluctuations and its impact on sectoral equity and returns.

Notably, positive oil price shocks can lead to rise money supply with possible implications on price level. On the other hand, the drop in oil prices weaken the earnings capabilities of oil producing countries with attendant consequences on currency value and inflation. Thus, oil price volatility, whether positive or negative, have significant and far-reaching implications on price level in oil-producing countries, such as Nigeria. Oil price volatility has adverse effect on security earnings of different economies with a reward profile of a security that is unbalanced or skewed towards the upside than the downside. Hence, oil prices changes impact greatly on the performance of stock market because oil is an input in production process. The influence of dwindling oil prices over prices of stock occurs via the revenue stream of companies. The impression of variability of prices of oil over stock prices is more enunciated in the long term run via economic indicators of inflation, prime interest rate since soaring price of oil causes inflation in an economy.

Previous empirical studies used linear models to check this interaction. Early studies on this also viewed only the symmetric perspective of the influence of oil price shock on stock performance. This study differs markedly through the inclusion of symmetric and asymmetric dimensions of the impact of oil price shocks on stock market performance. The study adopted the Nonlinear Autoregressive Distributed Lag (NARDL) model to evaluate the impact of crude oil prices on Nigerian stock market performance. This is a paradigm shift and a novelty as it simultaneously scrutinized the symmetric and asymmetric perspectives of the mold of oil price shocks on stock market activity. For this research, we adopt the Nonlinear Autoregressive Distributed Lag (NARDL) model by Shin, Yu, and Greenwood-Nimmo (2014) as it enables the evaluation of potential asymmetries in the interconnectedness of oil price shocks and stock market performance indicators, namely, market capitalization and All Share index.

It should be clearly noted that symmetric shocks refer to disturbances that produce uniform effects on a set of macroeconomic variables, meaning positive or negative shocks typically lead to movements in these variables in the same direction. Asymmetric relations between the two variables indicate that rise in oil price could have a different footprint on stock market performance from a decline in oil prices. This possible differences in reaction of stock market performance to the linear and nonlinear movement in oil price creates a need for an investigation especially for a country like Nigeria with high dependence on oil revenue and a stock market with rippling performance.

The rest of the work is divided thus: section two contains a review of relevant literature, section three presents the methodology of the study, the penultimate section presents the estimation results while section five concludes.

## 2. REVIEW OF RELATED

Sadorsky (1999) through an evidence-based study maintained that price of oil upset stirs eccentricity thereby exerting a crucial influence over US stock earnings. The frequency of oil price fluctuation influences security earnings asymmetrically. Earnings from security must decrease as a result of positive fluctuation of price of oil. In research by Park and Ratti (2008) that investigated the response of security earnings from some economies seem to diminish in value whenever there is an upward rise of even one month of oil price. Norway security is among those that reacts this way, though on a favourable note and symmetrically. While European countries that are not importers of oil

react unsymmetrically to price of oil volatility. A confirmatory study by Bjornland (2009) validated the stand that securities appreciated for a relative rise in price of oil for Norway an emerging economy that exports oil.

Narayan and Narayan (2010) identified two possible channels through which oil price movement can affect stock market performance. Firstly, oil is primarily viewed as a key production input hence an increase in oil prices directly increases cost of production and lowers the output of both capital and labor (Yıldırım and Öztürk, 2014). This ultimately leads to a decline in aggregate stock prices. Secondly, expected oil prices also influence stock earnings via rate of discount that comprises predicted rise in prices and the difference between nominal interest rate and inflation rate. Oil prices, therefore, influence both expected inflation and interest rates. Investors and other market participants encounter uncertainties related to the spillover effects through oil prices or stock return (See Glosten et al., 1993). Furthermore, a higher price increase causes the rate of discount to rise, which has an undesirable influence on the earnings of stock (Arouri et al., 2011). A clear noticeable trend places any country that does not produce but buys and uses oil to stand the risk of experiencing pressure over internal rise in price of goods and services which lowers the force in currency exchange rate as a result of an upward rise in price of oil.

Gokmenoglu and Fazlollahi (2015) highlighted the critical importance of understanding fluctuations in crude oil prices, as such changes can create economic uncertainty and instability for economies that export and import oil. Following Hulshof et al., 2016, indexation has been used as a pricing mechanism to contain this uncertainty which us a reflection of oil's central role in modern economies. As nations develop and modernize their oil demand, oil price rises correspondingly. Although forecasting future oil demand remains challenging, it is strongly correlated with industrial production growth. Consequently, rapidly expanding economies, particularly emerging markets, are expected to drive substantial increases in oil consumption (Basher & Sadorsky, 2006). Gupta (2015) further asserts that oil price shocks significantly impact economic activity. For oil-dependent nations, oil supply serves as a crucial determinant of revenue generation and economic growth (Mustapha & Sulaiman, 2015). Additionally, economic expansion in developing countries tends to have a greater effect on commodity demand than similar growth in developed nations (Ratti & Vespignani, 2015; Andriansyah & Messinis, 2019; Angelidis, Degiannakis, & Filis, 2015). An important fact arising from several studies that have submitted that crude oil being a factor of production would always cause production cost to rise whenever there is oil price rise. The ultimate burden bearer of increase in the cost of production is the final consumer who pays the price over a commodity that has accumulated extra costs because of impact of price rise in oil transferred to a particular product. These inflationary pressures have the tendency to reduce the total amount of goods and services demanded in an economy over a given time including expenditure pattern and money for investment, discouraging consumers' appetite and this results to a deceleration on the entire production process. Basically, sales of stock in its market reacts unfavourably and yield a low return when there is economic depression Antonakakis & Chatziantoniou (2017).

The relationship between oil prices and the security market is best understood through the lens of economic activity, which suggests that the cost of any investment can be determined using valuation methods that estimate its expected future cash flows. This approach is fundamental in finance and serves as a key mechanism for assessing the value of securities, projects, companies, or assets. It is grounded in the concept of time value of money as it refers to the principle that a specific amount of money has a different value over time due to its potential earning capacity, which asserts that shows value of an investment is influenced by its anticipated future returns, adjusted for the passage of time (Fisher, 1930; Williams, 1938). Hence, it is anticipated that any element capable of altering the current significant value of cash flow of securities would exert pressure on the prices of assets. We should note that a possible rise in the price of oil would result to a fall in the price of stock.

Additionally, the influence of fluctuating oil prices over stock prices is not the same for a country that produces and sells petroleum products. Essentially, one of the advantages that accrues to a country that extracts crude oil and refines it for export is that it results to more revenue earnings to firms in that country in general. When there is such a windfall of oil revenue it leads to increased consumption spending, investment productivity and employment which helps to boost dividends from shares and the entire financial market Badeeb & Lean (2018).

The type of influence of variation in oil prices on earnings from securities depends on what originated the price shock whether it is based on the need for production or consumption. Basically, increased demand for more production or consumption produces dual disturbance upset in response to price of oil variation which might be favourable or unfavourable. Countries that produce oil could through regulated quota of each country to the world crude oil market reduce their benchmark quota. This situation would result to a drop in quantity of oil supplied thereby causing an

upward rise in prices of oil which these countries enjoy, Diaz & De Gracia (2017).
When there is a positive oil price increase, it means that the price of oil has increased because of decreased quota in the supply of oil by exporting country or more effective demand arising from consumption by importing countries. The corresponding effect on securities in the financial market is largely dependent on variation in price of oil (Gogineni, 2010). Shocks arising from price of oil variation based on the upset experienced by countries that produce/sell or buy/use oil and its correlation to securities earning culminates to symmetric or asymmetric dimension Degiannakis, Filis & Arora (2017).

## 3. METHODOLOGY

This work used a sample size of (1970M01 – 2023M12) that is fifty-four (54) years. These translate to 648 monthly observations that include crude oil price in dollar denominated values, all share index (ASI) and Market Capitalization (MCAP). Data sources include The Federal Bureau of Statistics (FBS), Central Bank of Nigeria (CBN) verified by the figure from the World Development Indicators for some data points.

**Model Specification**

Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT), as employed in the research conducted by Afees and Kazeem (2017) underpin this study. According to these theories, asset returns are determined through a specific linear equation, which captures the link between risk factors and expected returns, thereby providing a robust framework for analyzing market dynamics:

$$r_i = \lambda_i + \beta_i \Re + \varepsilon_i \qquad (1)$$

where $r_1$ denotes earnings on asset i, is the unconditional expected return which is also a vector of different risk factors, $\beta_i$ measures the influence that each risk factor has on the asset return *i*, and the residual effect or stochastic term is shown by with the isolation of the effect of oil price shock as the risk factor of interest, the revised version of the above APT can be represented thus:

$$r_i = \lambda_i + \beta_i \Re + \varepsilon_i \qquad (2)$$

where i has as initially explained whereas P connotes oil price influence which shows expected risk from spontaneous fluctuation of oil price. Now, oil price variation has a multiple influence over stock earnings of firms and nation. For the sum of stock earnings which is derived by expected influence of the upset on the future cash flow stream of prospective company or country. (Huang et. al., 2017). This offers a little clearance on why positive upsets have been discovered to exert positive influence on stock earnings of nations that produce and sell oil whereas for countries that buy and use oil the influence is negative. It has been earlier stated that some current research disclosed that the influence of oil price upset on earnings of securities could be asymmetrical. It is a clear truth that positive and negative price shocks do not have the same proportion of influence as oil price upsets. Therefore, we segment energy price variation in equation 2 into positive and negative oil price upset therefore the equation is restated in this form:

$$r_i = \lambda_i + \beta_i \rho^+ + \beta_i \rho + \varepsilon_i \qquad (3)$$

Whereas $\rho^+$ and $\rho$ shows the positive and negative oil price disturbances accordingly.
Each model would test both linear and nonlinear relationship using the plus and minus partial sums respectively. The above model is specified in estimable form following the Greenwood, Shin and Yu (2014) Non-Linear ARDL approach.

$$y_t = \beta^+ x_t^+ + \beta^- x_t^- + \mu_t$$
$$\Delta x_t = v_t$$

Where $y_t$ and $x_t$ are scalar variables of I (1) nature and $x_t$ is decomposed as $x_t = x_0 + x_t^- + x_t^+$ where $x_t^- + x_t^+ \; and \; x_t^-$ are partial sum procedure of positive and negative difference in $x_t$.

The model is as stated below:

$$\Delta LMCAP_t = \alpha_1 + \sum_{i=1}^{p} \delta_i \, \Delta LMCAP_{t-i} + \sum_{j=0}^{q} \tau_j \, \Delta LOILP_{t-j}^{+} + \sum_{k=0}^{r} \vartheta_k \, \Delta LOILP_{t-k}^{-} + \sum_{l=0}^{s} \theta_l \, \Delta LEXR_{t-1} + \varepsilon_t \quad (4)$$

Where: $LOILP^{+}_{t-j}$ is the positive partial sum of oil price change $LOILP^{-}$ is the negative partial sum of oil price change $LEXR_t$ is the Moderating Variable $\varepsilon_t$ is the error term. The same model is rewritten with all share index as outcome variable as follows:

$$\Delta LASI_t = \alpha_1 + \sum_{i=1}^{p} \delta_i \, \Delta LMCAP_{t-i} + \sum_{j=0}^{q} \tau_j \, \Delta LOILP_{t-j}^{+} + \sum_{k=0}^{r} \vartheta_k \, \Delta LOILP_{t-k}^{-} + \sum_{l=0}^{s} \theta_l \, \Delta LEXR_{t-1} + \varepsilon_t \quad (5)$$

Following Pesaran et al. (2001), as used Arize(2017), the error correction representation appears as follows:

$$\Delta y_t = \rho \xi_{t-1} + \sum_{j=1}^{p-1} \Upsilon_j \Delta y_{t-j} + \sum_{j=0}^{q-1} (\acute{\varphi}_j^{+} x \Delta x_{t-j}^{+} + \acute{\varphi}_j^{-} x \Delta x_{t-j}^{-}) + \varepsilon_t \qquad (6)$$

$with\ \varepsilon_t$ as the nonlinear ECM term of the asymmetric long run framework.

Following Pesaran et al. (2001), as also used in Arize (2017) and Arize, Kalu and Nkwor (2018), the error correction equation looks thus:

$$\Delta y_t = \rho \xi_{t-1} + \sum_{j=1}^{p-1} \Upsilon_j \Delta y_{t-j} + \sum_{j=0}^{q-1} (\acute{\varphi}_j^{+} x \Delta x_{t-j}^{+} + \acute{\varphi}_j^{-} x \Delta x_{t-j}^{-}) + \varepsilon_t \qquad (7)$$

$with\ \varepsilon_t$ as the nonlinear ECM term of the asymmetric long run framework.

Following Pesaran et al. (2001), as also used in Arize (2017) and Arize, Kalu and Nkwor (2018), the error correction equation looks thus:

$$\Delta y_t = \rho \xi_{t-1} + \sum_{j=1}^{p-1} \Upsilon_j \Delta y_{t-j} + \sum_{j=0}^{q-1} (\acute{\varphi}_j^{+} x \Delta x_{t-j}^{+} + \acute{\varphi}_j^{-} x \Delta x_{t-j}^{-}) + \varepsilon_t \qquad (7)$$

The study adopts three-step estimation procedures:

First, the series for the study are subjected to some pre-estimation tests covering such areas as descriptive statistics, correlational analyses, graphical representation and tests for unit root.

Secondly, the Nonlinear Autoregressive Distributed Lag approach was adopted as the major estimation technique. This follows the approach developed by Shin, Yu, and Greenwood-Nimmo (2014) to study symmetric and asymmetric effect.

Thirdly, the estimates are subjected to some post-estimation tests to ensure that the residuals are not autocorrelated, homoscedastic and that the entire model follow the correct functional form and are devoid of misspecification.

## 4. RESULTS

The analysed datasets are monthly observations that include crude oil price in dollar denominated values, all share index (ASI) and Market Capitalisation (MCAP). The volatility series of crude price is the standard conditional variance of the level series data obtained from a Generalised Autoregressive Conditional Heteroscedasticity process (GARCH 1,1). The obtained oil price volatility (OPVOL) is further decomposed into the negative and positive partial sum following the Greenwood, Shin and Yu (2014) approach as earlier described. The volatility profile of the studied series is highlighted by the figure shown below:

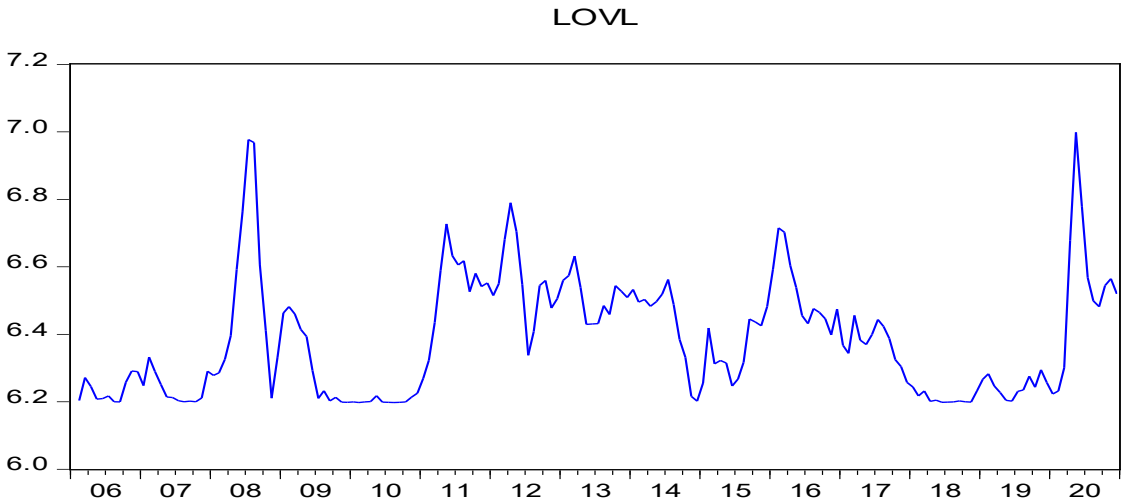


**Figure 1.** A plot showing the volatility of the Log transformed values of Crude Oil
**Source:** Author's Plot, 2023

This evidently confirms that oil price has volatility profile that is worth investigating. The pooling is supported by not only the swing and its persistence but also by the fact that high volatility episodes are succeeded by high episodes same also by low volatility episodes. The basic distributional properties of the oil price and stock market series are displayed in table 1.

**Table 1:** Summary of Basic Descriptive Statistics

| | Mean | Median | Max | Mini | Std. Dev. | RSD | S | K | Obs. |
|---|---|---|---|---|---|---|---|---|---|
| LASI | 10.33 | 10.29 | 11.09 | 9.89 | 0.27 | 0 | 0.64 | 2.78 | 180 |
| LMCAP | 9.09 | 9.18 | 9.82 | 7.83 | 0.42 | 0.1 | -1 | 3.76 | 180 |
| LOVL_NEG | -2.29 | -2.4 | 0.00 | -4.7 | 1.38 | 0.6 | 0.11 | 1.77 | 178 |
| LOVL_POS | 2.47 | 2.65 | 4.99 | 0.07 | 1.41 | 0.6 | -0.2 | 1.89 | 178 |

**Source:** Author's computation (2023)

Table 1 above contains strategies of central tendency (mean and median), measure of dispersion (standard deviation), Strategy of symmetrical properties of the series (skewness) and strategy of the degree of peakness (kurtosis) of the distribution. All the series indicated some degree of deviation from their mean value. The distributions are largely negatively skewed with all of them showing mesokurtic attributes except LMCAP with excess kurtosis (>3). As it is expected of financial time series, the variables are not normally distributed. Lastly, we report the CV which is coefficient of variation or relative standard deviation that combines measure of central tendency and dispersion (quotient of standard deviation and mean). The CVs do not show excessive departure from the mean as they are all less than unity (1). However, it can be inferred that the partial sums of oil price volatility tend to be more volatile than the other series.

Next, the linear association of the series is presented in table 2. The table above shows bivariate directionless correlation coefficient of the variables.

**Table 2:** Summary of Correlational Matrix

| | LASI | LMCAP | LOVL_NEG | LOVL_POS |
|---|---|---|---|---|
| LASI | 1.000000 | | | |
| LMCAP | 0.43 | 1.000000 | | |
| LOVLNEG | 0.16 | -0.73 | 1.000000 | |
| LOVLPOS | -0.17 | 0.74 | -0.79 | 1.000000 |

**Source:** Computed by the author using Eviews 10

The linear association amongst the variables are found to be mixed and could be suggestive of differences in comovement amongst the variables. While some are negatively correlated (LASI & LOVLPOS; LMCAP & LOVLNEG and LOVLNEG & LOVLPOS), the rest are positively correlated.
Furthermore, the stationarity parameters for the series are conveyed in table 3. This follows 'structural break consistent approach' which accounted for both innovational and additive outliers.

**Table 3:** Break Point Unit Root Test

| Variables | INNOVATIONAL OUTLIER | | | | ADDITIVE OUTLIER | | | |
|---|---|---|---|---|---|---|---|---|
| | ADF | Critical Value @ 5% | Inference | Break Date | ADF | Critical Value @ 5% | Inference | Break Date |
| LASI | -13.70 | -5.18 | I(1) | 2009M06 | -13.85 | -5.18 | I(1) | 2009M06 |
| LMCAP | -13.57 | -5.18 | I(0) | 2009M09 | -13.72 | -5.18 | I(1) | 2010M11 |
| LOVLNEG | -5.23 | -5.18 | I(0) | 2008M08 | -8.13 | -5.18 | I(1) | 2007M10 |
| LOVLPOS | -10.84 | -5.18 | I(1) | 2010M03 | -9.67 | -5.18 | I(1) | 2008M08 |

**Source:** Computed by the author using Eviews 10

The break dates are predominantly around the months of the global financial crises spanning from 2007 to 2008 and the spillover effects on the months following. This goes to show the impact of crises and instabilities on oil prices. The result further provides justification for the use of ARDL and NADRL because they accommodate variables integrated of order zero I(0) and order one I(1).
Next, the result of the NARDL estimates following the form specified in the model section of the study is declared in table 5 below:

**Table 5:** Summary of the NARDL Estimates.

| VARIABLES | MCAP | ASI |
|---|---|---|
| $OPVOL^{+}$ | 67.88(60.14)** | 79.16(88.53)** |
| $OPVOL^{-}$ | 61.30(17.30)** | 79.46(27.43)** |
| $ECM^{-1}$ | -0.07(4.41)** | -0.08(4.85)** |
| DIAGNOSTICS | | |
| F | 6.40 | 7.73 |
| LM | 0.82 | 1.42 |
| RESET | 0.11 | 0.26 |
| HET | 0.47 | 1.15 |
| CS/SS | STABLE | STABLE |
| $R^2$ | 0.20 | 0.28 |

**Source:** Author's Computation

The negative and positive partial sums of the volatility of the price of crude are shown as measurement of the symmetric and asymmetric reactions of market performance indicators to crude price volatility. Two dependent variables are used in this case All share index for market liquidity and market capitalisation for market depth. The

validity of our estimates are firstly confirmed before they were used in testing the formulated hypotheses.
The LM serial correlation tests with probability of 0.82 and 1.42 in the two models rule the existence of autocorrelated residuals while the BPG-Het tests suggest that the residuals are homoscedastic. The CUSUMsq and the probability values of the Regression Equation Specification Error Test (RESET) collectively confirm the stability of the investigated models.
Market depth was found to adjust positively to both positive and negative difference in oil prices. Positive oil price volatility produced a greater degree of increase in Market capitalisation at 67.88unit than negative changes with 61.30units change for every unit adjustment in oil price. With a variation in magnitude of positive and negative changes and a consistency in direction, the depth of the Nigerian stock market is found to be more responsive to positive push-factors than the negative ones.
Conversely, the results proved that positive changes in oil price positively and significantly increase all share index. The result shows that a unit positive difference in oil price volatility produced a 79.16 unit increase in all share index. It was discovered that negative difference in oil price produced a significant and positive effect on all share index. The result shows that a unit positive change in oil price volatility produced a 79.46 unit increase in all share index.
The error correction representations enter with the correct sign and direction in the two investigated models. It was proved that both stock market depth and liquidity/returns adjust to the disequilibrium arising from oil price volatility. It can be inferred that stock market depth adjusts to disequilibrium arising from oil price swing with a speed of 7%. This means that full equilibrium is restored in market depth in the event of such episodic changes in a little above 12months.
For the market returns model (LASI), the speed of adjustment is 8%. This implies that stock market returns fall back to full equilibrium a little above 12 months when unsettled by oil price movement. The adjustment profile of the two models fall within predictable threshold since the error correction terms are all less than one (1).
The finding arising from this study is consistent with the apriori theoretical and empirical expectation as the Nigerian stock market is shown to be responsive to the shocks and vicissitudes of the oil market. This is made even more profound by the fact that the economy is oil dependent and has the proclivity to react to the shocks and dynamics of the oil market generally but identifying the effect as it relates to the stock market becomes a key value addition of this study.

## 5. CONCLUSION

This work therefore was motivated by the desire to evaluate the impact of oil price volatility on stock market performance in Nigeria within the period 1970M01 – 2022M12. Using the Non-linear Autoregressive Distributed Lag (NARDL) approach developed by Shin, Yu and Greenwood Nimmo (2014) the study revealed that:

i. Oil price fluctuation symmetrically and asymmetrically exert significant effect on stock market depth proxied by stock market capitalization in Nigeria
ii. Stock market returns/liquidity proxied by all share index symmetrically and asymmetrically respond to oil price volatility in Nigeria.
iii. Stock market performance symmetrically and asymmetrically adjusts to the disequilibrium caused by oil price volatility in Nigeria.

This study recommends using hedging tools as stocks, exchange-traded funds, insurance, forward and futures contracts, swaps and options to cushion against the transmission effect of volatility of oil prices on stock market capitalization stock market performance. Also, since oil price volatility significantly impacts on stock market capitalization there should be intentional policies designed to protect the depth of the stock market from the unfavourable influence of energy price fluctuation. In addition, stock market operators should adopt diversification to areas that are less prone to oil price fluctuations. Government on the other hand should adopt protective policies that will continue to engender investors' confidence in the stock market while also providing government securities as viable option to risk averse investors.
This study is designed to stimulate discussion and generalization in this area of study especially for developing oil-rich economies in Asia and Africa who are exposed to the vagaries of the oil market. In addition, given the vulnerability of these countries' stock markets to cross border activities, understanding the dynamics of the oil markets which has a tendency to make them gain more from international exposures while reducing their vulnerabilities. Also, the fast-changing oil industry also brings asymmetries in the oil price stock market interaction. As countries continue to

migrate from fossil fuels to renewable energy (See Kalu, Arize, Okoyeuzu, Nwafor & Okwueze 2022), the dynamics keep changing and affects not just the stock market but the economy at large.

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