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GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 9, Issue 01, January 2021 Impact Factor: 5.779

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BRENT PRICE MOVEMENTS AND THE CHANGES IN THE NUMBER OF TRANSCATIONS IN THE NIGERIAN EQUITY MARKET

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Abstract
This study investigated the impact of Brent oil price movements on the number of transactions in the Nigerian stock market. Monthly frequency data were employed and covered the period from January1997 to August, 2020. The NARDL methodology was employed for data analysis. The results of the study show that Brent price movements have positve and non-significant effect on the number of transactions in the Nigerian equity market. Also,the results indicate the absence of asymmetry and long run relationship between the variables. We recommend that Nigeria should implement strategies that will ensure stability in its capital market by vigorously pursuing pro-growth policies irrespective of the movements in Brent price

Keywords: Brent oil price,Number of transactions,Stock market,Nigeria,NARDL.

1.Introduction

The intricacy of the world oil market has increased dramatically in recent years. There is the need for new approaches to understand, model, and forecast oil prices today (Huntingtona, Huang,Al-Fattahc, Gucwaa & Nouri,2020). In addition to the take off of the financialization era in oil markets, there have been structural changes in the global oil market. Sudden supply and demand modifications, such as the financial crisis of 2008-2009, faster Chinese economic growth, the Libyan uprising, the Iranian nuclear standstill or the deepwater horizon oil spill, all tend to change expectations and current prices. According to Huntingtona et al. (2020), the daily Brent spot price has fluctuated between $30 and above $140 per barrel since the beginning of 2004. The authors report that most researchers attribute the long-run oil price path to fundamental factors such as economic growth, resource depletion, technical advancements in both oil supply and demand, and the market organization of major oil petroleum exporting countries (OPEC). In addition, they

assert that several researchers attribute short-run price movements to fundamental supply and demand factors in a market that has very little quantity response to price changes

As a basic input in the production process, crude oil plays an important role in the world economy. Despite that role, changes in oil prices may have significant influence on the macro-economy; it could causes a slowdown in both economic growth and inflation. Theoretically, oil price shocks can impact macroeconomic activities through the supply and demand transmission channels(see Brown & Yucel, 2002; Cologni & Manera, 2008; Tang, Wu & Zhang, 2010 cited in Ekong & Effiong,2015). On the supply side, abrupt changes in oil price increases the marginal cost of production and lead to a reduction in capacity utilization and production. The increased production cost decreases investment expenditure through the uncertainty channel while consumption demand falls as a result of an increase in the prices of products. In addition,such fluctuations in oil price tend to worsen the terms of trade of oil-importing countries just as it transfers wealth to oil-exporting countries in the form of oil receipts. That is why it is pesumed that oil price shocks may have heterogeneous impact on the economies of both oil-importing and oil-exporting countries.

Oil price has witnessed a lot of upward and downward swings since the 1970s when the seminal work of Hamilton (1983) revealed that ten out of the eleven economic recessions that took place in America were caused by its oscillations Right from the end of the 20th century, the shocks in crude oil price have continued to be felt universally.For instance, the restriction of crude oil production and co-operation among the OPEC member states brought about the March 1999 spikes. Also, the growth of oil demand in Asia which signified its recovery took place as a result of the Asian financial crisis and a drop in oil production from non-OPEC countries (Al-Abri, 2013).

After 1999,oil price movements took place as follows.During the last quarter of year 2000, sharp increases in the price of crude oil were experienced;the price increased to the tune of more than $30 per barrel in the last quarter of 2000 (Chen, Hamori & Kinkyo, 2014). Ghosh and Kanjilal(2014)report that the members of Oil Producing and exporting countries (OPEC) tried to stabilize the prices by increasing or reducing production of crude oil at the prices ranging from $22 per barrel to $28 per barrel. Notwithstanding such efforts by the OPEC, there was a serious reduction in the price of crude oil in September 2001 as a result of the 9/11 attacks.This happened even when there were before then some decreases in oil production by non-OPEC exporters and the reduction of production quota by the OPEC member-nations. Almost immediately after that those steps were taken by the oil exporting countries,oil prices increased to $25. In 2004, oil prices rose from $25 to about $40 per barrel (Jimenez-Rodriguez, 2011). According to Chuku (2012), the factors responsible for the hyke in the price of oil were the steady devaluation of the United States dollar, the squabbles in the Middle East, China's enhanced demand for crude oil as well as the uncertainty of oil production in Russia.

In the early part of 2008,the price of crude oil movved down to less than $100 per barrel ; it went up to $140 per barrel in the middle of that year and by the year-end, the price had plummeted to $40 per barrel and changes were taking place almost on weekly basis week(Kilian,2009),. In 2011, the prices oscillated between $85 per barrel and $110 per barrel.Thereafter, there was shale oil glut. That culminated in the most recent and continuing oil price drop that started from June

2014.Also the global financial crisis of 2008 played a role in igniting a cyclical downturn in oil prices and stock market activity(Uzo-Peters, Laniran & Adenikinju, 2018).
Based on the overwhelming level of importance of crude oil, a lot of literature have since the 1970s investigated the impact of oil price shocks on the macro-economy(Ekong & Effiong,2015).Oil price movements have captured the attention of scholars who regard them as important determinants of macroeconomic activities and, ultimately, stock market indices in different parts of the universe. The degree of attention currently given to oil price movements is justified by the fact that oil prices play important roles in the modern economy. Cunado and Garcia (2003) and Kilian (2008) consider oil price shocks as a phenomenon that impacts significantly on domestic price levels, gross domestic product, investment and savings.Consequently, irregular and unpredictable movements in the energy markets have become an issue of serious concern (Eksi, Senturk & Vildirim, 2012).
Notwithstanding the general impression on the importance of oil price volatility and its economic consequences, the studies carried out on the relationship between oil price changes and stock markets are still relatively few, especially in Sub- Sahara Africa countries.
Masih, Peters and De Mello(2011) rationalize this dearth of studies as arising from the difficult nature of evaluating stock market activities. The few studies that have investigated such interactions were carried out mainly on industrialized net oil-importing countries such as the United States of America, United Kingdom and Japan (see Jones & Kaul 1996; Sadorsky, 1999; Akinlo,2014). In the recent times, however, several studies have shifted their focus to the relationship between oil price and stock returns. This recent upsurge of interest in the oil/stock relationships is attributed to the assumption of the investing public that such correlations have important implications for asset allocation and portfolio optimization.

Researchers like Jones and Kaul (1996) and Huang, Masulis and Stoll (1996) pioneered the empirical investigations into the relationship between oil prices and stock markets. Since 1996, this topic has continued to catch the attention of the financial press, investors, policymakers, researchers, and the general public. Generally, the studies were concentrated in developed economies.However, they emerged with mixed results. One group of studies observed positive relationship..Another group witnessed negative correlation while yet another group of studies failed to observe any causal *nexus* between oil price shock and stock market return. Some of the studies that observed some relationship between the variables found the effect of oil price shock on stock market return to be significant while others considered the effect to be non -significant. In addition, many of the studies that expanded their scopes to cover more than one country did not obtain consistent results for all of them.According to Brucal and Roberts (2018),this may have arisen because different kinds of shocks are likely to have different effects on different states, depending on the state's comparative advantage in oil production The authors found that the connection between oil and economic activity is not completely clear and that the negative impact of oil price increases are greater than the positive impact of oil price reductions.
Some other researchers propose that, with regard to the reaction in the stock market, oil demand price shocks are more important than oil supply price shocks and that lower fuel cost do not lead to augmented stimulus of firms who deeply rely on oil in their production activities.

The studies so far carried out in Nigeria have also emerged with mixed results. For instance, while the findings of Adaramola (2012) and Effiong (2014) disclose negative relationship between oil price shocks and stock market returns in Nigeria, Adebiyi,Adenuga,Abeng and Omanukwe (2010), Mordi, Michael and Adebiyi (2010), Asaolu and Ilo (2012), Akinyele and Ekpo (2013) Ogiri,Amadi,Uddin, and Dubon (2013), Effiong (2014), Akinlo (2014) Nwanna and Eyedayi (2016), Iheanacho (2016), Lawal , Somoye and Babajide (2016), Ojikutu,Onolemhemhen (2017), and Soyemi, Akingunola and Ogebe (2017) , among others, emerged with results that suggest positive influence of oil price changes on Nigerian stock market returns. Yet some studies assert that oil price shocks have no effect on stock market returns. Mordi et al. (2010) have results suggesting that oil price shocks have asymmetric effects on Nigerian stock market returns. For Ekong and Effiong (2015), macroeconomic aggregates show different response patterns to changes in oil price in Nigeria. The works of Nwanna and Eyedayi (2016) and Iheanacho (2016), among others, also suggest positive influence of oil price changes on Nigerian stock market returns.

In the face of all those conflicting reports, there is a clear knowledge gap which this paper attempted to close. This work revisits and extends the literature on the oil price/stock price relationship by exploring the effect of Brent oil price on the number of transactions in the Nigerian stock market. It differs from other studies in the past in a number of respects since, unlike many of those studies conducted in the past on Nigerian economy which employed annual or quarterly data, it used monthly frequency data and employed the non-linear autoregressive distributed lag(NARDL) model to estimate the relationship.

This study is motivated to contribute in filling this vacuum, considering the importance of finding out the exact relationship between oil price changes and the stock market returns. The importance of this venture is underscored by its envisaged ability to generate results that will improve stock returns forecasting accuracy, provide relevant information for investors and policy makers, make available reference materials for researchers and the academia as well as assist firms in constructing diversified portfolios and determining risk management strategies (see Youssef & Mokni,2019). This study covers the period from January 1st, 1997 to August, 2020.

.The remaining part of the paper is arranged as follows. Section 2 provides a review of the related literature. Section 3 describes the methodology adopted in this study. Section 4 presents the estimation results and diiscussions, while section 5 concludes the study.

2.0 Review of the Related Literature

2.1 Theoretical and Conceptual Framework

Crude oil is one of the most widely used commodities as it is employed in various forms in all sectors and at virtually all the levels of the economy of the universe(see Arnold,Guerene & Mendy,2018).According to the authors, in spite of the recent advent of renewable and alternative energies sources, the level of world crude crude oil intake has not altered.Rather, the rate of consumption of petroleum continues to be on the increase, especially among the developed countries . It is one of the most essential commodities and has a significant impact on country's economic activity, whether it is an importer or an exporter of oil. Arnold et al. (2018) assert that the prices of crude oil depend on market demand, the quantity produced, the reserves available, the geopolitical situation, and a number of other factors

Generally, it is understood that oil price increase leads to an increase in production costs. Hamilton (1988a, 1988b) as well asBarro (1984) cited in Youssef and Mokni (2019) contend that the escalating cost of petroleum will affect consumer's behavior, which will, in turn, decrease their demand and spending. Also, globally, in the oil-exporting countries in which oil plays a crucial role in the economy, the stock market is more sensitive to oil price changes than in the oil-importing countries(Kelikume.& Muritala,2019). A decrease in the consumption of crude oil will cause a decrease in production which will in turn increase unemployment (Brown & Yücel, 2001; Davis & Haltiwanger, 2001). In addition, movements in oil price affect stock markets as a result of the uncertainty they create for the financial sector. Williams (1938) and Fisher (1930) in Youssef and Mokni,2019) claim that any factor that can change the discounted cash flows wll have a significant influence on an asset price.Because of this,Hamilton (1996) and Sadorsky (1999) propose that an increase in oil price would result in a reduction in production since such a rise in oil price will make inputs more expensive and affect the level of inflation directly.

According to Taiwo,Abayomi and Damilare (2012), the Hotelling`s theory on oil price assumes that if non – renewable resources has to compete with other assets, there must be a systematic way to forecast their future prices. In addition, the theory It proposes that the owners of non-renewable resources will only produce a supply of their product if it will yield more than the instrument available to them in the market such as bonds and other interest bearing securities.

Stock markets are generally considered as the yardstick for measuring the performance of the economy of a nation. They play an essential part in capital accumulation, the productivity of capital, financing of innovations in technology and economic development (Levine,1997). Theoretically, oil prices have a strong link with stock markets the movements in oil price affect stock markets through their influence on economic activity, corporate income, inflation, and monetary policy(Huang et al.1996).

The most prominent indicators of capital market performance, particularly in Nigeria, include gross capital formation, market capitalization, all share index, total value of shares traded, trading volume, number of transactions, total new issues, listed domestic companies, total listed equities, government stock(bonds), market size, market concentration, efficiency of the assets pricing process in the securities market and liquidity of the stock exchange(Odo, Anioke,Onyeisi & Chukwu, 2017). This paper is concerned with one of the performance indicators – number of transactions.

Okereke (2000) cited in Taiwo,Abayomi and Damilare (2012) proposes that the provision of equity capital to the market enables companies to avoid over – reliance on debt financing and consequently improve corporate debt to equity ratio According to Alile (1997), the determination of the overall growth of an economy depends on how efficiently the stock market performs its allocative function of capital. As the stock market mobilizes savings, the market allocates a larger proportion of it concurrently to the companies that have relatively high prospects as shown by its rate of returns and level of risk. This is perfected by the mechanism of demand and supply. The theory on stock price has to do with the Efficient-Market Hypothesis (EMH). The latter asserts

that financial markets are information efficient. This implies that one cannot consistently achieve returns that are in excess of average market returns on a risk – adjustment basis, given the information publicly available at the time the investment is made. The theory specifies three major versions, nanely weak, semi-strong and strong.Theweak MH claims that prices on traded assets already reflect all past publicly available information. The semi strong EMH assumes that prices instantly change to reflect new public information while the strong EMH additionally posits that prices instantly reflect even hidden or insider information. However, based on the Random Walk Hypothesis put forward by a French Broker Jules Regnault, the stock market prices evolve according to a random walk. Consequently, the price of the stock market cannot be predicted. Hence, there is no exact regularities or patterns in security prices that repeat themselves overtime such will enable one to predict future stock prices based on the past prices (Taiwo, Abayomi & Damilare, 2012).

Number of transactions or number of deals in a capital market refers to the number of times in a given period that shares are sold. One transaction deal can involve one hundred or more shares. In a typical stock market, two general types of securities are mostly traded, namely over- the- counter (OTC) and listed securities. Listed securities are those securities which are traded on exchanges. They are supposed to meet the reporting regulations of the SEC as well as the exchanges on which they are quoted.

According to the Nigerian Stock Exchange(2020)'s Domestic and Foreign Portfolio Investment Report ofFebruary 2020, the information on the retail and institutional components of total domestic transactions in February 2020, based on data obtained from the monthly stockbroking transaction report of about 99% of the Active Dealing Members of The Exchange,discloses the foreign portfolio investment(FPI) outflow.It contains the rge information on the sales transactions or liquidation of portfolio investments through the stock market as well as the FPI inflow which includes purchase transactions on the Nigerian Stock Exchange (Equities only). On a monthly basis, The Nigerian Stock Exchange(NSE) collects trading figures from market operators on their Domestic and Foreign Portfolio Investment (FPI) flows. According to the report of the NSE,as at 29 February 2020, the total transactions at the Nigeria's bourse decreased by 36.93% from N235.46 billion (about $767.23million) in January 2019 to N148.50 billion (about $484.60 million) in February 2020. The performance of February 2020 when compared to the performance in the same period (February 2019) of the prior year showed that total transactions decreased by 21.04%. In February 2020, the total value of transactions executed by Domestic investors outperformed transactions executed by Foreign investors by about 4% . Egene(2020), reports that domestic investors had continued to dominate trading at the stock market as statistics showed that they accounted for 54.63 per cent of the total transactions in the month of March, 2020.The authe-or reports that the domestic investors have been leading foreign investors since the beginning of 2020, accounting for 70.1 per cent in January, 51 per cent in February and 54.63 per cent in March,2020. Citing the numbers released by the Nigerian Stock Exchange (NSE), investors traded N242.91 billion in the month of March. This was an increase of 63.58 per cent above the N148.5 billion recorded in February. The performance of March when compared to the performance in March 2019, revealed that total transactions increased by 120.6 per cent from N110.11 billion

Egene (2020) asserts that domestic investors accounted for N132.69 billion, which was a 54.63 per cent, while foreign investors accounted for N110.22 billion or 45.37 per cent. The performance of March when compared to the performance in March 2019, revealed that total transactions increased by 120.6 per cent from N110.11 billion.

2.2 Empirical Review

The relationship between oil price and stock returns has come to the forefront of public concern probably because crude oil prices have continued to exhibit an exceptional volatility. This sharp movement in crude oil prices has increased uncertainty in the energy sector, the entire economy as well as the financial markets.(Dhaoui & Khraief,2014) According to Dhaoui and Khraief (2014),this situation explains the enhanced interest among researchers in re-invstigating the reasons for the negative relationship between oil prices and the stock returns.Several previous studies are unanimous in positing that oil price also increases volatility and causes rising inflation and unemployment. Consequently,they depress macroeconomic growth and financial assets.

The major studies on oil changes have been focused on their effects on macroeconomic variables. Among others, Rebeca and Sanchez (2004, 2009), Sandrine and Mignon (2008), and Yazid and Dissou (2010) cited in Dhaoui and Kkraief (2014) report that macroeconomic variables are significantly influenced by oil price movements. Eksi, Senturk and Yeldirm (2012) propose that as oil is an important input for many industries, the increase in oil price sparks off economic crises by causing significant cost-push inflation and higher unemployment. In the same respect, Basher and Sadorsky (2006) argue that an increase in oil prices acts as inflation tax. With a rise in oil price, consumers are compelled to look for alternative energy sources just as they face increased risk and uncertainty that affect the stock price significantly and reduce wealth (Basher & Sadorsky,2006).

Dhaoui and Kraief (2014) sought to determine empirically whether oil price shocks affect stock market returns, using monthly data for eight developed countries for the period from January 1991 to September 2013.The authors observed significant negative correlations between oil price and stock market returns in seven of the selected countries. They observed that oil price changes have a non- significant effect on the stock market of Singapore. movements in oil prices were seen to be significant for six markets but without much effect on the others.

The early disagreed in their findings on the nature of the oil/stock relationship. For instance, while Faff & Brailsford (1999) observed a positive link, others like Jones & Kaul (1996), Sadorsky (1999) and Cunado & Perez de Gracia (2014) found a negative connection. Kilian and Park (2009) report that the response of the US stock returns to oil price changes depends on whether the latter are driven by supply-side or demand-side shocks.

Hsiao, Li,Yang and Chang(2005) examined the relationship between expected stock returns and volatility in twelve large international stock markets spanning the period from January 1980 to

December 2001.Using EGARCH-M models, the authors found a positive but non-significant relationship during for the majority of the markets. However, after using a flexible semi-parametric specification of conditional variance, they found evidence of a significant negative relationship between expected returns and volatility in six out of the twelve markets.

Sim, and Zhou (2015) investigated the relationship between oil prices and US equities by proposing a new quantile-on-quantile approach to construct estimates of the effect that the quantiles of oil price shocks have on the quantiles of the US stock return.The results of the study show that large and negative oil price shocks can affect US equities positively when the US market is doing well and that negative oil price changes can affect the US stock market.

The majority of the studies that investigated the nexus between oil price inAfrica focused their attention on the Nigerian stock market. Some of them includeAsaolu and Ilo (2012), Babatunde, Adenikinju.and Adenikinju (2013), Adebiyi, Adenuga, Abeng and Omanukwue (2009) and Ogiri, Amadi, Uddin and . Dubon (2013). They examined the impact of oil prices on the Nigerian stock market.Nevertheless,the study byChisadza, Dlamini,. Gupta and Modise (2013) investigated the impact of oil prices on the South African stock market. Also, Gatuhi and Macharia (2013) explored the correlation between diesel prices and stock market returns. Maghyereh (2004) studied the relationship between oil prices and 22 emerging stock markets in South Africa, Egypt, and Morocco. Afolabi and Dada(2014)carried out a study centered on trends of share prices in Nigeria Stock market between 1988-2011.The result of the study showed that market capitalization and exchange rate are very good determinants of share price volatility, while inflation is not.
,Ekong and Ebong(2016) modelled the dynamic relationship that exists between crude oil prices, stock market indicators and the economic growth in Nigrria using vector autoregressive (VAR) model and cointegration analysis. The authors employed market capitalization and exchange rate as proxies for stock market indicators and economic growth. The dat series consisted of monthly data points from 1995:1 to 2014:11 totaling up to 239 observations obtained from the Nigerian stock market and Central Bank of Nigeria bulletin. The studyrevealed the existence of a viable, long run and sustainable relationship among the series from the cointegration analysis. Soyemiet al. (2017) found that the studies on the connection between oil price and financial markets, especially with respect to stock market, are relatively more recent and they end up with mixed results.

3. Methodology

3.1 Data

This empirical work was centered on examining the effect of Brent price(OP) movements on the changes on the number of transctions(NOD) in the Nigerian equity market**.It employed** monthly historical data that covered the period from January 1997 to August 2020. The Brent oil prices per barrel were retrieved from the US Energy Information Administration (EIA) short-term outlook.In this paper, OP was selected as the explanatory variable. Monthly data series were used for estimation in conformity with the general preference of researchers, especially when investigating oil-stock-prices relationships. The monthly Brent spot prices were retrieved in US dollars. In order to check for robustness, some pre-tests were caccried out with other crude oil

benchmarks such as West Texas Intermediate (WTI) and the OPEC spot prices. We ascertained that using those oil prices instead of the Brent spot prices did not significantly change the results of our benchmark specifications. The monthly data on Nigeria's number of transactions were obtained from the Nigeria Stock Exchange (NSE), Stock Exchange House, 2-4 Customs Street, Lagos, Nigeria through contactcentre@nigerianstockexchange.com and www.nse.com.org. Each of the two data series used for the work comprised 284 observations.

3.2. Model specification

This study used the Nonlinear Autoregressive Distributed Lag(NARDL) model to examine the effect of Brent price(OP) movements on the changes on the number of transctions in the Nigerian equity market.The choice of this method of empirical estimation aligns with the studies by Jungo and Kim (2019) that were based on the assumption of nonlinearity. To investigate the subject thoroughly, it took specific account of the asymmetric effects of oil price changes during the modeling activity.

We are motivated to use the NARDL, a modified form of ARDL, introduced by Shin,Yu and Greenwood-Nimmo(2014).The reason is that it is said to be one of the simplest methods available for modeling combined short- and long-run asymmetries(Allen &McAleer,2020). Paseran, Shin and Smith (2001) report that NARDL employs the bounds testing framework and can be applied to both stationary and non-stationary time series vectors, or combinations on the condition that none of the data series is of the I(2) integration order.NARDL also accounts for asymmetry in stock data analysis which yields robust inferences(Ghosh & Kanjilal, 2016). Apart from theNARDL's flexibility of allowing both I(0) and I(1)in the model, its approach to cointegration provides several more advantages over other methods [Phong, Bao & Van.2017; Phong, Bao & Van,2018).

The calculation procedure of NARDL is similar to that of the traditional ARDL as soon as cointegration of the variables is tested (Phong et al.,2019).The general ARDL model for one dependent variable Y and a set of independent variable $X_1,X_2,X_3,...,X_n$ is denoted as$ARDL(p_0$ $p_1,p_2,p_3,...,p_n)$, in which p_0 is the lag order of Y and the rest are respectively the lag orders of X_1, X_2, $X_3,...,X_n$.

$ARDL(p_0, p_1, p_2, p_3,...,p_n)$is written as follows: $Y_t=\alpha+p_0\sum i=1(\beta_{0,i}\cdot Y_{t-1})+p_1\sum j=0(\beta_{1,j}\cdot X_{1,tj})+ p_2\sum k=0(\beta_{2,k}\cdot X_{2,t-k})+p_3\sum l=0(\beta_{3,1}\cdot X_{3,t-1})+...+p_n\sum m=0 (\beta_{n,m}\cdot X_{n,t-m}) +\varepsilon t.(1)$

T he NARDL methods also begin with bound test procedure to identify the cointegration among the variables; in other words, the long-run relationship among the variables(Pesaran & Pesaran,1997). The unrestricted error correction model (UECM) form of ARDL is shown as:$\Delta Y_t=\alpha+p_0\sum i=1(\beta_{0,i}\cdot\Delta Y_{t-1})+ p_1\sum j=0(\beta_{1,j}\cdot\Delta X_{1,t-j})+p_2\sum k=0(\beta_{2,k}\cdot\Delta X_{2,t-k})+ p_3\sum l=0(\beta_{3,1}\cdot\Delta X_{3,t-1})+...+p_n\sum m=0(\beta_{n,m}\cdot\Delta X_{n,t-m}) +\lambda_0\cdot Y_{t-1}+\lambda_1\cdot X_{1,t-1}+\lambda_2\cdot X_2,t-1+\lambda_3\cdot X_{3,t-1}+...+\lambda_n\cdot X_{n,t-1}+\varepsilon t.(2)$

These hypotheses are tested to find the cointegration among the variables. The null hypothesis $H_0:\lambda_0=\lambda_1=\lambda_2=\lambda_3=...=\lambda_n=0$: (no cointegration) against the alternative hypothesis $H_1:\lambda_{06}=\lambda_{16}=\lambda_{26}=\lambda_{36}=...{}_6=\lambda_{n6}=0$. (there exists cointegration among variables). The null hypothesis is rejected if the F statistic is greater than the upper bound critical value at standard significance level.However, if the F statistic is smaller than the lower bound critical value, H_0 cannot be

rejected.If the F statistic lies between the upper and lower bound critical values, it implies that there would be no conclusion about the null hypothesis.
After identifying the cointegration among variables, the next step is to ensure that the NARDL model is stable and trustworthy by conducting a number of preliminary tests,such as Wald test, Ramsey's RESET test , Larange multiplier (LM) test, CUSUM (Cumulative Sum of Recursive Residuals) and CUSUMSQ (CumulativeSum of Square of Recursive Residuals).Those tests allow some other essential examinations such as serial correlation, heteroscedasticity and the stability of residuals to be carried out. After the NARDL model's stability and reliability have been confirmed,the short-run and long-run estimations can be carried out.

The NARDL model for this study was specified as follows:-

$$\Delta NOD_t = \alpha_0 + \rho NOD_{t-1} + \beta_1^{+} OP^{+}_{t-1} + \beta^{-}_{2} OP^{-}_{t-1} + \sum_{t=1}^{-p} \alpha_1 \Delta NOD_{t-1} + \sum_{t=0}^{-p} \alpha_2 OP^{+}_{t-1} \sum_{t=0}^{-p} \alpha_3 OP^{-}_{t-1} + \mu_t \text{ .....(4)}$$

In the NARDL equation as modeled above, αi represent short run coefficients while βi stand for the long term coefficients with i = 1....4th. While the short term analysis relates to the immediate effect of the independent variable on the dependent variable, the long term analysis reveals the speed of adjustment towards equilibrium. The variables NOD_t and OP_t in this model represent monthly numbers of transaction and Brent spot oil prices respectively; t stands for time. Wald test is run to know the long run asymmetry $\beta=\beta+=\beta-$ and for short run asymmetry $\alpha=\alpha+=\alpha-$ for the variables of the study.

4.NARDL results and discussion

4.1 Descriptive statistics

Table 1:The effect of oil price changes on the number of transactionss in the Nigerian stock market.

Section 1: Descriptive Statistics

	NOD	OP
Mean	89187.48	57.72750
Median	79668.50	55.72500
Maximum	475952.0	133.9000
Minimum	3558.000	9.800000
Std. Dev.	72646.30	32.16818
Skewness	1.975572	0.451290
Kurtosis	8.682608	2.149733
Jarque-Bera	566.8589	18.19500

Probability	0.000000	0.000112
Sum	25329244	16394.61
Sum Sq. Dev.	1.49E+12	292846.1
Observations	284	284

Table 1 presents the descriptive statistics for price series as well as their stochastic properties. The monthly average oil price is 57.72USD and NOD has an average of 89187.48. On a monthly basis, the number of transactions and oil prices reach their maximum value of 475952.0 and 133.9USD respectively. The two series are positively skewed. NOD has a peaked kurtosis. The Jarque-Bera test indicates the non-normality of NOD and OP oil price series.

4.2 NARDL Tests for stationarity

Table 2.1a Unit Root Test for Stationarity for Oil Price (OP) (At level)
Null Hypothesis: OP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.066324	0.2587
Test critical values:	1% level	-3.453400	
	5% level	-2.871582	
	10% level	-2.572193	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(OP)
Method: Least Squares
Date: 12/04/20 Time: 07:09
Sample (adjusted): 1997M03 2020M08
Included observations: 282 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OP(-1)	-0.023666	0.011453	-2.066324	0.0397
D(OP(-1))	0.159905	0.058968	2.711706	0.0071
C	1.443707	0.757448	1.906014	0.0577

R-squared	0.036984	Mean dependent var	0.084787
Adjusted R-squared	0.030080	S.D. dependent var	6.254042

S.E. of regression	6.159262	Akaike info criterion	6.484372
Sum squared resid	10584.29	Schwarz criterion	6.523116
Log likelihood	-911.2965	Hannan-Quinn criter.	6.499909
F-statistic	5.357337	Durbin-Watson stat	2.036816
Prob(F-statistic)	0.005211		

The result of unit root test for OP (at level) in table 2.1a indicates that the t-statistic -2.066324 and the p-value is 0.2587.Since p-value is greater than 0.05, the null hypothesis that OP has a unit root was rejected .This implies that OP is not stationary at level.Consequently, the test was repeated with OP at first difference(table 2.1.b).

Table 2.1.b. Unit Root Test for Stationarity for Oil Price (OP) (at First Difference)

Null Hypothesis: D(OP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.40261	0.0000
Test critical values:	1% level	-3.453400	
	5% level	-2.871582	
	10% level	-2.572193	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(OP,2)
Method: Least Squares
Date: 12/04/20 Time: 07:10
Sample (adjusted): 1997M03 2020M08
Included observations: 282 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OP(-1))	-0.850886	0.059079	-14.40261	0.0000
C	0.074333	0.368937	0.201480	0.8405

R-squared	0.425565	Mean dependent var	0.014681
Adjusted R-squared	0.423513	S.D. dependent var	8.159340
S.E. of regression	6.195120	Akaike info criterion	6.492468
Sum squared resid	10746.26	Schwarz criterion	6.518297
Log likelihood	-913.4380	Hannan-Quinn criter.	6.502826
F-statistic	207.4352	Durbin-Watson stat	2.029434

Prob(F-statistic)	0.000000

The result of unit root test for OP at first difference shows that the t-statistic is -14.40261 while the p-valueis 0.0000.Since the p-value is less than 0.05, the null hypothesis that OP has a unit root was rejected in favor of the alternative hypothesis.This implies that OP is stationary at first difference

Tble 2.2a. Unit Root Test for Stationarity for Number of Deals (NOD) (At level Form)

Null Hypothesis: NOD has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.555564	0.1036
Test critical values:	1% level	-3.453400	
	5% level	-2.871582	
	10% level	-2.572193	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NOD)
Method: Least Squares
Date: 11/03/20 Time: 02:44
Sample (adjusted): 1997M03 2020M08
Included observations: 282 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NOD(-1)	-0.056033	0.021926	-2.555564	0.0111
D(NOD(-1))	-0.272559	0.057447	-4.744557	0.0000
C	5345.053	2508.044	2.131164	0.0339

R-squared	0.110606	Mean dependent var	257.3901
Adjusted R-squared	0.104230	S.D. dependent var	27755.71
S.E. of regression	26269.42	Akaike info criterion	23.20078
Sum squared resid	1.93E+11	Schwarz criterion	23.23952
Log likelihood	-3268.310	Hannan-Quinn criter.	23.21632
F-statistic	17.34834	Durbin-Watson stat	2.017444
Prob(F-statistic)	0.000000		

The result of unit root test for NOD at level indicates that the t-statistic is -2.555564 whle the

p-value is 0.1036. Since the p-value is greater than 0.05, therefore we had to accept the null hypothesis that NOD has a unit root. That is, it is not stationary at level .We proceeded to carry out aditional test at first difference(Table 2.2bs.).

Table 2.2b. Unit Root Test for Stationarity for Number of Deals (NOD) (At First Difference Form)

Null Hypothesis: D(NOD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-22.79461	0.0000
Test critical values:	1% level	-3.453400	
	5% level	-2.871582	
	10% level	-2.572193	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NOD,2)
Method: Least Squares
Date: 11/03/20 Time: 02:51
Sample (adjusted): 1997M03 2020M08
Included observations: 282 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NOD(-1))	-1.299644	0.057015	-22.79461	0.0000
C	335.2550	1579.766	0.212218	0.8321

R-squared	0.649822	Mean dependent var	-2.468085
Adjusted R-squared	0.648572	S.D. dependent var	44748.63
S.E. of regression	26527.61	Akaike info criterion	23.21683
Sum squared resid	1.97E+11	Schwarz criterion	23.24266
Log likelihood	-3271.573	Hannan-Quinn criter.	23.22718
F-statistic	519.5941	Durbin-Watson stat	2.030762
Prob(F-statistic)	0.000000		

The result of unit root test for NOD at first difference shows that the t-statistic is -22.79461 while the p-value is 0.0000. Since the p-value is less than 0.05, we had to reject the null hypothesis that NOD has a unit root and it is not stationary,We concluded that NOD does not have a unit root and that it is stationary at level .

In suummary, the unit root test results show that both oil price and number of transactions are stationary at the I(1) order integration.

4.3 Bound Test

table 3a: Short and long term relationship: bounds test

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNOD)
Selected Model: ARDL(3, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 11/11/20 Time: 21:31
Sample: 1997M01 2020M08
Included observations: 281

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.815164	0.283879	2.871516	0.0044
LNOD(-1)*	-0.076533	0.028449	-2.690159	0.0076
LOP_POS**	0.076906	0.044274	1.737031	0.0835
LOP_NEG**	0.079125	0.045882	1.724514	0.0857
D(LNOD(-1))	-0.407495	0.061002	-6.680025	0.0000
D(LNOD(-2))	-0.142327	0.059173	-2.405279	0.0168

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOP_POS	1.004878	0.380876	2.638335	0.0088
LOP_NEG	1.033872	0.426480	2.424195	0.0160
C	10.65119	0.489606	21.75461	0.0000

EC = LNOD - (1.0049*LOP_POS + 1.0339*LOP_NEG + 10.6512)

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	2.650523	10%	2.63	3.35
K	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
			Finite Sample: n=80	
Actual Sample Size	281			
		10%	2.713	3.453
		5%	3.235	4.053
		1%	4.358	5.393

The result of bounds test (See table 3a) shows that the F-Statistic is 2.650523.The Critical Value of the lower bound I(0) is 3.1 at 5%.We therefore failed to reject the Null hypothesis that there is no cointegration among the variables since 2.650523 is less than critical values of I(0).Hence, there is no cointegration among the variables.This implies that there is no long run relationship between the variables.Consequently, we specified only the short run model since there is no cointegration between the variables**.**

Table 3b:Dynamic Estimation of NARDL

Dependent Variable: LNOD
Method: ARDL
Date: 11/11/20 Time: 21:30
Sample (adjusted): 1997M04 2020M08
Included observations: 281 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LOP_POS LOP_NEG
Fixed regressors: C
Number of models evalulated: 100
Selected Model: ARDL(3, 0, 0)

Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNOD(-1)	0.515973	0.059808	8.627202	0.0000
LNOD(-2)	0.265168	0.065477	4.049811	0.0001
LNOD(-3)	0.142327	0.059173	2.405279	0.0168
LOP_POS	0.076906	0.044274	1.737031	0.0835
LOP_NEG	0.079125	0.045882	1.724514	0.0857
C	0.815164	0.283879	2.871516	0.0044

R-squared	0.934631	Mean dependent var	11.04008
Adjusted R-squared	0.933443	S.D. dependent var	0.996201
S.E. of regression	0.257007	Akaike info criterion	0.141691
Sum squared resid	18.16440	Schwarz criterion	0.219378
Log likelihood	-13.90754	Hannan-Quinn criter.	0.172848
F-statistic	786.3819	Durbin-Watson stat	2.008113
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selction.

4. 4: Dynamic Estimation of NARDL

The response of number of transactions to positive and negative shocks in oil price

The NARDL estimation result in table 3 indicate that one unit increase in oil price (LOP_POS) is associated with 0.076906 or (7.6%) increase in number of transactions. Positive shocks in oil price (LOP_POS) have non - significant effect on the number of transactions since the p-value is 0.0835. The p-value is greater than 0.05. Consequently, we had to accept the null hypothesis that oil price shocks have non-sgnificant effects on number of transactions.Also, the NARDL estimation result in table 3 show that one unit decrease in oil price (LOP_NEG) (Negative shocks) is associated with 0.079125 or (7.9%) decrease in number of deals. Negative shocks in oil price (LOP_NEG) do not have a statistically significant effect on the number of transactions since the p-value is 0.0857 which is greater than 0.05.Consequently, we had to accept the null hypothesis that oil price movements do not have some statistically significanteffect on number of transactions. In summary, the NARDL estimation results show that Brent price movements have positve and non-significant effect on the number of transactions in the nigerian equity market

4.5 Testing for Short-Run Asymmetries

We determined if the difference between the coefficient of the POS and NEG shocks is statistically significant. Should we have found the difference to be significant, we would be concludng that

the relationship between number of transactions and oil price is asymmetric.In table 5, the p-value of the F-statistics is 0.4004. This means that we should accept the null hypothesis that both the positive and negative shocks in the oil price are the same.Since the positive and negative shocks have the same effect on number of transactions,we concluded that there is no asymmetric effect between them.

Tabl4:Short-Run Asymmetric Test using Wald Test

The question is, are the two shocks of the same magnitude (symmetric effect) or are they different (asymmetric effect)?

The Null hypothesis is that the two impacts are the same. i.e. No short-run asymmetry.

Wald Test:
Equation: NARDL10

Test Statistic	Value	df	Probability
t-statistic	0.842168	275	0.4004
F-statistic	0.709247	(1, 275)	0.4004
Chi-square	0.709247	1	0.3997

Null Hypothesis: C(3)=C(4)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(3) - C(4)	0.065421	0.077681

Restrictions are linear in coefficients.

4.6: Heterskedasticity Test

Table 6 presents the result of the heterskedasticity test. A p-value of 0.2179 shows that the null hypothesis that which means that the residual is homoskedastic should be accepted.

Section 5: Serial Autocorrelation LM Test

Taable 6: Heterskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.417822	Prob. F(5,275)	0.2179
Obs*R-squared	7.061740	Prob. Chi-Square(5)	0.2161
Scaled explained SS	68.58087	Prob. Chi-Square(5)	0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares

Date: 11/11/20 Time: 22:24
Sample: 1997M04 2020M08
Included observations: 281

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.191133	0.320921	-0.595577	0.5519
LNOD(-1)	-0.139496	0.067612	-2.063199	0.0400
LNOD(-2)	0.069702	0.074020	0.941662	0.3472
LNOD(-3)	0.099105	0.066894	1.481529	0.1396
LOP_POS	-0.044103	0.050052	-0.881152	0.3790
LOP_NEG	-0.037792	0.051869	-0.728608	0.4669

R-squared	0.025131	Mean dependent var	0.064642
Adjusted R-squared	0.007406	S.D. dependent var	0.291624
S.E. of regression	0.290542	Akaike info criterion	0.386984
Sum squared resid	23.21404	Schwarz criterion	0.464671
Log likelihood	-48.37128	Hannan-Quinn criter.	0.418141
F-statistic	1.417822	Durbin-Watson stat	1.392595
Prob(F-statistic)	0.217881		

4.7 Serial correlation test

Table 7 presents the result of the serial correlation test. The F-statistic has a p-value of 0.2021 .Consequently, we had to accept the null hypothesis that there is no serial autocorrelation problem.

Table 7: Serial correlation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.608273	Prob. F(2,273)	0.2021
Obs*R-squared	3.272249	Prob. Chi-Square(2)	0.1947

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 11/11/20 Time: 22:24
Sample: 1997M04 2020M08
Included observations: 281
Presample missing value lagged residuals set to zero.

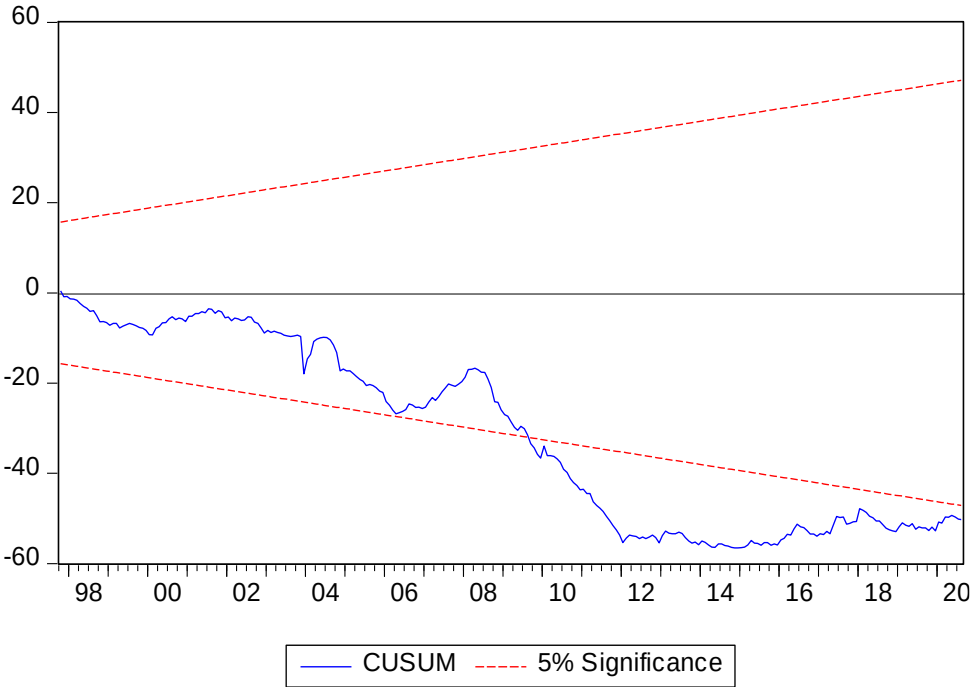
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNOD(-1)	-0.953160	0.916086	-1.040471	0.2990
LNOD(-2)	1.028284	0.813543	1.263959	0.2073

LNOD(-3)	-0.097732	0.149296	-0.654618	0.5133
LOP_POS	0.021366	0.063289	0.337594	0.7359
LOP_NEG	0.023654	0.065339	0.362014	0.7176
C	0.254233	0.568889	0.446894	0.6553
RESID(-1)	0.939807	0.913880	1.028371	0.3047
RESID(-2)	-0.569261	0.363749	-1.564984	0.1187

R-squared	0.011645	Mean dependent var	1.71E-15
Adjusted R-squared	-0.013697	S.D. dependent var	0.254702
S.E. of regression	0.256440	Akaike info criterion	0.144212
Sum squared resid	17.95288	Schwarz criterion	0.247795
Log likelihood	-12.26182	Hannan-Quinn criter.	0.185755
F-statistic	0.459507	Durbin-Watson stat	2.011256
Prob(F-statistic)	0.863247		

4.8 Stability Test

Fig.1 is the gragh employed to test the stability of the model used for estimation.The graph extended beyond the 5% significance boundary. This implies that the model is unstable.



.Fig 1: Stability test

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4.9 Discussion of findings

This study investigated the effect of Brent oil price movements on the number of transactions in the Nigerian capital market.It employed the nonlinear autoregressive lag model to capture the possible short-, medium-, and long-term causal effects between the variables of the study as well as the asymmetric nature of their relationship. The NARDL estimation was done after ex-raying the properties of the variables and ascertining their stationarity status. In addition,some preliminary tests were conducted to establish whether serial correlation was present,find out the nature of the data series, the short and lungrun relationship among the variables, the homoeskedasticity or heteroskedasticity of the date series,the long run relationship of the variable.the stability of the model and whether the relationship between them is asymmetric. The NARDL equation was estimated with oil price used as exogenous variable to number of transactions. .

The result of the study indicates that Brent price movements have positve and non-significant effect on the number of transactions in the Nigerian equity market. Also,the result suggests homoskedasticity, the absence of serial correlation and the absence of asymmetry and long run - relationship between the variables. Th9s result is inline with the findings of several empirical studies that propose a positve relationship between oil price and stock market return such as Alsharif(2020),Agbo and Nwankwo(2020), Asaolu and Ilo (2012) and Akinlo (2014).It confirms that an increase(decrease)in oil price positively(negatively)affects the corporate output, which positively affects the stock market returns (Arouri & Rault, 2009). It is in conformity with a priori expectation for an oil exporting country like Nigeria that an increase or decrease in the international oil price should have positive effect on Nigeria's stock market performance The non-significant effect of the oil supply indicates, again, that oil price changes tookplace mainly due to demand shocks, rather than supply shocks (Kilian, 2009; Kilian & Park, 2009; Hamilton, 2009). One of the policy implications of the findings of this study is that investors should not diversify in both oil and stock markets since that will not create benefits for someone holding the portfolio.The reason for this position is that the two markets itergrate (Anoruo & Mustafa ,2007)

5. Conclusion

This study expored the effect of Brent oil price movements on the number of transactions in the Nigerian stock market.It used monthly frequency data covering the period from January1997 to August, 2020. The NARDL approach was employed for data analysis . The results of the study suggest that Brent price movements have positve and non-significant effect on the number of transactions in the Nigerian equity market. Further, the results suggest the absence of asymmetry and long - run relationship between the variables.

The result of this study has several implications for Nigeria and other oil-related countries' policy makers. In the first place, the financial control system in these countries needs to pay more attention to the time-varying xharacteristics in the reaction of stock returns, given that the effect

of oil shocks is not constant but can alter in every time period. As a mtter of fact while authorities take decicions,they ought to double their effort to consider the changes in the reaction of the stock market returns to abrupt oil changes (Kelikume & Muritala,2019). Furthermore, the intense reaction of stock returns to oil demand shocks, compared to supply shocks, and the asymmetric reaction to different oil price shocks demand that authorities treat the sources of oil price shocks differently. They are expected to be more cautious as regards demand shocks than supply shocks. It is equqlly necessary for them to diagnose the events occurring in the oil market successively in soas to ascertain the type of shock and intervene in the stock market with appropriate decisions.According to Al-hajj et al.(2018), the intervention should be focused on the major determinants of stock market returns such as the interest rate, exchange rate, industrial production, and inflation In addition, during a financial crash, policymakers need to take into consideration the fact that stock market returns become more sensitive to different oil shocks in both oil-importing and oil-exporting countries. This demands intervening with appropriate policies to fight against the effects of oil shocks. Additionally, some other strategies could also be adopted, like the implementation of alternative energy sources to reduce dependency of their stock markets on oil shocks.

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