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IMPACT OF OIL PRICE VOLATILITY ON THE NUMBER OF DEALS IN THE CAPITAL MARKETS OF SUB – SAHARA AFRICAN COUNTRIES

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Abstract: *This study investigated the effect of oil price volatility on the number of deals in the capital markets of sub-Sahara African countries. Nigerian capital market was used as a case study. Monthly frequency data were employed and the paper covered the period from January1997 to December 2016. The EGARCH [1,1] methodology was used for data analysis .Average monthly exhange rates and inflation rates were introduced as control variables.The results of the study suggest that oil price volatility has a positive and weak effect on the number of deals in the Nigerian capital market. The study advises market participants to target oil price movements as an important instrument for predicting the volatility of stock market returns in developing nations.*

Keywords: Nigeria, sub-Sahara Africa , crude oil price, volatility, number of deals, capital market, EGARCH

1. Introduction

Since the end of the 20th century,the volatility of crude oil has continued to be felt universally. The restriction of crude oil production and co-operation among the OPEC member states caused 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 production from non-OPEC countries (see Al-Abri, 2013). 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 (see Chen, Hamori & Kinkyo, 2014).As reported by Ghosh and Kanjilal(2014), the members of Oil Producing and exporting countries (OPEC) endeavoured to stabilize the prices by increasing or reducing production of crude oil at the prices ranging from $22 per barrel to $28 per barrel. However,in September 2001, there was a serious reduction in the price of crude oil, as a result of the 9/11 attacks, despite the earlier decreases in production of oil by non-OPEC exporters and the reduction of quota by OPEC nations. Almost immediately after that exercise , prices increased to $25. In 2004, oil prices rose from that figure to about $40 per barrel (Jimenez-Rodriguez, 2011). Chuku (2012) enumerates the factors connected with the hyke in the price of oil as 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.

The price of crude oil was less than $100 per barrel in 2008; it went up to $140 per barrel in the middle of that year and by the year-end, the price had collapsed to $40 per barrel and changes were occurring almost every week(Kilian,2009),. In 2011, the prices hovered between $85 per barrel and $110 per barrel.

Oil price movements have captured the attention of scholars who regard them as important determinants that affect macroeconomic activities and, ultimately, stock market indices in different parts of the world.The anxiety among researchers, economists and public authorities concerning the frequent fluctuation in oil prices as highlighted above started to take serious dimension as soon as the seminal work of Hamilton (1983) revealed that ten out of the eleven economic recessions that took place in America were caused by such oscillations. The degree of attention currently given to oil price movements is justified also 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 variable that impacts significantly on domestic price levels, gross domestic product, investment and savings. For this reason, irregular and unpredictable movements in the energy markets have become an issue of serious concern (see Eksi, Senturk & Vildirim, 2012).

Notwistanding the general impressions 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 relatively few, especially in sub Saharan Africa countries. Peter and De-Mello (2011) in Soyemi, Akingunola and Ogebe (2017) interprete 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 cited in Akinlo,2014). In the modern times,however, several studies have shifted their attention to the interaction between oil and stock returns. The two authors attribute this recent upsurge of interest in the oil/stock relationships to the assumption of the investing public that correlations have important implications for asset allocation andportfolio optimization.

Researchers like Jones and Kaul (1996) and Huang, Masulis and Stoll (1996) kick-started the empirical investigation into the relationship between oil prices and stock markets.Since then,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 and 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 influence 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 failed to obtain consistent results for all of them.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 (see Brucal and Roberts, 2018). Their findings also show 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 find that oil demand price shocks are more important with regard to the reaction in the stock market than oil supply price shocks and that lower fuel cost, as a result of the decrease in prices of oil, do not lead to augmented stimulus of firms who deeply rely on oil in their production activities.

The studies carried out in Nigeria 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 et al, (2017), among others, emerged with results that suggest positive influence of oil price changes on Nigerian stock market returns. Contrarily, some studies assert that oil price shocks have no effect on stock market returns. Mordi et al. (2010) have results showing that oil price shocks have asymmetric effects on Nigerian stock market returns. For Ekong and Effiong (2015), macroeconomic aggregates exhibit different response patterns to changes in oil price in Nigeria. Only few of the studies reviewed used monthly frequency data series. . In addition, while the findings of Adaramola (2012) and Effiong (2014) disclose negative relationship between oil price shocks and stock market returns in Nigeria, Adebiyi et al. (2010), Mordi et al. (2010), Asaolu and Ilo (2012), Akinyele and Ekpo (2013) and Akinlo (2014) find the relationship as positive. 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. On the contrary, a number of other studies assert that oil price shocks have no effect on stock market returns. In addition, Mordi et al. (2010) have results showing that oil price shocks have asymmetric effects on Nigerian stock market returns, while Ekong and Effiong (2015) contend that macroeconomic aggregates exhibit different response patterns to changes in oil price in Nigeria.In the face of all those conflicting reports, there is a clear knowledge gap which this thesis attempts to close. This work differs from other studies in the past in a number of respects because, unlike many of those studies conducted in the past on Nigerian economy which employed annual or quarterly data, it used monthly frequency data and and employed the Exponential GARCH(EGARCH) model to estimate the relationship.

In the face of the many conflicting results in literature, it is obvious that even in Nigeria past researchers have not succeeded in finding out the true relationship between oil price shocks and stock price movements, a situation which has left much gap in literature and points to the need for continuing enquiries on the topic

This study is motivated to contribute in filling this vacuum considering importance of finding out the exact relationship between oil price changes and the stock market returns. The importance of this venture is. underscored 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 December 31st, 2016. The starting date of the sample period is determined by the availability of data on the number of deals. We select December , 2016 as the end month as the latest month for which all the relevant time series data were available when this project started. The reason for extending the study period to December 2016 is to incorporatesome of the months when Nigeria entered and had the full impact of a five- quarter economic recession that ended in the beginning of the first quarter of 2017.

The objective of this study is to examine the interaction between oil price volatility and the number of deals in the stock market of sub-Sahara African countries. These countries include Angola , Benin , BokinaFaso, Botswana,Burundi,Cameroon, Cape Verde,Chad,Central African Republic, Colombia, Comoros , Cote d'Ivoire , DemocraticRepublic of Congo, Djibouti, Equatorial Guinea, Eritrea, Etheopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Mali, Malawi, Mauritani, Mauritius, Mozambique, Namibia, Niger, Nigeria, Republic of Congo, Rwanda, Sao Tome and Principe ,Senegal, Sierra Leone, Seyechelles, South Africa, Sudan, Swaziland,Tanzania,Togo, Uganda, Zambia and Zimbabwe (see Heritage Foundation,2015) . Nigeria is selected as case–study. The use of Nigeria as a case study is considered reasonable for a number of reasons. Firstly, Nigeria is one of the largest economies and the largest exporter of oil in sub-Sahara Africa. Secondly, the Nigerian capital market is a highly promising area for international portfolio diversification. Thirdly, a lot of major reforms have been implemented recently in almost all the sectors of the economy (Akinlo,2014). January1997 is chosen as the start date, being the first month of the fiscal year immediately succeeding the year that the Odife Panel submitted their report on the review of the Nigerian capital market. December 2016 is selected as the end month in order to incorporate some of the months when Nigeria entered ,and had the full impact of, a five- quarter economic recession that ended in the beginning of the first quarter of 2017.

This paper extends the existing literature in a number of ways. First, the study provides, to the best of our knowledge, the first empirical inquiry on the effect of oil price price fluctuations on the number of deals in the Nigerian stock market. Second,like the recent study by Effiong (2014), this empirical study uses monthly, instead of quarterly or annual data, with the intention of reducing averaging biases and to capture more data points.

The remainder of the paper is arranged as follows: section 2 provides a review of the related theories and previous empirical studies. Section 3 describes the methodology adopted in this study. Section 4 presents the estimation results, 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,Gourène & Mendy,2018).According to Arnold,Gourène and Mendy(2018), in spite of the recent advent of renewable and alternative energies sources, the level of world crude oil consumption has not changed.Instead, the rate of consumption of petroleum continues to be on the increase, especially among the developed and industrialized nations. It is one of the most important commodities and has a significant impact on country's economic activity, whether it is an importer or an exporter of oil.The prices of crude oil depend on market demand,the quantity produced, the reserves available, the geopolitical situation, and a number of other factors(Arnold et al.,2018).

Oil price is considered by many researchers as representing information flow. Generally, it is understood that oil price increase leads to an increase in production costs. Hamilton (1988a, 1988b), and Barro (1984) cited in Youssef and Mokni (2019) argue that the galloping cost of petoleum will impact consumer's behavior, which will, in turn, decrease their demand and spending. A decrease in the consumption of crude oil will necessitate a reduction in production which will in turn increase unemployment (see Brown & Yücel, 2001; Davis & Haltiwanger, 2001). Also, changes in oil price affect stock markets because of the uncertainty they create for the financial sector.However, this depends on the forces that are responsible for the increase in oil prices.

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 impact on an asset price. In view of this line of reasoning,Hamilton (1996) and Sadorsky (1999) infer 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. Inflation would reduce investors' earnings expectations from the stock market. Consequently, an increase in oil price is expected to be accompanied with a decline in stock prices.

The 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 (see 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,Musulis and Stoll,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 deals,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(see Odo, Anioke,Onyeisi & Chukwu, 2017).

This paper is concerned with one of the performance indicators – number of deals.

Number of deals in a capital market refers to the number of times in a given period that shares are sold. A single 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 that 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.

Volatility refers to upward and downward drifts of the prices of crude oil universally.It is the conditional standard deviation of the underlying assets return and denoted by σ. Volatility refers to a characterization of price changes over time and has to do with consecutive positive and negative price shocks. . The three major volatility estimates include conditional-volatility, realized-volatility, and implied-volatility (Degiannakis, Filis and Kizys ,2014). Conditional volatility refers to the conditional standard deviation of the asset returns given the most recently available information. The conditional variance process of Y_t can be defined as V (Yt/I_{t-1}) which is equivalent to σ_t^2 ,for I_{t-1}.This represents the information set that investors know when they make their investment decisions at time t. The daily conditional-volatility is the conditional variance of daily returns which is generated by the GARCH (1,1) model. It is generally used and based on the assumption that investors know the most recently available information when they make their decisions to invest in securities. The implied-volatility is a volatility index which is considered as an essential instument for measuring the sentiments of investors which are inferred from option prices. Realized volatility is based on the idea of employing high frequency data to compute measures of volatility at a lower frequency. Both the conditional-volatility and realized-volatility measures the volatility of the moment as both of them estimate the stock market volatility at the current time.This study adopts the conditional volatility framwork.

2.2 Empirical Review

The correlations between oil price and stock returns has come to the forefront of public concern probably as a result the fact that crude oil prices have continued to exhibit an exceptional volatility. This volatility in crude oil prices has led to an increase in uncertainty of the energy sector, the entire economy and the financial markets.(Dhaoui & Khraief,,2014) According to the latter, it is those problems that brought about an increased interest among researchers in re-examining what exactly can be the explanation for the negative relationship between oil prices and the stock returns.Many previous studies are unanimous in claiming that oil price increases and volatility cause rising inflation and unemployment; as a consequence,they depress macroeconomic growth and financial assets.

Both financial practitioners and market participants are extremely concerned with oil price changes because such fluctuations affect the decisions made by producers and consumers in strategic planning and project appraisals significantly. .Another reason for their serious concern over oil price changes is that the latter determine the decisions of investors in oil-related activities, portfolio allocations and risk management. As a result of of these influences, the ability to accurately forecast the oil price changes is highly necessary for decision making in the financial sector(Dhaoui & Khraief,2014).The implication is that investors are in a better position to manage their portfolio when they make an efficient oil-volatility forecast (Kroner, Kneafsey, & Claessens, 1995).

As a result of the observations highlighted above, several researches have been carried out to examine the behaviour of oil price and volatility because of their macroeconomic and microeconomic effects in the whole economy,particularly in the specific in the financial markets. The major studies on oil oscillations have been concentrated on its effects on macroeconomicvariables. Among others, Rebeca and Sanchez (2004, 2009), Sandrine and Mignon (2008), and Yazid Dissou (2010) cited in Dhaoui and Kkraief(2014) report that macroeconomicvariables are significantly influenced by oil price increases and volatility. Eksi, Senturk and Yoldirm (2012) contend that as oil is a substantial input for many industries, the increase in oil price heralds economic crises by putting in place significant cost-push inflation and higher unemployment.In the same respect, Basher and Sadorsky (2006) argue that a hyke 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 which affect the stock price seriously and reduce wealth(Basher & Sadorsky,2006).

Dhaoui and Kraief (2014) examined empirically whether oil price shocks impact stock market returns empirically using monthly data for eight developed countries for the period from January 1991 to September 2013.The authors observevd strong negative correlations between oil price and stock market returns in seven of theselected countries. Oil price changes were observed to be having a non- significant effect on the stock market of Singapore.However, concerning the volatility of returns, the changes in oil prices were seen to be significant for six markets and without much effect on the others.

In spite of the overwhelming number of studies developed on the links between oil price movements and the macroeconomic activity,only few of them studied the connections between oil price volatility and stock returns are identified.Even at that, many of thse works disagreed in their findings on the nature of the oil/stock relationship. For instance, while Faff & Brailsford (1999) observe a positive link, others like Jones & Kaul (1996), Sadorsky (1999) and Cunado & Perez de Gracia (2014) find a negative connection. Kilian and Park (2009) report that the response of [United States'] 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) investigated the relationship between expected stock returns and volatility in twelve large international stock markets spanning theperiog from January 1980 to December 2001.With EGARCH-M models, the authors find a positive but insignificant relationship during for the majority of the markets. However, after using a flexible semiparametric specification of conditional variance, they find evidence of a significant negative relationship between expected returns and volatility in 6 out of the 12 markets.

Sim, and Zhou (2015) examined the relationship between oil prices and US equities by proposing a novel 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, negative oil price shocks can affect US equities positively when the US market is performing well and that negative oil price changes could influence the US stock market.The results if the study also show that the impact of positive oil price shocks is weak.The implication is that the relationship between oil prices on the US equities is asymmetric.

In the African continent, the majority of the studies that investigated the nexus between oil price actually concentrated their attention on the Nigerian stock market. Some of them includeAsaolu and Ilo (2012), Babatunde, Adenikinju.and Adenikinju (2013), Adebiyi et al. (2009) and Ogiri et al. (2013), who studied the impact of oil prices on the Nigerian stock market.

In South Africa, the study by Chisadza, Dlamini,. Guptaand Modise (2013) was aimed at determining the influence of oil prices on the country's stock market.In addition, while Gatuhi and Macharia (2013) investigated the correlation between diesel prices and stock market returns in Kenya, Maghyereh (2004) investigated the relationship between oil prices and 22 emerging stock markets in South Africa, Egypt, and Morocco.All in all,the results of all those previous studies equally demonstrate that there is an absence of a consensus among researchers on the exact impact of oil price shocks on the capital market.

3.0 Methodology

3.1 Data

This study examines the asymmetrical effects of oil price volatility on the number of deals in tne Nigerian capital market. We employ monthly frequency data to do the empirical analysis over the period from 01 January 1997 to 31 December 2016. The starting date of the sample period is determined by the availability of data on the number of deals(NOD). Other papers that also employed monthly data are those of Sadorsky (1999), Park and Ratti (2008), Driesprong, Jacobsan and Maat (2008) and Cunado and Perez de Gracia(2013) and Dhaoui and Kraief (2014) among others. Monthly frequency data are employed as many empirical studies have shown preference for high-frequency data when investigating oil-stock-prices correlation(see Cheikh, Naceur,Kanaan and Rault,2018). In order to check for robustness, another crude oil benchmark such as West Texas Intermediate (WTI) has been used in comparison with the Brent crude price. We discover that using the WTI price type does not significantly affect the results of our benchmark specifications. Oil prices are denominated in US dollars and obtained from the Energy Information Administration (EIA) database and the International Financial Statistics(International Monetary Fund)..In the crude oil market, there are various types and qualities of oil used for different purposes. The price of oil highly depends seriously on its grade, factors such as specific gravity, its content as well as location. 160 different blends of oil have been identified. However, the three primary benchmarks are WTI, Brent and Dubai. Prices are quoted in different markets all over the universe. In alignment with Alikhanov and Nguyen (2011), we select Europe Brent for the oil exporting country that we intend to investigate.

The oil price volatility is computed using the historical method. The end - month data for number of deals are obtained from the Central Bank of Nigeria Statistical Bulletins of the relevant period. The average monthly data on Nigeria's official exchange rate and inflation rate are retrieved from the CBN publications of the relevant years. The variables of the study include the historical prices of Brent spot crude oil(OP) used as independent variable. The UK Brent nominal price is used as a proxy for the nominal oil price as is commonly used by several authors such as Cunado and Perez de Gracia, (2003, 2005, 2013) and Engemann, Owyang and Wall (2011) while investigating the kind of correlations between oil shocks and macroeconomic variables. Number of deals (NOD) is employed as the dependentvariable. The inflation rate(INF),measured as the first logarithmic difference of the consumer price index, is used in this study as a control variable as well as proxy for the real stock return - in alignment with Park and Ratti (2008) and Cunado et Perez De Gracia(2013). The official exchange rate(OER) refers to the number of units of local currency per one USD. The data for the official exchange rate are also employed as control variable by this study.The motivation for using of this variable together with the oil price is hinges on the desire to benefit from the dispersion between oil supply and oil demand shocks. Exchange rate was earlier used by studies like Kilian (2009) and Kilian and Park (2009) . Further, literature recognizes inflation rates and exchange rates as part of those macroeconomic variables that affect stock market significantly (see Fama,1963). In addition, according to Ahkhanov and Nguyen (2011), exchange rate has a significant effect on stock return for exporting country just as industrial production has significant effect on a country engaged in production. Other studies such as Chen, Roll and Ross (1986), emerged with results that suggest a negative relationship between exchange rate and stock market performance.

3.1.1 Descriptive statistics

Table 1 shows the summary statistics of the data series. The average monthly series for all the variables are positive. NOD has the highest average monthy data (90544.04), while INF has the lowest average monthly data (11.47804). The size of the standard deviation indicates the risk of the data series. NOD has the highest standard deviation(78470.86),while INF has the lowest standard deviation (4.202081). The smallness of the standard deviation of inflation rate shows that the variable was relativelymore stable than other variables during the period covered by this study.NOD has a positive skewness (1.802749) and a positive kurtosis (7.424511). Hence, it is leptokurtic (greater than 3) OP has a positive skewness (0.458444) and platykurtic (1.911314). OER has a positive skewness

(0.285226) and a positive kurtosis (5.911730). INF has a positive skewness (0.248519) and a positive kurtosis (3.143751)..All the variables exhibit excessive kurtosis, a fairly common occurrence in high frequency financial time series data, and suggest that this excessive kurtosis may be due to heteroscedasticity in the data, which the EGARCH models maycapture. Excessive kurtosis would also explain the reasoning for high Jarque-Berastatistics, which reject the null hypothesis of normality for all return series.

Table 1 : Descriptive Statistics

	NOD	OP	OER	INF
Mean	90544.04	57.48429	131.3484	11.47804
Median	79668.50	50.31000	130.3400	11.38500
Maximum	475952.0	133.9000	321.5451	24.10000
Minimum	3558.000	9.800000	21.88610	0.900000
Std. Dev.	78470.86	34.55795	52.08417	4.202081
Skewness	1.802749	0.458444	0.285226	0.248519
Kurtosis	7.424511	1.911314	5.911730	3.143751
Jarque-Bera	325.7591	20.25920	88.03586	2.677119
Probability	0.000000	0.000040	0.000000	0.262223
Sum	21730570	13796.23	31523.63	2754.730
Sum Sq. Dev.	1.47E+12	285426.2	648349.7	4220.139
Observations	240	240	240	240

3.1.2 Test of normality using jarque bera statistic

We test for the normality of the data series usingJaque Bera statistic(see Fig.1).We observe thatthe Jarque Bera statistic for NOD is 325.7591; it has a p-value of 0.00000; The implication is that NOD is not normally distributed since the p-value of its Jarque Bera is less than 0.05. The Jarque Bera tatistic for INF is 2.677119 andhas a p-value of 0.262223. This means that INF is not normally distributed. Also, the Jarque Bera Statistic for OER is 88.03586 and it has a p-value of 0.00000; hence,OER is not normally distributed. OP has a Jarque Bera Statistic of 20.25920 and a p-value of 0.000040; The implication is that OP is equally not normally distributed as its p-value is less than 0.05

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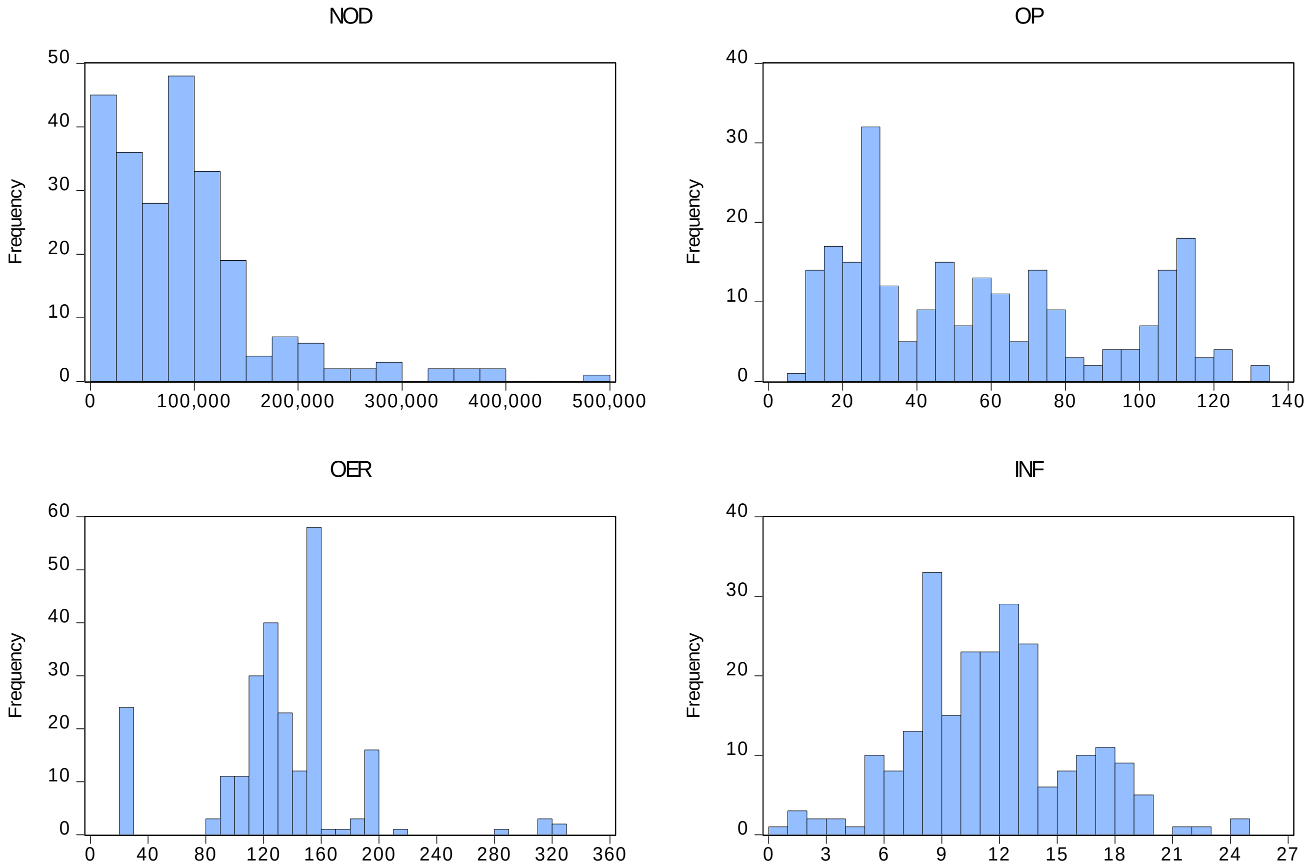


Fig.1 : Jaque Bera normality histograms for NOD,OP,OER,and INF.

Source: Researcher's computation

3.1.3 Unit Root Tests

We investigate the properties of our key variables by checking for stationarity. We test for the presence of unit roots in their levels(I,0) and first differences of oil prices and number of deals..

The summary results of these statistical tests(Tables 2 &3) for both oil price and nomberof deals series are reported in tables 3a and 3b. Our findings show that the null hypothesis of a unit root cannot be rejected for some of the variables across levels.The non-stationarity of some of the seies at their levels,[I,0], implies that the application of Ordinary Least Squares technique is likely to produce a spurious regression whose estimates will be both unreliable and misleading. We, therefore,difference the series to achieve in order to find out if the series is stationary at first difference. We observe that at first log difference level, all unit root tests suggest that we should reject the null hypothesis of non-stationarity.

Since the Augmented Dickey Fuller test in table 2a shows a significant result (p-value is 0.0000),wereject the null hypothesis. This means that DOP does not have a unit root [it is stationary].

Table 2a : Unit Root test for DOP

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=14)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-8.620566	0.0000
Test critical values:	1% level	-3.457865	
	5% level	-2.873543	
	10% level	-2.573242	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DOP)
Method: Least Squares
Date: 06/04/19 Time: 14:35
Sample (adjusted): 4 240
Included observations: 237 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DOP(-1)	-0.742573	0.086140	-8.620566	0.0000
D(DOP(-1))	-0.166106	0.064700	-2.567305	0.0109
C	0.118816	0.397821	0.298666	0.7655

R-squared	0.458697	Mean dependent var	0.039030
Adjusted R-squared	0.454070	S.D. dependent var	8.286513
S.E. of regression	6.122662	Akaike info criterion	6.474448
Sum squared resid	8771.955	Schwarz criterion	6.518348
Log likelihood	-764.2221	Hannan-Quinn criter.	6.492143
F-statistic	99.14494	Durbin-Watson stat	2.001256
Prob(F-statistic)	0.000000		

Source:Researcher's computation

3.1.4 Unit Root Test to test for Stationarity for DNOD using Augmented Dickey fuller Test

The series is differenced to achieve its first difference. i.e. DNOD .The intention is to find out if the series is stationary at first difference. (DNOD). The null hypothesis states that the series has a unit root (meaning that the series is non-stationary). **Null Hypothesis**: DNOD has a unit root Since the Augmented Dickey Fuller test statistic shows a significant result, p = 0.000; we reject the null hypothesis. This means that DNOD does not have a unit root.

Table 2b : **Unit Root test for DNOD**

Null Hypothesis: DNOD has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-20.40673	0.0000
Test critical values:	1% level	-3.457747	
	5% level	-2.873492	

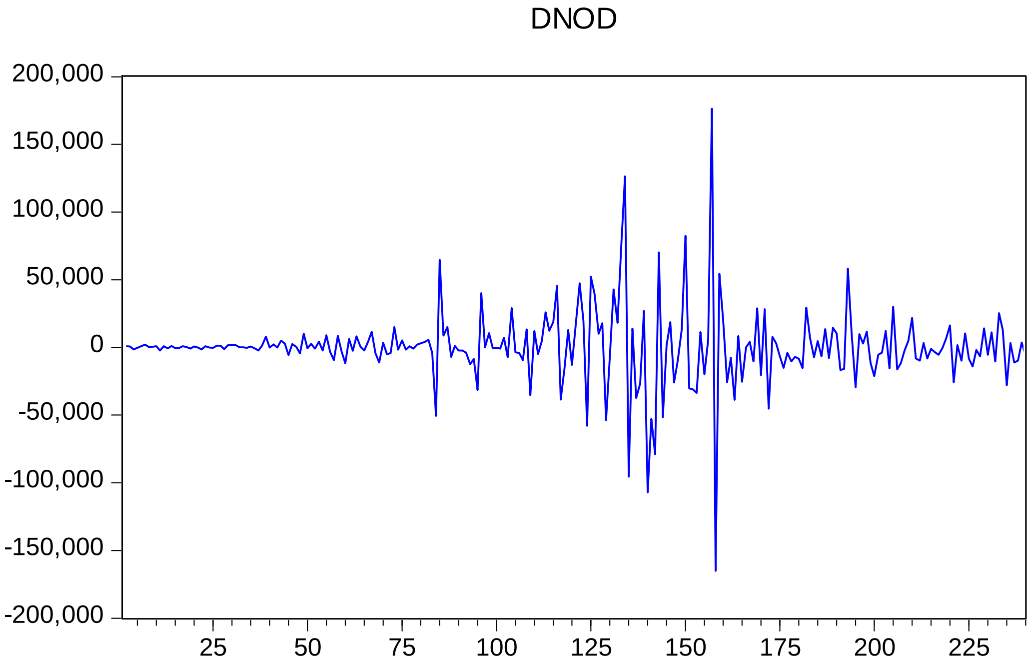
	10% level	-2.573215

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DNOD)
Method: Least Squares
Date: 06/04/19 Time: 16:05
Sample (adjusted): 3 240
Included observations: 238 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DNOD(-1)	-1.276685	0.062562	-20.40673	0.0000
C	264.3657	1778.384	0.148655	0.8820

R-squared	0.638278	Mean dependent var	-32.24370
Adjusted R-squared	0.636745	S.D. dependent var	45519.13
S.E. of regression	27434.66	Akaike info criterion	23.28537
Sum squared resid	1.78E+11	Schwarz criterion	23.31455
Log likelihood	-2768.959	Hannan-Quinn criter.	23.29713
F-statistic	416.4347	Durbin-Watson stat	2.031684
Prob(F-statistic)	0.000000		



3.1.5 Johansen Cointegration Test DNOD,OP,INFandOER

Tables 3a and 3b show the outcomes of co-integration tests. From the Trace and Maximum Eigen Value test outputs, the null hypothesis is that there is no cointegration among the variables; that is that.none of the variables are co-integrated. We accept the null hypothesis since p-values are 0.3068 and 0.2061 (greater than 0.05).This means that in the long run, the variables will not be cointegrated or there is no long run association between the variables.

Table 3a:Trace Test

Date: 06/23/19 Time: 17:27
Sample (adjusted): 6 240
Included observations: 235 after adjustments
Trend assumption: Linear deterministic trend
Series: NOD OP OER INF
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.106343	40.47144	47.85613	0.2061
At most 1	0.038042	14.04958	29.79707	0.8378
At most 2	0.020242	4.935173	15.49471	0.8157
At most 3	0.000551	0.129594	3.841466	0.7188

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 3a:Trace : Maximum Eigen Value Test Test

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

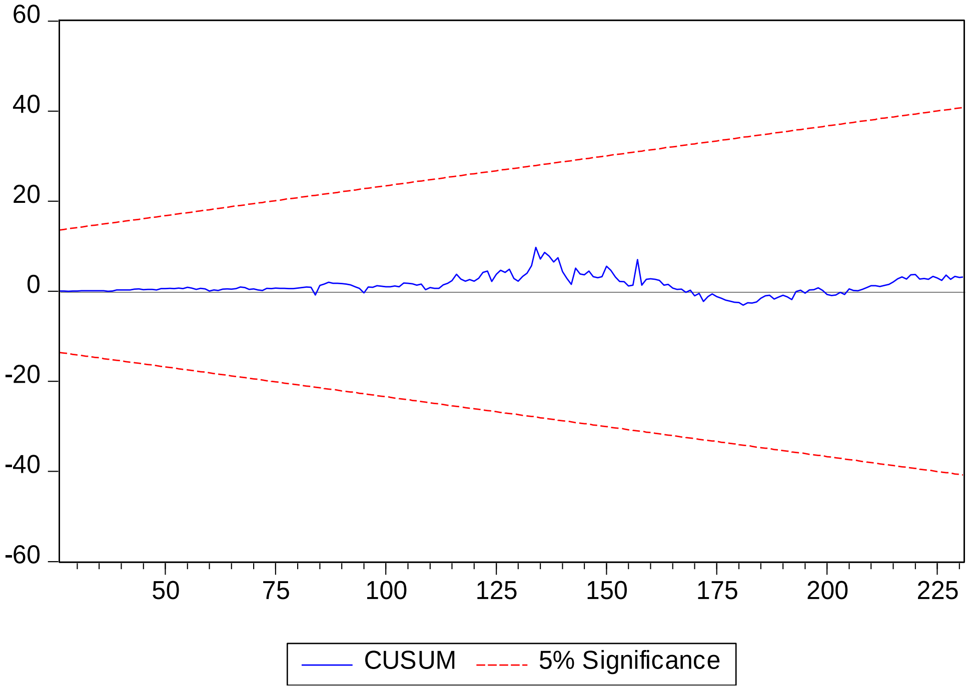
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**

None	0.106343	26.42186	27.58434	0.0698
At most 1	0.038042	9.114405	21.13162	0.8231
At most 2	0.020242	4.805579	14.26460	0.7662
At most 3	0.000551	0.129594	3.841466	0.7188

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

3.1.6 Stability Test For The Model For DNOD As The Dependent Variable (Dmval, Dop,Doer and Dinf)

From the CUSUM test (fig.2) it is evident that the dependent variable (DNOD) represented by the blue line did not digress out of the 5% significance boundary. There is no deviation from the 5% boundary. This implies that the model is stable.



3.2 Methods

3.2.1 Research Design

This work employed the *ex post facto* research design for determining the influence of oil prices shock on market capitalization..

3.2.2 Model Specification

Several studies find the presence of nonlinear connections between oil and economic activity (see Mork, 1989; Hamilton, 1996). Those studies suggest that oil price increases are much more influential than oil price decreases, implying an asymmetric relationship between oil price and output level. In the recent times, several papers have examined the potential asymmetric relationships between the crude oil market and other asset prices, such as stock prices or stock returns. For instance, Bittlingmayer (2005) asserts that oil price fluctuations arising from war risks, and those related to other causes, display asymmetric effects on stock price dynamics. Cheikh et al. (2018) warn that ignoring non-linearity can lead to problematic results. To identify the direct and indirect effects of oil price volatility on the volatility of number of deals inthe Nigerian capital market, we employ an Exponential Generalized Autoregressive Conditional Hetéroskedasticity model[1,1]. The use of the EGARCH specification makes allowance for supervising the possible asymmetries in effects. Soyemi et al, (2017) assert that EGARCH models have been used in recent studies to measure volatility (see Lux, Segnon & Gupta, 2015, in Soyemi et al., 2017; Lawal et al.(2016); Eagle, 2017), among others. We consider this approach as an appropriaqte means for accounting for the size effect of oil price movements on the dependent variable and allowing for movements in the conditional variance (see Manasseh & Omeje, 2016; Lawal et al., 2016). The EGARCH model was proposed by Nelson(1991). It is important in capturing asymmetry, which is the different impacts on conditional volatility of positive and negative shocks of equal magnitude, and possibly also leverage, which is the negative correlation between returns shocks and subsequent shocks to volatility.One advantage of the EGARCH model over the basic GARCH (1,1) specification is that it is an asymmetric model that specifies the logarithm of conditional volatility and avoids the need for any parametric constraints Exponential GARCH has some form of leverage effects in its equation. Accoding to Sardrsky (1999),many authors have suggested that oil price volatility shocks may play an essential role in explaining economic activity. Some authors consider volatility of price changes as an accurate measure of the rate of information flow in financial markets. Mokni and Mansouri(2017) report that such models are able to capture different volatility stylized facts that are often observed in financial time series,such as volatility clustering , heteroskedasticity and long memory, all at the sametime. The EGARCH[p,q] model is specified as follows: -

$$\log(h_t) = \alpha_0 + \sum_{j=1}^{q} \beta_j \log(h_{t-j}) + \sum_{i=1}^{p} \alpha_i \left| \frac{u_{t=i}}{\sqrt{h_{t=i}}} \right| + \sum_{k=1}^{r} \gamma_k \frac{u_{t-k}}{\sqrt{h_{t-k}}}$$

(conditional variance equation)..(2.1)

For this study, the conditional mean and variance equations for testing the hypothesis is presented as follows:-

LOG(GARCH) = **C(1) + C(2)*DOP ....(2.2)**

LOG(GARCH) = C(3) + C(4)*ABS[RESID(-1)/@SQRT{GARCH(-1)}] + C(5)*RESID(-1)/@SQRT(GARCH(-1)) + C(6)*LOG{GARCH(-1)} + C(7)*DOP ………………………….(2.3)

LOG (GARCH) is the conditional variance of the residual; it is the dependent variable. C (3) stands for the constant which indicates the last period (t-1) volatility. C(4) is the constant representing theimpact of a magnitude of a shock (size) /arch effect / spillover effect . It indicates the impact of long term volatility. At five percent level of significance, if C(4) has a p-value not higher than 0.05, the implication parameter measures the asymmetry or the leverage effect. If gamma = 0 , then the model is symmetric. When gamma < 0 , then positive shocks (good news) generate less volatility than negative shocks (bad news). When gamma > 0 , the implication is that positive innovations are more destabilizing than negative innovations.C (6) re[resents the GARCH effect. That is the alpha. Its parameter represents a magnitude effect or the symmetric effect of the model.Beta (the GARCH term) measures the persistence in conditional volatility irrespective of anything happening in the market. When beta is relatively large, then volatility takes a long time to die out is that it is significant and there seems to be an impact of long term volatility..C (5) is the gamma (γ) or leverageterm. The gamma following a crisis in the market (see Alexander,2009). C (7) is DOP ((the explanatory variable),The statistics for the hypotheses are shown in tables 11 – 16. The decision is base on 5%

level of significance. According to Brooks (2014), the model above, which is based on the assumption of normal gaussian distribution, captures the asymmetric volatility through the variable gamma(γ). The sign of the gamma determines the size of the asymmetric volatility and whether the asymmetric volatility is positive or negative.

The null hypothesis is that oil price shock had no positive and significant effects on the market value of trade.. The model for testing this hypothesis is presented respectively :as follows:-

DNOD = C(1) + C(2)*DOP ……….………………………………………………(2.4)

LOG(GARCH) = C(3) + C(4)*ABS[RESID(-1)/@SQRT{GARCH(-1)}] + C(5)*RESID(-1)/@SQRT{GARCH(-1)} + C(6)*LOG{GARCH(-1)} + C(7)*DOP……………………(2.5)

Where DNOD stands for NOD and DOP represents oil price both in their first difference forms.

4.0 Empirical results

This study aims to model the volatility of DNOD and factors affecting its volatility.The efficient market's assumption is that it is possible to forecast stock market returns and that stock returns should be regressed only on the constant term(Dhaoui & Kraief,2014). Hwever, because of the structural characteristics of the macroeconomic variables, their impact is often present in the stock market returns. Figure 3 shows that there is a prolonged period of low volatility (small shock) from day 1 to day 75 and also there exists a prolonged period of high volatility (big shock) from day 80 to day 160. In other words, periods of low volatility are followed by periods of low volatility and periods of high volatility tend to be follows by periods of high volatility. This suggests that residual or error term is conditionally heteroskedastic.

The estimation results of the volatilities and specifications on number of deals are presented in table 4..As equation estimations(3.1 and 3.2) represent, we model the volatility of crude oil returns with an AR(1)-EGARCH(1,1) specification. All parameter estimates of the EGARCH(1,1) model are highly statistically significant. We use the sum of β1 to measure the persistence in volatility and α1 in the GARCH model is closer tounity for each period.

The econometric results in table 4 show that, with a p-value of 0.0011, the impact or magnitude of shock of oil price on number of deals in the Nigerian capital market is significant and there seems to be impact of long term volatility.

The leverage coefficient C5 is negative at -0.026352. This implies there is leverage effect: bad news has more impact than good news of the same size. The GARCH (BETA) term has a value of 0.981475 and a P-value of 0.0000 which means that it is significant and there is volatility persistence. Oil price volatility(DOP) has a p-value of 0.3683. This implies that the impact of oil price volatility on the volatility of number of deals in the Nigerian capital market (DNOD) is not significant and its volatility or shocks does not affect the volatility of the DNOD. The positive coefficient of oil price volatility(0.009537) means that its impact on the volatility of the market value is in the positive direction. The result of the EGARCH estimation indicates that the coefficient of oil price shock is positive and the p-value is non-significant. It shows that a unit increase in oil price causes some increase in number of deals.. This result disagrees with the recent claim by Bekaert and Wu (2000) and Whitelaw(2000). that stock market returns are negatively correlated with stock market volatility.

Figure 3: Residuals of DNOD

Table 4 : EGARCH estimation results

Dependent Variable: DNOD
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 06/16/19 Time: 17:23
Sample (adjusted): 2 231
Included observations: 230 after adjustments
Failure to improve likelihood (non-zero gradients) after 66 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
LOG(GARCH) = C(3) + C(4)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(5)
*RESID(-1)/@SQRT(GARCH(-1)) + C(6)*LOG(GARCH(-1)) + C(7)*DOP

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+ C(8)*DINF + C(9)*DOER

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	236.7339	321.3988	0.736574	0.4614
DOP	43.33748	163.5243	0.265022	0.7910
	Variance Equation			
C(3)	0.199012	0.078669	2.529752	0.0114
C(4)	0.231513	0.042054	5.505097	0.0000
C(5)	-0.026352	0.039635	-0.664868	0.5061
C(6)	0.981475	0.003745	262.1098	0.0000
C(7)	0.009537	0.010600	0.899746	0.3683
C(8)	0.020294	0.005804	3.496262	0.0005
C(9)	0.005483	0.010461	0.524137	0.6002

R-squared	0.003523	Mean dependent var	302.1435
Adjusted R-squared	-0.000847	S.D. dependent var	28831.98
S.E. of regression	28844.20	Akaike info criterion	21.92620
Sum squared resid	1.90E+11	Schwarz criterion	22.06073
Log likelihood	-2512.513	Hannan-Quinn criter.	21.98047
Durbin-Watson stat	2.557910		

Estimation Equation:
=========================

DNOD = C(1) + C(2)*DOP - - - 3.1

LOG(GARCH) = C(3) + C(4)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(5)*RESID(-1)/@SQRT(GARCH(-1)) + C(6)*LOG(GARCH(-1)) + C(7)*DOP + C(8)*DINF + C(9)*DOER - - - 3.2

5. Conclusion

This study sought to identify the impact of oil price volatility on the number of deals in the capital markets of sub-Sahara African countries. Nigerian capital market was used as a case study. Monthly frequency data were employed and the paper covered the period from January1997 to December 2016. The EGARCH [1,1] model was employed for data analysis .Average monthly exhange rates and inflation rates were introduced as control variables.The results of the study suggest that oil price volatility has a positive and weak effect on the number of deals in the Nigerian capital market. The study advises market participants in thesub-Sahara African capital markets to target oil price movements as an important means for predicting the volatility of capital market performance,especially in sub-Sahara African nations.

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