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Effects of oil price shock on stock returns of energy firms in Nigeria

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Abstract

The destabilizing effects of oil price shocks on economies cannot be underestimated. Recent trends in the literature have hypothesized its direct and indirect effects on the economy, especially the financial markets. This paper examined the impact of the direct and indirect effects of oil price shocks on quoted energy-related stocks in Nigeria. While the direct effect of oil price shocks was captured with the Capital Asset Pricing Model (CAPM), the indirect impact was derived logically from an extant hypothesis which posits that the effect of oil price shocks will indirectly transmit through the stock market to affect company stocks. The sample for this study comprised seven blue chip, energy related firms listed on the Nigerian Stock Exchange (NSE), involving data collected between 2007 and 2014. The three stages least squares (3SLS) method was used to analyze the interrelationship between oil shocks and stock returns. The results showed that oil shocks have a direct positive effect on company stock returns. In addition, an indirect relationship exists between oil shocks and company stock returns, which is transmitted through market returns.

Introduction

Among the various basic global commodities, crude oil stands unique as every country, one way or another, depends on it either as a producer or consumer. Consequently, fluctuations in its price ultimately impact the global economy. Oil price shocks are unexpected changes in the prices of oil, which are capable of affecting the economy either positively or negatively. The United States (US) economic recessions in the 70s, and even more recently (where the energy stocks were reported to have been worst hit by lower oil prices as well as financial decreases which diminished the prospects of a near-term rate hike, as reported on Wall Street), have been attributed to this phenomenon with an attendant increase in general price levels and a significant decrease in productivity. Similarly, Kilian and Murphy (2014) asserted that oil price shocks can be held responsible for changes in monetary policy, labor market adjustments, and for changes in energy technologies, maintaining that the fluctuations in the real price of oil since 2003 have led to a resurgence of research on the oil market and its consequential effects on global economies.

In Nigeria, perhaps, like other emerging economies, the impact is felt even more. Ever since the beginning of the free fall in the global oil price, the country has been witnessing an adverse trend in all her macro-economic indices which have gradually snowballed the economy into recession with a spiraling current inflation rate of 17.6

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percent (the highest thus far in her history), GDP growth rate of −2.06 percent (year-on-year), and massive retrenchment in the private sector, leading to a geometric increase in unemployment now at 13.3 percent, accumulated salary arrears in the civil/public service, and a paucity of investible funds, especially foreign exchange. These have been attributed to the fact that the economy is a monolithic type, that is largely dependent on oil, consequent upon which her economy, especially the financial market, is susceptible to global energy prices. As a member of the Organization of Petroleum Exporting Countries (OPEC), responsible for the production and supply of the bulk of global oil, which stands at more than 81 percent, Nigeria has been susceptible to the activities of pipeline vandals and sabotage, thus significantly contributing to economic severity in the country. The study by Hamilton (1983) detailed the trail of research on the influence of oil price shocks on stock returns, which seeks to empirically provide explanations about this phenomenon in various jurisdictions. It was also observed that early studies concentrated on the oil price-macroeconomic relationship in the developed economies of the US, UK, Australia, Canada, and China, with abysmal contributions from emerging economies. Thus, studies on the oil price-financial markets nexus, especially with respect to stock markets, are a relatively more recent phenomenon, with mixed results. This opinion is corroborated by Masih, Peters, and De-Mello (2011) who claimed that the dearth of studies may not be unconnected with the difficult nature of evaluating stock markets activities which did not trend until the 1990s. The literature has revealed essentially two ways by which oil price shocks may ultimately affect stock returns: direct and indirect effects. This appears conceivable in the light of the weak stock market hypotheses, exhibiting informational inefficiency by displaying the capabilities to lock away some information, of which abrupt fluctuations in oil prices is one.

Interestingly, Broadstock, Wang, and Zhang (2014) uniquely dichotomize the effects of oil shocks into direct and indirect, and simultaneously examined the same on listed energy related stock portfolios in the Asia Pacific Region. From this perspective, this paper therefore investigated the direct and indirect impacts (first separately and thereafter simultaneously) of oil price shocks on quoted energy-related stocks in Nigeria, as an extension of earlier studies in this area. In Nigeria, scholarly studies relating to oil price shocks and stock market returns among others include Adebiyi, Adenuga, Abeng, and Omanukwue (2010) using a multivariate VAR analysis, Akinlo and Apanisile (2014) and Asaolu and Ilo (2012) using the co-integration and vector error correction (VECM) framework and Effiong (2014) using the structural vector auto-regression (SVAR) model. However, none examined the cumulative direct and indirect effects of oil price shocks on stock returns in Nigeria; this was the main thrust of this study and was justified as the aggregate knowledge from previous studies on possible effects of oil shocks pointed towards these two distinct ways. Nigeria, as a developing nation that is struggling to becoming a developed one cannot afford to join this moving train; hence, this study.

Literature Review

Numerous studies abound exploring the influence of oil price shocks on financial markets, especially, stock markets. Decomposing the effects, while the scholarly works of Arouri, Jouini, and Nguyen (2011), Arouri and Nguyen (2010), Arouri and Rault (2012), Boyer and Filion (2009), Broadstock, Cao, and Zhang (2012), El-Sharif, Brown, Burton, Nixon, and Russell (2005), Elyasiani, Mansur, and Odusami (2011), Faff and Brailsford (1999), Gogineni (2010), Hammoudeh and Li (2004, 2005), Huang, Masulis, and Stoll (1996), Kilian and Park (2009), Mohanty, Nandha, Turkistani, and Alaitani (2011), Nandha and Faff (2008), Narayan and Sharma (2011), Sadorsky (2001), and Scholtens and Yurtsever (2012) concentrated on examining the direct effects or individual industry sub-indices, studies by Bachmeier (2008), Chen (2010), Ciner (2001, 2013), Driesprong, Jacobsen, and Maat (2008), Filis (2010), Gjerde and Saettem (1999), Henriques and Sadorsky (2008), Jones and Kaul (1996), Lee and Chiou (2011), Miller and Ratti (2009), O'Neill, Penm, and Terrell (2008), Papapetrou (2001), and Park and Ratti (2008) considered the indirect effects. However, the only study that cumulated these two effects, that is, direct and indirect effects into one was that of Broadstock et al. (2014) using daily data from all active, listed, energy related stock portfolios in the Asia Pacific Region. The analytical technique adopted was a single equation GARCH method consequent upon the reduction to two independent regressions that were in application robust to structural instability and the specification of oil-shock used. The authors, countries, and areas covered, the sampled period and the data frequency alongside the major findings of these studies are listed in Table 1.

Theoretical Framework

There exist two opposing schools of thought on the effect of oil price shock or volatility on stock prices and GDP growth. One argues for a direct linkage, while the other posits an insignificant or perhaps no linkage, or, at best, an indirect link; the latter is the asymmetry-in-effects theory while the former is the linear/symmetric relationship theory. These are discussed as follows:

(a) Asymmetry-in-Effects Theory

The theory posits that there exists an insignificant difference or perhaps no relationship between the crude oil price and economic activities in the US economy (Oriakhi & Osaze, 2013). The asymmetry-in-effect of oil price volatility on economic growth has earlier been confirmed for some African countries (Mark, Olsen, & Mysen, 1994). Ferderer (1996) clarified three possible ways of the linkage as: uncertainty, sectoral shocks, and counter-inflationary monetary policy, and the later was confirmed in a study in the United States.

(b) The Linear/Symmetry Relationship Theory

The theory postulates that oil price volatility drives volatility in GNP growth. The theory was hinged on the

Table 1
Summary of related literature

Author	Country	Period	Data frequency	Results/Findings
Huang et al. (1996)	United States	1983–1990	Daily	Presence of significant influence of oil futures prices on oil-related companies' stock returns.
Faff and Brailsford (1999)	Australia	1983–1996	Monthly	Significant positive oil price sensitivity to Australian oil & gas returns but negative in the papermaking, packaging, and transport industries.
Sadorsky (2001)	Canada	1983–1999	Monthly	Positive significant influence of oil price shocks on stocks returns.
El-Sharif et al. (2005)	United Kingdom	1989–2001	Daily	Oil price shocks have significant and positive impacts on returns.
Nandha and Faff (2008)	United Kingdom	1983–2005	Monthly	Oil price rises have a negative impact on stock returns for all sectors, except the mining, and oil and gas industries.
Kilian and Park (2009)	United States	1973–2014	Monthly	Oil-demand shocks depress stock prices whereas oil price shocks driven by global economic expansion have a positive effect; oil-supply shocks had less impact on stock prices.
Boyer and Filion (2009)	Canada	1995–2002	Quarterly	Positive and significant impact of oil price shocks on stock returns.
Narayan and Narayan (2010)	Vietnam	2000–2008	Daily	Oil prices have a positive significant impact on stock market.
Elyasiani et al. (2011)	US	1998–2008	Daily	Oil price fluctuations constitute a systematic asset price risk at the industry level in 9 out of 13 industries.
Mohanty et al. (2011)	Gulf Cooperation Council (GCC) countries	2005–2009	Weekly	Stock markets have significant positive exposure to oil price shocks (at country level, except for Kuwait); Oil shocks are significantly positive (at industry level for 12 out of 120).
Broadstock et al. (2012)	China	2000–2011	Weekly	Presence of a significantly positive impact of the dynamics of global oil prices and energy related stock returns.
Dhaoui and Khraief (2014)	US, Swiss, France, Canada, UK, Australia, Japan & Singapore	1991–2013	Monthly	Significant negative effects between oil price and stock market returns exist in all markets, except Singapore.
Cunado and Gracia (2003)	12 oil importing European economies	1973–2011	Monthly	Responses of the European real stock returns to an oil price shock differ greatly depending on the underlying causes of the oil price change. The results showed the existence of a negative and significant impact of oil price changes on most European stock market returns. Stock market returns are mostly driven by oil supply shocks.
Ciner (2012)				Significant time variation in the linkage between oil and equities. Oil price shocks with less than 12-month persistency have a negative impact on stock returns, while shocks with persistency between 12 and 36 months are associated with positive stock returns.
Chen (2010)	US	2005–2010	Monthly	An increase in oil prices leads to a higher probability of a bear market emerging.
Miller and Ratti (2009)	6 major OECD countries	1971–2008	Monthly	Long-run impact of oil price shocks on real stock market returns.
Driesprong et al. (2008)	18 developed and 13 emerging nations		Monthly	Significant predictability in 12 developed markets as well as in all selected emerging markets.
Park and Ratti (2008)	US & 13 European countries	1986–2005	Monthly	Oil price shocks had a negative impact on stock markets in the US and many European countries, while the stock exchange of Norway showed a positive response to the rise in oil prices.
Henriques and Sadorsky (2008)	US	2001–2007	Weekly	A shock to technology stock prices has a larger impact on alternative energy stock prices than does a shock to oil prices.
Papapetrou (2001)	Greece	1989–1999	Monthly	Existence of a positive oil price shocks on real stock returns.
Ciner (2001)	US	1983–2000	Daily	Significant influence exists between real stock returns and oil price futures.
Jones and Kaul (1996)	US, Canada, Japan, and UK	1947–1991	Quarterly	The reaction of the US and Canadian stock prices to oil shocks can be completely accounted for by their returns. However, the evidence for Japan and the United Kingdom was not strong and was indecisive.
Effiong (2014)	Nigeria	1995–2011	Monthly	Stock market response to oil supply shocks is insignificantly negative but significantly positive to aggregate demand and oil-specific demand shocks.
Akinlo (2014)	Nigeria	1981–2011	Monthly	Long run relationship between oil price, exchange rate, and stock market. Growth with a unidirectional causality which runs from oil price change to stock market development.
Asaolu and Ilo (2012)	Nigeria	1984–2007	Annually	Oil price shocks leads to fall in stock market returns.
Adaramola (2012)	Nigeria	1985–2009	Quarterly	Oil price shocks had a negative effect on stock returns, while the causation runs from oil shocks to stock returns.
Adebiyi et al. (2010)	Nigeria	1990–2008	Quarterly	Oil price shocks had an immediate and significant negative impact on real stock returns and the causation flows from oil shocks to stock returns.

Source: Authors' compilation

impact of activities in the oil market between 1948 and 1972 on the economies of oil-exporting and importing countries (Gisser & Goodwin, 1986; Godwin, 1985; Hamilton, 1983; Hooker, 1996; Laser, 1987). In fact, Laser (1987) confirmed the existence of a symmetric relationship between oil price volatility, stock market performance, and economic growth. The study reported that an oil price increase lead to a decrease in GDP and stock prices, while the effect of an oil price decrease on GDP was ambiguous, as it varied across countries.

This paper synchronized the two theories of a probable rise or decline in stock prices and returns as a consequential effect of an increase or decrease in oil prices. The findings from this study will categorically assign Nigeria to either of the schools of thought, that is, the prevailing theory in the economy.

Methodology

Sample and Data

The sample for this study was taken from seven energy related firms listed on the Nigerian Stock Exchange (NSE) from 2007 to 2014. Daily data on stock returns for each firm and the entire market were sourced from NSE Daily Official List.[1] Also, daily oil price data were sourced from the US Energy Information Administration (EIA). In selecting the sample, we ensured that each of the firms has data for all years during this period. Hence our study was a cross-sectional time series analysis. This allowed us to study the behaviors of these firms over a period of time.

Variable Description[2]

(a) Oil Shocks: existing studies have employed a number of proxies to measure oil shocks. In this study, we employed two widely used measures of oil shocks. First, we modeled oil shocks (oilshock1) by computing the volatility of oil prices. To compute the volatility of oil prices, we employed the Exponential GARCH (EGARCH) model. This method has been used in recent studies to measure volatility and it improves on the basic GARCH model (see Lux, Segnon, & Gupta, 2015). The second measure of oil shock (oilshock2) was the oil returns. This was computed as the change in natural log of oil prices (Brent). This measure has been widely used in various studies (see Broadstock et al., 2012; Park & Ratti, 2008).

(b) Stock Market Returns: was defined as the growth of the All Share Index (stock market prices). It was computed as the change in the natural log of the All Share Index (ASI).

(c) Company Stock Returns: was defined as the growth of company stock prices. It was computed as the change in the natural log of stock prices for each of the firms. A similar definition has been used in various studies (see Broadstock et al., 2014).

Estimation Method

In line with empirical studies (see Broadstock et al., 2014; Gogineni, 2010; Huang et al., 1996), we estimated the direct and indirect effects of oil shocks on company stock (portfolio) returns. To examine the whole effect of oil shocks on company (portfolio) returns, we also computed the total effect.

(a) Direct Effect of Oil Shocks on Company's Returns

The direct effect of oil shocks on company stock returns was computed by employing the widely used Capital Asset Pricing Model (CAPM). The CAPM describes the relationship between required returns and market returns. This model is shown in Equation (1):

$$R_{it}^{c} = \alpha + \beta R_{t}^{m} + \mu_{it} \quad (1)$$

where R^c is the daily returns on energy related stocks and R^m is the daily market returns. Following Broadstock et al. (2014) who maintained that the stock prices are affected by oil shocks, we incorporated oil shocks in the CAPM model to capture the direct effect of oil shocks on each company's stock returns, thus Equation (1) can be written as Equation (2):

$$R_{it}^{c} = \alpha + \beta R_{t}^{m} + \theta Oilshock_{t} + \mu_{t} \quad (2)$$

where $Oilshock_t$ is the oil shocks, the parameter θ represents the direct effect of oil shocks on company stock returns and μ is the error term. The parameter β measures the direct effect of stock market returns on company stock returns.

(b) Indirect Effect of Oil Shocks on Company's returns

To examine the indirect effect of oil shocks on company's stock returns, we followed Broadstock et al. (2014) who argued that stock market is affected by oil shocks, and since a company's stock is driven by market activities, the effect of oil shocks will transmit through the stock market to affect company stock returns. To estimate the indirect effect, we specified the model in Equation (3):

$$R_{t}^{m} = \pi + \gamma Oilshock_{t} + \varepsilon_{t} \quad (3)$$

To capture oil shocks, we modeled the volatility of oil prices using the EGARCH model proposed by Nelson (1991) to capture asymmetries in volatility. It allows for positive shocks (good news) to have a different impact on volatility than negative shocks (bad news). It also gives a more accurate forecast of the conditional variance (Engle & Ng, 1993). The conditional variance in the EGARCH model is shown in Equation (4):

$$\ln(\sigma_{t}^{2}) = \omega + \beta \ln(\sigma_{t-1}^{2}) + \alpha(\varepsilon_{t-1}/\sigma_{t-1}) + \delta(\varepsilon_{t-1}/\sigma_{t-1}) \quad (4)$$

[1] The Daily Official List is a document containing information about all equities and debts quoted on The Nigerian Stock Exchange. The document is updated every day.

[2] See Table A in Appendix for definitions and acronyms of variables.

We estimated Equations (2) and (3) jointly using the instrumental variable estimation technique. Specifically, we applied the simultaneous equation-Ordinary Least Squares (OLS), two stage least squares (2SLS), and three stages least squares (3SLS) regression. The simultaneous equation methods give greater efficiency compared to single equation estimation methods and allowed us to capture both the individual (direct) and joint (indirect) effects of oil shocks on stock returns. The major advantage of the 3SLS over 2SLS is its gain in asymptotic efficiency. However, the estimations of each of the equations in 3SLS may be potentially less robust if the model is not well specified. To determine the most efficient model, we compared the estimates of 2SLS with those from 3SLS, using the Hausman test. We also tested whether the instruments used were valid using the Hansen-Sargan test of over-identifying restrictions. Under the null hypothesis, the statistic has a Chi-squared distribution of (G*L − K) degrees of freedom, where G is the number of simultaneous equations. The procedure takes proper account of linear constraints on the parameter vector imposed during estimation (Davidson & MacKinnon, 2004).

Solving both Equations (2) and (3) jointly, we obtained the indirect effect by interacting the effect of oil shock on company returns (β) with the oil shock effect on stock market returns (γ) which gives;

$$\frac{\partial \boldsymbol{R}_{\boldsymbol{it}}^{\boldsymbol{c}}}{\partial \boldsymbol{R}_{\boldsymbol{t}}^{m}} * \frac{\partial \boldsymbol{R}_{\boldsymbol{t}}^{m}}{\partial Oilshock_{\boldsymbol{t}}} = \boldsymbol{\beta\gamma}$$

We deduced three likely scenarios from the above. First, a direct effect exists if θ is significant; second, an indirect effect exists if β *and* γ are both significant, and third, the sum of the direct and indirect effects gives the total effect which is:

$$\frac{dR_{it}^{c}}{dOilshock_{t}} = \frac{\partial \boldsymbol{R}_{\boldsymbol{it}}^{\boldsymbol{c}}}{\partial \boldsymbol{R}_{\boldsymbol{t}}^{m}} * \frac{\partial \boldsymbol{R}_{\boldsymbol{t}}^{m}}{\partial Oilshock_{\boldsymbol{t}}} = \theta + \boldsymbol{\beta\gamma}$$

Results and Discussion

Table 2 presents the descriptive statistics of each variable. From the table, stock market prices ranged from 19,732.34 to 66,371.20, with an average and standard deviation of 33,807.79 and 12,142.83, respectively. Company stock prices (portfolio) hovered between NGN 1.32 and NGN 441.00, with a mean and deviation of NGN 94.14 and NGN 81.54, respectively. The oil price hovered around NGN 34.16 and NGN 143.95, with a mean of NGN 92.60 and a standard deviation of NGN 22.53, respectively. Similarly, stock market returns had a minimum of −0.12 percent and maximum of 0.08 percent, with a mean and deviation of 0.001 and 1.26 percent, respectively. The minimum company return was −0.93 percent and the maximum was 1.20 percent, with a mean and standard deviation of 0.04 percent and 4.30 percent, respectively. Oil shock1 (volatility) ranged from 0.17 to 0.10 (average and standard deviation of −0.0004 and 0.02, respectively). In addition, Oil Shock2 (returns) hovered between −0.17 percent and 0.10 percent (average and standard deviation of 0.001 and 0.02 percent, respectively).

Table 2
Descriptive statistics

Variable	Minimum	Maximum	Median	Mean	Standard deviation	Skewness	Kurtosis
Stock market index (ASI)	19,732.34	66,371.20	28,704.63	33,807.79	12,142.83	0.81	−0.377
Company stock price	1.32	441.00	75.80	94.14	81.54	0.567	−0.91
Oil price	34.16	143.95	99.44	92.60	22.53	−0.464	−0.706
Stock market returns	−0.12	0.08	0.0001	0.001	1.26	−0.52	12.60
Company stock returns	−0.93	1.20	0.0002	0.04	4.30	7.80	292.42
Oil Shock1	0.17	0.10	0.00007	−0.0004	0.02	−0.54	6.16
Oil Shock2	−0.17	0.10	0.04	0.001	0.02	−0.48	6.07

Note: (i) Shock1 = volatility measure of oil shock and Shock2 = oil return measure of oil shock
Source: Authors' computation

Table 3
Correlation analysis (energy firms)

Variable	R^c	R^m	Shock1	Shock2
R^c	1			
R^m	0.067***	1		
Shock1	0.035*	0.040***	1	
Shock2	−0.008	0.033**	0.060***	1

Note: (1) *, ** and *** represent significance at 10%, 5% and 1%, respectively; (ii) Shock 1 = volatility measure of oil shock and Shock2 = oil returns measure of oil shock
Source: Authors' computation

Correlation Analysis

Table 3 presents the correlations statistics which show the relationship of key variables in the study. The relationship among the variables was tested at the 5 percent level of significance. The results showed that company stock returns were positively related to stock market returns and oil shock (returns). This suggests that higher company stock returns were associated with higher returns in the market. Also, stock market returns were positively related to both measures of oil shocks (returns and volatility). This implies that higher stock market returns were associated with higher oil shocks. On the other hand, there was no significant association between company stock returns and oil price volatility.

Effect of Oil Shocks on Stock Returns

(a) Direct, Indirect and Total Effects of Oil Shocks (Oil price volatility) on Energy Stock Returns.

Table 4a
Regression estimates of Oil Shock1 (oil price volatility) on energy stock returns

	OLS		2SLS		3SLS	
	R^c	R^m	R^c	R^m	R^c	R^m
R^m	0.235*** (0.052)		1.119*** (0.382)		1.696*** (0.375)	
Shock1	−0.021 (0.033)	0.021** (0.010)	0.689** (0.279)	0.172* (0.089)	0.589** (0.279)	0.172* (0.089)
Constant	0.042 (0.066)	−0.011 (0.019)	0.046 (0.095)	0.027 (0.031)	0.031 (0.095)	0.027 (0.031)
F-test	10.21 (0.0000)	4.76 (0.0292)	3.78 (0.0229)	4.75 (0.0294)	53.75 (0.0000)	4.75 (0.0293)
R-square	0.84	0.63	0.77	0.46	0.67	0.59
Hansen-Sargan test			43.452 (0.235)		157.398 (0.132)	
Hausman test			61.44 (0.149)			

Note: (i) *, ** and *** represent 10%, 5%, and 1% significance levels, respectively; (ii) values in parenthesis represent standard errors
Source: Authors' computation

Table 4b
Direct, indirect and total effects of oil shocks (volatility) on company stock returns

	Direct	Indirect	Total
Oil shock	0.589	0.101	0.690

Source: Authors' computation

The impact of oil shock on stock returns is presented in Table 4a and b. The Hansen-Sargan statistic indicate that the null hypothesis should be accepted and that the instruments considered in the 2SLS and 3SLS models are valid. Based on the Hausman test, we focused attention on the three stages least squares result (3SLS). Stock market returns had a positive effect on company stock returns, while oil shock was positively related to company stock returns. Specifically, a 1 percent rise in stock market returns induced a direct impact of a 1.696 percent increase in company stock returns. This implies that company stock returns responded positively to changes in the market. Oil shock had a direct positive effect on company stock returns. Specifically, oil shock directly increased company returns by 0.589 percent. In a similar manner, oil shock directly increased market returns by 0.172 percent. The results of the direct effect were consistent with the findings of Boyer and Filion (2009), El-Sharif et al. (2005), Hammoudeh and Li (2004), and Sadorsky (2001).

In addition, an indirect relationship existed between oil shock and company stock returns and this was transmitted through the stock market. Table 3 shows that a 1 percent rise in oil shock will indirectly increase company stock returns by 0.101 percent, through its effect on the stock market. Comparatively, the direct effect of oil shocks on company stock returns was larger than the indirect effect. In totality, oil shock increased company stock returns by 0.690 percent. The results of the indirect effect were in line with the works of Chen (2010), Ciner (2013), and Lee and Chiou (2011).

Direct and Indirect and Total Effects of Oil Shock2 (Oil Returns) on Energy Stock Returns

The interrelationship among oil shock (returns), stock market, and company stock returns is presented in Table 5a, while in Table 5b, the direct, indirect, and total effects of oil shock (returns) on company stock returns are presented. Based on the Hausman's test, we accepted and interpreted the three stages least squares regression result. Oil shock (returns) was negatively related to company stock returns, but positively related to stock market returns. The result shows that a 1 percent rise in oil shock (returns) will lead to a 1.417 percent fall in company stock returns, while market returns will increase by 0.610 percent given a similar rise in oil shock (returns). The result also confirmed the indirect effect of oil shock (returns) on company stock returns, through the stock market. A percentage rise in oil shock (returns) will indirectly reduce company stock returns by 0.864 percent through the stock market. This confirms the result we obtained in Table 3. In sum, a 1 percent rise in oil shock (returns) will reduce company stock returns by 2.28 percent.

Table 5a
Regression estimates of Oil Shock2 (oil returns) on energy stock returns

	OLS		2SLS		3SLS	
	R^c	R^m	R^c	R^m	R^c	R^m
R^m	0.186*** (0.034)		0.938 (1.038)		1.902* (0.978)	
Shock2	−0.01 (0.022)	0.020*** (0.006)	−0.829 (0.887)	0.610*** (0.215)	−1.417* (0.861)	0.610*** (0.215)
Constant	0.001 (0.00)	0.001 (0.00)	0.001 (0.003)	0.002*** (0.001)	−0.001 (0.002)	0.002*** (0.001)
Obs	9935	9935	1936	1936	1936	1936
f-test (p-val)	14.78 (0.0000)	10.55 (0.0012)	0.49 (0.6106)	8.04 (0.0046)	3.95 (0.1386)	8.05 (0.0046)
Hansen-Sargan test			10.155 (0.1800)		9.195 (0.2390)	
Hausman test			7.63 (0.0221)			

Note: (i) *, ** and *** represent 10%,5% and 1% significance levels, respectively; (ii) values in parenthesis represent standard errors
Source: Authors' computation

Table 5b
Direct, Indirect and Total Effects of Oil Shocks2 (oil returns) on Company Stock Returns

	Direct	Indirect	Total
Oil price	−1.417	−0.864	−2.28

Source: Authors' computation

Concluding Remarks

This paper had three facets as it examined the direct, indirect, and combined effects of oil price shocks on stock returns using quoted energy related firms in Nigeria. Based on our findings, we noted that while oil shocks had a direct positive effect on company stock returns, an indirect relationship also existed between oil shocks and company stock returns and this was transmitted through the market returns. However, the direct effect of oil shocks on company stock returns was larger than its indirect effect. We also noted the existence of an indirect effect of oil returns and company stock returns through the stock market. These results are important for investors in the futures and commodity markets. This paper only examined the direct, indirect, and total effects of oil shock in an emerging market. However, future studies could examine the spillover effects of oil prices on the stock and currency markets.

Conflict of interest

There is no conflict of interest.

Appendix 1

Table A
Definition of variables used

S/N	Variable	Meaning	Computation
1	R^c	Company returns	Computed as the growth of company stock prices
2	R^m	Stock market returns	Computed as the growth of the entire stock market prices
3	Oilshock1	Oil shock	Volatility measure of oil shock; computed using the conditional variance
4	Oilshock2	Oil shock	Returns measure of oil shock

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