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Effect of Oil Fluctuation on Stock Market Return: An Empirical Study from India

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ABSTRACT

This paper examined the impact of oil price on Indian stock market. Data used for the study are monthly datasets from the period January 2000 to November 2018 obtained from Bombay stock exchange (BSE) and World Bank. BSE index is taken as dependent variable whereas oil price, inflation, exchange rate and real interest rate taken as independent variable. Augmented Dickey-Fuller unit root test is used to make it certain that variables should be stationary as most of the economic data are non-stationary in nature. The auto regressive distributed lag model is used here and bound testing test method to cointegration is employed to test for long-run association among our time series dataset. Our finding shows that oil price changes have a significant as well as positive impact of Indian stock market return in both long run and short run. Impact of inflation and real interest rate have negative relationship with Indian stock market but insignificant for long run. Log of exchange rate have positive relation with Indian stock market, but it is also insignificant.

Keywords: Oil Price, Stock Market Returns, Inflation, Exchange Rate
JEL Classifications: D4, C22, E31, E4

1. INTRODUCTION

Oil is considered the world's dominant fuel, and its global market is the most important of the world energy markets (BP Statistical Review of the World Energy, 2016). Its prices have shown great instability in recent times, caused by economic, financial and geopolitical factors. The variations in its prices have a great impact on the overall economy, inflation, the exchange rate, corporate earnings, and other economic variables due to its extensive use as a crucial input in the production process, and as a final consumption good (Muhtaseb and Assaf, 2017and Aggarwal and Saqib, 2017). A considerable volume of work has emerged examining the connections between oil price shocks and stock returns and between oil price shocks and stock market volatility (Kang et al., 2015; Lee et al., 2017; Aggarwal and Saqib, 2017; Smyth and Narayan, 2018). It has been seen that fluctuation of prices of oil has dominant effect on economy of the world. But it is still not clear how much fluctuation of oil price are affecting the market. Hence the objective in this paper is to investigate how structural oil price shocks drive the contemporaneous stock market return and volatility relationship.

2. LITERATURE REVIEW

In 1970's the only thing we really understood about the oil market was its role in contributing to recessions in the United States (Hamilton, 1983). But post that decade, large amount of literature has emerged that studies the effect of oil price changes on a range of macroeconomic variables (Hamilton, 2003; Cunado and Perez de Garcia, 2005; Bachmeier, 2008; Lee and Chiu, 2011a, 2011b; Lee et al., 2017; Aggarwal and Saqib, 2017; Smyth and Narayan, 2018). Starting with Jones and Kaul (1996), who found that oil prices had a negative association with stock returns in Canada, Japan, the United Kingdom and United States. The 2008 surge in oil prices, when, for the 1st time in history, oil prices reached the US$100 per barrel mark, ignited massive interest in oil market research (Narayan and Narayan, 2014; Narayan et al, 2017). Putting forward the theoretical validation proffered by Jones and Kaul (1996), most of the literature has sought to test the cash flow hypothesis, which states that asset values are determined by expected discounted cash flows (Fisher, 1930 and Williams, 1938). The cash flow hypothesis suggests that there could be a negative or positive relationship between oil prices and stock returns. There are two approaches for the negative relationship. First, oil being a major input for most firms, higher oil prices increase the cost of production, reducing future cash flows, earnings and dividends and, hence, stock returns. Second, higher oil prices can lead to an overestimation of expected inflation and higher nominal interest rates. Because interest rates are used to discount expected future cash flows, this will depress earnings, dividends and, hence, stock returns (Kling, 1985; Jones and Kaul, 1996; Gjerde and Saettem, 1999; Sadorsky, 2008; Papapetrou, 2001; Basher and Sadorsky, 2006; Driesprong et al., 2008; Park and Ratti, 2008; Henriques and Sadorsky, 2008; Chen, 2009; Filis, 2010; Arouri et al., 2011; Basher et al., 2012; Diaz and De Gracia, 2017; Anyalechi et al., 2019). However, some studies have found a positive relationship between the responses of stock returns to oil prices; higher oil prices, resulting from an unanticipated global expansion, has a positive effect on stock returns. Oil price volatility can influence the effect of sensitivity of changes in oil prices on the risk premium component of the discount rate and on cash flow through demand side consequences (Narayan and Narayan, 2010; Zhu et al., 2011; Zhu et al., 2014; Silvapulle et al., 2017).

Another possible reason for a positive association between oil prices and stock returns is, as Kollias et al. (2013. p. 744) note, “investors may well associate increasing oil prices with a booming economy. Thus, higher oil prices could reflect stronger business performance and the concomitant impact on stock markets.”

Along these lines, Chen et al. (2017) suggest that oil price volatility and stock market momentum are positively correlated. Using China as a case study, they suggest that this relationship is driven by time-varying investor sentiment, in which investors respond to oil return volatility associated with uncertainty through putting upward demand pressure on winner stocks. Using a two-stage Markov-switching approach, Zhu et al. (2017) also finds that the relative importance of demand and supply shocks varies between low and high-volatility regimes. However, Ciner (2013) argues the positive correlation can be surprisingly persistent. As Ciner (2013. p. 13) writes: “oil price increases do not always suggest negative stock returns. In fact, prolonged periods of joint increases in oil and stock markets may be observed” (emphasis ours). Narayan and Narayan (2010) modeled the impact of oil prices on Vietnam’s stock prices using daily data for the period 2000-2008 and include the nominal exchange rate as an additional determinant of stock prices. The results showed that stock prices, oil prices and nominal exchange rates are cointegrated, and oil prices have a positive and statistically significant impact on stock prices. This result is inconsistent with theoretical expectations. From the emerging market standpoint, Basher and Sadorsky (2006); Henriques and Sadorsky (2008) and Arouri et al. (2011) evaluated the impact of oil price changes on a large set of emerging stock market returns. The approach adopted in the paper was an international multi-factor model that allows for both unconditional and conditional risk factors to determine the relationship between oil price risk and emerging stock market returns. In general, the findings revealed strong evidence that oil price risk impacts stock price returns in emerging markets. Further, Diaz and De Gracia (2017) examined the impact of oil price shocks on stock returns of four oil and gas corporations listed on NYSE over the period January 1974-December 2015. The novelty evidence supports a significant positive impact of oil price shocks on stock returns in the short run. Also, Anyalechi et al., 2019 revealed that changes in oil price have had positive but insignificant impact on stock market returns both in the long-run and the short-run. Impact of inflation was positive and insignificant in the long-run but positively significant in the short-run. Real interest rate and log of exchange rate exerted negative influence on the stock market returns, where the short-run effect of real interest rate was significant, the long-run impact was found to be insignificant.

Thus, it can be concluded that oil is one of the important commodities of the world. It has been seen that fluctuation of prices of oil has dominant effect on economy of the world. But it is still not clear, how much fluctuation of oil price are affecting the market. Hence this paper is examining the effect of oil price on Indian stock market return, where other variable like inflation, exchange rate and real interest rate are also included to refine our research.

3. DATA AND METHODOLOGY

Indian stock market data is considered for our study. Since Bombay stock exchange (BSE) index is the true representative of the Indian economy, so BSE Index is taken as dependent variable, where oil price, inflation, exchange rate and real interest rate are taken as independent variables. Data for this study are monthly data for the period January 2000-November 2018 which consist of 227 observation. BSE index (stock market) data were obtained from BSE and oil price was obtained from World Bank. Our major study focused on oil price (brunt crude index) and stock market returns. Inflation rate, exchange rate (USD/INR rate) and real interest rate are other independent variables, which are sourced from Reserve Bank of India and Bloomberg.

Augmented Dickey-Fuller (ADF) unit root test is used to make it certain that variables should be stationary as most of the economic data are non-stationary in nature. The auto regressive distributed lag (ARDL) model is used here and bound testing test method to cointegration is employed to test for long-run association among our time series dataset.

The baseline equation function for our study expressed as below:

$$\begin{aligned}BSERET_t = {} & \beta_0 + \beta_1\ CRUDRET_t + \beta_2\ INFLATION_t \\ & + \beta_3\ RINTRATE_t + \beta_4\ LNEXCHRATE + \varepsilon_t \end{aligned} \quad (1)$$

Here t denotes time, BSERET=BSE index return (Indian stock market return), CRUDRET=Brent crude return, INFLATION=Inflation in

India, RINTRATE=Real interest rate, LNEXCHRATE=Log of exchange rate (USD/INR) and ε=Error term.

We can represent equation 1 in error correction model in line with Engle and Granger (1987), where this equation can be modified and allow short-run dynamic adjustment.

$$\Delta BSERET_{i,j} = \beta_0 + \sum_{i=1}^{l1} \beta_{1i,j}\, \Delta BSERET_{t-1,j} + \sum_{i=1}^{l2} \beta_{2i,j}\, \Delta CRUDRET_{t-1,j} + \sum_{i=1}^{l3} \beta_{3i,j}\, \Delta INFLATION_{t-1,j} + \sum_{i=1}^{l4} \beta_{4i,j}\, \Delta RINTRET_{t-1,j} + \sum_{i=1}^{l5} \beta_{5i,j}\, \Delta LNEXCHRATE_{t-1,j} + \delta\varepsilon_{t-1,j} + \mu_t \quad (2)$$

Here m_i represent the number of lags where represents differencing operator. ε_{t-1} is the lagged error after one period and derived from the residuals of equation 1.

Engle and Granger (1987) suggested that variables must be I(1) and error term I(0) for co-integration relationship. Pesaran et al. (2001) suggested that if the variables are either I(1) or I(0) then equation 2 can be represented as in equation 3. This approach is called as ARDL (Autoregressive Distributed lag) and replaces ε_{t-1} in equation 2.

Equation 3 is represented as below:

$$\Delta BSERET_{i,j} = K_0 + \sum_{i=1}^{p1} K_{1i,j}\, \Delta BSERET_{t-1,j} + \sum_{i=1}^{p2} K_{2i,j}\, \Delta CRUDRET_{t-1,j} + \sum_{i=1}^{p3} K_{3i,j} \Delta INFLATION_{t-1,j} + \sum_{i=1}^{p4} K_{4i,j}\, \Delta RINTRET_{t-1,j} + \sum_{i=1}^{p5} K_{5i,j}\, \Delta LNEXCHRATE_{t-1,j} + K_6\, BSERET_{t-1} + K_7\, CRUDERET_{t-1} + K_8\, INFLATION_{t-1} + K_9\, RINTRET_{t-1} + K_{10}\, LNEXCHRATE_{t-1} + \theta_t \quad (3)$$

The equation 3 is the representation of ARDL to co-integration which are widely employed in the long run relations when data generation process underlying the time series variables are integrated of order one or order zero.

We can also formulate an "unrestricted" error-correction model (ECM). This will be a particular type of ARDL model and perform a "Bounds Test" to see if there is evidence of a long-run relationship between the variables. If the outcome is positive, we can estimate a long-run "levels model", as well as a separate "restricted" ECM where lagged level variables in equation 3 can be replaced by ECT_{t-1} in Equation 4.

Equation 4 is represented as below:

$$\Delta BSERET_{i,j} = \varphi_0 + \sum_{i=1}^{q1} \varphi_{1i,j}\, \Delta BSERET_{t-1,j} + \sum_{i=1}^{q2} \varphi_{2i,j}\, \Delta CRUDRET_{t-1,j} + \sum_{i=1}^{q3} \varphi_{3i,j}\, \Delta INFLATION_{t-1,j} + \sum_{i=1}^{q4} \varphi_{4i,j}\, \Delta RINTRET_{t-1,j} + \sum_{i=1}^{q5} \varphi_{5i,j}\, \Delta LNEXCHRATE_{t-1,j} + \delta ECT_{t-1,j} + \mu_t \quad (4)$$

4. RESULTS AND DISCUSSIONS

The ADF test results has been shown in Table 1. It clearly shows that the null hypothesis of unit root is rejected in the case of INFLATION, RINTRET and LNEXCHRATE variables in the first difference at 1% level of significance and these variables are integrated of order one [I(1)]. Variables BSERET and CRUDERET are stationary and rejected the null hypothesis at 1% level of significance but these variables are integrated at order zero [I(0)].

As our variables are integrated at order I(0) and I(1),therefore our model ARDL model will be good estimator for finding the long-run association among our variables.

4.1. Model Selection

The Akaike information criterion (AIC) is applied here in process of selection of best model and optimum number of lags in the ARDL model. Among various model, we selected ARDL (1, 1, 1, 1, 1) based on AIC.

4.2. Bound Testing for Long Relationship

Our result of ARDL long-run form has been presented in Table 2. The value of F-statistic 55.33583 from F-bounds tests and the value of t-statistic value = −16.38036 from t-bounds tests indicates that these values are significant at 1% level and it clearly show that there is a long relation exist between the variables. So, our interest of variables BSE index and oil price have long run relationship. The t-statistics on the coefficient of the lagged error-correction indicates that there is Granger-causality.

Here we applied the cumulative sum (CUSUM) test to analyze the stability of selected ARDL model specifications. This Figure 1 shows that model is stable.

4.3. Regression Results

The ARDL long-run form is presented in Table 3. It shows that change in oil price are positively related to stock market return (BSERET)

Table 1: Result of augmented Dickey-Fuller unit root tests

Variable	Test results		
	ADF (t-statistics)	5% critical value	Order of integration
BSERET	−14.81856	−4.443649	I(0)
CRUDERET	−13.27519	−4.443649	I(0)
INFLATION	−13.04700	−4.443649	I(1)
RINTRET	−14.00444	−4.443649	I(1)
LNEXCHRATE	−13.63178	−4.443649	I(1)

Figure 1: Plots of cumulative sum statistics for coefficients stability tests

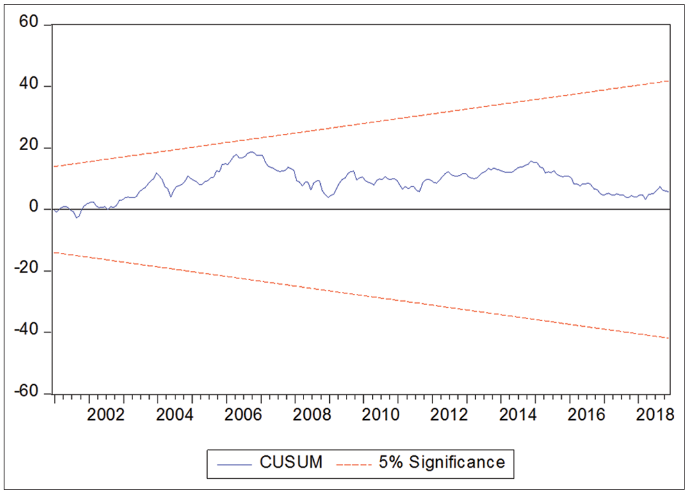
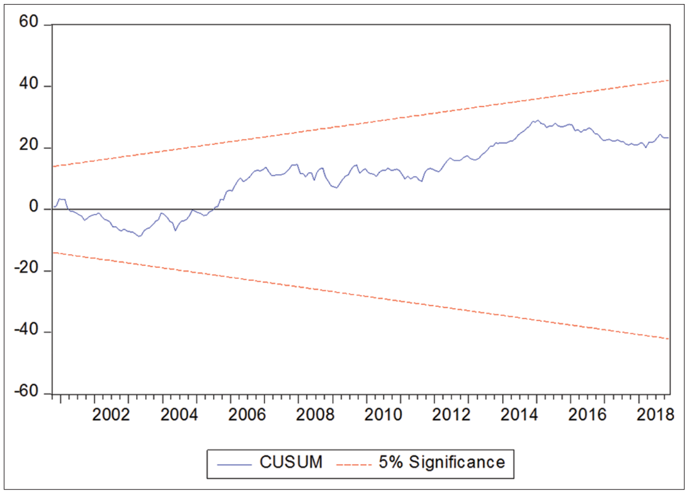


Figure 2: Plots of cumulative sum (CUSUM) statistics for coefficients stability tests



and significant. Other variables like inflation and real interest rate have negative influence on the regress and whereas log of exchange rate have positive influence, but all these variables are not significant.

But the results indicate that there are variables that are jointly significant and long relationship exist between the variables and there is cointegration between the variables.

Here, Table 4 (error correction model) shows that oil price (CRUDERET) is positively related to stock market return. Whereas inflation, real interest rate and log of exchange rate are negatively related and also significant. The coefficient of error term is negative and statistically highly significant at 1 percent level. So, there is cointegration between oil price and stock market return (BSERET). The magnitude of error term indicates that nearly 96% of any disequilibrium between crude oil and Indian stock market is corrected within 1 month.

4.4. Correlation Test

Table 5 shows the Breusch-Godfrey serial LM test data. The results indicate that our model has no auto correlation problems.

Table 2: ARDL bounds tests results

Null hypothesis: No long-run relationships exist		
Test statistics	**Value**	**K**
F-statistics	55.33583	4
Critical value		
Significance (%)	I(0)	I(1)
10	2.45	3.52
5	2.86	4.01
2.50	3.25	4.49
1	3.74	5.06
Test statistics	Value	
t-statistics	−16.38036	
Critical value		
Significance (%)	I(0)	I(1)
10	−2.57	−3.66
5	−2.86	−3.99
2.50	−3.13	−4.26
1	−3.43	−4.6

Table 3: ARDL long run form and bounds test

Selected model: ARDL (1,1,1,1,1)				
Dependent variable: BSERET				
Variable	**Coefficient**	**Std. Error**	**t-statistics**	**Prob.**
Intercept	−0.020519	0.09190	−0.223254	0.8235
CRUDERET	0.141782	0.060405	2.347182	0.0198
INFLATION	−0.004802	0.003102	−1.54796	0.1231
RINTRET	−0.005825	0.002996	−1.944498	0.531
LNEXCHRATE	0.017637	0.021989	0.802081	0.4234

Table 4: Estimated error correction model

Dependent variable: BSERET				
Variable	**Coefficient**	**Std. Error**	**t-statistics**	**Prob.**
Intercept	0.002685	0.003627	0.740146	0.4600
D(CRUDERET)	0.225262	0.31435	7.165894	0.0000
D(INFLATION)	−0.042966	0.01249	−3.440143	0.0007
D(RINTRET)	−0.042284	0.01178	−3.589498	0.0004
D(LNEXCHRATE)	−1.398051	0.17033	−8.126652	0.0000
ECT(-1)	−0.958047	0.058831	−16.28478	0.0000

Table 5: Serial-correlation test

Null hypothesis: No serial correlation			
Breusch-Godfrey serial correlation LM test			
F-statistic	1.417325	Prob. F (2,216)	0.2446
Obs. *R-squared	2.901559	Prob. Chi-square (2)	0.2344

We applied the cumulative sum (CUSUM) test to analyze the stability which is shown in below Figure 2. The model seems stable and correctly specified as it didn't exceed the bounds of the 5% level of significance.

5. CONCLUSION

The current empirical study analyses the impact of oil price on Indian stock market. We also took some other macro variable like interest rate, exchange rate and inflation for our study. But major focus emphasized on the Indian stock market return fluctuation due to movement in oil price.

Our finding shows that oil price changes have a significant as well as positive impact of Indian stock market return in both long run and short run. Impact of inflation and real interest rate have negative relationship with Indian stock market but insignificant for long run. Log of exchange rate have positive relation with Indian stock market, but it is also insignificant.

The bound test result showed that long run relationships exist between the oil price and stock market returns during the period under study. The magnitude of error term indicates that 95.8% of any disequilibrium between crude oil and Indian stock market is corrected within 1 month.

REFRENCES

Aggarwal, P., Saqib, N. (2017), Impact of macro economic variables of India and USA on Indian stock market. International Journal of Economics and Financial Issues, 7(4), 10-14.

Anyalechi, K., Chikezie, E.H.C., Onwumere, J.U.J., Okereke, E.J. (2019), Does oil price fluctuation affect stock market returns in Nigeria? International Journal of Energy Economics and Policy, 9(1), 194-199.

Arouri, M.E., Jouini, J., Nguyen, D.K. (2011), Volatility spillovers between oil prices and stock sector returns: Implications for portfolio management. Journal of International Money and Finance, 30(7), 1387-1405.

Bachmeier, L. (2008), Monetary policy and the transmission of oil shocks. Journal of Macroeconomics, 30, 1738-1755.

Basher, S.A., Haug, A.A., Sadorsky, P. (2012), Oil prices, exchange rates and emerging stock markets. Energy Economics, 34(1), 227-240.

Basher, S.A., Sadorsky, P. (2006), Oil price risk and emerging stock markets. Global Finance Journal, 17, 224-251.

BP Statistical Review of World Energy. (2016), Available from: https://www.bp.com/content/dam/bp/pdf/energy.

Chen, C.D., Cheng, C.M., Demirer, R. (2017), Oil and stock market momentum. Energy Economics, 68, 151-159.

Chen, S.S. (2009), Do higher oil prices push the stock market into bear territory? Energy Economics, 32(2), 490-495.

Ciner, C. (2013), Oil and stock returns: Frequency domain evidence. Journal of International Financial Markets, Institutions and Money, 23, 1-11.

Cunado, J., de Garcia, F.P. (2005), Oil prices, economic activity and inflation: Evidence for some Asian countries. Quarterly Review of Economics and Finance, 45, 65-83.

Diaz, E.M., De Gracia, F.P. (2017), Oil price shocks and stock returns of oil and gas corporations. Finance Research Letters, 20, 75-80.

Driesprong, G., Jacobson, B., Matt, B. (2008), Striking oil: Another puzzle? Journal of Financial Economics, 89(2), 307-327.

Engle, R.F., Granger, W.J. (1987), Co-integration and error correction: Representation, estimation. Econometrica, 55, 251-276.

Filis, G. (2010), Macro economy, stock market and oil prices: Do meaningful relationships exist among their cyclical fluctuations? Energy Economics, 32(4), 877-886.

Fisher, I. (1930), Theory of Interest. New York: Macmillan.

Gjerde, O., Saettem, F. (1999), Causal relations among stock returns and macroeconomic variables in a small, open economy. Journal of International Financial Markets, Institutions and Money, 9, 61-74.

Hamilton, J.D. (1983), Oil and the macro economy since world war II. Journal of Political Economy, 91, 228-248.

Hamilton, J.D. (2003), What is an oil shock? Journal of Econometrics, 113, 363-398.

Henriques, I., Sadorsky, P. (2008), Oil prices and the stock prices of alternative energy companies. Energy Economics, 30, 998-1010.

Jones, C., Kaul, G. (1996), Oil and the stock markets. Journal of Finance, 51, 463-491.

Kang W., Ratti, R.A., Yoon, K.H. (2015), The impact of oil price shocks on the stock market return and volatility relationship. International Financial Markets, Institutions and Money, 34, 41-54.

Kling, J.L. (1985), Oil price shocks and the stock market behaviour. Journal of Portfolio Management, 12(1), 34-39.

Kollias, C., Kyrtsou, C., Papadamou, S. (2013), The effects of terrorism on the oil price-stock index relationship. Energy Economics, 40, 743-752.

Lee, C.C., Chiu, Y.B. (2011a), Nuclear energy consumption, oil prices, and economic growth: Evidence from highly industrialized countries. Energy Economics, 33(2), 236-248.

Lee, C.C., Chiu, Y.B. (2011b), Oil prices, nuclear energy consumption, and economic growth: New evidence using a heterogeneous panel analysis. Energy Policy, 39(4), 2111-2120.

Lee, C.C., Lee, C.C., Ning, S.L. (2017), Dynamic relationship of oil price shocks and country risks. Energy Economics, 66, 571-581.

Muhtaseb, B.M.A., Assaf, G.A. (2017), Oil price fluctuations and their impact on stock market returns in Jordan: Evidence from an asymmetric cointegration analysis. International Journal of Financial Research, 8(1), 172-180.

Narayan, P., Narayan, S. (2010), Modelling the impact of oil prices on Vietnam's stock prices. Applied Energy, 87(1), 356-361.

Narayan, P.K., Ranjeeni, K., Bannigidadmath, D. (2017), New evidence of psychological barrier from the oil market. Journal of Behavioral Finance, 18, 457-469.

Papapetrou, E. (2001), Oil price shocks, stock market, economic activity and employment in Greece. Energy Economics 23, 511-532.

Park, J., Ratti, R.A. (2008), Oil price shocks and stock markets in the US and 13 European countries. Energy Economics, 30(5), 2587-2608.

Pesaran, H.M., Shin, Y., Smith J.R.J. (2001), Bounds testing approaches to the analysis of level relationships. Applied Economics, 16, 289-326.

Sadorsky, P. (2008), Assessing the impact of oil prices on firms of different sizes: It's tough being in the middle. Energy Policy, 36, 3854-3861.

Silvapulle, P., Smyth, R., Zhang, X., Fenech, J.P. (2017), Nonparametric panel data model for crude oil and stock prices in net oil importing countries. Energy Economics, 67, 255-267.

Smyth, R., Narayan, P.K. (2018), What do we know about oil prices and stock returns? International Review of Financial Analysis, 57, 148-156.

Williams, J.B. (1938), The theory of Investment Value. Cambridge, Massachusetts: Harvard University Press.

Zhu, H., Li, R., Li, S. (2014), Modelling dynamic dependence between crude oil prices and Asia-Pacific stock market returns. International Review of Economics and Finance, 29, 2013-2015.

Zhu, H.M., Li, R., Yu, K. (2011), Crude oil shocks and stock markets: A panel threshold cointegration approach. Energy Economics, 33(5), 987-994.

Zhu, H.M., Su, X., You, W., Ren, Y. (2017), Asymmetric effects of oil price shocks on stock returns: Evidence from a two-stage Markov regime-switching approach. Applied Economics, 49, 2491-2507.