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Oil Price Shocks and Stock Market Returns in the Three Largest Oil-producing Countries

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ABSTRACT

This paper analyzes whether oil price changes can predict stock market returns in the three largest oil-producing countries in the world, namely, Saudi Arabia (SA), Russia and the United States, using different vector error correction models for the period 2000:01-2015:05. Our main hypothesis is that the effects of oil price changes on stock prices depends not only on whether the origin of the oil price shocks is from the demand side or supply side but also on whether the country under study is a net oil-importing or oil-exporting country. The results confirm our hypothesis. In particular, oil price changes driven by supply shocks exert a clearly positive impact on stock market returns in Russia, a negative impact on the US and an ambiguous impact on KSA. However, oil price changes driven by demand shocks have a positive impact on all three countries.

Keywords: Oil Demand Shock, Oil Supply Shock, Oil Importing Countries, Oil Exporting Countries, Stock Market Returns
JEL Classifications: C13, G10, G12, Q43

1. INTRODUCTION

In recent years, global energy prices have experienced considerable instability. Oil prices in particular have experienced a high level of volatility over the last decade because of oil's extensive use as both a main input in the production process and as a final consumption good (Swanepoel, 2006). While oil prices rose sharply to more than $145/b in 2008, they declined significantly to <$30/b in January 2016, which is the lowest value since September 2003. Several factors have the potential to impact the volatility in oil prices, and they are classified primarily into physical and financial factors. Demand and supply, geopolitics, technology, and weather are among the physical factors. With regard to financial factors, the most important are the exchange rate, interest rate, and financial speculation.

This influence of oil prices on the global economy has raised serious concerns among economic policymakers, investors, consumers and international institutions about the possibility of detrimental impact on the macro economy (Goodness, 2015). Consequently, researchers have shown great interest in understanding the nature of this relationship, and a large body of literature has focused on the impact of oil price changes on macroeconomic variables. One of the first studies in this field is the pioneering work of Hamilton (1983), who established oil price shocks as one of the main factors contributing to almost all US recessions after World War II. In particular, he found that at that time seven out of eight postwar US recessions had been preceded by a sharp increase in the prices of crude oil. In a more recent study, Hamilton (2011) noted that 10 out of 11 postwar US recessions had been preceded by an increase in oil prices. Following Hamilton (1983), several studies such as Bernanke et al. (1997), Cunado and Perez (2003), Hamilton and Herrera (2004), Cunado and Perez (2005), Jimenez-Rodriguez and Sanchez (2005), Chen and Chen (2007), Coudert et al. (2008), among others, have examined the impact of oil price changes on several economic variables such as GDP growth, exchange rates, inflation, monetary policy and industrial activity.

Given the importance of oil prices to the world economy, more research has been conducted recently on the effect of oil prices on stock market returns. Changes in the price of crude oil are often considered to be an important factor affecting stock market returns. This research has shown that oil price shocks do affect stock markets, but there is no consensus about this relationship among researchers (Kilian and Park, 2009). Some studies have found a negative relationship between the price of crude oil and the performance of the stock market, others have found a positive relationship, and some studies have found inconclusive results. However, a literature review has shown that the nature of a country's economy, oil intensity and the nature of the oil shocks can have a considerable effect on the interaction between oil prices and stock returns (Bouoiyour and Selmi, 2016).

One of the first studies to examine this relationship was undertaken by Jones and Kaul (1996), who reported the negative effects of oil price shocks on aggregate real stock market returns for four developed countries. Other studies, such as Sadorsky (1999), Gjerde and Sattem (1999), Park and Ratti (2008), Chen (2009), and Filis (2010) also reported negative impacts. However, other studies reported a positive relationship, especially in oil exporting countries; these studies include Arouri and Rault (2011) and Filis et al. (2011). Finally, other studies found inconclusive results in that neither a negative nor positive impact of oil prices on stock market returns was found (Chen et al., 1986; Huang et al., 1996; Wei, 2003; Filis et al., 2011; Narayan and Sharma, 2011).

Oil price shocks are classified into three different types depending on the cause of fluctuations in the real price of oil (Hamilton 2009a, b). These types are supply oil shock, demand oil shock and oil specific demand shock. Supply oil shock is caused by a change in global oil production (a shock in the global supply). Demand oil shock is caused by an increase in the aggregate demand for all industrial commodities, including crude oil, which is driven by global real economic activity. Oil specific demand shock is caused by an increase in the demand of crude oil in response to increased uncertainty about future oil supply shortfall (Kilian and Park, 2009).

There are different theories regarding the mechanism of how changes in oil prices affect stock market returns. One rationale is based on the notion that the fair value of a stock price should be determined by the expected discounted future cash flows and that these cash flows are affected by different macroeconomic factors. Changes in oil prices are considered one of these factors; therefore, these changes can alter the expected discounted cash flows, which will be reflected in the price of this asset. Accordingly, any increase in the price of oil will increase the cost of production, reduce the profit of the firm, and to a greater extent reduce the value of the share. Hence, changes in oil prices greatly influence stock markets (Jones and Kaul, 1996). Another commonly held view in this regard is that an increase in oil prices is beneficial for upstream oil companies, whose cash flows are directly related to the difference between the oil price and crude oil lifting cost; it is therefore expected that an increase in the oil price would have a positive impact on the stock returns of oil companies while having an adverse effect on other companies whose cash flows are affected negatively by the increase in oil prices since oil is the main source for energy and one of the main costs of production. In addition, several studies reveal that increased energy prices generate uncertainty for firms, resulting in delayed investment decisions, which will more likely affect the prices of their stocks (Degiannakis et al., 2014). On the other hand, there are several likely explanations as to why changing oil prices might have no impact on stock markets. The first explanation is that there are multiple factor prices in the economy, such as interest rates, wages, industrial metal, and technology, which can offset changes in energy costs. Another explanation is that corporations are becoming more sophisticated in reading future markets and are better able to anticipate shifts in factors prices. That said, to say that oil price changes may affect some economic sectors more than others depends on the relative importance of oil as a factor of production in these sectors (e.g., the transportation sector).

Despite the significant number of studies that have examined the effect of oil price shocks on developed and emerging stock markets, no studies have covered this relationship in the largest oil-producing countries in the world, namely, Russia, Saudi Arabia (SA) and the US. In 2015, these three countries alone contributed approximately 40% of the world's oil production. Specifically, Russia contributes approximately 14.05%, SA contributes 13.09% and the US contributes approximately 12.23%; there is a big gap between them and the fourth producer, China, which contributes approximately 5.25%. It is worth noting that in 2011, the US became a net fuel exporter for the first time in 62 years (Pleven and Gold, 2011). In addition, both the Russian and Saudi economies share similar macroeconomic features. The Russian economy is highly dependent on exports of commodities, with revenues from sales of oil and gas accounting for about half of the country's federal budget, 16% of its GDP and over 70% of its total exports. The Saudi economy depends mainly on the petroleum sector, which accounts for approximately 92.5% of Saudi budget revenues, 97% of export earnings, and 55% of GDP (Saudi Arabian Monetary Agency, 2013).

Although these three countries share similar features with regard to the level of oil production, their stock markets are classified differently. The US market is classified as a developed market, Russia's market is classified as an emerging market and is dominated by oil and gas companies representing approximately 60% of total market capitalization. The stock market in SA is not yet classified by most international agencies, which is mainly because this market had been closed to international institutional investors. However, despite the recent accessibility enhancements announced by the SA capital market authority and the Saudi stock exchange (Tadawul), MSCI still classifies the Saudi market as a standalone market[1] (MSCI, 2016; FTSE, 2016). In addition, unlike the US market, both the Russian and Saudi stock markets have not been studied thoroughly in the literature. For all of these reasons, this study attempts to close the gap and shed more light on the impact of oil price changes on the stock market returns in these three countries, as well as to explore the extent to which the impact of changes in oil prices potentially depends on the cause

1 The MSCI has classified the Saudi market as a standalone market index, which uses either the Emerging Markets or the Frontier Markets methodological criteria concerning size and liquidity. On the other hand, FTSE, the London-based index provider, reported in its 2016 Annual FTSE Country Classification Review that Saudi Arabia would join the Watch List for possible addition to Secondary Emerging market status based on the prospective opening of the market to international institutional investors through the Qualified Foreign Investor (QFI) framework.

of the change itself. The remainder of this paper is organized as follows. Section 2 reviews the literature on the nexus between oil price shocks and stock market returns. Section 3 outlines the empirical methodology and the estimation technique applied in this study. Section 4 describes the relevant variables and dataset used in the empirical analysis. Section 5 presents and discusses the results. Finally, the conclusion and policy recommendations are introduced in section 6.

2. LITERATURE REVIEW

As mentioned earlier, Jones and Kaul (1996) was one of the earliest studies to report a correlation between oil price shocks and stock market returns. The authors tested the impact of oil price shocks on stock market returns in four developed markets (U.S., UK, Japan and Canada) for the postwar period. The empirical results generated from a standard present value model indicate that both U.S. and Canadian stock markets are rational as their reaction can be completely accounted for by the effect of oil price shocks on current and future cash flows. In particular, the study found a negative relationship between oil price shocks and stock market returns in both the US and Canada, while for the UK and Japan the results were inconclusive. In another study by Huang et al. (1996), they found that changes in oil returns have a direct effect on individual oil company stock returns, but they do not have considerable impact on the general market indices in US stock markets.

Following these pioneering studies, additional studies examined the relationship between oil prices and stock prices. However, the bulk of this research has focused on developed markets. Faff and Brailsford (1999) examined the sensitivity of the Australian industry equity returns to oil price changes. The results show a significant positive impact on the equity returns of oil and gas sectors to any change in oil prices. Sadorsky (2001) found a positive relationship between the price of crude oil and oil and gas equity index in Canada. Nandha and Faff (2008) examined the relationship between oil price shocks and stock market returns for global industry indices; their study examines this relationship over the period from 1984:4 to 2005:9, and the results show little evidence of any asymmetry in oil price sensitivities.

Kilian and Park (2009) examined the impact of oil price shocks on the US stock market over the period 1973-2006, and their results show that the reaction for these changes differs substantially depending on the underlying causes of the oil price changes whether it is a supply or a demand shock. Shocks in global aggregate demand play a more important role in understanding changes in stock prices at the industry level than shocks in the production of crude oil. The results indicate that joint supply and demand shocks explain one-fifth of the long run variation in US real stock returns, and more than two-thirds of that contribution is driven by shocks to demand for crude oil. There is evidence of large declines in US stock prices in the wake of major political disturbances in the Middle East, as shifts in precautionary demand are ultimately driven by growing uncertainty about future oil supply shortfalls.

In a more recent study, Dhaoui and Khraief (2014) used monthly data over the period January 1992-September 2013 for eight developed countries, i.e., the US, Switzerland, France, Canada, the UK, Australia, Japan and Singapore, to measure the impact of oil price shocks on stock market returns and volatility of returns. The results indicate strong negative connections between oil price and stock market returns in seven of the selected countries, whereas the oil price changes increase the volatility of returns.

Other studies have examined the impact of oil price changes on European stock markets. In this context, Degiannakis et al. (2014) examined the effect of three different oil price shocks on stock market volatility in the European stock markets using a structural VAR. These shocks are the supply side shock, aggregate demand shocks and oil specific demand shocks. The study uses both aggregate stock market indices and industrial sector indices. The results suggest that supply side and oil specific demand shocks do not affect volatility, whereas demand shocks influence volatility at a significant level. Cunado and Perez (2014) also examined what is known as oil shocks -expressed in both world real prices and local real prices- on stock returns in some European economies using vector autoregressive (VAR) and vector error correction models (VECM). This paper identifies two alternative oil price specifications, namely, oil demand and oil supply shocks, using the behavior of both oil prices and oil production. Thus, when oil prices and global oil production vary in the same direction, this will be identified as a demand shock, and when they vary in the opposite direction, it will be identified as an oil supply shock. The results suggest the existence of a significant negative impact of oil price changes on most European stock market returns and that stock market returns are driven by oil supply shocks. Berk and Aydogan (2012) use the structural VAR model to investigate the impact of oil price variations on the Turkish stock market for the period between 1990 and 2011. This long horizon was divided into three sub-periods. The results suggest that oil price changes significantly affect stock market returns only in the third sub-period, which began after the financial crisis in 2008. This indicates that oil price shocks have little or limited impact on the Turkish stock market.

While most studies examine this relationship in developed markets, others investigate it in emerging markets. Narayan and Narayan (2010) analyze the effects of oil price changes on Vietnam’s stock prices by employing daily data for the period 2000-2008. The study found that all three variables, oil prices, nominal exchange rates and stock prices are cointegrated in the long run and that oil prices have a significant positive impact on stock prices. Zhang and Chen (2011) found a positive influence of oil prices changes on China’s stock market. Masih and Peters (2011) use the VEC model to examine the impact of oil price changes on South Korea’s equity market, the study found a significant positive impact of oil price volatility on real stock returns. In a more recent study applied to the Ghanaian and Nigerian economies, Lin et al. (2014) find significant spillover and interdependence between oil and the two stock markets returns. However, the spillover effects are stronger in the case of Nigeria. Additionally, the study shows evidence of short-term predictability in oil and stock price changes over time and reveals that conditional volatility changes more rapidly as result of substantial effects of past volatility rather than past news for both markets returns.

Other studies focus on examining this relationship among a group of countries bounded by economic or political alliances such as BRICS[2] or the GCC[3]. Ono (2011) analyzed the impact of oil prices on real stock returns for BRICS using the VAR model, and the results suggest that oil prices have a positive impact on real stock returns in China, India and Russia whereas they have no statistically significant impact on Brazilian stock returns. Another study on BRICS was undertaken by Bouoiyour and Selmi (2016), who examine the casual relationship between BRICS stock returns and real oil prices using the frequency domain approach. Their results show that the impact of oil prices on stock returns is not uniform for all BRICS countries. In particular, they found that some slowly fluctuating components of oil prices exert a significant impact on real stock returns in Brazil and Russia, while quick fluctuations have a significant impact on India and South Africa.

Other studies examine this relationship among the GCC countries. One of the earliest studies is Hammoudeh and Eleisa (2004); they found a negative relationship between changes in oil prices and stock market returns in the case of six Gulf Cooperation Council countries (GCC). Arouri and Rault (2011) examined both short- and long-term linkages between oil prices and stock markets in the GCC countries; their results indicate positive short-term linkages between oil prices and stock markets in the UAE, Qatar and to some extent in SA. The long-term analysis shows no evidence of a long-term link between Brent oil prices and stock markets in most of the GCC countries. Naifar and Al-Dohaiman (2013) investigate the relationship between crude oil prices, stock market returns and macroeconomic variables using a sample composed of the GCC countries. The main findings show a regime-dependent relationship between GCC stock market returns and OPEC oil market volatility with the exception of Oman. The results also show an asymmetric dependence structure between inflation rates and crude oil prices and that this structure orients toward the upper side during the financial crisis in 2008 and 2009. Another symmetric dependence is found between crude oil prices and the short-term interest rate during the financial crisis. Finally, a recent study by Awartani and Maghyereh (2014) has examined the relation between return and volatility spillover effects between oil market and the GCC stock market. As expected in oil producing countries, such as GCC; their results show that information flows from oil returns to the GCC stock markets is important, while the opposite is marginally important.

Even though the aforementioned literature has examined the impact of oil price changes on stock market returns in different developed and emerging countries, no study has examined this impact on the three largest oil producing countries in the world, namely SA, Russia and the US. This current paper fills a void in the existing literature by comparing this impact in these three countries, which play a pivotal role in the global economy.

2 BRICS is the acronym acronym for an association of five major emerging national economics: Brazil, Russia, India, China and South Africa.

3 GCC is the Cooperation Council of the Arab States of the Gulf, which is a regional intergovernmental political and economic union consisting of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates.

3. DATA AND TIME SERIES PROPERTIES

3.1. Data

In implementing the empirical investigation, data from the three largest oil producing countries, namely Russia, the Kingdom of SA (KSA), and the US are used. While Russia and the KSA have long been net oil exporting countries, the US has only held that status since 2011. The sample for Russia and the US includes 186 observations spanning from January 2000 to June 2015, whereas that for the KSA involves 168 observations from July 2001 to June 2015. Since the sample for the US is dominated by the period when it was a net oil importer, we consider the US to be a net importing country. The choice of the sample period, especially for Russia and the KSA, is based purely on data availability considerations. Coincidently during the chosen period, the regimes in the three countries were quite stable and therefore concern about combining different regimes can be ignored. Table 1 shows variable definitions and sources of data. Like most previous studies on the same topic, this study employs variables that include stock prices, real output, oil prices and short-term interest rates (Park and Ratti, 2008; Cunado and Perez, 2014). Since data on real output or real GDP are only available quarterly, industrial production indices, which are available monthly, are used as a proxy. Unfortunately, because this series is also not available for the KSA, we include only three variables in the KSA study.

3.2. Time Series Properties

The use of time series data for empirical work requires that the underlying time series be stationary. To check the stationary of the variables, all the variables (expressed in logs except for the short-term interest rate) must be tested for unit roots. Table 2 reports the Augmented Dickey-Fuller (ADF) unit root tests for each of the variables in levels and first differences, respectively. Employing two models, one including intercept only (C) and the other both intercept and linear time trend (C&T), the results show that all the variables are integrated of degree one. Although for Russia the tests using one of the two models reject the null hypothesis for three variables in levels, the tests using the other variable fail to reject it. Accordingly, we assume that all the variables are differenced stationary.

Many argue that the traditional ADF test might fail to reject the null hypothesis when structural breaks are present in the data-generating process of the series but are not included in the model. They proposed alternative methods that include structural breaks in the model. While Perron (1989) modified the ADF test to allow for one a priori exogenous break, Zivot and Andrews (1992), Banerjee et al. (1992), Vogelsang and Perron (1998) proposed methods that allow for structural breaks to be endogenously determined to test whether the process that contains a broken intercept or trend has a unit root. Their tests proved to be robust and more powerful than the traditional tests. We believe that the break does not occur at only a single point in time. Instead, the break occurs and evolves over several periods. Perron (1989) calls such a break an "innovational outlier," which can change both the intercept and trend of the data or the intercept only. In testing the time series under study, this type of break is taken into account. Table 3 shows the results from employing the Vogelsang and Perron (1998) test that allows for one endogenously determined break. As expected, the estimated break dates for most of the variables for the US and Russia are statistically significant and coincide with the global financial crisis (between the last quarter of 2007 and 2008). The results for the KSA and Russia show that the null hypothesis cannot be rejected for all variables using both models, with the exception of the model with a broken intercept and trend that can reject the null hypothesis for interest rates for the KSA and real industrial production index for Russia. For the US, the results of the test using both models are mixed. The test can reject the null hypothesis for the real industrial production index and interest rates and fails to reject it for stock prices and oil prices. Since the null hypothesis cannot be rejected for the majority of the series, following the previous literature (Sadorsky, 1999; Park and Ratti, 2008; Miller and Ratti, 2009; Cunado and Perez, 2014), we assume that all the series have unit root.

The next step is to test for the existence of cointegration among variables following Johansen and Juselius (1990). Table 4 reports the results of the test making use of two models - one with an intercept, and the other with an intercept and a linear trend - based on the trace and the maximum Eigenvalue statistics for the three countries. The results show that the test using both models can reject the null hypothesis of no cointegration and cannot reject the null hypothesis of maximum one cointegration for all three

Table 1: Variable description and data sources

Name	Description	Source
Stock returns	Share prices, end of period	Yahoo Finance and Saudi Stock Exchange (Tadawul)
Industrial production	Industrial production index	International Financial Statistics (International Monetary Fund)
Interest rate	Short-term interest rate	International Financial Statistics (International Monetary Fund)
Exchange rate	Number of units of national currency per US dollar, average	International Financial Statistics (International Monetary Fund)
Oil price	UK Brent nominal oil price in US dollars per barrel per day	International Financial Statistics (International Monetary Fund)
CPI	Consumer price index	International Financial Statistics (International Monetary Fund)
Oil production	Production in thousands of barrels	International Financial Statistics (International Monetary Fund) and the US Energy Information Administration

Table 2: ADF unit root test

Country	Stock prices		Real industrial production		Interest rates		Oil prices	
	ADF		ADF		ADF		ADF	
	C	C&T	C	C&T	C	C&T	C	C&T
Variables in levels								
KSA	−1.84	−1.70			−1.24	−1.67	−2.09	−1.09
Russia	−1.90	−1.58	−0.92	−3.71**	−1.99	−2.02	−2.67*	−3.05
US	−2.11	−1.72	−1.64	−1.64	−2.97**	−3.06	−1.44	−1.68
Variables in first differences								
KSA	−10.43***	−10.47***			−5.62***	−5.59***	−5.76***	−6.14***
Russia	−10.96***	−11.05***	−15.24***	−15.20***	−8.26***	−8.33***	−7.64***	−7.61***
US	−5.46***	−12.32***	−3.27**	−3.37*	−3.40**	−3.53**	−6.51***	−6.61***

ADF: Augmented Dickey-Fuller unit root tests. ***,**, and * mean significant at the 1% level, 5% level, and 10% level, respectively. C: Model with constant only, C&T: Model with both constant and a linear trend. The lag length is determined based on the Akaike Information Criteria (AIC)

Table 3: One endogenously determined break: Innovational outlier model

Country	Stock prices		Stock prices		Real industrial production		Real industrial production	
	Change in C		Change in C&T		Change in C		Change in C&T	
	t stat	Tb	t stat	Tb	t stat	Tb	t stat	Tb
Variables in levels								
KSA	−0.91	2006:03	−3.99	2006:02				
Russia	−2.26	2013:12*	−4.77	2008:06^{CT}	−3.00	2007:12	−5.446**	2008:10^{C}
US	−2.11	2007:10	−4.04	2008:05^{CT}	−4.38**	2007:10***	−5.13**	2008:08^{CT}
Country	**Interest rates**		**Interest rates**		**Oil prices**		**Oil prices**	
Variables in levels								
KSA	−3.40	2007:10	−6.15***	2007:10	−2.42	2014:02	−2.77	2012:02^{T}
Russia	−2.34	2002:03*	−3.50	2002:03^{CT}	−2.71	2013:M12	−3.87	2008:03^{CT}
US	−4.83***	2007:07***	−4.91*	2007:07^{CT}	−1.18	2013:12**	−3.37	2012:02^{T}

***,**, and * mean significant at the 1% level, 5% level, and 10% level, respectively. Change in C: Model includes break in the intercept only, Change in C&T: Model includes break in both intercept and linear trend. The lag length is determined based on the Akaike Information Criteria (AIC). C: Only break in the intercept is statistically significant, T: Only break in the trend is statistically significant. CT: Break in both the intercept and trend is significant at 1 or 5%

Table 4: Johansen and Joselius (1990) cointegration tests

Country	r=0		r≤1		r≤2		r≤3	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Global oil prices								
KSA								
Trace statistic	37.20***	n	15.39	n	2.51	n		
Max-Eigen statistic	21.82**	n	12.88	n	2.51	n		
Russia								
Trace statistic	49.33**	78.22***	14.09	37.89	5.92	14.02	0.40	3.66
Max-Eigen statistic	35.24***	40.34***	8.17	23.86	5.52	10.36	0.40	3.66
US								
Trace statistic	49.17**	65.67**	30.14	41.11	12.59	22.04	2.20	6.03
Max-Eigen statistic	19.03	24.56	17.55	19.06	10.39	16.05	2.20	6.03
National oil prices								
Russia								
Trace statistic	67.15***	94.16***	22.19	39.00	3.74	16.33	0.06	4.18
Max-Eigen statistic	44.96***	55.15***	18.45	22.68	3.68	12.15	0.06	4.18

1: Model with an intercept, 2: Model with an intercept and a linear trend, r: Number of cointegrating vector, ***,** and * mean significant at the 1% level, 5% level, and 10% level, respectively, r=0 refers to H_0 of no cointegration, r≤1 to H_0 of maximum 1 cointegration, r≤2 to H_0 of maximum 2 cointegrations, and r≤3 refers to H_0 of maximum 3 cointegrations

countries. This suggests only one cointegrating vector, implying the existence of only one long-run relationship between the four variables (real stock prices, real industrial production index, interest rates, and oil prices) in Russia and the US, and between three variables (real stock prices, interest rates, and oil prices) in the KSA. Accordingly, the estimation of VECM becomes much simpler than when two or more cointegrating vectors are assumed, since it does not require a difficult identification of different cointegration relations. This is done by estimating the VECM where the vector is normalized on the stock prices for all three countries.

1. For US the results of the test with model (1) cannot reject H_0: No cointegration relation among variables with 6, 4 or 3 lags; can reject it with 8 lags and above; model (2) can reject H_0 with 7 lags.
2. For RUSSIA when global oil prices are used the results of the test with model (1) can reject H_0 of no cointegration relation with 3 lags only; cannot reject it with other lags. Model (2) can reject H_0 with 2 lags. When national oil prices are used the results of the test with model (1) can reject H_0 of no cointegration relation with 1 lags and is robust to up to 5 lags. Model (2) can reject H_0 with 1 lag and robust to up to 6 lags.
3. For KSA the results of the test with model (1) can reject H_0: No cointegration relation among variables with 4 and 5 lags only; model (2) cannot reject H_0 with any reasonable lag.

3.3. Decomposition of Shocks Origins

Some underlying empirical and theoretical issues need to be taken into consideration before the empirical investigations are implemented. The sign of the relationship between oil prices and stock prices likely depends on whether the countries under study are net exporters or net importers of oil. The sign is expected to be positive in the former and negative in the latter countries. However, theoretically the effect of oil price shocks on stock prices might also be sensitive to the source of shocks. The question is: Does a particular source of shocks have equal or different effects on stock prices for net importing and net exporting countries? To our knowledge, this question has never been addressed in previous studies. Kilian (2009), Peersman and Van (2009) and Cunado and Perez (2014) are arguably the pioneers in the effects of source of shocks, but did not raise and answer this question. We are of the opinion that a particular source of shocks likely works differently depending on whether the countries are net exporters or net importers of oil. For net oil importing countries, the expected effects are the following. While a positive effect is expected to result from price shocks originating from the demand side, a negative effect may result from supply shocks. This is expected to be true for the world's largest economies, such as the US, China, Europe and Japan, which also occur to be the largest importers of oil. An increase in the oil market demand produced by stronger economic activities in (at least) one of these economies and hence higher stock prices, given the oil market supply, likely pushes oil prices to increase. For small and oil importing economies, this positive relationship might not be the case, since their economic activities are too small to have effects on global oil demand and do not necessarily go together with those of the largest economies. Regarding the net oil exporting countries, the expected result is as follows. While oil price shocks arising from the demand side are expected to produce unambiguous positive signs, the shocks resulting from the supply might produce ambiguous signs. Whereas the expected positive sign in the former is irrespective of the relative price elasticity of demand and supply curves, the resulting sign in the latter tends to depend on it. There are three possible situations. When the market supply of oil is more price elastic than the demand, a price shock originating from the supply side likely produces positive effects on the economy and hence on stock prices. Conversely, when the opposite is true (the market demand of oil is more price elastic than the supply), the same shocks create negative effects on stock prices. Still, when both market supply and demand are of comparable price elasticity, the shocks might have no effect on stock prices. This is especially true for the KSA and Russia where the oil sector accounts for significant portions of GDP, export revenues, and state budgets. Figures 1 and 2 help clarify these hypotheses.

Previous related studies that include, among others, Kilian (2009), Peersman and Van (2009) and Cunado and Perez (2014) identify three different sources of oil shocks: An oil supply shock, an oil demand shock driven by global economic activity and an oil specific demand shock. While Kilian (2009) and Peersman and Van (2009) identify shocks by imposing sign restrictions on the

Figure 1: Oil price increase from demand shocks

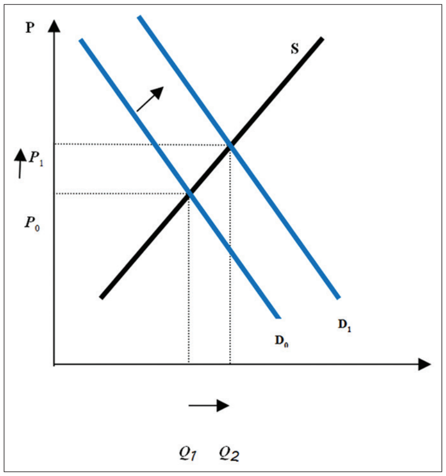
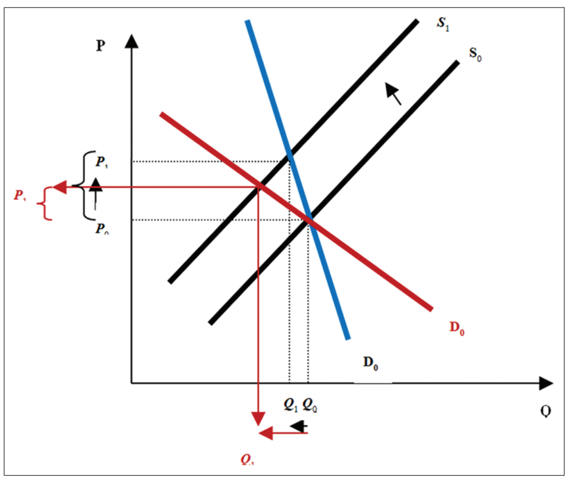


Figure 2: Oil price increase from supply shocks with demands of different price elasticities



estimated VAR models employed to analyze the stock market response to oil shocks, Cunado and Perez (2014) identify shocks by inspecting the movements in the price and production volume of oil. If they move together the price shocks originate from the demand side. In contrast, if they move in the opposite direction, price shocks result from supply shocks. In this study, we will follow Cunado and Perez (2014) in identifying the origin of oil price shocks. However, unlike Cunado and Perez (2014), who use data only from net oil importing countries, i.e,. 12 European countries, we focus on stock markets in the three largest oil producing countries, two of which are the main net oil exporters (the KSA and Russia), and the other one being net oil importer (the US). As suggested above, we expect that oil price shocks originating from the demand side will produce positive effects on stock prices in both groups of countries, and those coming from supply side will create contradictory effects on stock prices, namely unambiguous negative effects in net oil importing countries and potentially ambiguous effects in net oil exporting countries. The ambiguity in the latter case relates to relative price elasticity in the demand and supply of oil market faced by the countries.

According to Cunado and Perez (2014. p. 371), the decomposition of shocks is as follows. The oil supply shocks (oss_t):

$oss_t = \Delta oil_t$ if $sign(\Delta oil_t) \neq sign(\Delta yoil_t)$, and 0 otherwise,

And oil demand shocks (ods_t),

$ods_t = \Delta oil_t$ if $sign(\Delta oil_t) = sign(\Delta yoil_t)$, and 0 otherwise.

Where Δoil_t and $\Delta yoil_t$ are the growth rates of global real oil prices and global oil production, respectively, in time t. That is, an oil price change is identified as an oil supply shock if the sign of the oil price variation differs from the sign of the oil production variation, while it is identified as an oil demand shock if these signs are equal. For example, an oil price increase (decrease) together with an oil production increase (decrease) will be identified as a demand shock, while an oil price increase (decrease) followed by an oil production decrease (increase) will be identified as a supply shock.

4. EMPIRICAL METHODOLOGY

For the sake of comparability, the research questions in this paper will be addressed by employing VAR methodology that have also been widely used in studies of dynamic interaction between monetary policy variables and economic activity or between oil prices and economic activity. The examples include Hamilton (1983, 1996, 2011), Lee et al. (1995), Bernanke et al. (1997), Cunado and Perez (2003; 2005; 2014), among others. Owing to Sims (1980), a VAR model with k variables and p number of lags can be expressed as:

$$y_t = A_0 + \sum_{i=1}^{p} A_i y_{t-i} + u_t \quad (1)$$

Where y_t is a column vector of the current values of all variables in the model (real stock prices, real industrial production, nominal short-term interest rates and oil prices); A_i is k x k matrix of unknown coefficients; A_0 is a column vector of deterministic constant terms; the column vector of errors, u_t, satisfy the following conditions:

$$E(u_t)=0\ \forall_t; E(u_s u'_t) = \Omega \text{ if } s = t;\ E(u_s u'_t)=0 \text{ if } s \neq t$$

Where u'_t are not serially correlated but may be contemporaneously correlated and Ω is the variance-covariance matrix with non-zero off-diagonal elements.

When all the variables are of I(1) are cointegrated, the VAR model is transformed into a VECM where the relationships between variables are assumed to have both long run equilibrium and short run equations. The VECM is a vector of short run equations that includes the current growth value of each variable as the dependent variable and the lagged growth values of all variables and the error terms of the long run equilibrium equation as explanatory variables. The coefficients on the error terms of the long run equilibrium equation are called loading or speed of adjustment toward long run equilibrium. They must be of a negative sign, meaning that any positive or negative shock to the equilibrium relation will always be temporary and ultimately

Table 5: Estimated effect of oil prices on stock prices based on VEC models for different sources of shocks

Country	Demand shocks		Supply shocks		Total shocks	
	LR	SR	LR	SR	LR	SR
KSA	0.76***	0.29 (2L)**	-	0.30 (2L)**	-	0.16 (2L)**
Russia	1.98***	0.28 (1L) ***	1.06***	0.34 (1L)**	1.62***	0.34 (3L)***
US	0.97**	-	−0.61**	0.11 (1L)*	−1.38**	0.13 (3L)**

VECMs for demand shocks for the KSA and the US are with 5 lags, and that for Russia is with 6 lags; VECM for the KSA is with 3 lags, the US is with 4 lags, and Russia is with 6 lags for supply shocks; VECMs for the KSA is with 6 lags, the US is with 8 lags, and Russia is with 9 lags for total shocks; LR is long run equilibrium equation and SR is short run equation; 1L, 2L and 3L mean first, second, and third lag, respectively, ***,**, and * mean significant at the 1% level, 5% level, and 10% level, respectively, - means not significant at all accepted levels of α

revert to equilibrium. In addition, the short dynamic interaction between variables can also be captured by the impulse response function that tells how quickly stock prices respond to oil price shocks within a selected span of time can be traced out.

The VECM takes the following form:

$$\Delta y_t = \prod y_{t-1} + B_0 + \sum_{i=1}^{p-1} B_i \Delta y_{t-i} + e_t \qquad (2)$$

Where y_t is the vector of the same variables; Δ is the first difference operator; y_{t-i} is a vector of error correction terms, which are one period lag of the residuals of estimated long run equilibrium equations; Π is the loading matrix representing the speed of adjustment toward the equilibrium and rank (Π)=r, the number of cointegration vectors, which in this study is equal to 1 in all three cases; B_0 is a column vector of deterministic constant terms and the column vector of errors, e_t, satisfies the same conditions as the u_t in (1). Since cointegration tests do not always produce reliable results, in which case r can be equal to 0, in this study equation (2), which does not include $\prod y_{t-1}$ (or a VAR with all variables in differences), is also estimated. For each country separated VEC and VAR models are estimated based on datasets associated with each type of oil price shock (demand shocks, supply shocks, and total shocks). Based on each model the estimated long run equilibrium equations and short run equations and the generalized impulse response functions (GIRFs) of real stocks returns to oil demand shocks, oil supply shocks, and total shocks are presented and interpreted.

4.1. Long Run Equilibrium and Short Run Equations

Table 5 presents the estimated effects of oil prices on stock prices for different sources of oil price shocks based on VEC models for each of the three countries. As expected in the case of the US, a net oil importing country, oil prices have a positive and statistically significant long run effect on stock prices when the shocks come from the demand side and negative and statistically significant effects when the shocks originate from the supply side[4]. This means that an increase in oil prices that arises from the increase in the global demand for oil tends to increase stock prices in the US. This is because the increase in the global demand for oil is likely driven by increased economic activity, especially in the US, which is usually associated with rising stock prices. In contrast, if oil prices that increase because of the global oil supply decline for one reason or another, economic activity and hence stock prices will inevitably decline given that the US economy still relies on fossil fuel as the main source of energy, causing fuel consumption to contribute a significant amount to production costs. This finding is in line with the result by Kilian and Park (2009) for US stock prices, by Apergis and Miller (2009) for eight economies, and Cunado and Perez (2014) for 12 European economies, who also find different effects due to oil supply and oil demand shocks.

Interestingly, when the origin of shocks is not considered, the long run effect of oil prices on stock prices is negative and significant. It seems that for the US the effect of oil supply shocks outweighs the effects of oil demand shocks. The results are in line with the previous related studies that found negative effects of oil prices (Jones and Kaul, 1996; Sadorsky, 1999; Gjerde and Sattem, 1999; Park and Ratti, 2008; Chen, 2009; and Filis, 2010). However, relying on the findings of those studies can be misleading if the origins of shocks are not taken into account, since it has been proven that the demand shocks produce positive effects of oil prices on stock prices. The table also reports the short run effects of oil prices on stock prices, which are not statistically significant for both demand and supply shocks. This may imply that the effects of oil prices on stock prices in the US are permanent, although once the origin of shocks is not accounted for the short run effect is positive and significant with 3 months lag. This conclusion is corroborated by the results based on the VAR estimation shown in Table 6.

Can the same be said for the KSA and Russia, the two largest oil exporting countries? For both countries, as expected, oil demand shocks produce the same positive and significant long run effects of oil prices on stock prices as those in the US. This is not surprising, since this result confirms what is expected by the theory. The short run effects also corroborate the long run effects. However, the supply shocks produce different effects for these two countries. For Russia, the long run effects of oil prices on stock prices are unambiguously positive and significant, which is expected as the Russian stock exchange is dominated by oil and gas companies, representing approximately 60% of the market capitalization. The results for the KSA are ambiguous, i.e., they are of negative sign and not statistically significant at any accepted level of α.

4 For the demand shocks, the long run effects of real industrial production (RIP) and short-term interest rates (STIR) are significant at 1%. Interestingly, the effect of STIR is negative. For the supply shocks the long run effects of RIPI and STIR are significant at 1%. Interestingly, the effects of both oil prices and STIR are negative and RIPI is positive. This can be interpreted that when the oil price shocks originating from supply side there is long run negative effect of oil prices on stock prices in the US, which makes sense. This negative relationship can be both temporary and permanent (long run). Although the US is now a net oil exporting country, it has been so only for four years, and the entire observation of the period when the US was a net oil importer. The results of the study suggest that the US is indeed a net oil importer.

Table 6: Estimated effect of oil prices on stock prices based on VAR models for different sources of shocks

Country	Demand shocks	Supply shocks	Total shocks
	SR	SR	SR
KSA	0.17 (1L)* and 0.34 (2L)***	0.31 (2L)***	0.19 (2L)***
Russia	0.42 (1L)*** and 0.0.31 (2L)***	0.48 (1L)***and 0.55 (2L)***	0.41 (3L) ***
US	0.09 (1L)* and 0.13 (2L)**	0.09 (1L)* and 0.10 (2L)*	0.12 (3L)***

All variables in VAR models for all three countries are in differences with 2 lags for demand shocks; VAR for the KSA is with 2 lags. VAR models for supply shocks for the US and Russia are with 2 lags, and for the KSA is with 2 lags; VAR for total shocks for the US is with 3 lags. KSA is with 6 lags, the US is with 8 lags, and Russia is with 9 lags for total shocks; LR is long run equilibrium equation and SR is short run equation; 1L, 2L and 3L mean first, second, and third lag, respectively, ***,** and * mean significant at the 1% level, 5% level, and 10% level, respectively, - means not significant at all accepted levels of α

As suggested previously, this difference might be related to the relative price elasticity of oil supply and demand faced by these two countries. Arguably, given the global demand for oil, the oil supply of Russia is more price elastic than that of the KSA, since the former is not regulated by the OPEC cartel and relatively more independent of pressure from the Western world, especially the US, than the latter. It is no secret that the KSA is often subject to some pressures from Western powers in supplying oil, in addition to its leading role in the OPEC cartel. Similarly, an agreement to change the quantity of supply by the OPEC cartel in response to changes in oil prices is often very difficult to achieve, since its leading member countries, most notably the KSA and Iran, often have conflicting agendas with respect to the oil supply. They are frequently locked in the status quo amid mounting pressures for revising oil supply. This inevitably makes it more difficult for the KSA to respond to changes in oil prices by changing its oil supply. Accordingly, countries such as Russia tend to reap larger benefits from rising oil prices driven by supply shocks produced by such events as conflicts in the Middle East. These results are unprecedented, since the previous related studies that take account of origins of oil shocks, as shown in the literature review section, concern stock markets in advanced and net oil importing countries. Such studies that focus on the emerging stock markets in the main oil exporting countries are virtually absent.

The results for total shocks strengthen those of demand and supply shocks for Russia, while those for the KSA are in line with those of supply shocks; in other words, the long run effects of oil prices on stock prices are not significant. This can also be seen from the short run effects of oil prices on stock prices, which for the KSA are positive and significant but with two periods lag as opposed to Russia, which only has one period lag. The short run results based on VAR reinforce those based on VECM, as shown in Table 6.

Figure 3: Generalized response of stock returns to alternative oil price shocks based on VECM: SA

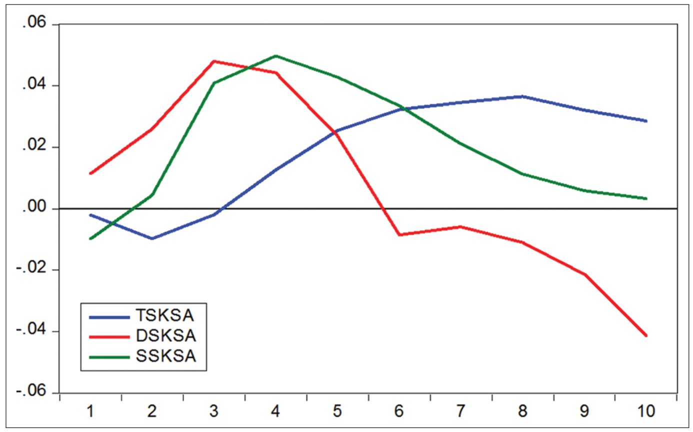
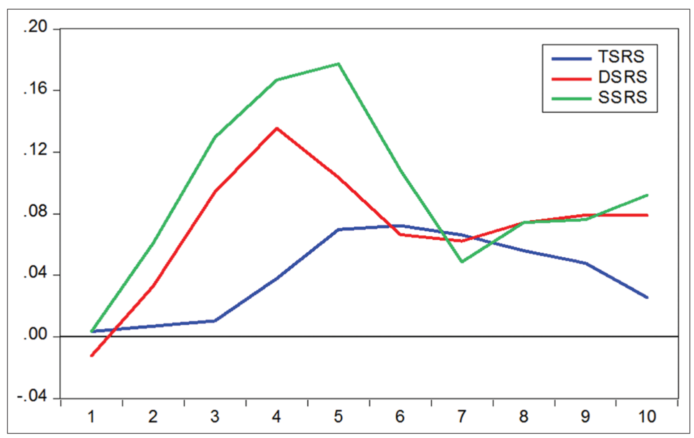


Figure 4: Generalized response of stock returns to alternative oil price shocks based on VECM: Russia

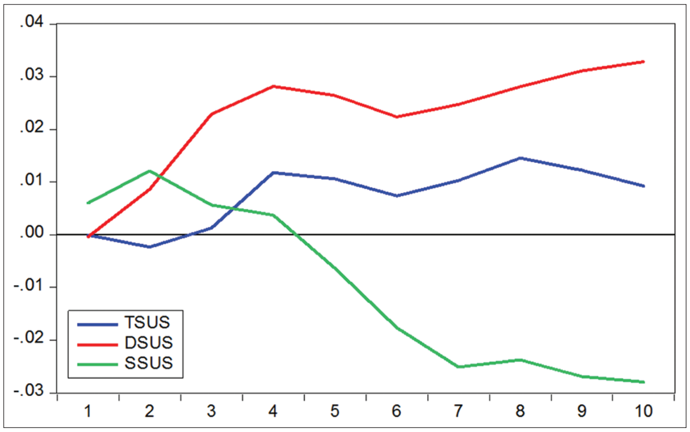


Source: TSRS: Response of stock returns to total oil shocks, DSRS: Response of stock returns to oil demand shocks, SSRS: Response of stock returns to oil supply shocks

4.2. GIRFs

Figures 3-5 show the GIRFs of real stock returns to a shock to oil prices that originate from (i) global oil demand shocks (DS, red line), (ii) global oil supply shocks (SS, green line), and (iii) global oil shocks (TS, blue line) for the KSA, Russia, and the US, respectively. Each figure puts together the GIRFs for each type of shocks so that we can better compare their relative magnitude and strength. For the KSA, as shown by Figure 3, the effect of global oil demand shocks on stock returns is clearly positive, while those of global supply and total shocks are negative, which is in line with the result based on the estimated long run equilibrium equation. For the Russian case, as shown by Figure 4, all three types of oil shocks produce unambiguous positive effects on stock returns. This also corroborates the results based on the estimated long run equilibrium equation. Interestingly, the positive effects created by the supply shocks are greater than those created by the demand shocks. This may be because Russia, as explained above, tends to reap more benefits from oil supply shocks because of its relatively more independent position as one of main oil exporters, which makes its oil supply more price elastic. The GIRFs for the US, as shown in Figure 5, are also in line with the results based on the estimated long run equilibrium equation. While the effects of demand shocks are unambiguously positive and tend to be permanent, the effects of supply shocks are initially positive and quickly turn to negative and tend to last long. Meanwhile, the

Figure 5: Generalized response of stock returns to alternative oil price shocks based on VECM: The US



Source: TSUS: Response of stock returns to total oil shocks, DSUS: Response of stock returns to oil demand shocks, SSUS: Response of stock returns to oil supply shocks

effects of total shocks are initially negative and quickly turn to positive.

In summary, these results show that the effects of oil price changes on stock prices are not uniform, depending on whether the origin of the oil price shocks is from the demand side or supply side and on whether the country under study is a net oil importing or net exporting country.

5. CONCLUSION

Given that fossil fuel still serves as an important source of energy to propel the engine of economic activity, oil price changes must be able to predict economic activity and in turn stock market returns. However, the ability of oil price changes to predict stock market returns is not conclusive. This paper aims to analyze whether oil price changes can predict stock market returns in the three largest oil producing countries in the world, namely, the KSA, Russia and the USA. While the first two are considered to be the two largest net oil-exporting countries, the US is assumed to be a net importing country, although it has held the status of a net oil exporter since 2011. Using monthly data for the period 2000:01-2015:05 for the US and Russia and 2001:07-2015:05 for the KSA, several VEC models that include such variables as stock prices, industrial production indexes, short-term interest rates and various oil price specification are estimated.

The main argument and contributions of the paper is that the effects of oil price changes on stock prices depends not only on whether the origin of the oil price shocks is from the demand side or supply side but also on whether the country under study is a net oil importing or net exporting country. We argue that oil price shocks originating from the demand side produce positive effects on stock prices in both net oil exporting and net importing countries, but those coming from supply side potentially create contradictory effects on stock prices, namely unambiguous negative effects in net oil importing countries and ambiguous effects in net oil exporting countries. The ambiguity in the latter case is related to relative price elasticity of the demand and supply of oil market faced by the countries.

The main findings of this paper are as follows. First, when the origin of shocks is not taken into account, oil price changes have a positive and significant effect on stock market returns in Russia, a negative and significant effect in the US, and a negative and not significant effect in the KSA. Second, when oil price changes are driven by demand shocks, they produce uniform positive impacts on stock market returns in all three countries. Third, when oil price changes are driven by supply shocks, they exert a clearly positive impact on stock market returns in Russia, a clearly negative effect in the US, and an ambiguous impact in the KSA. In this case, there is nothing to dispute the result for the US, a net oil importer, as related previous studies reinforce it. However, the different results for Russia and the KSA, as two main net oil exporters, demand further explanation. The positive effect for Russia and negative effect for the KSA of the supply shocks might result from the fact that the oil supply of Russia is more price elastic than that of the KSA given global oil demand.

REFERENCES

Apergis, N., Miller, S. (2009), Do structural oil-market shocks affect stock prices? Energy Economics, 31, 569-575.

Arouri, M., Rault, C. (2011), Oil prices and stock markets in GCC countries: Empirical evidence from panel analysis. International Journal of Finance and Economics, 17, 243-253.

Awartani, B., Maghyereh, A. (2014), Dynamic Spillovers between oil and stock markets in the gulf cooperation council countries. Energy Economics, 36, 28-42.

Banerjee, A., Lumsdaine, R., Stock, J. (1992), Recursive and sequential tests of the unit-root and trend-break hypothesis: Theory and international evidence. Journal of Business and Economic Statistics, 10, 271-287.

Berk, I., Aydogan, B. (2012), Crude Oil Price Shocks and Stock Returns: Evidence form Turkish Stock Market under Global Liquidity Conditions. EWI Working Paper No. 12/15.

Bernanke, B.S., Gertler, M., Watson, M.W. (1997), Systematic monetary policy and the effect of oil price shocks. Brookings Papers on Economic Activity, 1, 91-157.

Bouoiyour, J., Selmi, R. (2016), How differently does oil price influence BRICS stock markets? Journal of Economic Integration, 31, 547-568.

Chen, N., Roll, R., Ross, S.A. (1986), Economic forces and the stock market. Journal of Business, 59, 383-403.

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

Chen, S.S., Chen, H. (2007), Oil prices and real exchange rates. Energy Economics, 29, 390-404.

Coudert, V., Mignon, V., Penot, A. (2008), Oil price and dollar. Energy Studies Review, 15, 48-65.

Cunado, J., Perez, G.F. (2003), Do oil price shocks matter? Evidence for some European countries. Energy Economics, 25, 137-154.

Cunado, J., Perez, G.F. (2005), Oil prices, economic activity and inflation: Evidence from some Asian economies. Quarterly Review Economics Finance, 45, 65-83.

Cunado, J., Perez, G.F. (2014), Oil price shocks and stock market return: Evidences for some European countries. Energy Economics, 42, 365-377.

Degiannakis, S., Filis, G., Kizys, R. (2014), The effects of oil price shocks on stock market volatility: Evidence from European data. The Energy Journal, 35, 35-56.

Dhaoui, A., Khraief, N. (2014), Empirical Linkage Between Oil Price and Stock Market Returns and Volatility: Evidence from International Developed Markets. Discussion Paper. 2014-12.

Faff, R., Brailsford, T.J. (1999), Oil price risk and Australian stock market. Journal of Energy Finance Development, 49, 69-87.

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

Filis, G., Degiannakis, S., Floros, C. (2011), Dynamic correlation between stock market and oil prices: The case of oil-importing and oil-exporting countries. International Review of Financial Analysis, 20, 152-164.

FTSE. (2016), Annual Country Classification Review. Available from: http://www.ftse.com/products/downloads/ftse-country-classification-update_latest.pdf. [Last accessed on 2016 Oct 13].

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

Goodness, C.A. (2015), Does oil price uncertainty matter for stock returns in South Africa? Investment Management and Financial Innovations, 12, 179-188.

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

Hamilton, J.D. (1996), This is what happened to the oil price-macro economy relationship. Journal Monetary Economics, 38, 215-220.

Hamilton, J.D. (2009a), Understanding crude oil prices. Energy Journal, 30, 179-206.

Hamilton, J.D. (2009b), Causes and consequences of the oil shock of 2007-08. Brookings Papers on Economic Activity, 1, 215-261.

Hamilton, J.D. (2011), Nonlinearities and the macroeconomics effects of oil prices. Macroeconomic Dynamics, 15, 364-378.

Hamilton, J.D., Herrera, A.M. (2004), Oil shocks and aggregate macroeconomic behavior: The role of monetary policy. Journal Money Credit and Banking, 36, 265-286.

Hammoudeh, S., Eleisa, L. (2004), Dynamic relationship among GCC stock markets and NYMEX oil future. Contemporary Economic Policy, 22, 250-269.

Huang, D.R., Masulis, R.W., Stoll, H. (1996), Energy shocks and financial markets. Journal of Future Markets, 16, 1-27.

Jimenez-Rodirguez, R., Sanchez, M. (2005), Oil price shocks and real GD growth: Empirical evidence from some OECD countries. Applied Economics, 37, 201-228.

Johansen, S., Joselius, K. (1990), Maximum likelihood estimation and inference on cointegration-with application to the demand for money. Oxford Bulletin of Economics and Statistics, 52, 169-210.

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

Kilian, L. (2009), Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market. American Economic Review, 99, 1053-1069.

Kilian, L., Park, C. (2009), The impact of oil price shocks on the U.S. stock market. International Economic Review, 50, 1267-1287.

Lee, K., Shawn, N., Ratti, R.A. (1995), Oil shocks and the macro economy: The role of price variability. Energy Journal, 16, 39-56.

Lin, B., Wesseh Jr P.K., Appiah, M.O. (2014), Oil price fluctuation, volatility spillover and the Ghanaian equity market: Implication for portfolio management and hedging effectiveness. Energy Economics, 42, 172-182.

Masih, R., Peters, S.L.D. (2011), Oil price volatility and stock price fluctuations in an emerging market: Evidence from South Korea. Energy Economics, 33, 975-986.

Miller, J.I., Ratti, B. (2009), Crude oil and stock markets: Stability, instability, and bubbles. Energy Economics, 31, 559-568.

MSCI. (2016), Results of MSCI 2016 Market Classification Review. Available from: https://www.msci.com/documents/10199/4b1ba122-5f18-4a36-91c0-41a9b358c2ff. [Last accessed on 2016 Oct 13].

Naifar, N., Al-Dohaiman, M.S. (2013), Nonlinear analysis among crude oil prices, stock markets' return and macroeconomic variables. International Review of Economic and Finance, 27, 416-431.

Nandha, M., Faff, R. (2008), Does oil move equity prices? A global view. Energy Economics, 30, 986-997.

Narayan, P.K., Narayan, S. (2010), Modeling the impact of oil prices on Vietnam's stock prices. Apply Energy, 87, 356-361.

Narayan, P.K., Sharma, S.S. (2011), New evidence on oil price and firm returns. Journal of Banking and Finance, 35, 3253-3262.

Ono, S.H. (2011), Oil price shocks and stock markets in BRICs. The European Journal of Comparative Economics, 8, 29-45.

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

Peersman, G., Van, R.I. (2009), Oil and the euro area economy. Economic Policy, 24, 603-651.

Perron, P. (1989), The great crash, the oil price shock and the unit root hypothesis. Econometrica, 57, 1346-1401.

Pleven, L., Gold, R. (2011), U.S. Nears Milestone: Net Fuel Exporter. The Wall Street Journal. Available from: https://www.elsevier.com/journals/energy-economics/0140-9883/guide-for-authors#67000. [Last accessed on 2016 May 12].

Sadorsky, P. (1999), Oil price shocks and stock market activity. Energy Economics, 21, 449-469.

Sadorsky, P. (2001), Risk factors in stock returns of Canadian oil and gas companies. Energy Economic, 23, 17-28.

Saudi Arabian Monetary Agency. (2013), Annual Report. Available from: http://www.sama.gov.sa/sites/samaen/ReportsStatistics/ReportsStatisticsLib/5600_R_Annual_En_48_2013_02_19.pdf. [Last accessed on 2016 May 12].

Sims, C.A. (1980), Macroeconomics and reality. Econometrica, 48, 1-48.

Swanepoel, J.A. (2006), The impact of external shocks on South African inflation at different prices stages. Journal of Studies in Economics and Econometrics, 30, 1-22.

Vogelsang, T.J., Perron, P. (1998), Additional tests for a unit root allowing for a break in the trend function at an unknown time. International Economic Review, 39, 1073-1100.

Wei, C. (2003), Energy, the stock market, and the putty-clay investment model. American Economic Review, 93, 311-323.

Zhang, C., Chen, X. (2011), The impact of global oil price shocks on china's stock returns: Evidence from the ARJI (-ht)-EGARCH model. Energy Economics, 36, 6627-6633.

Zivot, E., Andrews, D.W.K. (1992), Further evidence on the great crash, the oil price shock and the unit root hypothesis. Journal of Business & Economic Statistics, 10, 251-270.