Comparative Economic Research. Central and Eastern Europe
Volume 26, Number 3, 2023
https://doi.org/10.18778/1508-2008.26.27

A Reassessment of Oil Market Volatility and Stock Market Volatility: Evidence from Selected SAARC Countries

Tariq Aziz https://orcid.org/0000-0001-6073-0628
Ph.D., Assistant Professor, Prince Muhammad Bin Fahd University, Finance and Accounting, Khobar, Dhahran Saudi Arabia, e-mail: taziz@pmu.edu.sa

Abstract

Volatility spillover informs whether the information in one market impacts the information in another. This paper examines whether oil market volatility spills over to the equity markets of selected SAARC countries. The study uses data from February 2013 to September 2019 to obtain updated evidence about the transmission of global oil price volatility to the equity markets of the SAARC member countries. The bivariate EGARCH model is used to test for volatility transmission from the oil market to the stock market. It is found that oil price shocks do not significantly impact equity market volatility, except in Bangladesh. Policymakers can use these findings when making policy decisions.

Keywords: stock market, oil market, volatility spillovers, information transmission, EGARCH

JEL: C32, G15

Received: 17.01.2023. Verified: 13.02.2023. Accepted: 10.06.2023

Introduction

Emerging countries' stock markets have grown rapidly over the last few decades. It has created many investment opportunities in those markets, increasing capital inflows from developed markets to emerging markets (Beckmann, Berger, and Czudaj 2015). Despite this, global news and events also affect emerging markets' stock returns, making them more volatile and creating an uncertain environment. Oil is one of the world's most widely used and traded products, and it remains the backbone of any economy. Because of recent major oil price fluctuations, research on oil markets received a boost as it has a wide impact on the business cycle of any economy. Studies have demonstrated that the relationship between stock returns and oil prices is still inconclusive, even though much research has been carried out on this topic. The stock market represents the economic condition of any country (Hamilton and Herrera 2004; Kilian 2008; Korhonen and Ledyaeva 2010). Therefore, oil market and stock market volatility spillover is crucial for decision-makers, such as energy policymakers and others who mitigate the risk generated through these fluctuations in oil price changes. This is one of the most debatable topics, as evidenced by increased research in this area (Filis, Degiannakis, and Floros 2011; Awartani and Maghyereh 2013; Ewing and Malik 2016; Kang, McIver, and Yoon 2017).

In the recent past, the analysis of stock market returns has revealed a high level of volatility. Different countries have different macroeconomic conditions and different types of investors with different perspectives on the stock market, which causes this high volatility. Because of the uncertainty in the stock market, risk-averse investors are always reluctant to invest in the stock market (Jones and Kaul 1996). The Financial Crisis of 2008 and the European sovereign debt crisis of 2011 adversely affected investor sentiment (Malmendier and Nagel 2011; Hoffmann, Post, and Pennings 2013). Many papers have investigated the correlation between stock and commodity prices because of their diversification advantage in the economy. Tiwari and Sahadudheen (2015) studied oil and gold as the most highly liquid commodities and found movement in stock market returns when oil and gold are included in the portfolio. That is why investors are motivated to add commodities (gold and oil) to their portfolios. During economic downturns, which negatively impact investors' returns, e.g., the economic crisis of 1970, the Russian crisis in 1997, the Asian financial crisis in 1998, and the global financial crisis of 2007–2009, investors are encouraged to look for alternative investments to diversify their assets and avoid return losses. To hedge the risk, a portfolio construction strategy remains the focus for all individual investors suggested by researchers and investment managers. It will bring back investors' confidence in the financial markets and help them prevent sudden losses because of market turmoil.

Much research has been conducted on oil as an asset in portfolio optimization in connection with stock returns. Researchers have found a significant association of this asset class in portfolio optimization (Park and Ratti 2008; Degiannakis, Filis, and Kizys 2014; Lin and Appiah 2014; Khalfaoui, Boutahar, and Boubaker 2015; Wang and Liu 2016).

According to a 2015 report by Jadwa Investment, investor sentiment is affected by oil price fluctuations in the international market because 90% of trading volumes are generated by individual investors, and these sentiments drive investors to take investment decisions. In Saudi Arabia (a major oil exporting country), 86% of government revenue comes from oil and oil-related products. Whenever the price of oil fluctuates in the international market, Saudi Arabia's government expenditures and stock market returns are affected. In addition, according to Raza et al. (2016), all emerging markets are less impacted by oil price changes. Thus, emerging markets have negative relationship with oil price. Global oil prices showed a rapid decline from January 2013 to mid-2015, and then they increased steadily. Noor and Dutta (2017) noted that volatility spillover exists between the oil market and the stock market for selected countries (i.e., Sri Lanka, India, and Pakistan). Fowowe (2017) investigated Nigeria and South Africa for volatility spillover between oil prices and the stock market. They note that in Nigeria, volatility spillover is not significant. The mixed results could be attributed to the use of different data frequencies, different econometric models, or different variable measurements. Regarding the mixed results and changing patterns of global oil prices, this study aims to provide updated evidence of volatility spillover from global oil prices to the stock markets of the South Asian Association for Regional Cooperation(SAARC) member countries.

The study contributes to the literature in multiple ways. First, it examines the volatility spillover between the oil market and the stock market for selected SAARC member countries. Second, the study uses the prices of two different oil standards, including Brent oil and WTI, which ensures consistent and reliable results. Third, the study employs the EGARCH model, which allows for the leverage effect and is more efficient than the simple GARCH model and other linear regression models. Because the rise and fall in oil prices do not cause uniform shocks to stock returns; thus, that behavior can be captured efficiently using the EGARCH model. Fourth, oil prices and stock prices are time-varying variables; hence continuous screening and investigation are needed. Therefore, the current study provides up-to-date evidence about the link between oil prices and stock returns.

The rest of the paper is organized as follows. The second part provides a literature review, while the third part provides the research methodology. The fourth part contains the results and discussion, while the fifth part provides conclusions.

Literature review

Numerous researchers have examined global economies and found that fluctuations in oil prices have significant and insignificant impacts. Whenever there is a new oil price shock in the international market, the movement of oil prices gains significance in the literature, emphasizing a new research horizon. Earlier research (Hamilton 1983; Mork 1989; Kilian 2009) found significant evidence that oil prices negatively correlate with GDP, which means that oil price shocks will not be affected much and economic recessions are under control. In four developed markets, including the USA, Japan, Canada and the UK, Jones and Kaul (1996) found that oil prices pose a significant risk factor for the stock market because they negatively impacted stock market returns.

In contrast, Sadorsky (2001) found that oil prices and stock market returns are positively correlated. He found that key factors that affect the stock market are interest rates, risk premiums, and exchange rates. It may also be possible that both equity returns and oil prices have no relationship. In this regard, Wei (2003) found no relationship between stock market returns and oil prices because their correlation was insignificant, which shows that oil prices cannot determine movements in stock prices. Fayyad and Daly (2011) used (VAR) and used data from seven counties (the UAE, the UK, the USA, Oman, Kuwait, Bahrain, and Qatar) to investigate the relationship between stock market returns and oil prices. Empirical findings suggested that there is a significant relationship between fluctuations in oil prices and Gulf Coordination council (GCC) countries' stock market returns. They also found that developed countries' (UK and USA) equity market returns are also affected by oil prices.

Further, Arouri and Nguyen (2010) showed that macroeconomic variables are affected by oil price fluctuations, including inflation, income level, interest rate, investor confidence, and production costs. The study conducted by Arouri, Lahiani, and Nguyen (2011) investigated the spillover effects between oil and stock market returns by utilizing data from the US and European stock markets. To examine the role of oil as an asset in hedging portfolio risk, they employed the VAR-GARCH model. Their analysis revealed that oil plays a vital and noteworthy role in both hedging portfolio risk and optimizing portfolios. Further, Arouri, Jouini, and Nguyen (2012) studied stock index returns and oil prices in European countries in terms of volatility spillovers. They found that price fluctuations of oil and equity market returns have significant volatility transmission. This means that we must understand this correlation first to make an optimal portfolio, which should include oil prices. Raza et al. (2016) examined developed countries and examined the relationship by using asymmetric effects between oil and stock market returns. They found a significant negative relationship between them.

Emerging economies are negatively influenced by oil price volatilities. Lin and Appiah (2014) studied oil prices and stock market returns in Ghana and Nigeria in terms of volatility spillover. They found when hedging stock market risk, oil is the better alternative asset for investment. They also found that the Nigerian stock market was affected by oil price fluctuations; it means volatility spillover was higher in that market. Meanwhile, the Ghanaian stock market was more affected when hedging the portfolio risk.

Singhal and Ghosh (2016) studied the link between the oil market and the stock market in India. They utilized the VAR_DCC_GARCH model to study the link between two variables from January 1, 2006, to February 28, 2015. They did not find significant volatility spillover between the oil market and the stock market. Dedi and Yavas (2016) examined five countries for volatility spillover between oil prices and the stock market. They employed various GARCH techniques to study this link for Germany, Turkey, Russia, the United Kingdom, and China. They noted that volatility spillover existed between all the countries between March 31, 2011, and March 11, 2016.

Many researchers have also found that news regarding oil price fluctuations specifically affects emerging economies and creates a more sensitive, ambiguous economic environment. Using data from eleven countries from 2008 to 2015, Maghyereh, Awartani, and Bouri (2016) found that both oil and stock market returns are affected by news spillovers. Guesmi (2014) used a multivariate GJRDCC-GARCH model in countries that export oil (i.e., Venezuela, the Kingdom of Saudi Arabia (KSA), Kuwait, and the UAE) and those countries that import oil (the USA, France, Italy, Germany, and the Netherlands) to analyze the impact of oil prices fluctuations on stock markets in terms of volatility spillover. They found that in periods of global turmoil, oil prices significantly impacted the stock market returns of these exports and import-oriented countries. Bouri (2015) studied the shock effects of the 2008 global financial crisis on Jordan and Lebanon, which are small oil importers, by focusing on volatility spillover to see whether the financial crisis shocks had any impact on their price of oil and stock market returns. He found that price of oil and returns of stock market both were significantly affected in Jordan but not in Lebanon.

Gbatu et al. (2017) applied the ADL bounds test approach of Pesaran, Shin, and Smith (2001) to investigate the impact of oil price fluctuations on the Liberian economy. They showed that oil prices have a significant impact in the short run, and Real GDP has a nexus with these oil price fluctuations. Using data from February 2007 to July 2016, Trabelsi (2017) examined three major oil-exporting economies (the UAE, Saudi Arabia, and Russia). He used the stock market indices of these countries to see the impact of oil price spillovers. He adopted the DCC-GARCH and Co Var measure. For Saudi Arabia, he used the Saudi Arabia (TASI) Index, for the UAE, he used the DFM index, and for Russia, he used the RSI index. He noted a significant negative relationship between stock market indices and oil prices.

Bouri et al. (2018) used quantile response methods and a multivariate regression quantile technique to see the relationship between countries that export oil (i.e., Brazil and Russia) and those that import oil (i.e., India and China) by applying a shock transmission mechanism. He also used oil prices to examine the dependence of the oil shocks and BRICS sovereign risk on stock volatility. The empirical results showed that there is an asymmetric effect. In addition, a negative shock in oil volatility impacts oil-importing economies more, whereas a positive shock in oil volatility impacts oil-exporting economies more. Ping et al. (2018) examined the energy stock market in connection with fuel oil spots and fuel oil futures by focusing on volatility spillover using DCC-GARCH and VAR-BEKK-GARCH frameworks. They found these markets have bidirectional effects in connection with volatility spillovers.

Methodology

Data and variables

The paper uses monthly time series data from February 2013 to September 2019 to study the volatility spillover between stock market returns and oil prices. For a fair examination, the study used the two most traded and popular benchmark oil commodities, i.e., West Texas Intermediate (WTI) and Brent North Sea Crude (Brent). The data of both benchmarks were obtained from Investing.com. The target sample of the study is SAARC member countries, although another four countries are included in the sample, i.e., Pakistan, Sri Lanka, India, and Bangladesh. These countries account for more than 90% market capitalization of the SAARC region. The market data of the countries are taken from the global market data forum, Investing.com.

The prices are used at the percentage difference level calculated by using the following equations:

$$Ret_{(equity, WTI, Brent)} = \left[\frac{price_t - price_{t-1}}{price_{t-1}}\right] \cdot 100, \tag{1}$$

where $R_{(equity,\ WTI,\ Brent)}$ shows the returns/percentage change in oil prices and equity prices.

$Price_t$ shows the prices of the current month, while $Price_{t-1}$ represents the prices of the previous month.

Unit root test

As stationarity influences the behavior of variables, the stationary and non-stationary variables are treated differently (Brooks 2019). Therefore, before selecting the econometric model, the level of stationarity for each variable is important. The study uses the Augmented Dickey-Fuller test (ADF) and the Phillip-Perron unit root test (PP) to test the stationarity of the variables.

Econometric model

To examine the volatility spillover effect between stock market returns and oil prices, Generalized Autoregressive Conditional Heteroscedastic (GARCH) and Exponential Generalized Autoregressive Conditional Heteroscedastic (EGARCH) models are employed. The EGARCH model is an extended version of the GARCH model to investigate the leverage effect.

The GARCH model is a widely used model to study volatility that makes it possible to predict the conditional variance on its own lag terms (Brooks 2019). The general equations of the GARCH model are given below:

$$y_t = \mu + \alpha y_{t-1} + u_t, \dot{o}_t \sim N\left(0, \delta_t^2\right), \tag{2}$$

$$\delta_t^2 = \beta_0 + \beta_1 u_{t-1}^2 + \gamma \delta_{t-1}^2. \tag{3}$$

This is a univariate standard GARCH (1,1) model, where equation (2) shows the conditional mean and equation (3) represent the conditional variance. The model can convert to order (p, q) by extending previous lags of ut to the qth order, and the lag terms of δ_t^2

to the pth order, as given below:

$$\delta_t^2 = \beta_0 + \sum_{i=1}^{q} \beta_1 u_{t-1}^2 + \sum_{j=1}^{p} \gamma_j \delta_{t-j}^2, \tag{4}$$

where equation (4) shows the conditional variance; β_0, β_i, and γ_j are the coefficient of the model; u_{t-1}^2 is the previous lags of the error term, and δ_{t-1}^2 is the lag terms of the variance. The study employed a bivariate GARCH (1,1) model to check the volatility persistence. The specification of the models is shown below:

$$\delta_{t(Ret)}^2 = \alpha_1 + \beta_1 u_{t-1}^2 + \gamma_1 \delta_{t-1(Ret)}^2 + \omega_1 WTI_{t-1}, \tag{5}$$

$$\delta^2_{t(Ret)} = \alpha_2 + \beta_2 u^2_{t-1} + \gamma_2 \delta^2_{t-1(Ret)} + \omega_2 Brent_{t-1}, \tag{6}$$

where $\delta^2_{t(Ret)}$, $\delta^2_{t(WTI)}$ and $\delta^2_{t(Brent)}$ are the conditional variance of stock market returns, WTI, and Brent, respectively. α_1–α_4 are intercepts of the models. β_1–β_4 are the coefficients of moving average terms (MA), which show the impact of the error term on the conditional variance. Similarly, $\gamma_1\gamma_4$ measures the impact of own lags of the variance on the variance of the current month. $\omega_1-\omega_4$ shows the impact of the lag term of the independent variable in the model on the conditional variance of the dependent variable.

To investigate the leverage effect, the EGARCH model is a better tool that also does not necessitate the condition of positive variances (Brooks 2019). The conditional variance of the EGARCH model is given below:

$$\ln(\delta^2_t) = \alpha_0 + \beta \ln\left(\delta^2_{t-1}\right) + \gamma \frac{u_{t-1}}{\sqrt{\delta^2_{t-1}}} + \varphi\left[\frac{|u_{t-1}|}{\sqrt{\delta^2_{t-1}}} - \sqrt{\frac{2}{\pi}}\right]. \tag{7}$$

In the equation, $\ln(\delta t^2)$ shows the natural log of conditional variance; β measures the persistence of volatility; γ gives the existence of an asymmetric or leverage effect in the model; φ provides the symmetric effect.

The specific equations for the conditional mean and the conditional variance of the bivariate EGARCH model are developed, following Kanas (2000) and Jebran and Iqbal (2016).

Volatility transmission from WTI oil prices to stock market

To examine the volatility spillover or volatility transmission from WTI crude oil market returns to stock market returns, the algebraic equations of the bivariate EGARCH model are given below:

$$Ret_t = \alpha_0 + \alpha_1 Ret_{t-1} + \alpha_2 WTI_{t-1} + u_t, \tag{8}$$

$$\ln\left(\delta^2_{t(Ret)}\right) = \beta_0 + \beta_1 \ln\left(\delta^2_{t-1(Ret)}\right) + \beta_2 \frac{u_{t-1}}{\sqrt{\delta^2_{t-1}}} + \varphi\left[\frac{|u_{t-1}|}{\sqrt{\delta^2_{t-1}}} - \sqrt{\frac{2}{\pi}}\right] + \rho V_{(WTI)}, \tag{9}$$

where Ret shows the stock market returns, and V represents the volatility of WTI and ρ provides the spillover effects.

Volatility transmission from Brent oil prices to the stock market

The bivariate EGARCH (1,1) model checks the volatility spillover from the Brent oil market returns to the stock market returns. The conditional mean and variance of the model are:

$$Ret_t = \alpha_0 + \alpha_1 Ret^t{}_{-1} + \alpha_2 Brent_{t-1} + u, \tag{10}$$

$$\ln\left(\delta^2_{t(Ret)}\right) = \beta_0 + \beta_1 \ln\left(\delta^2_{t-1(Ret)}\right) + \beta_2 \frac{u_{\ -1}}{\sqrt{\delta^2_{t-1}}} + \varphi\left[\frac{|u_{\ -1}|}{\sqrt{\delta^2_{t-1}}} - \sqrt{\frac{2}{\pi}}\right] + \rho V_{(Brent)}, \tag{11}$$

where the coefficients and symbols have the same interpretations as provided in the later section.

The models are used separately for each country for the bidirectional volatility spillover or volatility transmission between stock market return and WTI oil prices, and stock market return and Brent oil prices.

Results and discussion

Before the empirical analysis, the behavior of oil prices and returns of the stock market is visualized through univariate analysis, including univariate graphs and descriptive statistics. The trends of oil prices and stock market prices are shown in Figure 1. The oil prices of both benchmarks are at peak in 2012–2013, showing a downward trend in the beginning months of 2014, and reaching the lowest level in 2015–2016. After mid-2015, oil prices show an upward trend with minor shocks till the last month of the sample. The same figure shows the equity market trends of all four countries, including the KSE–100 index (Pakistan), the BSE SENSEX index (India), the CSE all-share index (Sri Lanka), and the DSEX index (Bangladesh).

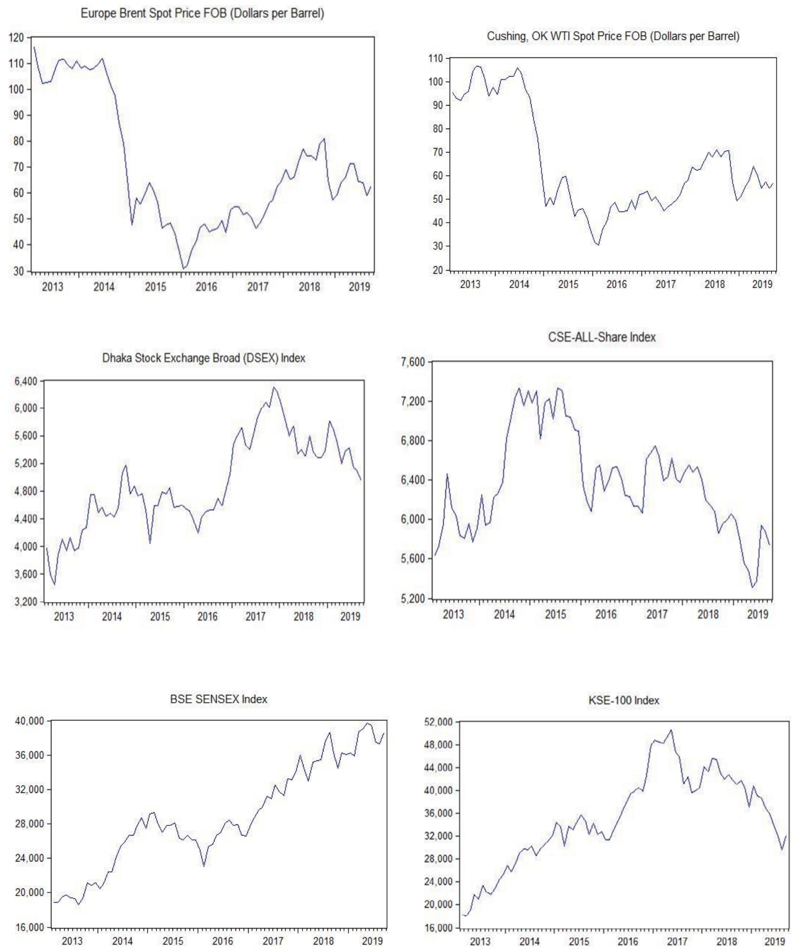

Figure 1. Plots the market indices and oil prices

Sources: http://www.investing.com by Fusion Media Limited.

The descriptive statistics are shown in Table 1. The average value of WTI is –0.65, and fluctuated between 21.38 and –24.55 with a standard deviation of 8.58. The maximum value of Brent oil prices is 19.59, the minimum is –26.64, and the standard deviation is 8.82. The mean values of stock returns of all the countries are positive over the sample period. India (the Bombay stock exchange) shows the highest average returns, whereas Sri Lanka (the Colombo stock exchange) has the lowest. However, the Colombo stock exchange is more stable as it has the lowest standard deviation. In contrast, the equity market of Pakistan (KSE–100 index) is highly volatile compared to the other SAARC member countries. The data of stock returns of all countries are normally distributed at the 5% level of significance as the p-value of the Jarque-Bera statistics is greater than 0.05 for all countries. The WTI series is normally distributed, although the normality hypothesis of Brent is not supported at the 5% level of significance.

Table 1. Descriptive statistics

	Pakistan	India	Sri Lanka	Bangladesh	WTI	BRENT
Mean	0.71	0.90	0.02	0.27	– 0.65	– 0.77
Median	1.14	0.92	– 0.20	0.36	1.01	0.52
Maximum	13.94	9.68	9.96	12.5	21.38	19.59
Minimum	– 11.02	– 7.81	– 8.38	– 11.27	– 24.55	– 26.64
Std. Dev	5.32	3.77	3.38	4.71	8.58	8.82
Skewness	0.01	– 0.07	0.53	0.29	– 0.56	– 0.65
Kurtosis	2.63	2.63	3.75	3.33	3.54	4.00
Jarque-Bera	0.44	0.52	5.59	1.49	5.12	9.01
Probability	(0.80)	(0.76)	(0.06)	(0.47)	0.07	0.01

Source: data from http://www.investing.com by Fusion Media Limited.

After examining the descriptive statistics, the unit root test was conducted to determine whether the variables are stationary or not. Table 2 summarizes the results of AD and PP, with both tests showing that the variables are stationary at first difference.

Table 2. Unit root test – stock returns of selected countries

Market	ADF		PP	
	Level	1st Difference	Level	1st Difference
Pakistan	– 2.12	– 9.11*	– 2.12	– 9.12*
India	– 0.85	– 9.03*	– 0.75	– 9.11*
Srilanka	– 1.98	– 8.83*	– 1.99	– 8.83*
Bangladesh	– 1.86	– 8.96*	– 1.79	– 9.02*

*, **, *** is 1, 5, 10 % level respectively.
Source: own calculation using EViews software.

Table 3 shows the results of the EGARCH model, which investigated the volatility transmission from the oil market to the equity market. Panel A of the table summarizes the results for WTI oil prices, and Panel B provides the results for Brent prices. The results show that the value of ρ is insignificant at the 5% significance level for both panels for all the countries except Bangladesh, which is significant for WTI. This finding indicates that the volatility of global oil prices does not affect the equity markets of SAARC member countries. Only the volatility of WTI oil prices positively influences the volatility of Bangladesh stock market returns. In other words, the stock market returns of the selected SAARC member countries do not significantly react to the shocks in global oil prices.

The coefficient of ARCH and GARCH (β_1 and φ) are insignificant in all the countries except Pakistan. The results show that volatility persistence and shock dependency of the conditional variance model exist only in Pakistan, which means the previous shocks influence the conditional volatility of the stock prices. The coefficient of leverage effect (β_2) is negative in most of the countries but not significant in any of them, meaning that negative shocks have no significantly higher influence than positive shocks. Therefore, positive shocks and negative shocks have the same effect on the volatility of the stock market returns.

The coefficient of the mean equation (α_1) is negative for both the benchmarks of crude oil markets for India and Pakistan, meaning that the previous month's stock prices negatively influence the average prices of the current month. In contrast, the coefficient is positive for Bangladesh in the models for both crude oil benchmarks. However, the relationships are not statistically significant. The coefficient (α_2) is positive for Pakistan and India in the models for both WTI and Brent. The signs are mixed for Bangladesh and Sri Lanka, but not significant at the 5% level of significance. These findings mean that fluctuations in the equity market and global crude oil markets of the previous month cannot predict the average stock market returns of the SAARC member countries.

The same relationships were investigated by Noor and Dutta (2017) using data from January 2001 to December 2014 for three South Asian countries, i.e., Sri Lanka, India, and Pakistan. Using the VAR-GARCH model, they found unidirectional volatility spillover from global oil prices to equity markets.

This study provides an up-to-date version of the volatility spillover and includes another major SAARC member, i.e., Bangladesh. Our findings are in contrast to the literature. A possible reason could be government subsidies and internal energy sources, which may help in reducing the effect of shock on global oil prices. Further, it may be quite possible that the companies have defensive plans to overcome the instability of their stock prices. The methodology also plays a key role in the mixed results in the literature. As the findings of Chittedi (2012) show, there is a volatility spillover from oil prices to stock market returns in the Indian equity markets. He used oil prices relative to stock market indices and investigated the impacts through the auto regressive distributed lag ARDL model.

Table 3. Volatility spillover

Country	India	Sri Lanka	Pakistan	Bangladesh
Panel A: Volatility spillover from West Texas Intermediate (WTI) to the stock market				
α_0	0.98** (0.02)	0.11 (0.78)	1.12** (0.07)	0.73 (0.21)
α_1	− 0.01 (0.90)	0.02 (0.76)	− 0.14 (0.23)	0.05 (0.47)
α_2	0.08 (0.13)	0.02 (0.58)	0.04 (0.43)	− 0.06 (0.31)
β_0	1.76 (0.16)	2.86** (0.01)	6.36*** (0.00)	4.38 (0.00)
β_1	− 0.37 (0.35)	− 0.47 (0.12)	0.33 (0.31)	− 0.64 (0.02)
β_2	− 0.33 (0.16)	0.24 (0.16)	0.04 (0.68)	− 0.21 (0.24)
φ	0.42 (0.31)	− 0.04 (0.93)	− 0.98*** (0.00)	− 0.32 (0.17)
ρ	− 0.01 (0.49)	0.02 (0.28)	0.03 (0.20)	0.08** (0.01)
LL	− 209.69	− 203.41	− 233.12	− 223.62
SCI	5.82	5.66	6.42	6.18
Panel B: Volatility spillover from Europe Brent oil prices to the stock market				
α_0	1.01** (0.02)	0.02 (0.95)	0.88** (0.02)	0.52 (0.33)
α_1	− 0.05 (0.60)	− 0.02 (0.81)	− 0.08 (0.27)	0.05 (0.51)
α_2	0.05 (0.21)	0.00 (0.94)	0.08 (0.14)	0.00 (0.87)
β_0	2.49* (0.05)	3.44** (0.01)	0.81*** (0.00)	4.04*** (0.00)
β_1	− 0.06 (0.89)	− 0.31 (0.25)	− 0.48*** (0.00)	− 0.29 (0.33)
β_2	− 0.36 (0.10)	0.24 (0.22)	− 0.02 (0.48)	− 0.28 (0.16)
φ	0.04 (0.93)	− 0.33 (0.56)	0.87*** (0.00)	− 0.28 (0.28)
ρ	0 (0.80)	0.00 (0.97)	− 0.01 (0.16)	0.04 (0.14)
LL	− 210.71	− 204.09	− 233.06	− 225.62
SCI	5.84	5.68	6.42	6.23

*, **, *** is 1, 5, 10 % level respectively.
Source: own calculation using EViews software.

Conclusion

The paper studied the volatility spillover from global oil prices to the stock market returns of four SAARC member countries, namely Pakistan, India, Sri Lanka, and Bangladesh. For the empirical analysis, monthly data was used. The literature mainly focused on developed economies or investigated the simple cause-and-effect relationship between the monetary values of oil prices and stock prices using correlation-based statistical techniques. Therefore, the study makes important contributions by examining the volatility spillover of oil prices on stock returns in developing countries and using the EGARCH model, which allows for the asymmetric/leverage effect of positive and negative shocks. Two different popular oil benchmarks (WTI and Brent) were taken into consideration to obtain more consistent results. The results of the EGARCH model show that volatility does not transmit from global oil prices to the equity markets of the selected SAARC countries.

Implications & limitations

The findings are important for investors in making portfolio decisions. Investors must consider oil price shocks in their stock market returns and create a diversified portfolio. Although the literature argues there is a significant impact of oil prices on stock returns, the current study argues that the shocks in oil prices do not propagate into the stock markets of SAARC member countries. Therefore, investors should consider other macro and microeconomic factors. Further, the findings are important for policymakers to formulate effective and efficient market strategies and policies. The current investigation is limited to oil.The results can be improved by using additional commodities and a longer time frame in the analysis.

Future recommendations

There are a few recommendations for future research. First, the study could extend by including other macroeconomic factors like energy consumption, renewable energy, economic growth, and trade deficit. Second, the results can be made more robust by considering structural breaks and extreme quantile effects.

References

Arouri, M.E., Nguyen, D.K. (2010), *Oil prices, stock markets and portfolio investment: Evidence from sector analysis in Europe over the last decade*, "Energy Policy", 38, pp. 4528–5439, https://doi.org/10.1016/j.enpol.2010.04.007

Arouri, M.E.H., Jouini, J., Nguyen, D.K. (2012), *On the impacts of oil price fluctuations on European equity markets: Volatility spillover and hedging effectiveness*, "Energy Economics", 34 (2), pp. 611–617, https://doi.org/10.1016/j.eneco.2011.08.009

Arouri, M.E., Lahiani, A., Nguyen, D.K. (2011), *Return and volatility transmission between world oil prices and stock markets of the GCC countries*, "Economic Modelling", 28, pp. 1815–1825, https://doi.org/10.1016/j.econmod.2011.03.012

Awartani, B., Maghyereh, A.I. (2013), *Dynamic spillovers between oil and stock markets in the Gulf Cooperation Council Countries*, "Energy Economics", 36, pp. 28–42, https://doi.org/10.1016/j.eneco.2012.11.024

Beckmann, J., Berger, T., Czudaj, R. (2015), *Does gold act as a hedge or a safe haven for stocks? A smooth transition approach*, "Economic Modelling", 48, 1624, https://doi.org/10.1016/j.econmod.2014.10.044

Bouri, E. (2015), *Oil volatility shocks and the stock markets of oil-importing MENA economies: A tale from the financial crisis*, "Energy Economics", 51, pp. 590–598, https://doi.org/10.1016/j.eneco.2015.09.002

Bouri, E., Shahzad, S.J.H., Raza, N., Roubaud, D. (2018), *Oil volatility and sovereign risk of BRICS*, "Energy Economics", 70, pp. 258–269, https://doi.org/10.1016/j.eneco.2017.12.018

Brooks, C. (2019), *Introductory Econometrics for Finance*, Cambridge University Press, Cambridge, https://doi.org/10.1017/9781108524872

Chittedi, K.R. (2012), *Do oil prices matters for Indian stock markets? An empirical analysis*, "Journal of Applied Economics and Business Research", 2 (1), pp. 2–10.

Dedi, L., Yavas, B.F. (2016), *Return and volatility spillovers in equity markets: An investigation using various GARCH methodologies*, "Cogent Economics & Finance", 4 (1), 1266788, https://doi.org/10.1080/23322039.2016.1266788

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 (1), pp. 35–56, https://doi.org/10.5547/01956574.35.1.3

Ewing, B.T., Malik, F. (2016), *Volatility spillovers between oil prices and the stock market under structural breaks*, "Global Finance Journal", 29, pp. 12–23, https://doi.org/10.1016/j.gfj.2015.04.008

Fayyad, A., Daly, K. (2011), *The impact of oil price shocks on stock market returns: Comparing GCC countries with the UK and USA*, "Emerging Markets Review", 12 (1), 6178, https://doi.org/10.1016/j.ememar.2010.12.001

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 (3), pp. 152–164, https://doi.org/10.1016/j.irfa.2011.02.014

Fowowe, B. (2017), *Return and volatility spillovers between oil and stock markets in South Africa and Nigeria*, "African Journal of Economic and Management Studies", 8 (4), pp. 484–497, https://doi.org/10.1108/AJEMS-03-2017-0047

Gbatu, A.P., Wang, Z., Wesseh Jr., P.K., Tutdel, I.Y.R. (2017), *The impacts of oil price shocks on small oil-importing economies: Time series evidence for Liberia*, "Energy", 139, pp. 975–990, https://doi.org/10.1016/j.energy.2017.08.047

Guesmi, K. (2014), *Comovements and Volatility Spillovers Between Oil Prices and Stock Markets: Further Evidence for Oil-Exporting and Oil-Importing Countries*, [in:] M. Arouri, S. Boubaker, D. Nguyen (eds.), *Emerging Markets and the Global Economy*, Elsevier, Oxford, pp. 371–382, https://doi.org/10.1016/B978-0-12-411549-1.00016-8

Hamilton, J.D. (1983), *Oil and the Macroeconomy since World War II* , "Journal of Political Economy", 91 (2), pp. 228–248, https://doi.org/10.1086/261140

Hamilton, J.D., Herrera, A.M. (2004), *Comment: Oil Shocks and Aggregate Macroeconomic Behavior: The Role of Monetary Policy*, "Journal of Money, Credit and Banking", 36 (2), pp. 265–286, https://doi.org/10.1353/mcb.2004.0012

Hoffmann, A.O., Post, T., Pennings, J.M. (2013), *Individual investor perceptions and behavior during the financial crisis*, "Journal of Banking & Finance", 37 (1), pp. 60–74, https://doi.org/10.1016/j.jbankfin.2012.08.007

Jebran, K., Iqbal, A. (2016), *Dynamics of volatility spillover between stock market and foreign exchange market: evidence from Asian Countries*, "Financial Innovation", 2 (1), 3, https://doi.org/10.1186/s40854-016-0021-1

Jones, C.M., Kaul, G. (1996), *Oil and the Stock Markets*, "The Journal of Finance", 51 (2), pp. 463–491, https://doi.org/10.1111/j.1540-6261.1996.tb02691.x

Kanas, A. (2000), *Volatility Spillovers Between Stock Returns and Exchange Rate Changes: International Evidence*, "Journal of Business Finance & Accounting", 27 (3–4), pp. 447–467, https://doi.org/10.1111/1468-5957.00320

Kang, S.H., McIver, B., Yoon, S.M. (2017), *Dynamic spillover effects among crude oil, precious metal, and agricultural commodity futures markets*, "Energy Economics", 62, pp. 19–32, https://doi.org/10.1016/j.eneco.2016.12.011

Khalfaoui, R., Boutahar, M., Boubaker, H. (2015), *Analyzing volatility spillovers and hedging between oil and stock markets: Evidence from wavelet analysis*, "Energy Economics", 49, pp. 540–549, https://doi.org/10.1016/j.eneco.2015.03.023

Kilian, L. (2008), *The Economic Effects of Energy Price Shocks*, "Journal of Economic Literature", 46 (4), pp. 871–909, https://doi.org/10.1257/jel.46.4.871

Kilian, L. (2009), *Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market*, "American Economic Review", 99 (3), pp. 1053–1069, https://doi.org/10.1257/aer.99.3.1053

Korhonen, I., Ledyaeva, S. (2010), *Trade linkages and macroeconomic effects of the price of oil*, "Energy Economics", 32 (4), pp. 848–856, https://doi.org/10.1016/j.eneco.2009.11.005

Lin, B., Wesseh Jr., P.K., Appiah, M.O. (2014), *Oil price fluctuation, volatility spillover and the Ghanaian equitymarket: Implication for portfolio management and hedging effectiveness*, "Energy Economics", 42, pp. 172–182, https://doi.org/10.1016/j.eneco.2013.12.017

Maghyereh, A.I., Awartani, B., Bouri, E. (2016), *The directional volatility connectedness between crude oil and equity markets: New evidence from implied volatility indexes*, "Energy Economics", 57, pp. 78–93, https://doi.org/10.1016/j.eneco.2016.04.010

Malmendier, U., Nagel, S. (2011), *Depression Babies: Do Macroeconomic Experiences Affect Risk Taking?*, "The Quarterly Journal of Economics", 126 (1), pp. 373–416, https://doi.org/10.1093/qje/qjq004

Mork, K.A. (1989), *Oil and the Macroeconomy When Prices Go Up and Down: An Extension of Hamilton's Results*, "Journal of Political Economy", 97 (3), pp. 740–744, https://doi.org/10.1086/261625

Noor, M.H., Dutta, A. (2017), *On the relationship between oil and equity markets: evidence from South Asia*, "International Journal of Managerial Finance", 13 (3), pp. 287–303, https://doi.org/10.1108/IJMF-04-2016-0064

Park, J., Ratti, R. (2008), *Oil price shocks and stock markets in the U.S. and 13 European countries*, "Energy Economics", 30 (5), pp. 2587–2608, https://doi.org/10.1016/j.eneco.2008.04.003

Pesaran, M.H., Shin, Y., Smith, R.J. (2001), *Bounds testing approaches to the analysis of level relationships*, "Journal of Applied Econometric", 16, pp. 289–326, https://doi.org/10.1002/jae.616

Ping, L., Ziyi, Z., Tianna, Y., Qingchao, Z. (2018), *The relationship among China's fuel oil spot, futures and stock markets*, "Finance Research Letters", 24, pp. 151–162, https://doi.org/10.1016/j.frl.2017.09.001

Raza, N., Jawad Hussain Shahzad, S., Tiwari, A.K., Shahbaz, M. (2016), *Asymmetric impact of gold, oil prices and their volatilities on stock prices of emerging markets*, "Resources Policy", 49, pp. 290–301, https://doi.org/10.1016/j.resourpol.2016.06.011

Sadorsky, P. (2001), *Risk factors in stock returns of Canadian oil and gas companies*, "Energy Economics", 23 (1), pp. 17–28, https://doi.org/10.1016/S0140-9883(00)00072-4

Singhal, S., Ghosh, S. (2016), *Returns and volatility linkages between international crude oil price, metal and other stock indices in India: Evidence from VAR-DCC-GARCH models*, "Resources Policy", 50, pp. 276–288, https://doi.org/10.1016/j.resourpol.2016.10.001

Tiwari, A.K., Sahadudheen, I. (2015), *Understanding the nexus between oil and gold*, "Resources Policy", 46, pp. 85–91, https://doi.org/10.1016/j.resourpol.2015.09.003

Trabelsi, N. (2017), *Tail dependence between oil and stocks of major oil-exporting countries using the CoVaR approach*, "Borsa Istanbul Review", 17 (4), pp. 228–237, https://doi.org/10.1016/j.bir.2017.07.001

Wang, Y., Liu, L. (2016), *Crude oil and world stock markets: volatility spillovers, dynamic correlations, and hedging*, "Empirical Economics", 50 (4), pp. 1481–1509, https://doi.org/10.1007/s00181-015-0983-2

Wei, C. (2003), *Energy, the Stock Market, and the Putty-Clay Investment Model*, "American Economic Review", 93 (1), pp. 311–323, https://doi.org/10.1257/000282803321455313

Ponowna ocena zmienności na rynku ropy naftowej i zmienności na rynku akcji na przykładzie wybranych krajów SAARC

Przenoszenie zmienności dostarcza informacji, czy informacje na jednym rynku wpływają na informacje na innym rynku. W niniejszym artykule zbadano, czy zmienność rynku ropy naftowej przenosi się na rynki akcji wybranych krajów SAARC. W badaniu wykorzystano dane z okresu od lutego 2013 r. do września 2019 r. w celu uzyskania zaktualizowanych danych na temat przenoszenia zmienności globalnych cen ropy naftowej na rynki akcji państw członkowskich SAARC. Wykorzystano dwuwymiarowy model EGARCH do testowania przenoszenia zmienności z rynku ropy naftowej na rynek akcji. Należy zauważyć, że szoki cenowe na rynku ropy naftowej nie mają znaczącego wpływu na zmienność na rynkach akcji, z wyjątkiem rynku akcji w Bangladeszu. Decydenci mogą wykorzystać te ustalenia przy podejmowaniu decyzji w obszarze polityki.

Słowa kluczowe: giełda, rynek ropy naftowej, przenoszenie zmienności, transmisja informacji, EGARCH