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Time-varying dependence between stock markets and oil prices during COVID-19: The case of net oil-exporting countries

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Abstract

This article provides an empirical investigation of the time-varying dependence between oil prices and stock markets in the top ten net oil-exporting countries. Using daily data focusing on COVID-19 period, we implement the DCC-GARCH to identify the dynamic dependence. Then, we apply structural break techniques to detect the shift in the dependence structure. We find that there exists a positive time-varying dependence between oil returns and stock returns during the ongoing COVID-19 pandemic wherein the breakpoints mostly coincided with the emergence of oil price war and global stock market crash. Overall, results imply that declining oil prices lead to a fall in stock returns due to lower future earnings for oil companies, exhibiting a signal of reduction in aggregate demand and economic activity in oil-exporting countries. Thus, the high positive co-movement may have ill-effects on portfolio diversification, as the latter will be less effective if the asset returns are highly correlated.

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1. Introduction

The COVID-19 pandemic outbreak and subsequent lockdowns worldwide has led to a sudden slash in demand for oil by 5% in the first quarter of 2020 (IEA 2020). Consequently, the crude oil prices in the international market declined drastically between January and April, from US$61 on January 2, 2020 to US$12 on April 28, 2020. Similarly, IEA's (2020) forecast suggests that investment in the oil sector will drop by 32% in 2020 compared to 2019, the lowest in thirteen years. As the oil-exporters economic activities largely depended on oil prices, the decline in the oil prices due to COVID-19 and the corresponding lower expected investment may adversely affect the profitability of oil-related firms and thereby, their stock prices. It is argued in the literature that variations in oil prices due to demand-side shocks affect stock prices more as compared to supply-side shocks (Filis et al. 2011; Kilian 2009; Mokni 2020). However, due to the demand disruption associated with the COVID-19, changes in the oil prices impact on stock prices of oil-exporting countries are unknown. Due to the suspension of production and transport associated with lockdowns, the oil-importing countries may not take advantage of lower oil prices; thus, usual stabilization in the market through demand rise may not be possible in the current pandemic scenario (IEA 2020). Given this unusual context, it is imperative to revisit the oil price – stock return relationship focusing on major net oil-exporting countries.

The existing literature on oil price – stock market nexus is large and mostly focused on oil-importers. The key studies on oil-importing countries found that oil price movements negatively affecting stock price returns, as a decline in oil prices reduces the cost of production and increases future earnings and dividends. Whereas, the studies in the context of oil-exporting countries assumes a positive relationship between the 'duo', i.e., the stock price returns rises (falls) when there is an increase (decrease) in oil price returns (Elder and Serletis 2010; Filis et al. 2011; Mokni 2020; Narayan and Narayan 2010)[1]. Specifically, a rise in oil price returns leads to higher cash flows to oil companies, which subsequently leads to higher economic activity in oil-exporting countries, higher future earnings and dividends, and thus a rise in stock price returns (Arouri and Rault 2012; Basher et al. 2018)[2]. The effect of oil prices on stock returns is also determined by the sources of variations in oil prices (Kilian 2009). The evidence suggests that variations in oil prices due to the demand-side shocks exert a larger effect on stock price returns in oil-exporting economies in comparison to variations due to the supply-side shocks (Filis et al. 2011; Mokni 2020).

The COVID-19 has created the fear of the unknown and uncertainty among investors about global economic conditions. Thus the global oil and financial markets reacted strongly to this unanticipated event (Phan and Narayan 2020). The studies by Narayan et al. (2018) and Sharma et al. (2019) found that unanticipated events like shutdowns and terrorism attacks contain valuable information that improves prediction capabilities. COVID-19 is a classic case of an unexpected event wherein the global oil markets have experienced a nosedive in its prices along with poor stock market performance in net oil-exporting countries. Along these lines, we test if the oil

[1] See Lang and Auer (2020) for a detailed review of oil prices' impact on financial markets.

[2] These arguments are based on stock valuation theory, which states that the value of a stock is equal to the sum of discounted expected future cash flows, which can be affected by macroeconomic factors such as output, inflation, interest rate (Kilian 2009). As oil prices influence these factors, any change in oil price is expected to influence stock prices (Narayan and Narayan 2010).

markets and stock markets in net oil-exporting countries have shown time-varying dependence during the COVID-19 period.

The literature on the impact of COVID-19 has been evolving and found that the pandemic has a significant adverse impact on economic growth and trade (Baldwin and Freedman 2020; Liu et al. 2020; Vidya and Prabheesh 2020); firm-level performance (Gu et al. 2020; Qin et al. 2020; Shen et al. 2020; Xiong et al. 2020); foreign exchange market (Iyke 2020a); financial markets (Ali et al. 2020; Haroon and Rizvi 2020a, 2020b; He et al. 2020; Phan and Narayan 2020; Zhang et al. 2020). There have been few attempts on how the COVID-19 has impacted the global oil markets (Apergis and Apergis 2020; Devpura and Narayan 2020; Fu and Shen 2020; Gil-Alana and Monge 2020; Huang and Zheng 2020; Iyke 2020b; Liu et al. 2020; Narayan 2020; Narayan et al. 2020; Prabheesh et al. 2020; Qin et al. 2020). However, none of these studies investigates the oil price – stock market nexus among the major net oil-exporting countries. Thus, the present study tries to fulfil this gap. To our best knowledge, this is the first study to analyze the time-varying dependence between the stock return and oil return for net oil-exporting countries focusing on the COVID-19 period, which is an unanticipated event occurred in the 21st century, and therefore novel. Our findings contribute to the existing literature that supports time-varying dependence between oil and stock returns (see Arouri and Rault 2012; Filis et al. 2011; Prabheesh et al. 2020; Narayan and Narayan 2010). While we focus solely on COVID-19 period, we reach similar conclusions despite studying the market, which is affected by a global oil price and public health shock never seen before.

Our approach to empirical analyses is as follows. (1) We select the top ten net oil-exporting countries that include eight EMEs and two developed countries, namely, Brazil, Canada, Kazakhstan, Mexico, Nigeria, Norway, Russia, Saudi Arabia, U.A.E., and Venezuela, and draw a sample of daily observations that runs from January 2, 2020 to August 10, 2020. (2) We implement the DCC-GARCH model to identify the time-varying conditional correlation. (3) Then, we detect the shifts in the correlation structures. Our empirical findings suggest that (1) there is an increased positive relationship between oil returns and stock returns for all ten countries. (2) The strength of the time-varying dependence increased sharply during the initial period of COVID-19 breakout, i.e. February and March. (3) We detect that the shifts in correlation structure mostly occur on the 10th of March, owing to the stock market reaction to Black Monday on the 9th of March.

The rest of the article is organized as follows. Section 2 deals with the data and methodology. Section 3 reports the empirical results. Section 4 concludes.

2. Data and Methodology

Our sample consists of daily oil prices and stock market indices in major ten net oil-exporting countries, covering the period from January 2, 2020 to August 10, 2020[3]. The starting date is attributed to the first business working day after the novel COVID-19 was detected in China. We selected the major net oil-exporting countries based on the list published in *The World Factbook* by the Central Intelligence Agency (CIA). Thus our sample includes Brazil, Canada, Kazakhstan,

[3] We treat the observation for April 20, 2020 as an outlier since it was the first time in history that oil prices recorded negative prices (US$ -36.98). Hence, we exclude it from our empirical analysis.

Mexico, Nigeria, Norway, Russia, Saudi Arabia, U.A.E. and Venezuela[4]. As a proxy for world oil prices, we consider West Texas Intermediate (WTI) crude oil spot prices as it is widely used as a benchmark for the oil price in the literature, and highly co-move with other major crude oil prices such as Brent[5]. WTI crude oil prices are drawn from the Energy Information Administration website (https://www.eia.gov/dnav/pet/hist/rwtcD.htm). As a proxy for the stock market index, we use a major stock index for each country: IBOVESPA (Brazil), S&P/TSX Composite Index (Canada), KASE Index (Kazakhstan), S&P/BMV IPC (Mexico), NSE ASI (Nigeria), OSEAX (Norway), RTS Index (Russia), TASI (Saudi Arabia), DFM Index (U.A.E), and IBVC (Venezuela)[6]. Daily returns are calculated as $r_t = [\ln(P_t)/\ln(P_{t-1}) * 100]$ where r_t and P_t denote daily return and price, respectively.

We implement the DCC-GARCH model developed by Engle (2002) to calculate the time-varying correlation between stock returns and oil returns. The M dimensional multivariate GARCH (1, 1) model to determine the dynamic conditional correlation is:

$$Y_t = \phi_0 + \phi_1 Y_{t-1} + \varepsilon_t \qquad \varepsilon \sim (0, H_t) \tag{1}$$

$$H_t = \Gamma_t R_t \Gamma_t \tag{2}$$

$$\Gamma_1 = diag\left\{\sqrt{h_{11,t}}, \sqrt{h_{22,t}}, \ldots \sqrt{h_{MM,t}}\right\}$$

$$h_{ii,t} = w_i + \beta_1 h_{ii,t-1} + \gamma_i \varepsilon_{i,t-1}^2 \qquad i = 1,2 \ldots M$$

$$R_t = \left(diag\{Q_t\}\right)^{-1/2} Q_t \left(diag\{Q_t\}\right)^{-1/2}$$

$$Q_t = (1-\alpha-\beta)\overline{Q} + \alpha u_{t-1} u'_{t-1} + \beta Q_{t-1}$$

where $Y_t = (Y_{1,t}, Y_{2,t}, \ldots, Y_{M,t})'$ and $\varepsilon_t = (\varepsilon_{1,t}, \varepsilon_{2,t}, \ldots, \varepsilon_{M,t})$ are the $M \times 1$ vectors. H_t is the conditional covariance matrix of the random vector ε_t and $u_t = \left(\frac{\varepsilon_{1,t}}{\sqrt{h_{11,t}}}, \frac{\varepsilon_{2,t}}{\sqrt{h_{22,t}}}, \ldots, \frac{\varepsilon_{i,t}}{\sqrt{h_{MM,t}}}\right)'$ is a vector that contains the standardized values of ε_t. R_t is the time-varying correlation matrix and Q_t is the positive definite symmetric matrix. $\overline{Q}$ represents the unconditional variance matrix of u_t. Finally, the time-varying elements of $Y_t, \rho_{ij,t}$ are as follows:

$$\rho_{ij,t} = \frac{q_{ij,t}}{\sqrt{q_{ii,t}, q_{jj,t}}} \tag{3}$$

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[4] While Iraq and Angola were also among the top net-exporters, we excluded Iraq because of excessive missing observations during March-June and Angola because of data unavailability.

[5] The pairwise correlation coefficient between the WTI and Brent prices is very high, i.e. Corr(WTI,Brent)=0.99.

[6] The stock indices data are collected from various websites such as https://in.investing.com/, https://finance.yahoo.com/ , http://www.b3.com.br/ , https://www.spglobal.com/en/.

Where $q_{ij,t}$ is the $i-j^{th}$ element of Q_t. Finally, we conducted the Bai and Perron (2003) test and applied the sequential testing procedure to detect the structural breaks in the estimated time-varying correlation coefficients[7].

3. Empirical Findings

Table 1 reports the descriptive statistics for oil returns and stock returns for all ten countries[8]. The standard deviations for both oil returns and stock returns are higher than their mean, indicating a higher level of risk in these markets during COVID-19 outbreak. Further, oil returns are more volatile than stock returns. The skewness value is negative (except for Venezuela), and the kurtosis is significantly higher than three for all return series, suggesting a leptokurtic distribution with fat tails. This was further supported by the Jarque-Bera test, which indicates a strong rejection of normality for all series. All these statistics reveal higher turbulence in both the oil and stock markets.

Table 1. Summary of descriptive statistics.

This table reports the descriptive statistics of oil returns and stock returns. R as a prefix stands for Returns and * represents 1% significance level. The sample period used is from 2nd January 2020-10th August 2020.

	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
ROIL	-0.255	42.583	-72.027	10.668	-1.543	18.814	1601.012*
RBRAZIL	-0.092	13.022	-15.993	3.552	-1.240	9.402	290.749*
RCANADA	-0.019	11.294	-13.176	2.636	-1.132	12.165	560.781*
RKAZAKHSTAN	0.015	2.229	-3.541	0.849	-0.766	5.524	53.431*
RMEXICO	-0.098	4.180	-6.638	1.767	-0.477	4.474	19.403*
RNIGERIA	-0.046	3.475	-5.032	1.146	-0.654	6.513	87.291*
RNORWAY	-0.072	5.842	-9.831	2.112	-1.391	7.975	203.135*
RRUSSIA	-0.139	8.825	-11.684	2.903	-0.814	6.332	85.983*
RSAUDIARABIA	-0.091	8.831	-16.755	2.365	-3.217	23.687	2307.853*
RUAE	-0.187	7.064	-8.657	2.170	-0.788	7.301	130.283*
RVENEZUELA	1.114	17.016	-8.048	4.197	1.086	5.130	56.712*

Table 2(a) reports the month-wise DCC results between oil returns and stock returns[9]. It is interesting to note that the correlation coefficients are small for most countries in February, except for Brazil, Canada, Norway and Saudi Arabia. Similarly, the correlation also shows a positive sign in all cases, indicating the well-established relationship that holds between stock returns and oil returns for net oil-exporting economies. Interestingly, the findings show that a remarkable increase in correlation from February to March for all countries, demonstrating that the COVID-19 pandemic outbreak strengthened the oil price – stock market relationship.

Saudi Arabia witnessed the highest correlation coefficient of 0.633 during March. Further, during April-August, the dependence between stock returns and oil returns almost remains the

[7] See Bai and Perron (2003) for details of the procedure.

[8] We find that both oil and stock returns are stationary at levels. For brevity, unit root results are not reported, but are available on request.

[9] The time-varying correlation is calculated using the DCC-GARCH model implemented on a rolling window technique. Due to the rolling window procedure, most of the data from January are submerged during the estimation procedure; therefore, the DCC-GARCH results are presented from February to August 2020.

same for, Canada, Kazakhstan, Mexico, Nigeria, Norway, Russia, UAE, and Venezuela. On the contrary, the correlation coefficient was volatile during this period for Brazil, and Saudi Arabia wherein Brazil witnessed negative correlation during the month of May, which can occur at the backdrop of increased fears of an economic downturn globally fuelled by adverse demand-side shocks. Conclusively, the positive sign of correlation coefficient in all ten countries indicates that stock markets perceive the news related to oil price decline during the COVID-19 outbreak as a negative demand shock and weak business environment.

Table 2.

Table 2(a) shows a comparative analysis of the monthly average of DCC-GARCH results of oil returns with stock returns. The time-varying correlation is calculated using the DCC-GARCH model implemented on a rolling window technique. Table 2(b) reports the breakpoints identified from the Bai and Perron (2003) multiple breakpoint test. R as a prefix stands for Returns.

(a) Month-wise DCC-GARCH Results

Pairs/Time	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST
RBRAZIL_ROIL	0.253	0.629	0.013	-0.047	0.187	0.496	0.189
RCANADA_ROIL	0.109	0.495	0.448	0.393	0.422	0.483	0.477
RKAZAKHSTAN_ROIL	0.012	0.097	0.099	0.101	0.102	0.091	0.068
RMEXICO_ROIL	0.016	0.238	0.254	0.245	0.236	0.256	0.296
RNIGERIA_ROIL	0.024	0.090	0.075	0.092	0.075	0.064	0.051
RNORWAY_ROIL	0.178	0.498	0.435	0.392	0.367	0.397	0.528
RRUSSIA_ROIL	0.088	0.409	0.419	0.418	0.405	0.423	0.528
RSAUDIARABIA_ROIL	0.179	0.633	0.468	0.296	0.283	0.278	0.177
RUAE_ROIL	0.010	0.336	0.330	0.320	0.306	0.294	0.297
RVENEZUELA_ROIL	0.001	0.010	0.011	0.008	0.009	0.012	0.011

(b) Shift dates of the dynamic correlation levels between oil returns and stock returns

Pairs	Break Date
RBRAZIL_ROIL	No break
RCANADA_ROIL	10/03/2020
RKAZAKHSTAN_ROIL	10/03/2020
RMEXICO_ROIL	10/03/2020
RNIGERIA_ROIL	10/03/2020
RNORWAY_ROIL	10/03/2020
RRUSSIA_ROIL	10/03/2020
RSAUDIARABIA_ROIL	27/04/2020
RUAE_ROIL	10/03/2020
RVENEZUELA_ROIL	No break

Fig. 1(a) - 1(j) presents a visual representation of the time-varying correlation and shifts in its structure (see Table 2(b) for specific break dates). Most of the breakpoints are located on the 10th of March, which also coincided with the stock market was falling worldwide with the occurrence of Black Monday on 9th March and the corresponding stock market reaction the next day. Whereas only one other breakpoint, identified in case of Saudi Arabia, occurs on April 27, the week following with the WTI prices fell into negative territory for the first time in the history of oil prices due to insufficient storage capacity.

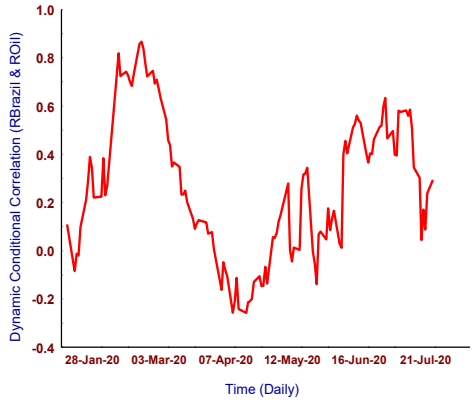
From Fig.1, it can be observed that the time-varying correlation has increased significantly from February end and reached its peak in March in all cases. This increase in the correlation

indicates that the COVID-19 pandemic outbreak strengthened the relationship between oil return and stock return in these countries. Further, the correlation remained stable or declined marginally after March but still found to be high compared to February in most cases such as Canada, Kazakhstan, Mexico, Nigeria, Norway, Russia, UAE and Venezuela. Whereas, the experience with Brazil and Saudi Arabia indicates that their stock return co-movement with oil return remains volatile during the COVID-19 period.

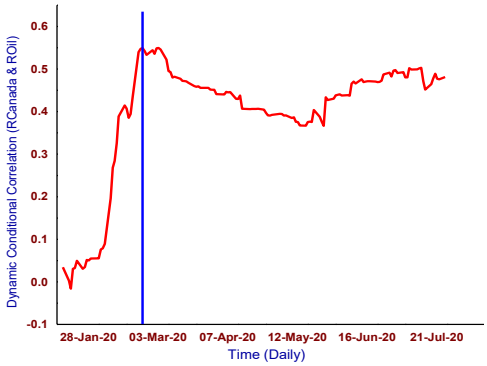
Figure 1. Dynamic Conditional Correlation (Stock Returns with Oil Returns)

The figure shows the results of dynamic conditional correlation between oil returns and stock returns. The vertical line represents the breakpoints associated with the shifts in the time-varying dependence structure.

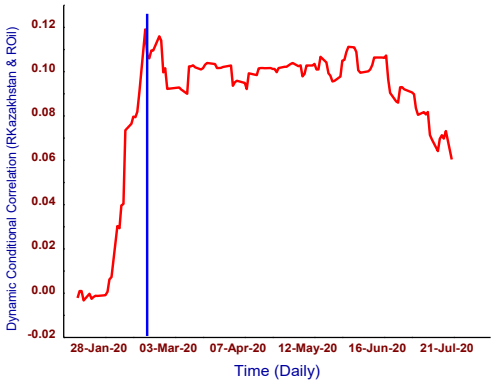
(a) Brazil



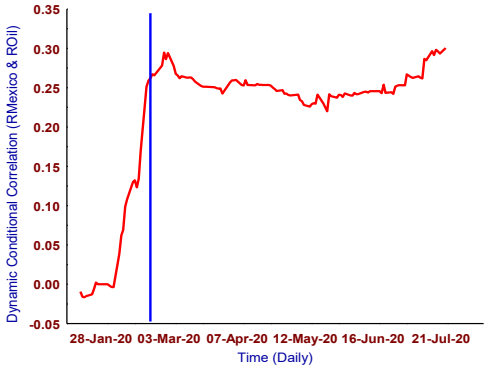
(b) Canada



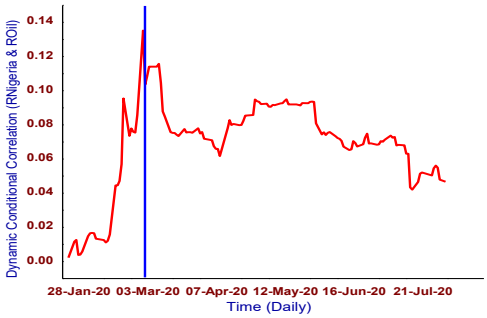
(c) Kazakhstan



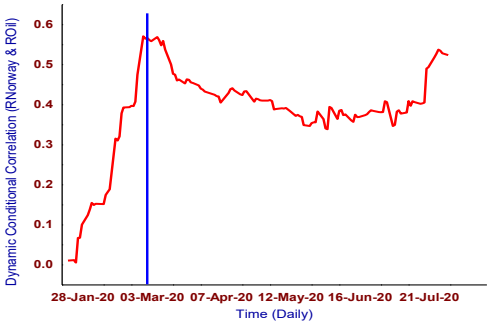
(d) Mexico



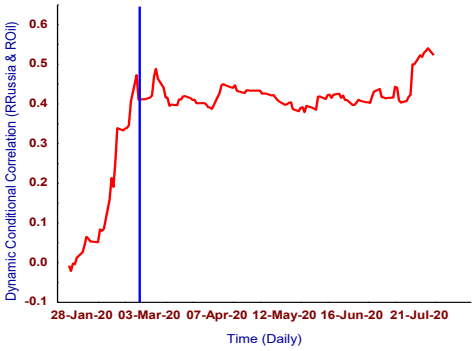
(e) Nigeria



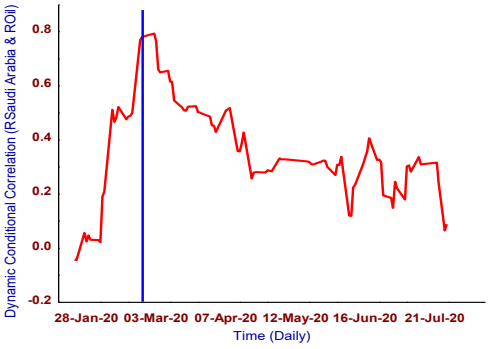
(f) Norway



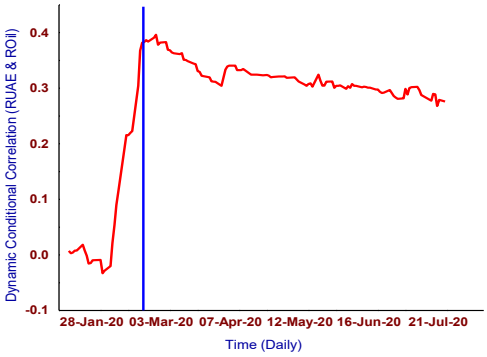
(g) Russia



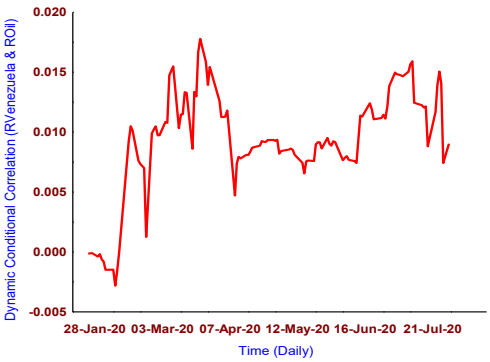
(h) Saudi Arabia



(i) UAE



(j) Venezuela



Overall results suggest that the COVID-19 outbreak strengthens the positive dependence between oil returns and stock returns in net oil-exporting economies. Further, our findings are in line with arguments made in Bjørnland (2009), Arouri and Rault (2012) and Maghyereh et al. (2017) that there is a positive time-varying dependence between oil returns and stock returns in net oil-exporting countries.

4. Conclusion

This article investigates the dynamic relationship between oil returns and stock returns in the top ten net oil-exporting countries during the COVID-19 outbreak using the DCC-GARCH model. Overall, we find evidence that the ongoing COVID-19 pandemic has strengthened the dynamic relationship between the two markets. The relationship between stock returns and oil returns is found to be positive for all cases, implying that the decline in the oil price during the COVID-19 pandemic outbreak adversely affected the market sentiments in the net oil-exporting economies. Among the ten economies, Saudi Arabia exhibits the highest positive correlation between oil returns and stock returns. The high positive co-movement may have ill-effects on portfolio diversification, as the latter will be less effective if the asset returns are highly correlated. Therefore, for global investors, a portfolio of stocks in net oil-exporting economies may not be a better choice during the present pandemic period.

Our paper opens up the scope for further research on the economic impact of COVID-19 on financial markets. More specifically, further econometric work on identifying the dependence between stock markets during the current pandemic period can be carried out since we establish that the investors in stock markets utilize the information from the oil market and thus exhibit time-varying dependence. This research can also be complemented by testing causal relations between the two markets.

Reference

Ali, M., Alam, N. and Rizvi, S. A. R. (2020) "Coronavirus (COVID-19) – An epidemic or pandemic for financial markets" *Journal of Behavioral and Experimental Finance*, 100341.

Apergis, E. and Apergis, N. (2020) "Can the COVID-19 pandemic and oil prices drive the US Partisan Conflict Index?" *Energy Research Letters* **1(1)**, 13144.

Arouri, M. E. H. and Rault, C. (2012) "Oil prices and stock markets in GCC countries: empirical evidence from panel analysis" *International Journal of Finance & Economics* **17(3)**, 242-253.

Bai, J. and Perron, P. (2003) "Computation and analysis of multiple structural change models" *Journal of Applied Econometrics* **18(1)**, 1-22.

Baldwin, R. and Freeman, R. (2020) "Supply chain contagion waves: Thinking ahead on manufacturing 'contagion and reinfection' from the COVID concussion." *VoxEU. org*. https://voxeu.org/article/covid-concussion-and-supply-chain-contagion-waves

Basher, S. A., Haug, A. A. and Sadorsky, P. (2018) "The impact of oil-market shocks on stock returns in major oil-exporting countries" *Journal of International Money & Finance* **86**, 264-280.

Bjørnland, H. C. (2009) "Oil price shocks and stock market booms in an oil exporting country" *Scottish Journal of Political Economy* **56(2)**, 232-254.

Devpura, N. and Narayan, P. K. (2020) "Hourly oil price volatility: The role of COVID-19." *Energy Research Letters* **1(2)**, 13683.

Elder, J. and Serletis, A. (2010) "Oil price uncertainty" *Journal of Money, Credit and Banking* **42(6)**, 1137-1159.

Engle, R. (2002) "Dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional heteroskedasticity models" *Journal of Business & Economic Statistics* **20(3)**, 339-350.

Filis, G., Degiannakis, S. and 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)**, 152-164.

Fu, M. and Shen, H. (2020) "COVID-19 and corporate performance in the energy industry" *Energy Research Letters* **1(1)**, 12967.

Gil-Alana, L. A. and Monge, M. (2020) "Crude oil prices and COVID-19: Persistence of the shock" *Energy Research Letters* **1(1)**, 13200.

Gu, X., Ying, S., Zhang, W. and Tao, Y. (2020) "How Do Firms Respond to COVID-19? First Evidence from Suzhou, China" *Emerging Markets Finance and Trade* **56(10)**, 2181-2197.

Haroon, O. and Rizvi, S. A. R. (2020a) "COVID-19: Media coverage and financial markets behavior—A sectoral inquiry" *Journal of Behavioral and Experimental Finance*, 100343.

Haroon, O., and Rizvi, S. A. R. (2020b) "Flatten the Curve and Stock Market Liquidity–An Inquiry into Emerging Economies" *Emerging Markets Finance and Trade* **56(10)**, 2151-2161.

He, P., Sun, Y., Zhang, Y. and Li, T. (2020) "COVID–19's Impact on Stock Prices Across Different Sectors—An Event Study Based on the Chinese Stock Market" *Emerging Markets Finance and Trade* **56(10)**, 2198-2212.

Huang, W., and Zheng, Y. (2020) "COVID-19: Structural changes in the relationship between investor sentiment and crude oil futures price" *Energy Research Letters* **1(2)**, 13685.

IEA (2020) *Oil Market Report - April 2020*, IEA, Paris.

Iyke, B.N. (2020a) "The disease outbreak channel of exchange rate return predictability: Evidence from COVID-19" *Emerging Markets Finance and Trade* **56(10)**, 2277-2297.

Iyke, B. N. (2020b) COVID-19: The reaction of US oil and gas producers to the pandemic. *Energy Research Letters* **1(2)**, 13912.

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)**, 1053-69.

Lang, K. and Auer, B. R. (2020) "The economic and financial properties of crude oil: A review" *The North American Journal of Economics and Finance* **52**, 100914.

Liu, D., Sun, W. and Zhang, X. (2020) "Is the Chinese economy well positioned to fight the COVID-19 pandemic? The financial cycle perspective" *Emerging Markets Finance and Trade* **56(10)**, 2259-2276.

Liu, L., Wang, E. Z. and Lee, C. C. (2020) "Impact of the COVID-19 pandemic on the crude oil and stock markets in the US: A time-varying analysis" *Energy Research Letters* **1(1)**, 13154.

Maghyereh, A. I., Awartani, B. and Tziogkidis, P. (2017) "Volatility spillovers and cross-hedging between gold, oil and equities: Evidence from the Gulf Cooperation Council countries" *Energy Economics* **68**, 440-453.

Mishra, A. K., Rath, B. N. and Dash, A. K. (2020) "Does the Indian Financial Market Nosedive because of the COVID-19 Outbreak, in Comparison to after Demonetisation and the GST?" *Emerging Markets Finance and Trade* **56(10)**, 2162-2180.

Mokni, K. (2020) "Time-varying effect of oil price shocks on the stock market returns: Evidence from oil-importing and oil-exporting countries" *Energy Reports* **6**, 605-619.

Narayan, P. K. (2020) "Oil price news and COVID-19—Is there any connection?" *Energy Research Letters* **1(1)**, 13176.

Narayan, P. K., Phan, D. H. B. and Liu, G. (2020) "COVID-19 lockdowns, stimulus packages, travel bans, and stock returns" *Finance Research Letters*, 101732.

Narayan, P. K., Narayan, S., Khademalomoom, S. and Phan, D. H. B. (2018) "Do terrorist attacks impact exchange rate behavior? New international evidence" *Economic Inquiry* **56(1)**, 547-561.

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

Phan, D. H. B. and Narayan, P. K. (2020) "Country responses and the reaction of the stock market to COVID-19—A preliminary exposition" *Emerging Markets Finance and Trade* **56(10)**, 2138-2150.

Prabheesh, K. P., Padhan, R. and Garg, B. (2020) "COVID-19 and the oil price–stock market nexus: Evidence from net oil-importing countries" *Energy Research Letters* **1(2)**, 13745.

Qin, X., Huang, G., Shen, H. and Fu, M. (2020) "COVID-19 Pandemic and Firm-level Cash Holding—Moderating Effect of Goodwill and Goodwill Impairment" *Emerging Markets Finance and Trade* **56(10)**, 2243-2258.

Sharma, S. S., Phan, D. H. B. and Narayan, P. K. (2019) "Exchange rate effects of US government shutdowns: Evidence from both developed and emerging markets" *Emerging Markets Review* **40**, 100626.

Shen, H., Fu, M., Pan, H., Yu, Z. and Chen, Y. (2020) "The Impact of the COVID-19 Pandemic on Firm Performance" *Emerging Markets Finance and Trade* **56(10)**, 2213-2230.

Vidya, C. T. and Prabheesh, K. P. (2020) "Implications of COVID-19 Pandemic on the Global Trade Networks" *Emerging Markets Finance and Trade* **56(10)**, 2408-2421.

Xiong, H., Wu, Z., Hou, F. and Zhang, J. (2020) "Which Firm-specific Characteristics Affect the Market Reaction of Chinese Listed Companies to the COVID-19 Pandemic?" *Emerging Markets Finance and Trade* **56(10)**, 2231-2242.

Zhang, D., Hu, M. and Ji, Q. (2020) "Financial markets under the global pandemic of COVID-19" *Finance Research Letters*, 101528.