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Impact of global health crisis and oil price shocks on stock markets in the GCC

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ARTICLE INFO

JEL classification:
C13
G15

Keywords:
COVID-19
Oil price shocks
GCC stock markets
Global health crisis
Kalman filter

ABSTRACT

This study examines the impact of global COVID-19 cases and oil price shocks on the stock markets in the GCC. Using the Kalman filter to generate the unexpected oil price shocks, we find that, with the exception of Oman, the GCC markets responded to positive and negative oil price shocks before and during the pandemic, with impacts of higher magnitude since March 11, 2020. We also find that the spread of global COVID-19 cases had in itself no meaningful impact on the GCC stock markets.

1. Introduction

The global health crisis resulting from COVID-19 has undone years of global economic growth, brought unemployment surging to record levels, and pushed the world’s economies into severe recession. As far back as June, 2020, the IMF (2020a) warned that the global economy was contracting faster than expected, and predicted over $12 trillion in losses by the end of 2021. The pandemic has also amplified the market’s volatility in ways not seen since the depression of the 1930s (Baker et al., 2020; Sharif et al., 2020), and decoupled stock markets from the prospects of the real economy due to investors’ speculations (Krugman, 2020).

The slowdown and contraction of the global economy have diminished the demand for crude oil. Between February 24 and April 21, 2020, oil prices dropped by almost 66%. Global storage facilities reached their maximum levels due to shocks in the demand and supply of oil, pushing down prices further due to the intensity of the trading speculation. The hydrocarbons in the GCC states constitute a large percentage of their fiscal budgets and economic outputs. The break-even prices to balance their budgets in 2021 ranged from $80 a barrel for Oman to $37 for Qatar. According to (Fetch, 2020a), the global recession seems certain to push their budgets into deeper deficits and contract their economies.

This study examines the impact of the global health crisis and oil price shocks on the GCC markets. Our paper has some novelties. First, we investigate whether the GCC markets are likely to respond to global COVID-19 cases, since the current literature claims that their growth could increase market volatility and sway investors’ sentiment (see Albulescu, 2021; Ashraf, 2020; Baig et al., 2021; Lyoecs and Molnar, 2020; Sharif et al., 2020; Topcua and Gulal, 2020; Trang Anh and Gan, 2020; Zaremba et al., 2020). Second, since many investors are constantly monitoring oil prices and their projected impact on the GCC economies, we treat the shocks to oil prices as expectation generated, a treatment that has never been used for the oil factor. In the view of Fetch (2020b), a $10 decline in oil prices would increase the deficit by 9% of GDP for Kuwait and 4–6% for other GCC states. Such projections will have an impact on the...
business sectors and performance of the GCC stock markets. With our contributions in mind, we test whether global COVID-19 cases are to blame for depressing the GCC market returns (hypothesis 1). Second, since the GCC states are energy-dependent, we test whether the literature is right in concluding that positive shocks to oil price can increase/depress asset prices and increase market volatility (hypothesis 2) (see Abul Bashier et al., 2018; Benlagha, 2020; Charfeddine and Al Refai, 2019; Fenech and Vosgha, 2018; Jean Louis and Balli, 2014; Jouini, 2013). Given the gloomy economic recovery, S&P (2020) expected that the budget deficit of the GCC states may cumulatively reach $490 billion over the next 4 years based on oil prices of $30 per barrel for 2020, $50 in 2021 and $55 in 2022. Therefore, we seek answers to the following questions: Do the GCC markets respond to the global COVID-19 cases? Do the GCC markets asymmetrically respond to oil price shocks? If so, how great has been the impact of these shocks before and during the pandemic? Contradicting recent studies, our results show that the outbreak of COVID-19 has had no meaningful impact on the GCC markets. However, consistent with the theory and literature, we see that, with the exception of Oman, positive and negative oil price shocks made significant impacts on the GCC markets before and during the pandemic. We provide evidence that the impacts are found to have been greater since March 11, 2020, consistent with the theoretical expectations for energy-dependent economies.

2. Data and methodology

2.1. Data

On March 11, 2020, the World Health Organization made an assessment that COVID-19 had created a pandemic and a crisis in public health. In view of this, we divided the data into two sub-samples: pre-pandemic (January 5, 2017 to March 10, 2020), and during-pandemic (March 11 to September 17, 2020) (Fig. 1). We synchronized the data from Monday to Thursday, since the GCC markets trade from Sunday to Thursday. Global COVID-19 cases were obtained from the ECDC public health. In view of this, we divided the data into two sub-samples: pre-pandemic (January 5, 2017 to March 10, 2020), and during-pandemic (March 11, to September 17, 2020) (Fig. 1). We synchronized the data from Monday to Thursday, since the GCC

2.2. Methodology

Predicting oil prices is challenging for forward-looking traders. According to Baumeister and Kilian (2016) and Kilian (2009), to forecast oil prices, the models would need inputs such as global oil production, global business cycle, and oil stockpiles. Accordingly, the shifts in traders’ expectations in the oil market reflect changes in the oil prices. Since news about the determinants of oil price is unanticipated, a fact which avoids the possibility of market traders making systematic forecast errors, the unexpected oil price shocks are then measured by the unanticipated components of oil price fluctuations (Kilian, 2010). In view of this, we follow Priestley (1996) and extract the unexpected components of the observed factor using the Kalman filter.

There are several advantages in using the Kalman filter and the unexpected component through the expectations generating process. First, the forming of expectations is a learning process in which market agents update their expectations recursively, as more information becomes available (Cowan and Joutz, 2006). Second, the Kalman filter can estimate the expectations series and generate any unanticipated component by signal extraction. Third, Priestley found that the expectations generating process using the Kalman filter meets the requirements of providing the unexpected shocks that are true innovations and forms an expectation for each period, which avoids the possibility of market traders making systematic forecast errors. To generate such process for oil prices, let the oil price $OIL_t^*$ be the expectation of $OIL_t$, and shocks to $OIL_t$ be independent. Changes to $OIL_t$ are time-varying with $\gamma_t - 1$. The process can be expressed in the following state space form:

$$OIL_t = OIL_t^* + u_t, \tag{1}$$

$$OIL_t^* = OIL_{t-1}^* + \gamma_{t-1} + \epsilon_t, \tag{2a}$$

$$\gamma_t = \gamma_{t-1} + \omega_t \tag{2b}$$

where $u_t$, $\epsilon_t$, $\omega_t$ are error terms. Eq. (1) is the measurement equation and (2a, 2b) are the transition equations. The expectation variable $OIL_t^*$ follows a random walk in a drift with a time-varying component $\gamma_t = \gamma_{t-1} + \omega_t$ that also follows a random walk. The prediction residuals are the unexpected shocks of oil prices, which are supposed to be serially uncorrelated. If they are serially correlated, Priestley suggested the following general structure:

$$OIL_t = \delta_t + \delta_t OIL_{t-1} + u_t \tag{3}$$

$$\delta_t = \delta_{t-1} + \omega_t \tag{4}$$

For robust estimation, we let $\epsilon_t$, $\omega_t$ follow the student t-distribution as detailed in Durbin and Koopman (2012). According to

1 European Centre for Disease Prevention and Control.
2 Priestley showed that the APT model with the expectation process performed better in the UK than other methods did. See also Antoniou et al. (1998) and Cowan and Joutz (2006).
Priestley, setting the transition equations as random walks implies that information regarding an observed factor reaches financial markets randomly and this characterizes the stochastic environment surrounding market investors. If the oil price shocks pass the serial correlations test, the next step is to use the following model:

\[ R_t = \psi_0 + \psi_1 MSCI_{World, t-1} + \psi_2 COVID_{t-j} + \psi_3 OIL_{Shocks} + \psi_4 OIL_{Shocks}^{-} + \nu_t, \quad \nu_t \sim (0, h_t^2) \]  \hspace{1cm} (5)

\[ \log(h_t^2) = \alpha_0 + \alpha_1 |\nu_{t-1}| h_{t-1}^{2} + \alpha_2 \log(h_{t-1}^2) + \alpha_3 \frac{|\nu_{t-1}|}{h_{t-1}} \]  \hspace{1cm} (6)

where \( R_t \) represents the stock market returns, \( COVID_{t-j} \) accounts for the lagged effect of COVID-19 cases, \( MSCI_{World, t-1} \) is the lagged returns on the World index, and \( OIL_{Shocks} \) denotes the unexpected oil price shocks. To avoid the symmetric impact of oil price shocks on market returns, we defined \( OIL_{Shocks} \) in Eq. (5) as:

\[ OIL_{Shocks, t}^+ = \sum_{j=1}^{t} \Delta OIL_{Shocks, j}^+, \]  \hspace{1cm} \[ \text{max}(\Delta OIL_{Shocks, j}, 0) \]  \hspace{1cm} when the shocks to oil prices are positive, and;

\[ OIL_{Shocks, t}^- = \sum_{j=1}^{t} \Delta OIL_{Shocks, j}^-, \]  \hspace{1cm} \[ \text{min}(\Delta OIL_{Shocks, j}, 0) \]  \hspace{1cm} when the shocks to oil prices are negative. \( \alpha_1, \alpha_2, \alpha_3 \) are the coefficients of ARCH, GARCH, and leverage effect of the EGARCH model. We choose a distribution for \( \nu_t \) that maximizes the final likelihood value. We can also trace the
duration of the volatility persistence, obtaining it by calculating the half-life of a volatility shock proposed by Engle and Patton (2001) as: $HL = \log \left( \frac{0.5}{\alpha_2} \right)$.

3. Empirical results

3.1. Results of the Kalman filter

To ensure maximum accuracy, we ran the expectation process before the start of the first sub-sample, and once more before the start of the second sub-sample\(^3\). For the Kalman filter to formulate the expectation process, we used a maximum of one month of daily oil prices before each sub-sample. According to Priestley, data before the estimation period is needed for the Kalman filter to initialize the estimates that investors are assumed to use and are later updated as each new period starts. To avoid repeating the results, Table 1 reports the serial correlations test for the oil price shocks that were used for Bahrain\(^4\). The results indicated the absence of serial correlations and, therefore, the unobserved model was found valid and the general structure model was discarded.

3.2. Impact of COVID-19 and oil price shocks

The results of Eq. (5) and (6) are reported in Tables 2 and 3. Before the pandemic, the results show that, with the exception of Oman, positive oil price shocks had a significant impact on the GCC markets. This suggests that investors were optimistic about the prospect of recovering oil prices and expected that these higher oil prices would stimulate the GCC economies and positively impact on their stock prices. The results also show that, with the exception of Oman, negative oil price shocks had a significant impact. The explanation for this is the reverse: investors expected that diminishing oil prices would have an adverse impact. The results are consistent with the theory and literature, showing that the stock markets of the energy-dependent economies are sensitive to asymmetric oil price shocks (for instance, Abul Basher et al., 2018; Jean Louis and Balli, 2014). Both positive and negative oil price shocks seemed to have had a greater impact on Saudi Arabia (0.168, 0.167), the UAE (Abu Dhabi: 0.144, 0.143; Dubai: 0.137, 0.136), and Kuwait (0.133, 0.131). This may provide further evidence that the biggest oil exporters in the region are more vulnerable to oil price shocks than the smaller states are.

During the pandemic, results show that, except for Oman, positive and negative oil price shocks made significant impact on the GCC stock markets at 1% level, except for Bahrain (significant at 5%). Like the results reported in Table 2, the positive and negative oil price shocks had their greatest impact on Saudi Arabia, the UAE, and Kuwait. We also observe that the impact of the positive and negative oil price shocks was even greater during the pandemic, almost twice the impact on Saudi Arabia (0.261, 0.268), Kuwait (0.237, 0.229), Qatar (0.196, 0.192), and the UAE (Abu Dhabi: 0.230, 0.228; Dubai: 0.248, 0.237), of positive and negative oil prices before the pandemic. The results show conclusively that the GCC markets have strongly reacted to oil price shocks during the pandemic compared to their response before, evidence of their vulnerability to a fragile global oil market due to the gloomy prospects for the global economy.

The results in Table 3 also show that the spread of COVID-19 cases had no meaningful impact on the GCC markets. The current literature has been investigating whether the COVID-19 cases signify a delayed economic recovery and warnings of a receding stock market. Okorie and Lin (2021) provided evidence that investors took into account the impact of COVID-19 cases on market returns for diversified economies. Corbet et al. (2020) showed that COVID-19 cases had a significant impact on the market volatility of the US and China. Our results, like those of Topcu and Gulal (2020) for some emerging markets, are not in line with literature. The explanation for the GCC states may be that the spread of COVID-19 cases has been a major cause of halting economic activities and creation of demand-side shocks in economies everywhere. The effect of COVID-19 could have already been entrenched in the fragile global demand for oil, resulted in volatile and diminishing oil prices, which had been channeled to GCC markets by investors speculating about their impact on the GCC states. This could also be a possible reason why the impact of oil price shocks during the pandemic has been much higher than it was before the onset of COVID-19.

Although we have shorter time series data during the pandemic than before it, we notice that the oil price shocks made the market volatility persist for more days during the pandemic than before it, especially for the UAE and Saudi Arabia. This is a clear evidence of the transmission channels of oil price shocks and the vulnerability of the GCC to the global oil market. Future research on the stock-oil position should look into global macroeconomic shocks, demand-supply shocks, geopolitics, shifts in OPEC policies, and pressure on the US dollar during and after the pandemic.

3.3. Implications of the results

There is no doubt that the low and unstable oil prices are the source of fears among investors and policymakers in the GCC. The losses predicted by the IMF (2020b) could prove to be undervalued if the forecasts for the developed economies turn out to be accurate (OECD, 2020). It is reasonable then to assume that the rebound of oil prices will depend on the conquest of COVID-19 and the gradual steps towards economic recovery, which will help the GCC states to sustain their economic prospects and reverse the damage inflicted on their financial markets.

\(^3\) All indices were nonstationary in level but stationary when first differenced using the Phillips-Perron test.

\(^4\) The length of the dataset for each market is different due to synchronization.
Providing fundamental remedies to the GCC states to overcome the repercussions of COVID-19 is categorically bold, since no country has fully reversed the damage to its business sectors. Well-diversified economies have spent trillions of dollars in total without managing to escape from deep recession. In May, the GCC initiated stimuluses amount to 30% of GDP in Bahrain and Oman, 10% in Kuwait, Qatar and the UAE and 7% in Saudi Arabia (Fetch, 2020b). The GCC should continue such policies and offer more incentives to their business sectors. This will restore the confidence of investors and reduce financial uncertainty, together with mitigating the negative effects of the oil price shocks. Second, the GCC states should continue their economic reforms to diversify their income and address structural issues in their economic sectors. This will help to insulate them from future external shocks, including those originating in the global oil market.

4. Conclusion

This study examines the impact of the global health crisis and oil price shocks on the stock markets in the GCC. Using the Kalman filter to generate the oil price shocks, we found that with the exception of Oman, positive and negative oil price shocks had significant impacts on the GCC markets before the pandemic, and also, except for Oman, during the pandemic. The impact was found to have been
greater since March 11, 2020 for Saudi Arabia, Kuwait, and the UAE. Our results also show that COVID-19 cases have had no meaningful impact on the GCC markets. To alleviate the repercussions of COVID-19, policymakers should continue with their policies to reduce uncertainty and increase the confidence of investors, as well as maintaining their own diversification plans.

CRediT authorship contribution statement

Hisham Al Refai: Conceptualization, Methodology, Software, Data curation, Validation, Visualization, Writing – original draft. Rami Zeitun: Conceptualization, Visualization, Writing – review & editing. Mohamed Abdel-Aziz Eissa: Visualization, Writing – review & editing.

Declaration of Competing Interest

All authors have no conflict of interest when writing this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.frl.2021.102130.

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