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Does Economic Cooperation Lead to Great Stock Market Integration in the GCC Region?

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Executive summary

The Gulf countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE)) share common economic interests and priorities, which incentivized them to establish the Gulf Cooperation Council (GCC) in 1981 in order to achieve joint cooperation and integration in economic and financial fields. Since then, the six member states have negotiated multilateral agreements within the region to reinforce economic integration between them, in addition to adopting common regulations and legislations in the economic fields. These achieved steps did not lead to great economic and financial linkages among the GCC member states, an outcome explained in part by the economic similarity between these states.

The study explores the empirical evidence of one of the most important issues which is the evolution of financial linkages from the stock index data within the GCC region, and investigates whether cross-market integration encompasses significant changes over volatile periods. The analysis is conducted in a time-varying framework using a reliable econometric methodology that provides information about the intensity of cross-market linkages through the calculation of dynamic correlations between countries. Unlike related empirical works that are limited to the detection of possible structural breaks in the cross-market linkages and to relate them to

influential economic and financial events, this study presents an in-depth analysis to reveal either increasing or decreasing trend of equity market integration within the GCC region over turbulent periods.

The estimation results suggest that the financial integration process still faces some challenges within the GCC region, as evidenced by the relatively weak stock market linkages despite the great efforts made by the authorities in the field of economic cooperation and integration. The structural change analysis generates evidence of either increasing or decreasing equity market integration between the GCC economies over periods of high turbulence, suggesting that regional stock portfolio diversification is regime-dependent. These results may be a guide for equity index portfolio diversification over different periods given the time-variation of cross-market linkages within the GCC region.

Important policy implications and recommendations may be provided from the obtained findings to enhance the extent of financial integration between the GCC economies. Indeed, authorities have to ensure more harmonization and cooperation between market participants across all stock sectors in the region through digitalization that may foster intermediation in this context. However, cybersecurity of networks related to technological

development must be seriously addressed to avoid potential financial destabilization. A unified financial force in the GCC region may be built by establishing a common financial market whose policies should be aligned with the objectives of the GCC countries to achieve greater equity index integration.

Introduction

Since its establishment in 1981, the GCC has aimed to achieve joint cooperation and integration between the six member states by negotiating multilateral agreements within the region, as they have the same economic interests and priorities. The GCC has achieved many steps in line with its objectives to enhance economic integration between its members, such as the establishment of the Customs Union for GCC States in 2003 and the Gulf Monetary Council in 2010, in addition to adopting general strategies and policies to be a springboard for national policies in the GCC countries, as well as unifying laws, regulations and procedures in the economic fields. These achievements still do not meet reaching strong economic and financial integration among GCC countries, in order to achieve one of the basic goals for which the GCC is established.

Some believe that the economic similarity represents a challenge to the process of economic integration between GCC countries. The greatest evidence for this claim is the relative importance of oil, gas and petrochemicals, as well as the services sector such as banking and tourism in GCC economies. Hence, this study discusses one of the most important issues which is the evolution of financial integration between GCC countries over time to provide useful

policy implications that can help financial authorities take appropriate decisions to achieve greater financial integration. Under these conditions, as most GCC economies are rich and have huge reserves of oil and gas, which gives each country an economic advantage, how would the situation be if these economies were more integrated, especially in light of a global trend towards expanding into major economic entities. Indeed, great regional integration may be a catalyst to lowering gaps in economic development between GCC countries.

The study aims to provide a more complete picture of the evolution of the financial linkages between GCC countries during the 2005-2019 period by opting for a suitable econometric methodology that allows estimating the time-varying conditional correlations between stock index returns, in addition to analyzing the repercussions of turbulent periods on the integration process. It also attempts to provide investors with reliable information on the linkages between GCC stock index markets, in order to develop investment activities and, thus, to contribute to financing sustainable economic development in the GCC region. In addition, the study may help financial authorities regulate the equity index markets to facilitate the flow of resources into the GCC region. It should be noted in this context that great attention was devoted to the financial sector and its significant interdependence with economic growth in the related

literature. Indeed, Samargandi et al. (2014) reveal a positive finance-growth nexus for the non-oil sector in Saudi Arabia from 1968 to 2010.

Arouri and Nguyen (2010) find weak equity market integration within the GCC region, thus suggesting international and regional stock portfolio diversification gains for global investors. Graham et al. (2013) show evidence of relatively high financial linkages within the MENA region (including Kuwait, Qatar, Saudi Arabia and the UAE) across the 2002-2010 period, and that these linkages increase toward the end of the study period. In a similar context, Aloui and Hkiri (2014) reveal an increasing strength of co-movements between the GCC equity index markets over the global financial crisis, suggesting enhanced stock portfolio gains in the short-term relative to the long-term.[1] Therefore, given these mixed outcomes, our study revisits the financial linkages between GCC countries over a more recent period that includes the latest influential international events and examines their effects on stock market integration.

The remainder of the paper is organized as follows. Section 1 presents a preliminary data assessment. The econometric methodology is provided in Section 2. Section 3 discusses the

[1] Related studies in the literature provide evidence of weak cross-market linkages between GCC and international economies over different periods (see Jouini, 2015; Hatemi, 2012; and Arouri and Nguyen, 2010).

empirical results related to financial integration between the GCC economies. We conclude the study with some useful policy implications and recommendations.

1. Data assessment

We investigate whether the economic cooperation as well as the geographical proximity lead to great financial integration between five GCC state members, namely Bahrain (Bahrain All Share), Oman (MSM 30), Qatar (QE General), Saudi Arabia (Tadawul All Share), and the UAE (ADX General). We consider weekly data from January 2, 2005 to December 15, 2019 (781 observations),[2] which is long enough to investigate the financial integration between the selected GCC countries in a time-varying context, thereby leading to reliable outcomes.

Stock prices are denominated in the local currency. Under these conditions, GCC financial linkages and, thus, equity portfolio diversification gains may not be contaminated by foreign exchange risk, since the local currencies are pegged to the U.S. dollar, which allow currency rates to be steady throughout the study period. Indeed, the currency rates of the Bahraini dinar (BHD), the Omani rial (OMR), the Qatari riyal (QAR), the Saudi riyal (SAR), and the

[2] Data are gathered from the global financial portal (https://www.investing.com).

Emirati dirham (AED) against the U.S. dollar over the 2005-2019 period are 0.376, 0.3845, 3.64, 3.75, and 3.6725, respectively.[3]

1.1. Performance indicators

Figure 1 plots some equity index performance indicators for the selected GCC economies in 2018. It is clear that the Saudi stock index market is the largest market in the GCC region in terms of market capitalization that is about US$500 billion in 2018, which represents more than twice the value of the UAE and more than three times the value of Qatar. For Bahrain and Oman, the market capitalization is low compared to those of Qatar, Saudi Arabia and the UAE. In terms of share of GDP, Qatar has the highest market capitalization with a percentage of 85.2%, followed by Saudi Arabia (63.1%), Bahrain (57.9%), the UAE (56.8%), and Oman (23.7%). As expected, the total value of stocks traded, the share of stocks traded in the GDP, the number of listed domestic companies and the turnover ratio reveal the dominance of the Saudi equity index market in the GCC region, since the values of its indicators are clearly much higher than those of the other GCC countries. Overall, the GCC stock index markets appear to be attractive and efficient, as they are characterized by increasing trading activity, which reflects the strong financial setting in the GCC region. The question is whether such

[3] Data are sourced from World Development Indicators (World Bank).

attractiveness and efficiency are reflected in the financial integration between the GCC countries, which will be examined later in the study to determine its importance for investors and financial regulators.

1.2. Preliminary data analysis

The time-varying patterns of the stock prices illustrated in Figure 2 reveal similar downward or upward trends over different times especially over the 2007-2009 global financial crisis and 2014-2015 oil price fall periods, where there is evidence of changes in stock price levels. Significant changes are also recorded in the equity markets of Qatar, Saudi Arabia and the UAE at the beginning of the study period in 2005 and early 2006. All these time-variations of stock prices are reflected in the graphs of index returns[4] (Figure 3) where we observe high volatility during the mentioned periods. This initial data assessment helps us draw some evidence on financial integration between the GCC countries and the influence of the 2007-2009 global stock market crash and the 2014-2015 oil price declines on such integration.

Descriptive statistics and statistical properties of equity index returns are reported in Table 1. The average index returns are mixed, and range from -1.64E-4 for Bahrain to 5.62E-4 for Qatar. Despite of its

[4] Index returns are computed as the difference of two successive logarithmic equity prices.

worst performance in terms of index returns (-1.64E-4), the Bahrain's market is the less volatile, as measured by the standard deviation (0.014). However, the Qatar's market reveals high volatility (0.034) in addition to its high performance. It is also remarked that the Saudi market presents low performance (0.005) and the highest volatility (0.035) compared to the other GCC markets. The skewness coefficient is negative for all stock markets, thereby indicating that large negative returns are likely to be observed more than large positive returns, as shown by the graphs of index returns (Figure 3). The kurtosis coefficient is greater than 3, the value of the normal distribution, indicating that all GCC stock markets have fat tails (leptokurtic). The Oman's equity market records the highest kurtosis value (13.613), suggesting that this market displays more frequent extreme changes. The fact that the skewness and kurtosis coefficients are not respectively equal to 0 and 3 refers to non-normally equity index returns, which is in line with the results of the Jarque–Bera test. The Ljung–Box test reveals serial correlation for all index returns, except for Qatar, at the conventional levels, and shows evidence of heteroskedasticity for all markets at the 1% level.

The Geweke and Porter-Hudak (1983) and Robinson and Henry (1999) tests show evidence of long-range dependence in the index returns (mean proxy) and in the squared index returns (volatility proxy), except of the Saudi returns based on the first test, thus

suggesting no consensual conclusions on long-memory in the index returns by both tests. In addition, for the cases of persistence in the returns, there is evidence of no high statistical significance since four coefficients are significant at the 10% level. However, for the squared index returns, the test results reveal high significance since the coefficients are statistically significant at the 1% level.[5] A striking feature is that long-range dependence is more pronounced in the squared index returns than in the index returns, except for Bahrain, as evidenced by the estimated long-memory coefficients that are in addition between 0 and 0.5.

Unconditional correlations displayed in Table 2 show that GCC stock markets are positively and moderately interrelated, as the coefficients approximately range between 0.3 and 0.5. This simple analysis cannot be considered as a solid basis for equity portfolio construction due to the time-varying character of the correlation coefficients, as argued by Baum and Schofield (1991) and Tarbert (1998), thus revolving risk exposure. We therefore opt for a more advanced econometric methodology in our analysis to examine accurately the cross-market dependence in a time-varying framework in order to

[5] For Bahrain, the coefficient is statistically different from zero at the 5% level based on the Geweke and Porter-Hudak (1983) test.

draw reliable outcomes on financial integration within the GCC region.

To check the stationarity properties of the index returns, the unit root tests of Elliott (1999) and Lee and Strazicich (2003) are applied using two models for each test. Indeed, for the Elliott (1999) test, the first model includes an intercept, while the second includes a linear time trend. For the Lee and Strazicich (2003) test, we consider a model with two endogenous structural breaks in the level as well as a model with two endogenous structural breaks in both the level and trend. The results reported in Table 3 show that all index returns are stationary at the 1% level regardless of the test and the specification, which is aligned with the fact that long-memory coefficients for the index returns are between 0 and 0.5, as shown in Table 1.

2. Econometric methodology

To properly capture the dynamics of the index returns, we consider an econometric methodology that takes into account the insights drawn from the above preliminary analysis of the data, namely the non-normality, the serial correlation, the heteroskedasticity, and the persistence properties. For this purpose, we believe that an autoregressive model for the conditional mean and a fractionally integrated process for the conditional variance are well-suited to fit

the data. Practically, we consider the following autoregressive process of order 1, AR(1):

$$y_t = \mu + \varphi y_{t-1} + u_t, \qquad u_t = \varepsilon_t \sigma_t, \qquad \varepsilon_t \to iid(0,1) \qquad (1)$$

where y_t is a GCC index return series, μ is a constant term, φ is an autoregressive coefficient that measures the response of the current index returns to its past own values, u_t is the disturbance term, and σ_t^2 is the conditional variance that is modelled according to the following FIGARCH(1, *d*, 1) model (see Baillie et al., 1996; and Chung, 2001):[6]

$$\sigma_t^2 = \omega + [1 - (1 - \beta L)^{-1}(1 - L)^d(1 - \alpha L)]u_t^2 \qquad (2)$$

where the ARCH coefficient, α, measures how the conditional variance of the index returns reacts to the past unexpected chocs, the GARCH coefficient, β, measures the responses of the current conditional variance of the index returns to its past own values, and d measures the persistence of the conditional variance. The estimation of the AR(1)-FIGARCH(1, *d*, 1) model[7] for each GCC index return series consists in determining the estimates of the

[6] FIGARCH stands for Fractionally Integrated Generalized Autoregressive Conditional Heteroskedasticity.

[7] The AR(1)-FIGARCH(1, *d*, 1) model is well-suited compared to other GARCH models based on information criteria.

standard deviation σ_{it} for $i = 1, 2, \dots, 5$, which are then used to compute the standardized residuals $\varepsilon_{it} = u_{it}/\sigma_{it}$.

To draw more interesting insights on the financial integration between the GCC economies, we compute the dynamic conditional correlations (DCC) based on the Tse and Tsui (2002) method. Within this context, the conditional variance-covariance matrix is given by:

$$H_t = D_t R_t D_t \tag{3}$$

where $D_t = diag(\sigma_{1t}, \sigma_{2t}, \dots, \sigma_{5t})$, $R_t = (1 - \theta_1 - \theta_2)R + \theta_1 \emptyset_{t-1} + \theta_2 R_{t-1}$ such that $\theta_1 \geq 0$, $\theta_2 \geq 0$ and $\theta_1 + \theta_2 \leq 1$, $R = (\rho_{ij})$ is a symmetric positive definite square matrix of order 5 with $\rho_{ii} = 1$, and $\emptyset_{t-1}$ is a correlation square matrix of order 5 of u_τ for $\tau = t - M, t - M + 1, \dots, t - 1$ whose $(i, j)th$ element is given by:

$$\emptyset_{ij,t-1} = \frac{\sum_{l=1}^{M} \varepsilon_{i,t-l}\varepsilon_{j,t-l}}{\sqrt{\left(\sum_{l=1}^{M} \varepsilon_{i,t-l}^2\right)\left(\sum_{l=1}^{M} \varepsilon_{j,t-l}^2\right)}}, \qquad 1 \leq i < j \leq 5 \tag{4}$$

To ensure the positivity of $\emptyset_{t-1}$ and thus R_t, the parameter M should be greater than or equal to the number of index return series.[8] The dynamic conditional correlation coefficient between two GCC index return series i and j is given by

$$\rho_{ij,t} = (1 - \theta_1 - \theta_2)\rho_{ij} + \theta_1 \emptyset_{ij,t-1} + \theta_2 \rho_{ij,t-1} \tag{5}$$

[8] In our study, M is fixed at 5.

As seen, the AR-DCC-FIGARCH model has some advantages over other existing methodologies, since it examines the return and volatility patterns of the stock markets in addition to the integration between them in a time-varying framework. The model is estimated by the maximum likelihood method using the Student's-t distribution to take into account the fat-tail property of the index returns, as shown above in the data assessment.

3. Discussion of the results

3.1. Estimate results of the model

The estimate results of the AR-FIGARCH model displayed in Table 4 reveal that for the mean equation, the constant term is statistically significant for only the Saudi stock market at the 5% level. However, the autoregressive coefficient is statistically significant and positive for all equity markets at the conventional levels, reflecting the transmission of pertinent market information to stock prices and, thus, some predictability for all index returns. Regarding, the variance equation, the constant term is not statistically significant for all stock markets. The ARCH coefficient is statistically different from zero for only the Oman's equity market at the 10% level, suggesting that the conditional volatility of this market is sensitive to past unexpected shocks. The GARCH coefficient is positive for all equity markets, but statistically significant for the stock markets of

Bahrain, Oman, Saudi Arabia and the UAE at the conventional levels, implying that the conditional variance of these four markets positively reacts to past own volatility. The conditional variance of the Qatar's stock market is not sensitive to its past own volatility, as shown by the statistical insignificance of the GARCH coefficient. The conditional variances of index returns obtained from the estimation of the AR-FIGARCH model are reported in Figure 4. They reflect the time-variations of index returns (see Figure 3) where we observe high volatility during the 2007-2009 global financial crisis and 2014-2015 oil price fall periods, thus highlighting the usefulness of the adopted methodology. The fractional differencing parameter is statistically significant for all index returns at the conventional levels, reflecting the presence of long-range dependence in the stock markets. Another noticeable feature is that the intensity of the persistence degree varies across countries, as it ranges from 0.432 for Bahrain to 0.712 for the UAE, thus reflecting mixed hyperbolic decay of the effects of shocks on conditional volatility of the stock markets.

The DCC estimates reported in Table 5 reveal that the average conditional correlations between the GCC stock markets are statistically significant and positive at the 1% level. The UAE stock market shows moderate linkages with Qatar, as evidenced by the correlation coefficient (0.502). However, financial integration is

relatively weak for the other cases, as conditional correlation coefficients are below 0.5, i.e., they range from 0.187 for Bahrain/Saudi Arabia to 0.402 for Qatar/Saudi Arabia.[9] Therefore, Qatar and the UAE are relatively integrated financially, but there is evidence of weak regional financial integration for the other cases. These findings are somewhat consistent with prior studies that reveal weak regional integration between the GCC equity markets (see Arouri and Nguyen, 2010). The statistical significance and positivity of the coefficients θ_1 and θ_2 reflect the time-variation of the conditional correlations between the GCC equity markets,[10] which implies a solid basis for stock portfolio construction. The fact that the sum of the coefficients estimates is 0.986 (very close to unity) reflects the high persistence of the conditional correlations and the slowness of the conditional volatilities to reach the normal equilibrium state.

To outline the validity of the estimated model, we have conducted the Ljung-Box test that is applied to standardized and squared standardized residuals. The results displayed in Table 6 show in

[9] The average conditional correlations between Qatar on one side and Saudi Arabia and the UAE on the other side (0.402 and 0.502) are close to the unconditional correlations reported in Table 2 (0.434 and 0.540).

[10] The time-variation of the conditional correlations is confirmed by the Tse (2000) test, thereby allowing us to conduct an in-depth analysis of these correlations in order to draw reliable insights on the linkages between the GCC equity index markets.

general evidence of no autocorrelation and no ARCH effects, thereby suggesting that the selected model is well-suited to analyze the integration between the GCC equity index markets.

3.2. Financial linkages between the GCC economies

The time-varying conditional correlations reported in Figure 5 reveal increasing and decreasing trends in all patterns, to varying degrees, with particular upward shifts over the 2007-2009 global financial crisis and the 2014-2015 oil price declines periods, thereby suggesting increasing financial integration and, thus, supporting the herding behavior and contagion effects between the GCC stock price markets around these periods. The correlations appear to be higher than the average values (see Table 5) at the upward shifts around the 2007-2009 and 2014-2015 periods, while they are smaller than these average values at other times of the sample period.[11] These insights suggest that the GCC countries are more integrated financially around the 2007-2009 and 2014-2015 periods, leading to declining regional diversification earnings when investors diversify their

[11] Although the correlations between the GCC equity index markets increase around the 2007-2009 and 2014-2015 periods, the linkages between these markets are relatively small over the whole sample period, except of Qatar/UAE, as discussed earlier in the study. In a similar context, Berger et al. (2011) outline that investment restrictions or formation of economic unions explain the change in international financial integration across periods.

portfolios by considering assets from the GCC stock markets. Therefore, cross-market linkages have important implications for stock index portfolio diversification, and investors should take the necessary precautions when diversifying their equity portfolios in the GCC region over turbulent periods.

The increasing financial integration between countries over volatile periods has been highlighted by some previous studies in the literature. In this context, Gjika and Horváth (2013), Chiang et al. (2007), Ang and Bekaert (2002), and Forbes and Rigobon (2002) find that the linkages between stock index markets increase during turbulent periods, putting forward the herding behavior and, thus, reducing the benefits of portfolio diversification.

3.3. Time-varying financial integration rate

Given that cross-correlations patterns exhibit increasing and decreasing trends during the 2007-2009 global financial crisis and the 2014-2015 oil price falls periods (see Figure 5), we estimate a time-trend regression for each correlation series between two GCC stock index markets to capture changes in the financial integration rate over time during these periods.[12] Specifically, for each cross-

[12] In a similar context, Bekaert et al. (2002) estimate structural break models to highlight the segmentation and integration periods, and find financial integration between economies following the official liberalization dates.

correlations series $\rho_{ij,t}$, we estimate the following two linear regression models with changes in the time trend:

$$\begin{cases} \rho_{ij,t} = a + b_1 t + b_2 t D_{FC,t} + v_{FC,t} \\ \rho_{ij,t} = c + d_1 t + d_2 t D_{OIL,t} + v_{OIL,t} \end{cases} \quad (6)$$

where $D_{FC,t}$ is a dummy variable that is equal to one from July 1, 2007 to June 28, 2009 and zero otherwise,[13] and $D_{OIL,t}$ is a dummy variable that is equal to one from June 1, 2014 to December 27, 2015 and zero otherwise.[14] Under these conditions, the statistical significance of the time-trend dummy coefficient b_2 (d_2) indicates that the financial integration rate during the global financial crisis (oil price declines) period differs from that of the pre- and post-crisis (pre- and post-falls) period, thereby suggesting increasing or decreasing financial integration between the two markets of interest depending on the sign of the sum of the two financial integration rates, $b_1 + b_2$ $(d_1 + d_2)$.[15]

[13] By doing this, we divide the sample period into two subperiods, namely the global financial crisis subperiod and the pre- and post-crisis subperiod.

[14] By doing this, we divide the sample period into two subperiods, namely the oil price falls subperiod and the pre- and post-falls subperiod.

[15] Other prior studies opted for the same approach for developed and developing countries and found mixed results in terms of increasing or decreasing financial integration over different periods, such as notably the 2007-2008 stock market turmoil and the 2009 Eurozone sovereign debt crisis (see Arruda and Valls Pereira, 2013; Dimitriou and Kenourgios, 2013; and Dimitriou et al., 2013).

As regards the impact of the global financial crisis on the integration between the GCC stock markets, the estimate results are displayed in Table 7. They reveal significant and positive financial integration rates for Bahrain/Qatar, Oman/Qatar, and Qatar/UAE, as shown by the estimate coefficient of b_1 during the pre- and post-crisis period, thus indicating increasing integration for these cases. However, there is evidence of significant and negative financial integration rates for Bahrain/Oman, Bahrain/Saudi Arabia, Oman/Saudi Arabia, Oman/UAE, Qatar/Saudi Arabia, and Saudi Arabia/UAE, as measured by the estimate coefficient of b_1 during the pre- and post-crisis period, thus suggesting decreasing integration for these cases. The coefficient b_2 is statistically significant and positive (negative) for Bahrain/Oman, Bahrain/Qatar, Bahrain/Saudi Arabia, Bahrain/UAE, Omar/Qatar, and Qatar/UAE (Oman/Saudi Arabia and Qatar/Saudi Arabia). Additionally, Bahrain (Qatar) exhibits increasing integration with the other GCC countries (Oman and the UAE) during the global financial crisis since the sum of b_1 and b_2 is positive. However, for Oman/Saudi Arabia, Oman/UAE, Qatar/Saudi Arabia, and Saudi Arabia/UAE, there is evidence of decreasing integration during the global stock market crash since the sum of b_1 and b_2 is negative.

We now turn to the effect of the oil price falls on the financial integration between the GCC economies, the estimate results are

reported in Table 8. They show significant and negative financial integration rates for Bahrain/Oman, Bahrain/Qatar, Bahrain/Saudi Arabia, Bahrain/UAE, Oman/Saudi Arabia, Oman/UAE, and Saudi Arabia/UAE, as displayed by the estimate coefficient of d_1 during the pre- and post-falls period, thus suggesting decreasing integration for these cases. However, there is evidence of a significant and positive financial integration rate for Qatar/UAE, as indicated by the estimate coefficient of d_1 during the pre- and post-falls period, thus suggesting increasing integration between Qatar and the UAE. The coefficient d_2 is statistically significant and positive for all cases, except of Bahrain/Oman and Qatar/Saudi Arabia. Additionally, Qatar (Oman) exhibits increasing integration with the other GCC countries (Saudi Arabia and the UAE) during the oil price falls period since the sum of d_1 and d_2 is positive. However, there is evidence of decreasing integration during the oil price declines period between Bahrain on one side and Oman, Saudi Arabia and the UAE on the other side, and between Saudi Arabia and the UAE since the sum of b_1 and b_2 is negative.

In summary, the two time-trend regressions under structural breaks reveal interesting insights on financial integration between the GCC economies. Indeed, the constant terms a and c are statistically significant and positive for all cases at the 1% level, thus suggesting that the GCC economies exhibit a positive level of financial

integration between them, as evidenced by the cross-correlations displayed in Figure 5. It is also found that Qatar exhibits increasing stock market integration with Bahrain, Oman and the UAE during the global financial crisis and oil price falls periods, while the analysis generates evidence of decreasing equity market integration between Saudi Arabia and the UAE over these periods. For the other cases, the behavior of the financial linkages is mixed during the global stock market crash and oil price declines periods, since there is evidence of either increasing or decreasing integration between the GCC countries of interest. These insights appear to be a guide for stock portfolio diversification over different periods.

Conclusion and policy implications

The paper investigates whether the economic cooperation and geographical proximity between five GCC countries lead to high mutual financial linkages over the 2005-2019 period using the AR-DCC-FIGARCH methodology that has the advantage to examine the return and volatility patterns of the equity index markets in addition to the linkages between them in a time-varying framework. The effects of the 2007-2009 global financial crisis and the 2014-2015 oil price falls on the stock market integration between the GCC economies are also investigated by opting for time-trend regressions

subject to regime-shifts to highlight the benefits of investors from equity index portfolio diversification over different periods.

The findings reveal that Qatar and the UAE are financially integrated to a certain extent, while there is evidence of relatively weak financial linkages for all the other cases, suggesting that despite the great progress made in the field of economic cooperation and integration between the GCC economies, this process still faces some challenges, as evidenced by the relative weakness of stock market integration between these countries. The structural break analysis reveals either increasing or decreasing trend of financial integration between the GCC economies during the 2007-2009 global stock market crisis and the 2014-2015 oil price declines periods. Given these results, investors may benefit from including assets from the GCC stock markets in their portfolios and should be vigilant during periods of high turbulence given the dissimilarity of equity portfolio diversification earnings across these periods. Based on the findings of financial integration between the GCC countries, the study provides a set of important policy implications and recommendations that may be of great interest for investors and decision makers:

- In spite of the opening policies undertaken by the GCC countries and the wide range of financial assets offered to attract investors who seek for advantageous opportunities

to diversify their stock portfolios and to facilitate their access to the equity index markets, the financial integration in the GCC region is still relatively weak. In this vein, further required measures, such as more harmonization and cooperation between stakeholders across all sectors in the GCC equity index markets, should be implemented to enhance the extent of the stock market integration within the GCC region.

- The time-varying financial linkages between the GCC economies should not be neglected by investors who have to be aware of the necessity to well manage and diversify their equity index portfolios when making investment decisions, especially during high turbulent periods where stock market integration records either decreasing or increasing trends.
- Digital transformation may play an important role in fostering the efficiency of equity index markets and providing intermediation for the financial service providers, thereby improving financial integration between the GCC economies. However, the heavy regulation in this context may obstruct new entrants to the stock index markets, thus turning the bet from the desire to keep pace with the technological development for

enhancing financial integration to the need to reduce the level of risks involved. In addition, cybersecurity of networks may also be a major problem and must be seriously addressed by providing the appropriate mechanisms in order to avoid potential financial destabilization and, therefore, improve equity index integration.

- Financial authorities have to be aware that the economic cooperation and geographical proximity do not lead duly to attain the objectives in terms of equity market integration between the GCC economies. In this context, a common financial market in the GCC region may be useful to build a unified financial force, thereby allowing to ease restrictions on access to stock markets. The policies of this common financial market should be consistent with the goals of the GCC economies to yield greater benefits in terms of financial integration.

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Table 1. Descriptive statistics and statistical properties for index returns

	Bahrain	Oman	Qatar	Saudi A.	UAE
Mean × 10^3	-0.164	0.167	0.562	0.005	0.559
Std. Dev.	0.014	0.024	0.034	0.035	0.028
Skew.	-0.532	-1.506	-0.623	-1.294	-1.037
Kurt.	4.170	13.613	6.683	7.414	9.330
JB	601.917	6317.800	1502.008	2004.092	2968.936
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LB	86.496	51.327	9.152	21.735	25.699
	(0.000)	(0.000)	(0.518)	(0.017)	(0.004)
LB^2	91.323	260.472	315.218	288.921	164.448
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GPH-returns	0.136	0.066	0.067	0.055	0.067
	(0.000)	(0.075)	(0.069)	(0.136)	(0.072)
RH-returns	0.112	0.066	0.044	0.056	0.078
	(0.000)	(0.009)	(0.084)	(0.028)	(0.002)
GPH-Squared returns	0.085	0.197	0.191	0.220	0.127
	(0.021)	(0.000)	(0.000)	(0.000)	(0.001)
RH-Squared returns	0.082	0.179	0.152	0.206	0.132
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)

Notes: JB is the Jarque-Bera test for normality; LB is the Ljung-Box test for no serial correlation in the index returns; LB^2 is the Ljung-Box test for no serial correlation in the squared index returns; GPH is the Geweke and Porter-Hudak (1983) log-periodogram regression test applied to index returns (mean proxy) and squared index returns (volatility proxy); and RH is the Robinson and Henry (1999) Gaussian semi-parametric test applied to index returns and squared index returns. The values in parentheses are the *p*-values of the tests.

Table 2. Correlations between index returns

	Bahrain	Oman	Qatar	Saudi A.	UAE
Bahrain	1.000	0.360	0.336	0.298	0.353
Oman		1.000	0.455	0.391	0.555
Qatar			1.000	0.434	0.540
Saudi A.				1.000	0.464
UAE					1.000

Table 3. Unit root test results for index returns

	QT		LS	
	Intercept	Trend	Level Breaks	Level and Trend Breaks
Bahrain	0.127***	0.091***	-4.724***	-12.296***
Oman	0.001***	0.001***	-6.382***	-11.600***
Qatar	0.110***	0.067***	-4.866***	-12.007***
Saudi A.	0.002***	0.002***	7.299***	-13.540***
UAE	0.001***	0.001***	-7.484***	-9.811***

Note: The Elliott (1999) (QT) and Lee and Strazicich (2003) (LS) tests are constructed under the null hypothesis of unit root. The QT test considers a model with intercept as well a model with linear time trend; and the LS test considers a model with two structural breaks in the level as well as a model with two structural breaks in both the level and trend. *** denotes stationarity at the 1% level.

Table 4. Estimation results of the AR-FIGARCH model

	Bahrain	Oman	Qatar	Saudi A.	UAE
			Mean equation		
μ	-5.500E-5	5.400E-5	9.160E-4	0.002**	7.780E-4
	(5.073E-4)	(6.886E-4)	(0.001)	(0.001)	(8.363E-4)
φ	0.101***	0.140***	0.106***	0.094**	0.098**
	(0.039)	(0.042)	(0.041)	(0.045)	(0.040)
			Variance equation		
ω	4.489E-4	0.003	0.003	0.004	0.006
	(5.363E-4)	(0.003)	(0.003)	(0.003)	(0.006)
d	0.432*	0.709***	0.535***	0.544***	0.712***
	(0.257)	(0.108)	(0.126)	(0.111)	(0.121)
α	0.245	0.240*	-0.289	-0.010	0.067
	(0.237)	(0.131)	(0.496)	(0.155)	(0.142)
β	0.528*	0.669***	0.039	0.312**	0.631***
	(0.270)	(0.101)	(0.555)	(0.149)	(0.102)

Notes: The autoregressive coefficient φ measures the response of the current index returns to its past own values; the coefficient d measures the persistence of the conditional variance; the ARCH coefficient α measures the reactions of the conditional variance to the past unexpected chocs; and the GARCH coefficient β measures the responses of the current conditional variance to its past own values. The values in parentheses are the standard errors. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 5. DCC estimates

	Coefficient	Standard Error
$\rho_{BAH,OMA}$	0.219***	0.058
$\rho_{BAH,QAT}$	0.221***	0.064
$\rho_{BAH,SAU}$	0.187***	0.061
$\rho_{BAH,UAE}$	0.200***	0.061
$\rho_{OMA,QAT}$	0.309***	0.060
$\rho_{OMA,SAU}$	0.284***	0.060
$\rho_{OMA,UAE}$	0.383***	0.051
$\rho_{QAT,SAU}$	0.402***	0.061
$\rho_{QAT,UAE}$	0.502***	0.047
$\rho_{SAU,UAE}$	0.354***	0.056
θ_1	0.012***	0.003
θ_2	0.974***	0.006
df	6.319***	0.553

Notes: The coefficient ρ_{ij} measures the average dynamic conditional correlation between the index returns of the countries *i* and *j*; the coefficients θ_1 and θ_2 reflect the time-varying aspect of the conditional correlations between the index returns; and df is the estimate of the number of freedom degrees of the Student's-t distribution. *** denotes significance at the 1% level.

Table 6. Diagnostic tests

	Bahrain	Oman	Qatar	Saudi A.	UAE
LB	24.462	13.264	4.692	5.993	7.443
	(0.006)	(0.209)	(0.911)	(0.816)	(0.683)
LB^2	7.612	4.742	7.990	4.531	5.427
	(0.667)	(0.908)	(0.630)	(0.920)	(0.861)

Notes: LB is the Ljung-Box test for no serial correlation in the standardized residuals; and LB^2 is the Ljung-Box test for no serial correlation in the squared standardized residuals. The values in parentheses are the *p*-values of the tests.

Table 7. Effects of the global financial crisis on cross-market integration

	a	b_1	b_2
Bahrain/Oman	0.256***	-1.088E-4***	4.080E-4***
	(0.003)	(6.924E-6)	(2.506E-5)
Bahrain/Qatar	0.194***	2.690E-5***	5.014E-4***
	(0.005)	(9.928E-6)	(3.593E-5)
Bahrain/Saudi A.	0.205***	-5.735E-5***	2.238E-4***
	(0.004)	(8.035E-6)	(2.908E-5)
Bahrain/UAE	0.187***	3.584E-6	4.805E-4***
	(0.004)	(7.838E-6)	(2.837E-5)
Oman/Qatar	0.278***	3.946E-5***	2.035E-4***
	(0.006)	(1.360E-5)	(4.924E-5)
Oman/Saudi A.	0.291***	-5.220E-5***	-7.294E-5**
	(0.005)	(1.027E-5)	(3.715E-5)
Oman/UAE	0.406***	-9.003E-5***	7.331E-5
	(0.006)	(1.311E-5)	(4.745E-5)
Qatar/Saudi A.	0.405***	-3.051E-5**	-2.614E-4***
	(0.006)	(1.218E-5)	(4.406E-5)
Qatar/UAE	0.449***	9.663E-5***	1.988E-4***
	(0.003)	(6.543E-6)	(2.368E-5)
Saudi A./UAE	0.375***	-1.177E-4***	1.870E-5
	(0.004)	(8.704E-6)	(3.150E-5)

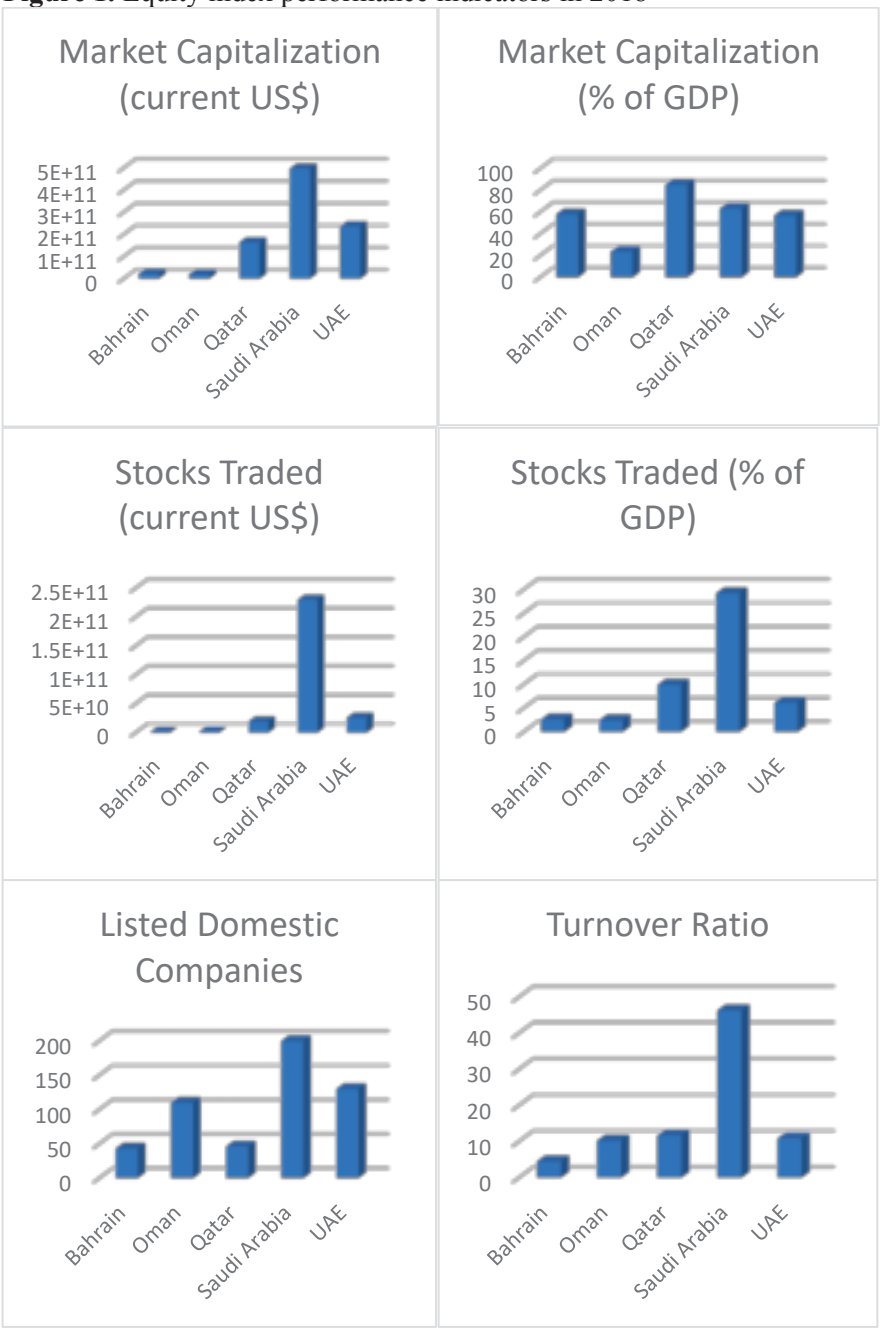
Notes: The coefficient a measures the level of financial integration between the countries; and the coefficients b_1 and b_2 measure the financial integration rate between the countries. The evidence of increasing or decreasing financial integration during the global stock market crash depends on the sign of $b_1 + b_2$. The values in parentheses are the standard errors. *** and ** denote significance at the 1% and 5% levels, respectively.

Table 8. Effects of oil price falls on cross-market integration

	c	d_1	d_2
Bahrain/Oman	0.281***	-1.467E-4***	-1.461E-5
	(0.003)	(7.670E-6)	(1.052E-5)
Bahrain/Qatar	0.226***	-4.051E-5***	1.138E-4***
	(0.004)	(1.020E-5)	(1.399E-5)
Bahrain/Saudi A.	0.219***	-9.073E-5***	7.157E-5***
	(0.003)	(7.755E-6)	(1.063E-5)
Bahrain/UAE	0.217***	-5.150E-5***	4.885E-5***
	(0.003)	(8.689E-6)	(1.192E-5)
Oman/Qatar	0.292***	-1.461E-6	1.319E-4***
	(0.006)	(1.270E-5)	(1.741E-5)
Oman/Saudi A.	0.287***	-5.829E-5***	8.393E-5***
	(0.004)	(9.599E-6)	(1.316E-5)
Oman/UAE	0.412***	-1.160E-4***	1.185E-4***
	(0.005)	(1.218E-5)	(1.670E-5)
Qatar/Saudi A.	0.388***	-7.321E-6	1.631E-5
	(0.005)	(1.191E-5)	(1.633E-5)
Qatar/UAE	0.462***	6.071E-5***	1.032E-4***
	(0.003)	(5.955E-6)	(8.165E-6)
Saudi A./UAE	0.376***	-1.227E-4***	2.043E-5*
	(0.004)	(8.314E-6)	(1.140E-5)

Notes: The coefficient c measures the level of financial integration between the countries; and the coefficients d_1 and d_2 measure the financial integration rate between the countries. The evidence of increasing or decreasing financial integration during the oil price falls period depends on the sign of $d_1 + d_2$. The values in parentheses are the standard errors. *** and * denote significance at the 1% and 10% levels, respectively.

Figure 1. Equity index performance indicators in 2018



Source: World Development Indicators (World Bank).

Figure 2. Time-variations of stock prices

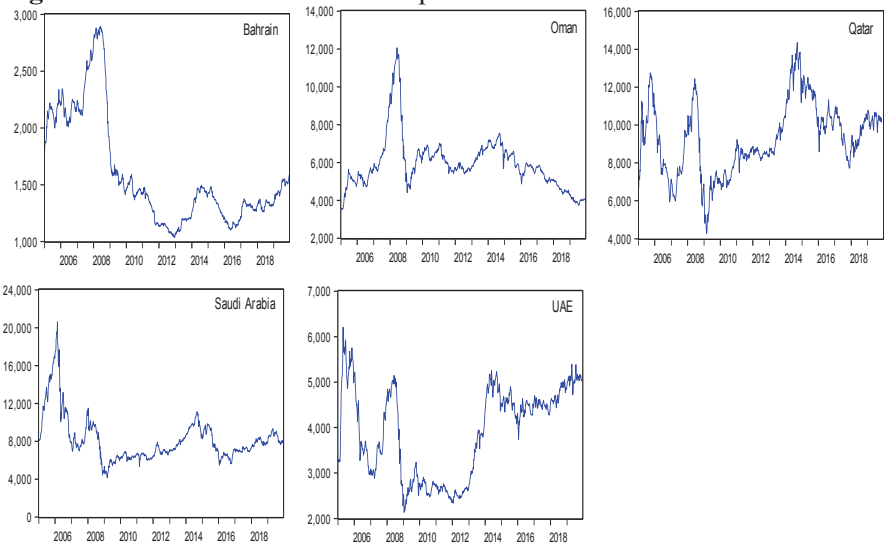


Figure 3. Time-variations of index returns

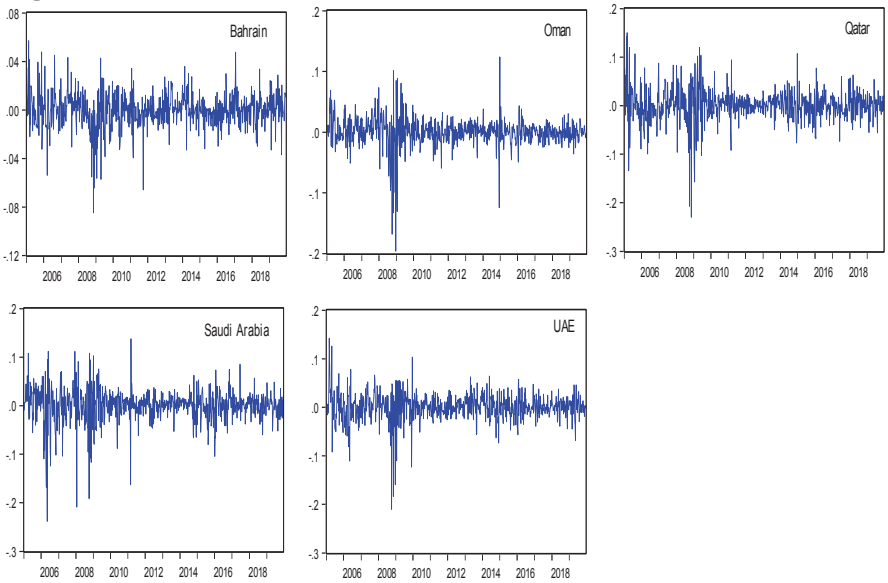


Figure 4. Conditional variances of index returns

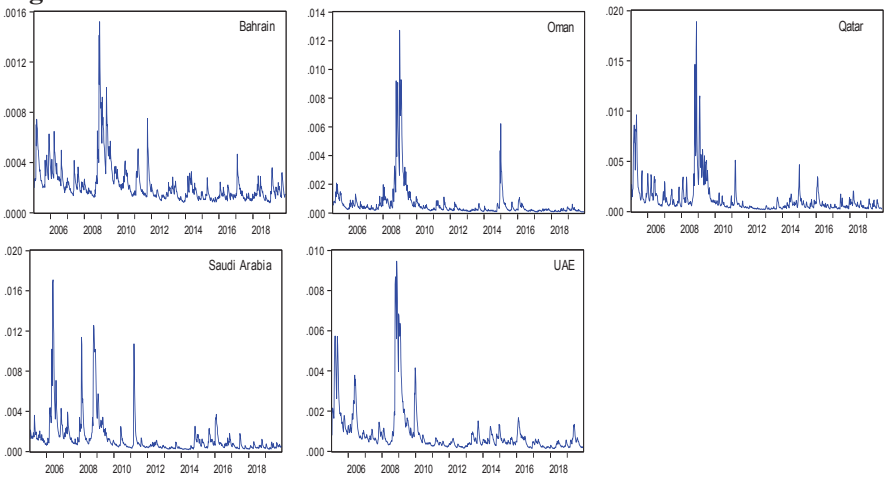
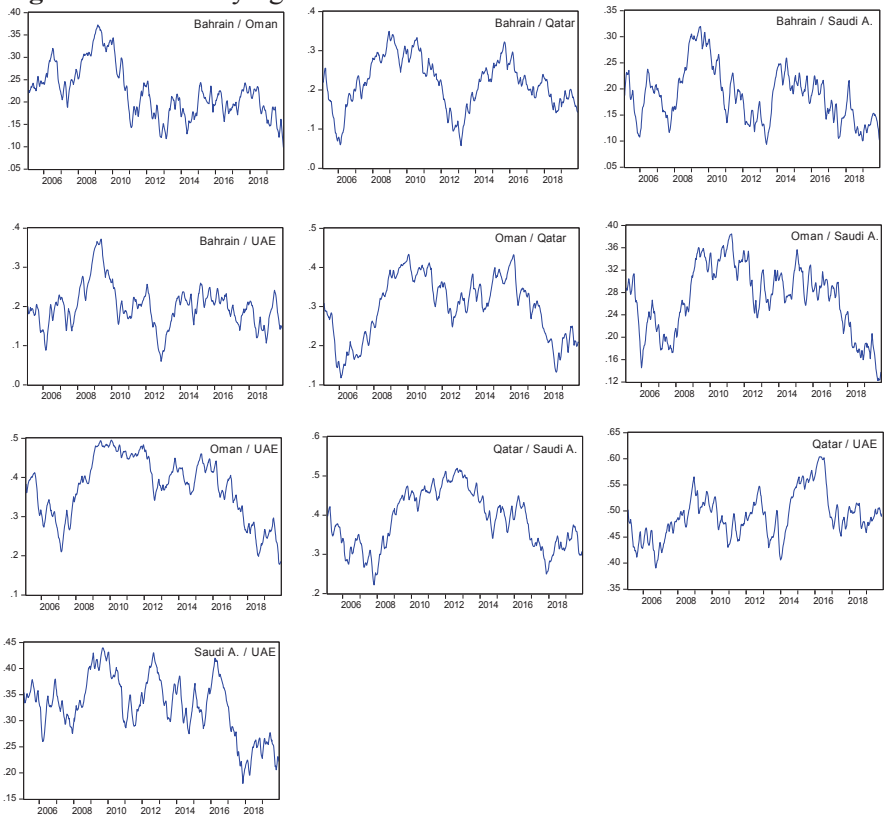


Figure 5. Time-varying correlations between index returns



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