THE SENSITIVITY OF GCC FIRMS' STOCK RETURNS TO EXCHANGE RATE, INTEREST RATE, AND OIL PRICE VOLATILITY

Mariam Alenezi *, Ahmad Alqatan **, Obby Phiri ***

* American International College, Kuwait
** *Corresponding author,* University of Portsmouth, United Kingdom
Contact details: University of Portsmouth, Portland Building, Floor 3, Room 3.01, Office 12, United Kingdom
*** University of Westminster, London, United Kingdom

Abstract

This study seeks to investigate the sensitivity of stock returns to exchange rate, interest rate and oil price volatility in the Gulf Cooperation Council (GCC) countries. It employs both the multivariate ordinary least square (OLS) regression and the exponential generalized autoregressive conditional heteroscedastic in mean (EGARCH-M) models to analyse the data collected from Bloomberg and DataStream on the GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates) for the period January 2007 to June 2012. The study shows that stock returns in GCC countries are influenced by the exchange rate risk, interest rate risk and oil price risk. However, the exposure is highest for exchange rate risk and lowest for interest rate risk. While the effects of these risks were mixed, overall, exchange rate risk and oil price risk showed a positive and significant relationship as compared to the interest rate risk that showed a negative significant effect on firm values. The level of the effect of these risks also differed from country to country. Further, foreign operations and firm size had a significant influence on the extent of the firms' exposure to all three risks. The study findings suggest that the volatility of stock returns affected by changes in the risk factors could indicate non-prioritisation of risk management by firms. This has implications in terms of consideration of the long-term exposure of firms to these three risks and thus, the need for effective risk management strategies.

Keywords: GCC Countries, Exchange Rates, Interest Rates, Oil Price Risk, Stock Returns

Authors' individual contribution: Conceptualization – M.A.; Methodology – A.A.; Investigation – M.A. and A.A.; Formal Analysis – A.A. and M.A.; Resources – M.A. and O.P.; Writing – Original Draft – M.A. and A.A.; Writing – Review & Editing – M.A., A.A., and O.P.; Visualization – M.A.; Project Administration – A.A. and O.P.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

1. INTRODUCTION

Macroeconomic variables (such as gross domestic product (GDP), interest rates, exchange rates, price level, industrial production rate, unemployment rate) are generally volatile, constantly changing. The changes in these macroeconomic variables have an influence on stock market returns (English, Van den

Heuvel, & Zakrajšek, 2018; Maheshwari, 2020; Mollick & Sakiki, 2019; Parab & Reddy, 2020). This study focusses on three macroeconomic variables: exchange rates, interest rates and oil prices. Among the macroeconomic variables, these have been identified in the literature as the main sources of risks that need to be monitored and managed (Arouri, Lahiani, & Nguyen, 2011; Singhal, Choudhary, & Biswal, 2019). Thus, the changes in these macro-economic variables are examined in order to assess their effect on the firm values as reflected in the share prices. This is accomplished through establishing a cause and effect relationship between exchange rate returns, interest rate returns, oil price returns and stock returns.

Several studies have examined the relationship between stock price movements with either oil price changes (Basher, Haug, & Sadorsky, 2018; Dhaoui & Khraief, 2014; Wong & ElMassah, 2018), interest rate fluctuations (Afshar, Arabian, & Zomorrodian, 2008; English et al., 2018) or exchange rate changes (Bartram & Bodnar, 2012; Dash & Sahu, 2018; Joseph & Vezos, 2006; Mollick & Sakaki, 2019) and found mixed results. These factors have often been studied separately with only a few studies examining more than one factor (Akram, 2009; El-Masry, Olugbode, & Pointon, 2010; Kim & Jung, 2018; Nordin, N., Nordin, S., & Ismail, 2020; Richards, Simpson, & Evans, 2009; Rostamy, Hosseini, & Bakhshitakanlou, 2013; Singhal et al., 2019). Further, most studies have been inclined to western countries or oil-importing countries (El-Masry, 2006). Few studies have focussed on the oil-exporting countries (Arouri et al., 2011; Hammoudeh & Choi, 2006).

The investigation of the possible relationship between the chosen macroeconomic variables and stock return in this study is performed on the GCC countries. As such, this study makes a contribution in focussing on the GCC countries which have rarely been studied. Further, unlike studies that have focussed on oil-importing countries to investigate oil price shocks, this study examines the exposure on oil-exporting countries providing additional insight. The study also makes a contribution to the literature by examining the three risks in one study. Most studies have mainly concentrated on only one or two of the risk exposures but rarely three of the risks together. Also, whilst some studies have focussed on either the financial sector or the non-financial sector, this study gives insights on both and makes a segregated analysis to reveal the unique characteristics of each sector for each of the GCC countries. As the GCC countries are increasingly opening up their economies to foreign investment (PWC, 2020), understanding and managing such key risks has significant economic implications.

In summary, the study aims to answer the following two questions:
1. What is the impact of changes in exchange rates, interest rates and oil prices on stock returns in the GCC countries?
2. Which of the three risks has the greatest impact on the stock's returns of GCC listed firms?

The next section gives some context to the study in describing the GCC countries.

2. CONTEXTUAL BACKGROUND

The Gulf Cooperation Council (GCC) countries, which comprise Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE) have a great endowment in oil reserves, and this makes them largely dependent on this commodity. Oil remains their main trade commodity and source of revenue (Arouri et al., 2011; Statista, 2019a). As it is important to these countries, it is vital to examine the different variables associated with it. Oil, being a commodity that is traded around the world, is associated with various issues including the currencies of different countries and the interest rates associated with funds sought to buy or sell oil. These are key macro-economic variables that must be examined alongside oil (Lee, Milesi-Ferretti, Ostry, Prati, & Ricci, 2008; Marcel, & Mitchell, 2006).

Arouri et al. (2011) described the GCC countries (establishment in 1981) as having similarities at different levels. They do have the same financial infrastructure and economic structure. They account for around 20% of the world's oil production, 36% of world oil exports and 47% of world petroleum reserves (Statista, 2019b). In all, their earnings, domestic price level and share prices of companies are highly influenced by oil price changes. The rise in oil price affects their economies usually reflected in their inflation rates which then affects their overall interest rates and investments (Arouri et al., 2011). Thus, any shock affecting the world oil market can have an influence on their capital and financial markets (Hammoudeh & Li, 2008). These countries' government budget and expenditure are largely based on the revenue from oil exports. The demand for oil affects directly corporate output and domestic prices while indirectly affects stock prices and expected inflation and interest rates (Maghyereh & Al-Kandari, 2007). Simply put, in the GCC countries, an increase in oil prices positively affects earnings, government revenues and expenditures (Arouri & Rault, 2010).

In terms of the stock markets, Saudi Arabia leads the GCC countries by 50% of the total capital market, and the smallest market is the Oman market (PWC, 2019). Saudi Arabia's stock market accounts for one-third of the total market capitalisation in the GCC countries with a recorded value of US$451 billion in 2017 (Statista, 2019a). In terms of the number of listed firms, ranked from the highest, there is Kuwait, Oman, UAE, and Saudi Arabia respectively (Table 1.1). On the other hand, Qatar and Kuwait have the largest market capitalisation relative to their GDP (PWC, 2019). In general, the GCC stock markets have several weaknesses which include a small number of listed firms, low sector of diversification and large institutional holding (Arouri et al., 2011). To increase market transparency, a board for legal, regulatory, and supervisory activities was formed, with the largest Gulf regulator being the Saudi Arabian Monetary Agency (SAMA) (Ramady, 2015). In addition, the markets started to improve their liquidity and opening their market to foreign investors (PWC, 2019).

The GCC countries' stock market presents an opportunity for a comparative case study for

examining sudden changes or any change in market variables (Hammoudeh & Li, 2008). These countries are a major oil supplier hence their markets are susceptible to follow oil price changes. They are identified as largely segmented from international markets and sensitive to political events. In addition, they are a very promising area for international portfolio diversification (Arouri & Rault, 2010) and lastly provide a fascinating area for research.

3. LITERATURE REVIEW

Several studies from different contexts have investigated the relationship between the three types of risks (exchange rate, interest rate and oil price) and stock returns (Bodnar, de Jong, & Macrae, 2003; Dhaoui & Khraief, 2014; El-Masry et al., 2010; Mollick & Sakaki, 2019; Richards et al., 2009; Rostamy et al., 2013; Wong & ElMassah, 2018). Most studies on these risks have either focussed discretely on financial firms (e.g., Bodnar et al., 2003), non-financial firms (Doidge, Griffin, & Williamson, 2006) or oil-producing companies (e.g., Battermann, Broll, & Pong Wong, 2006; Dhaoui & Khraief, 2014). Hence, previous studies have rarely examined a combination of these financial risks (exchange rate, interest rate and oil price risk). Noticeably, previous studies on exchange rate risk have mostly focused on non-financial firms (Bartram, 2005) while those on interest rate risk have been biased to financial firms (e.g., Kilian & Lewis, 2011). Oil price risk, on the other hand, has been studied in several ways, with some studies concentrating on the oil firms (Hammoudeh & Li, 2005) and others on non-oil producing firms (Huang, Masulis, & Stoll, 1996; Jones & Kaul, 1996). Of these studies, some have considered all the risks examined in this study but only focused on one sector of firms (El-Masry et al., 2010). Although some studies have examined the exposure to exchange rate, interest rate, and oil price risks at the same time (e.g., Rostamy et al., 2013; Singhal et al., 2019) these are limited by not representing the market or by concentration on a sector.

With respect to the effect of oil price changes on the stock market, several studies have investigated this relationship (Aloui & Aïssa, 2016; Basher et al., 2018; Dhaoui & Khraief, 2014; Jones & Kaul, 1996; Sadorsky, 2008). For instance, Dhaoui and Khraief (2014) investigated the link between crude oil and stock prices and found that there is a strong negative connection between oil prices and stock market which is consistent with a large body of literature that suggests that oil price variations have strong and negative consequences for oil-importing countries (e.g., Papapetrou, 2001; Sadorsky, 1999). Basher et al.'s (2018) study also showed a statistically significant effect of oil shocks on excess stock returns in oil-exporting countries which included Kuwait and UAE. Thus, the proposition in this study is that there is a significant negative relationship between oil price changes and stock returns.

Similarly, interest rate effects on stock return have been investigated in many studies (Afshar et al., 2008; Chow & Chen, 1998; English et al., 2018; Joseph, 2002). Chow and Chen (1998), for example, found a significant and negative relationship between stock returns and the variability of interest

rates. Joseph (2002) investigated the sensitivity of equity of life insurance companies and found these to be sensitive to long-term interest rates. The companies' equity was found to be sensitive to long-term interest rates and the sensitivity also varied through sub-periods and cross risk and size based risk (Willett, 2003). Therefore, consistent with most studies, the proposition in this study is that there should be a significant negative relationship between interest rate changes and stock returns in the GCC countries.

The relationship between exchange rate changes and stock returns has also attracted investigation. However, the findings of the relationship between exchange rate and stock returns are mixed. Some studies found that there is a positive relationship such that an appreciation of the local currency causes increases in stock values (for instance, Richards et al., 2009), while some found that there is a negative relationship (Joseph, 2002). Other studies, however, did not find any relationships (Bartov & Bodnar, 1994; Chow, Lee, & Solt, 1997; Franck & Young, 1972) while some studies show a mix of relationships (e.g., Joseph & Vezos, 2006). On the other hand, Mollick and Sakaki (2019) investigated the influence of global oil price and equity shocks on commodity currencies. The proposition in this study is that there is a positive relationship between exchange rate changes and stock returns, with the increase in exchange rates reflecting a favourable economic outlook.

With respect to studies that have investigated a combination of these risks (oil, interest and exchange) on stock returns, some approaches vary and so are the findings (for instance, Beirne, Caporale, & Spagnolo, 2009; El-Masry, 2006; Prasad & Rajan, 1995). Some studies have examined two of these three risks at the same time, such as exchange rate and interest rate exposure (Joseph, 2002; Ryan & Worthington, 2004; Wetmore & Brick, 1994), oil price exposure and interest rate exposure (e.g., Wu & Ni, 2011), oil price and exchange rate exposure (Lizardo & Mollick, 2010). On the other hand, El-Masry et al., (2010) examined the three risks, exchange rate exposure, interest rate exposure and oil price exposure, however, this was specific to the shipping firms only.

In comparing the risks impact, Murtagh and Bessler's (2003) study revealed that UK industries were more susceptible to interest rate exposure than exchange rate exposure. In their study, they investigated the exchange rate and interest rate exposure of some UK industries using the Bank of England trade-weighted exchange rate, one to three-year bond for the short-term interest rate and 10-year government bond for the long-term interest rate. The results further revealed more statistically significant exposure coefficients for the long-term interest rate measure (same number of negative and positive coefficients) than for the short-term interest rate. On the other hand, Ryan and Worthington (2004), using a first-order autoregressive (AR(1))-GARCH-M model, found that banks' returns were only affected by the short-term and medium-term interest rate but not influenced by the long-term interest rate and the trade-weighted exchange rate.

Further, Joseph (2002) examined the impact of foreign exchange and interest rate changes on UK firms in the chemical, electrical, engineering and

pharmaceutical industries for the period 1998 to 2000. Joseph used the UK one-month Treasury bill as a proxy for interest rates and the trade-weighted sterling for exchange rates. Joseph investigated initially using the Ordinary Least Square (OLS) model and detected autocorrelation and ARCH effects in the residuals and thus proceeded to use GARCH type models, EGARCH and EGARCH-M models. The results indicated that interest rates had a stronger influence on portfolio returns than exchange rates (only significant for the electrical sector) and there was no indication of asymmetric effects (positive and negative news seemed to have similar effects on the volatility of stock prices). This research agrees with the reasoning by Joseph (2002) in employing both the OLS and EGARCH-M models.

In terms of the relationship that exists between the exchange rates and the interest rates, having examined these two variables separately, it can be argued that they appear to have a relationship since they are two variables that affect the oil prices

(Lardic & Mignon, 2008; Mishra, 2004). The exchange rate of a country is dependent on many factors including the level of debt of the country, its level of trade and the behaviour of investors in the country (Joseph, 2002; Willett, 2003). These two variables are also important in examining the level of domestic inflation, outputs, imports and exports; and therefore, for GCC countries, these are crucial variables that should be examined.

The oil-exporting countries are often faced with a policy dilemma with regard to the effects of the increase in oil prices. When there is anticipation that oil prices will increase, this should benefit the GCC countries. However, such high prices and benefits often bring about the challenge of inflation in the region (Huang et al., 1996). When the prices increase, there is the risk of focusing on public spending to grow the economy, which makes private sector recovery very difficult (Hammoudeh & Li, 2005). This is illustrated in Figure 1 below.

Figure 1. The policy response model to oil price rises

Higher oil prices – the challenge facing monetary policy
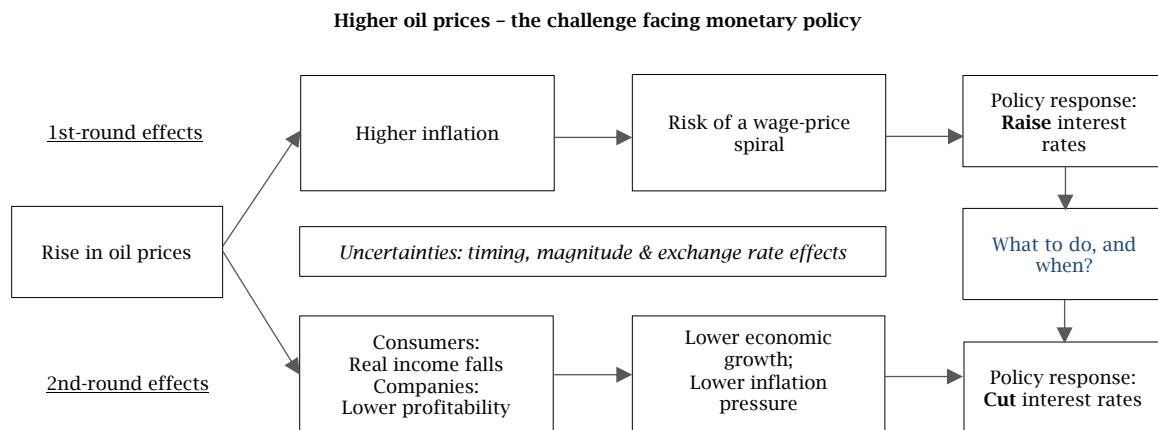
Source: adapted from Mishra (2004) and Lardic and Mignon (2008)

In the model above, it can be seen that there are two kinds of effects on oil price increases, the first round, and second-round effects. The first-round effects are during high inflation when the risk of wage-price spiralling is high. The response to this by policymakers will be to raise the interest rates (Lardic & Mignon, 2008) to counter the increase in inflation. If the interest rates are high, this will also affect the firm. If the interest rates increase, meaning the buyers have to pay more to secure the funding for the oil, the outcome will be that the buyers might resort to agreements with the oil production firms and at the same time, engage the banks to enter into agreements to buy the oil and pay the debts later. Such a scenario might mean that the firms might have to either reduce their purchases, which does not seem to be an option or increase the price which may also not be a good option since the clients will seek other sources of supply, other than the firm (Hammoudeh & Li, 2005). There are, thus, three key entities involved in the process: the oil-producing firms, the buyers, and the financiers.

The second-round effects are when real income falls for the customers and companies' profitability decrease. The economic growth slows and there is less inflationary pressure as a result. In this

instance, the policymakers' response would be to cut interest rates. The proposition is that when there is a decrease in the interest rates in the home country, this will make the demand for money to rise, increasing aggregate demand in the economy. An increase in aggregate demand will cause a corresponding increase in prices (Mishra, 2004). With increased aggregate demand, then there will be an increase in exchange rate causing the currency of the home country to fall (Lardic & Mignon, 2008).

The relationship between the three risks can be conceived, for instance, when oil prices increase, buyers will have to borrow more to secure the same quantity of oil. This will imply pressure on the funding bodies and cause interest rates to rise (Halim, Lean, & Wong, 2006). On the same note, an increase in oil prices means higher payments and this, if done using the US Dollar should cause a change in the exchange rate. As an independent variable, it can show different movements per day, and this volatility may be good or bad for the entire economy.

The assumption is that the buyers will always depend on funding, which might in itself be wrong. But such a possibility cannot be ruled out since this is a very expensive venture and might require huge investments. In terms of the exchange rates, when

the oil producers have to borrow from the international market or when the buyers have to do the same, it means that the local currency will be under no pressure. In other words, the local currency will not be under any pressure to support the needs of the borrowers and this can be beneficial to the local economy since the interest rates might be kept low. It must, however, be noted that there are various forms of borrowings that have interest payments attached to them.

From another perspective, low-interest rates reduce the financing cost and increases demand for the commodity. This should cause the commodity price to rise from the increased demand. In addition, the low-interest rate should cause an increase in economic activity, which in turn causes an increase in commodity prices. Using this argument, Halim et al. (2006) showed how the US Dollar declined as a result of reductions in interest rates. Using the VAR model, Halim et al. (2006) study found that there was a negative relationship between the real interest rate and commodity price. Their study showed that

a 20% fluctuation in oil prices was as a result of real interest rate shocks while exchange rate shocks had a higher effect at 50%. This is similar to Akram (2009) findings that oil price was affected little by interest rate and exchange rate shocks.

4. METHODOLOGY

4.1. OLS and EGARCH models employed

The OLS model is utilised to capture the risk exposure from exchange rate, interest rate and oil price changes. Many studies have used this model and adjusted for autocorrelation and heteroscedasticity using the Newey-West procedure (e.g., Bartram, Brown, & Minton, 2010; Gómez & Zapatero, 2003). This study uses the multi-index OLS regression presented below (Equation 1) following other studies (such as, Choi, Elyasiani, & Kopecky, 1992) which have used a similar model:

$$R_{it} = \alpha_i + \beta_{m,i}RM_t + \beta_{r,i}XR_t + \beta_{s,i}SR_t + \beta_{l,i}LR_t + \beta_{o,i}OR_t + \varepsilon_{it} \qquad t=1, T \qquad (1)$$

Where α_i is the intercept term for firm i; R_{it} is the returns of the firm in period t; RM_t is the market portfolio returns in period t; XR_t presents the percentage changes in exchange rates over time t; SR_t is the changes in short term interest rate over time t; LR_t is the changes in long term interest rate over time t; OR_t is the changes in oil prices over time t; and ε_{it} represents the error term with zero mean, constant variance and assumed normal and independent distribution. Stock returns used in Iqmal and Putra's (2020) study model to conduct the influence of explanatory variables exchange rate, interest rate, and inflation in their study. The frequency of independent variables is on a daily basis. For all the variables used in this study, lags have been used to reduce the residual errors and outlier problems. The *beta* of the equation is represented as follows:

$\beta_{m,i}$ – market portfolio *beta*;

$\beta_{r,i}$ – exchange rate exposure coefficient for firm i;

$\beta_{s,i}$ – short term interest rate exposure coefficient for firm i;

$\beta_{l,i}$ – long term interest rate exposure coefficient for firm i;

$\beta_{o,i}$ – the oil price exposure coefficient for firm i.

Regression residuals will be tested for autocorrelations using Q-statistics. The equation used to determine the lag length is K = ln (T), where T is the number of observations. The application of the method is similar to other studies (e.g., Fang & Thompson, 2004; Fang, Lai, & Thompson, 2007).

However, the OLS does not give any explanation of the heteroscedasticity of residuals in the regression, hence the need to use another model to

further analyse the data. Therefore, the EGARCH model was used to capture most of the asymmetric (Brandt & Jones, 2006; Engle & Ng, 1993). The EGARCH model captures the most important features in stock returns volatility (time series clustering), negative correlation with returns, log-normality and in long memory (Andersen, Bollerslev, Diebold, & Ebens, 2001). Faff, Hillier, and Hillier (2000) argued that the arrival of shocks with a negative impact on assets values leads to redundancy in price and increases the debt to equity level of firms. The EGARCH model adds value to the traditional GARCH model by adding more specification to the volatility equation to differentiate positive shock from the negative shock. Under the EGARCH framework, separated into leverage effects, it indicates that negative news increases the volatility of returns more than positive news. This model was used in other studies (e.g., Brandt & Jones, 2006; Harvey & Sucarrat, 2014; Zhang & Chen, 2011). Zhang and Chen (2011) noted that the EGARCH model supplies the evidence of asymmetry, thus, it discriminates between the influence of positive and negative innovations. Creal, Koopman, and Lucas (2011) defined EGARCH model variance as driven by the equation depending on the conditional score of the last observation. Koutmos and Martin (2007) argued that high frequent time series data which estimated with the normal distribution was incapable of accounting for the leptokurtosis in the residuals.

As such, this study uses the AR(1) EGARCH-M model with t-distribution to all estimations as shown below:

$$R_t = \alpha_i + \beta_{rt}R_{it-1} + \beta_{mt}RM_t + \beta x_t XR_t + \beta_{st}SR_t + \beta_{lt}LR_t + \beta_{ot}OR_t + \lambda log(h^2{}_{it}) + \varepsilon_{it} \qquad (2)$$

$$\varepsilon_{i,t}|I_{t-1} \sim t\,(0, h^2{}_{i,t}, V_{i,t}) \qquad (3)$$

$$log\,h^2{}_{i,t} = \alpha_o + \alpha_1\frac{\varepsilon_{i,t-1}}{h_{i,t-1}} + \alpha_2(|\frac{\varepsilon_{i,t-1}}{h_{i,t-1}}|) + \varphi_1 log\,h^2{}_{i,t-1} \qquad (4)$$

The variables in Equation (2) can be explained as follows: α_i is the intercept for firm i; R_{it} present the returns of the firms at time t; R_{t-1} autoregressive lag parameter for firm i at time $t-1$ accounting for autocorrelation; RM_t the rate of return of market at time t; XR_t is the percentage change in exchange rate index time t; SR_t is the percentage of short term interest rate at time t; LR_t is the change in the long term interest rate at time t; OR_t is the change in oil price at time t; $log(h^2_{it})$ is the log of conditional firm volatility with coefficient λ, thus, expressing the relationship between expected return and the measure of previous conditional volatility.

In order to capture risk pattern over time and the error term ε_{it}, Equation (3) presents $\varepsilon_{i,t}$ error term with zero mean and the variance; h^2_i time is varying, and t-density of distribution $V_{i,t}$, whereas I_{t-1} is the information available at time $t-1$. In Equation (4), $log\ h^2_{i,t}$ is the log of the conditional variance which is a forecast of the current volatility restricted to the conditional variance of previous periods and error. The constant term thus finds the time-independent module of volatility that shows volatility when ARCH and GARCH are statistically insignificant. In addition, past innovation has an asymmetric impact on present volatility measured by α_1. Once $\alpha_1 < 1$, there is a leverage effect, but once $\alpha_1 \neq 0$ there are asymmetric effects. ARCH term (α_2) that links between the conditional variance and asymmetric function of past innovation. Past period variance ($logh^2_{i,t-1}$) and the GARCH (φ_1) term parameters associate current volatility with past volatility.

Equation (2) above is used to estimate the contemporaneous changes in the exchange rate, interest rate, and oil price changes on firms' stock returns using the actual changes for a sample period from 2006 to 2012. Both OLS and EGARCH models are checked by using Q-statistics for the residual autocorrelation. At the same time, Q^2 test and Lagrange multiplier (LM) are used to test the presence of residual ARCH. Furthermore, to test the normality of the residual, Jarque-Bera statistics is used.

4.2. Data and sample

The data for the present study is collected from Bloomberg and Datastream databases. The data collected from Bloomberg is for the exchange rates for the GCC currencies against the respective major trading currencies. The interest rates for the countries is also obtained from Bloomberg database. For the information on the most traded currencies for each GCC country, this was taken from the central bank websites of the countries. Further, the share prices of the listed firms were obtained from Datastream on a daily basis with stock returns being the percentage change of the returns, which includes capital changes and adjustments for dividends. Daily stock returns have been used in several studies as a proxy for the firm's performance (Allayannis & Ofek, 2001; Chamberlain, Howe, & Popper, 1997; Nydahl, 1999). Also, the market index and the oil prices used in this study were taken from Datastream. The data collected span for the period of January 2007 to June 2012, a five and a half years. The data span a long period in order to effectively capture the risk exposure as argued by Bodnar and Wong (2003) that short term horizon leads to a weak result in stock return regression. Since the study conducted data from the financial crisis of 2007, the exchange rate, interest rate and oil prices should be more volatile and the risk exposure greater.

Table 1 below gives a summary of the population and sample that was selected for the study. The sample selected has been segregated between the financial and non-financial firms. In total, this study analysed 77% of the population of listed firms in the GCC countries. The explanation of how this was derived is given below.

Table 1. Sample selection and analysis

Category	United Arab Emirates	Oman	Kuwait	Saudi Arabia	Qatar	Bahrain	Total	Percent
Financial	32	25	50	13	14	30	164	34%
Non-financial	33	75	100	74	21	18	321	66%
Total	65	100	150	87	35	48	485	
Population	119	118	205	92	48	48	630	
Sample percentage	55%	85%	73%	95%	73%	100%	77%	

The selection of the study sample started with the identification of all the listed firms in the GCC countries (population). The population was then filtered to remove firms that had been listed for only part of the study period. These were firms that had subsequently been de-listed or new listings during the period. The filtered population is what makes the selected sample. This sample has been further divided into financial and non-financial firms. For instance, out of a total population of 118 listed firms in Oman, 100 firms qualified the criteria and were included in the analysis, representing 85% of the population. Of the 100 firms selected, 75% were non-financial and 25% financial firms. Out of the total of 485 firms selected (representing 77% of the population), 164 firms (34%) were financial firms, and 321 (66%) non-financial firms.

After collecting the data, Microsoft Excel was used to set it up and then Statistical Package for the Social Sciences (SPSS) was used to measure the correlation and run the diagnostic test while Econometric Views (EViews) was used to run the Ordinary Least Square (OLS) regression and EGARCH-M models. Further, the analysis was done on the segregated data so that results for the financial and non-financial firms could be examined separately. The results are discussed next.

5. RESULTS AND DISCUSSION

5.1. Descriptive statistics

The descriptive statistics for the listed firms' returns is presented in Table A.1 and that of changes in the independent variables of the firms presented in Table A.2. These descriptive statistics show the mean, maximum and minimum values, the standard deviation, skewness and kurtosis. The average stock returns for the study period was highest in Qatar at 0.0273% and lowest in Bahrain at -0.0315% which

also had the lowest and highest absolute returns. The stock returns in Qatar and Saudi Arabia had the highest volatility of 2.8392% and 2.5851% respectively while the lowest stock fluctuations were observed in Kuwait at 0.0259%. In other words, stock returns in Qatar, Saudi Arabia and Bahrain fluctuated the most.

With respect to independent variables statistics (Table A.2) for Bahrain (*Panel A*), for instance, positive average returns are observed for oil price returns and the currency variations of the Euro and British Pound against the Bahraini Dinar. On the other hand, negative average returns are observed for the other variables with the highest being interest rate at 0.16%. The highest volatility occurred in the oil returns (2.24%) and interest rate changes (2.15%). The currency fluctuations to the Bahraini Dinar are highest in the British Pounds (0.87%) and lowest for the United Arab Emirates Dirham (0.04%). For Bahrain, it can be observed that both the United Arab Emirates Dirham and US Dollar currencies had the lowest average variations and were the least volatile. This is largely explained by the pegging of the Bahraini Dinar (and the United Arab Emirates Dirham) to the US Dollar. Interpretations for the other countries can be made following this format.

5.2. Correlation coefficients of explanatory variables

This test is aimed at examining whether there is any pair-wise correlation between the independent variables and that any correlation is less than 80% (Abd. Kadir, Selamat, Masuga, & Taudi, 2011). The multicollinearity would be considered if the correlation is over 80% (Léon, 2008). With reference to Bahrain (Table B.1), there are no high correlations between the explanatory variables in the Bahrain equations. The highest correlations can be found between the market and the oil price changes (12.8%), which understandably refer to their dependence on the market for oil revenue. Since there is no high level of correlations, this justifies the reason for putting all the explanatory variables into the same equation. Table B.2 presents the correlations of the explanatory variables in Kuwait that show that there is an acceptable level of correlation sufficient to put the entire variables in one equation. There is, however, some relatively high correlations for the Chinese Yuan (CNY) to the UAE and US currencies (30.07% and -38.68% respectively). At the same time, the UAE currency with the Euro (-29.86%), US currency with AED (-31.19%). The high levels of correlation though, are still sufficiently acceptable to be in the same model. Table B.3, which summarises the correlation for Qatar, shows there are high correlations between the Euro and the Singaporean Dollar (61.33%). Table B.4 shows the Oman explanatory variables correlations. The correlation was not too high except in Euro and the British Pound (66.82%). Table B.5 summarises results for Saudi Arabia where there is no high correlation between the independent variables. Also, Table B.6 shows there is no high correlation for the United Arab Emirates. Thus, all the independent variables for each country can be in one equation as no correlation was observed to be higher than 80%.

5.3. The effect of exchange rate, interest rate and oil price risk on stock returns

The study examined the effect of changes in the exchange rate, interest rate and oil prices on firm value using both the OLS regression model and the EGARCH-M model. The EGARCH-M model was used so that the deficiencies of the OLS regression model, with regard to volatility clustering and time series heteroscedasticity, could be addressed. Comparing the results from the two model, it was found that using the EGARCH-M model increased the number of significant coefficients for exchange rate exposure (Joseph & Vezos, 2006) but reduced the number of significant observations for interest rate risk and oil price risk in general.

The examination of the effect of the risk exposure on firm value was done, firstly, on all listed firms in each country, and then secondly, the firms segregated between financial and non-financial firms. This was necessary to give a better understanding of the effect of the risk exposure on firm values as the risk characteristics and management of financial firms is generally different to non-financial firms (Kilian & Lewis, 2011; Ryan & Worthington, 2004). In this respect, because the risks being considered are financial risks, there is an inherent limitation that the financial firms already manage these risks. The results obtained from using the EGARCH-M model are shown in Appendix C for each risk. A summary of these results is discussed next.

In summary, the exposure to exchange rates risk was higher than that of interest rate risk and oil price risk. The GCC firms revealed high exposure to exchange rate risk with the highest exposure observed in Oman, Qatar, and the United Arab Emirates and the lowest in Saudi Arabia. When segregated between the financial and non-financial firms, the financial firms showed lower exposure to exchange rate risk than non-financial firms. The non-financial firms in the United Arab Emirates were of the highest exposure and the lowest exposure was in Bahrain. The highest exposed financial firms were those in Oman and lowest in Saudi Arabia.

Of the three risks, the interest rate risk had the least effect on the firm values. The highest effect was observed on firms in Oman, Bahrain, and the United Arab Emirates. The effect was negatively significant for firms in Bahrain and Saudi Arabia but positive for firms in Qatar. Firms in Kuwait, Oman, and the United Arab Emirates were both negatively and positively affected by changes in interest rates. Similar to exchange rate risk exposure, the financial firms overall showed lower interest rate risk exposure than non-financial firms. Interestingly, however, financial firms in Oman and Saudi Arabia (for long term interest only) were affected more than non-financial firms.

The oil price exposure showed mixed results with the exception of firms in Qatar that were positive and significantly influenced. These results are largely inconsistent with the proposition expected of a negative significant relationship. The firms in the United Arab Emirates and Qatar were the most exposed to oil price changes while those in Saudi Arabia were the least affected. Overall, the

financial firms' market values were less affected than non-financial firms. However, in Qatar, the financial firms were most affected than the non-financial firms while in Saudi Arabia, the financial firms were not significantly affected by oil price changes. The listed firms in the GCC countries are positively affected by market risk with the highest effect observed in the Saudi Arabian firms.

These results are largely consistent with Choi and Elyasiani (1997) and Joseph and Vezos (2006) studies that both found exposure to the exchange rate to be stronger than that of the exposure to interest rate changes for US banks. However, this is contrary to Joseph (2002) findings that exposure to changes in the short term interest rates was stronger than that for fluctuations in the exchanges for a selected sample of UK non-financial firms. Further, the results for interest rate and oil price exposure agree with Hammoudeh and Aleisa (2004) and Sadorsky (2001) studies that found significant effects of both the interest rate and oil price changes on stock market returns. The high oil price risk exposure in the United Arab Emirates and Qatar is consistent with Fayyad and Daly's (2011) study that showed the responsiveness to oil shocks as highest in the two countries when compared to the other GCC countries. The positive significant exposure to oil price changes however contradicts Dhaoui and Khraief (2014) findings of a strong negative effect of oil price changes on stock market returns in seven out of the eight countries studied. The results of the segregated analysis between financial and non-financial firms' exposure to the risks are consistent with Bodnar, Hayt, and Marston (1998) survey that revealed lower risk exposure of financial firms as compared to non-financial firms owing to the limited risk management practices in the non-financial firms. However, in Bahrain, the non-financial firms were less exposed as compared to the financial firms disagreeing with Bodnar et al. (1998) survey.

5.4. AR(1) EGARCH-M variance equation parameters

The results from the variance equation of the EGARCH-M framework showed that the asymmetric coefficient was mostly positively significant for over half of the firms suggesting that positive news (surprises) increase return volatility more than negative news (Appendix D). In addition, the ARCH parameter coefficient was mostly positively significant indicating the presence of volatility clustering. Similarly, the GARCH coefficients were mostly positive and higher than the ARCH coefficients, showing significant persistence of volatility in returns. Further, the number of firms with significant ARCH and GARCH coefficients supports the postulation that the current volatility of most GCC firms' returns is time-varying, which is a function of past innovations and past volatility.

With respect to the risk-return parameters, the number of firms with significant risk-return coefficients were few. Compared to the other GCC countries, the significant parameter coefficients in Saudi Arabia suggests that investors might be adversely affected by taking additional risks. These results are similar to Elyasiani and Mansur (1998)

and Ryan and Worthington (2004) findings of negative risk parameters for banks in their studies. This is also consistent with Glosten, Jagannathan, & Runkle's (1993) study which showed a negative relationship between the trade-off risk parameter and returns.

6. SUMMARY AND IMPLICATIONS

This study has examined the effect of the three financial risks (exchange rate, interest rate and oil prices) on firm values of GCC countries. The study has revealed that the exchange rate exposure has the highest effect on the stock returns. This has implications in terms of the planned GCC currency union (Reuters, 2016) and the need for exchange rate risk management as firms' size of foreign operations increase. With regard to a regional currency, this could have an effect of reducing the exchange rate exposure. On the part of governments, there is a need for governments to maintain a stable currency that does not fluctuate greatly exposing the firms to more exchange rate risk. The pegging to the US Dollar of the local currencies does not eliminate the exchange rate exposure of the GCC firms. Further, as these countries open their economies to more trade, there is a need for deliberate government action to monitor and maintain a stable currency in order to promote investor confidence. This is particularly important since this risk has a significant influence on firm values in GCC countries.

Additionally, GCC countries need to open their economies to more investment as this could have an effect of reducing market interest rates which have an effect on firm values. The relationship between the exchange rate, interest rate, and oil price effect on firm values have important policy implications. As argued by El-Masry (2006) there is a need for policymakers to understand the link between the policies that affect the exchange rate, for example, and relative wealth effects. Similarly, as oil prices have an effect on firm values, there is need for policymakers to be aware of changes in oil price levels and policies that could influence the oil prices (Maghyereh & Al-Kandari, 2007). This could include policy decisions regarding oil production increases or decreases.

For international investors, Papaioannou (2006) argues that international investors usually manage their exchange rate risk for fundamental assets and liabilities, since exchange exposure is linked to translation risks of assets and liabilities in foreign currencies. This implies that an increased level of international investors may result in a reduction of exchange rate exposure. Masih, Peters, and De Mello (2011) argue that oil-importing countries should carefully measure policies to improve energy efficiency, conservation of oil, and use alternative fuels. At the same time, they need to enhance their dialogue with oil-exporting countries to increase multilateral cooperation and minimise shocks which adversely affect their economies. Thus, oil-exporting countries, such as the GCC countries, need to be aware of the reactions of oil-importing countries despite them benefiting from oil price increases. The oil-producing countries should collaborate with oil-

importing countries economically to minimise the effects of oil price shocks.

For investors, knowing the risk and returns relationship of firms is most important. This study can help investors in GCC countries to understand share movements and enhance performance forecasts. Maghyereh and Al-Kandari (2007), for instance, showed that there is a nonlinear relationship between oil prices and stock market returns which could be estimated using a predictive model. This study, arguably, could increase the investors' understanding of share price behaviour. Knowing the volatility of asset returns is important in its pricing. Thus, from the results of this study, prospective investors could be hinted on which markets in the region could give higher returns relative to risk. The highest volatility of returns, for example, is observed in Qatar and lowest in Kuwait. Investors could be attracted to invest in Qatar as the average returns are also highly positive. Saudi Arabia, on the other hand, showed the highest risk premiums which could make it most attractive to investors.

The findings of the study are also important to investors and fund managers as they highlight to what extent stock returns react to the financial risks considered. This should enhance their financial decision making (El-Masry, 2006). Similar to Masih et al.'s (2011) study that showed that oil price volatility

affects investment, this study has revealed that exchange rates, interest rates and oil price fluctuations have an effect on stock returns. In terms of prioritisation of risk management, firms should hedge or manage exchange rate fluctuations first, then oil price movements and lastly interest rate changes. Firms in the GCC countries should adjust their risk management strategies accordingly. Further, interest rates are an analytic implication for the state of the economy (Espinoza, Fornari, & Lombardi, 2012). In the GCC countries, the interest rates have been relatively constant which could also be implicated in the growth of Islamic finance (which prohibits interest) in the region (IFSB, 2019).

Another implication relates to how the exchange rates fluctuate in the GCC countries. As Verdelhan (2010) argued, an exchange rate tied to domestic consumption growth could be more volatile as compared to one pegged to a basket of currencies. Firms need stability in their trading hence the need to manage risk, whether operational or financial risks. Further, firms should be aware of market returns and factors that could influence these returns so as to remain competitive and attractive to investors.

One of the limitations of this study relates to the time series of the data set that ends in 2012. As such, future research will focus on extending the time period beyond 2012.

REFERENCES

1. Abd. Kadir, H. B., Selamat, Z., Masuga, T., & Taudi, R. (2011). Predictability power of interest rate and exchange rate volatility on stock market return and volatility: Evidence from Bursa Malaysia. Paper presented at the *International Conference on Economics and Finance Research IPEDR (Vol. 4)*. Retrieved from http://www.ipedr.com/vol4/38-F00079.pdf
2. Afshar, T. A., Arabian, G., & Zomorrodian, R. (2008, April, 24-26). Oil price shocks and the US stock market. *Proceedings of the IABR & TLC Conference.*
3. Akram, Q. F. (2009). Commodity prices, interest rates and the dollar. *Energy Economics, 31*(6), 838-851. https://doi.org/10.1016/j.eneco.2009.05.016
4. Allayannis, G., & Ofek, E. (2001). Exchange rate exposure, hedging, and the use of foreign currency derivatives. *Journal of International Money and Finance, 20*(2), 273-296. https://doi.org/10.1016/S0261-5606(00)00050-4
5. Aloui, R., & Aïssa, M. S. B. (2016). Relationship between oil, stock prices and exchange rates: A vine copula based GARCH method. *The North American Journal of Economics and Finance, 37,* 458-471. https://doi.org/10.1016/j.najef.2016.05.002
6. Andersen, T. G., Bollerslev, T., Diebold, F. X., & Ebens, H. (2001). The distribution of realized stock returns volatility. *Journal of Financial Economics, 61*(1), 43-76. https://doi.org/10.1016/S0304-405X(01)00055-1
7. Arouri, M. E. H., & Rault, C. (2010, January). *Oil prices and stock markets: What drives what in the Gulf Corporation Council countries?* (CESifo Working Paper Series No. 2934). Retrieved from https://ssrn.com/abstract=1549536
8. Arouri, M. E. H., Lahiani, A., & Nguyen, D. K. (2011). Return and volatility transmission between world oil prices and stock markets of the GCC countries. *Economic Modelling, 28*(4), 1815-1825. https://doi.org/10.1016/j.econmod.2011.03.012
9. Bartov, E., & Bodnar, G. M. (1994). Firm valuation, earnings expectations, and the exchange-rate exposure effect. *The Journal of Finance, 49*(5), 1755-1785. https://doi.org/10.1111/j.1540-6261.1994.tb04780.x
10. Bartram, S. M. (2005). The impact of commodity price risk on firm value – An empirical analysis of corporate commodity price exposures. *Multinational Finance Journal, 9*(3/4), 161-187. https://doi.org/10.17578/9-3/4-2
11. Bartram, S. M., & Bodnar, G. M. (2012). Crossing the lines: The conditional relation between exchange rate exposure and stock returns in emerging and developed markets. *Journal of International Money and Finance, 31*(4), 766-792. https://doi.org/10.1016/j.jimonfin.2012.01.011
12. Bartram, S. M., Brown, G. W., & Minton, B. A. (2010). Resolving the exposure puzzle: The many facets of exchange rate exposure. *Journal of Financial Economics, 95*(2), 148-173. https://doi.org/10.1016/j.jfineco.2009.09.002
13. Basher, S. A., & Sadorsky, P. (2006). Oil price risk and emerging stock markets. *Global Finance Journal, 17*(2), 224-251. https://doi.org/10.1016/j.gfj.2006.04.001
14. Basher, S. A., Haug, A. A., & Sadorsky, P. (2018). The impact of oil-market shocks on stock returns in major oil-exporting countries. *Journal of International Money and Finance, 86,* 264-280. https://doi.org/10.1016/j.jimonfin.2018.05.003
15. Battermann, H. L., Broll, U., & Pong Wong, K. (2006). Cross-hedging of exchange rate risks: A note. *Japanese Economic Review, 57*(3), 449-453. https://doi.org/10.1111/j.1468-5876.2006.00318.x

16. Beirne, J., Caporale, G. M., & Spagnolo, N. (2009). Market, interest rate and exchange rate risk effects on financial stock returns: A GARCH-M Approach. *Quantitative and Qualitative Analysis in Social Sciences, 3*(2), 44-68.

17. 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. https://doi.org/10.1111/j.1467-9485.2009.00482.x

18. Bodnar, G. M., & Wong, M. F. (2003). Estimating exchange rate exposure: Issues in model structure. *Financial Management, 32*(1), 35-67. https://doi.org/10.2307/3666203

19. Bodnar, G. M., de Jong, A., & Macrae, V. (2003). The impact of institutional differences on derivatives usage: A comparative study of US and Dutch firms. *European Financial Management, 9*(3), 271-297. https://doi.org/10.1111/1468-036X.00221

20. Bodnar, G. M., Hayt, G. S., & Marston, R. C. (1998). 1998 Wharton survey of financial risk management by US non-financial firms. *Financial Management,* 70-91. https://doi.org/10.2307/3666414

21. Brandt, M. W., & Jones, C. S. (2006). Volatility forecasting with range-based EGARCH models. *Journal of Business and Economic Statistics, 24*(4), 470-486. https://doi.org/10.1198/073500106000000206

22. Chamberlain, S., Howe, J. S., & Popper, H. (1997). The exchange rate exposure of U.S. and Japanese banking institutions. *Journal of Banking & Finance, 21*(6), 871-892. https://doi.org/10.1016/S0378-4266(97)00002-2

23. Choi, J. J., & Elyasiani, E. (1997). Derivative exposure and the interest rate and exchange rate risks of U.S. banks. *Journal of Financial Services Research, 12*(2-3), 267-286. https://doi.org/10.1023/A:1007982921374

24. Choi, J. J., & Prasad, A. M. (1995). Exchange risk sensitivity and its determinants: A firm and industry analysis of U.S. multinationals. *Financial Management, 24*(3), 77-88. https://doi.org/10.2307/3665559

25. Choi, J. J., Elyasiani, E., & Kopecky, K. J. (1992). The sensitivity of bank stock returns to market, interest and exchange rate risks. *Journal of Banking and Finance, 16*(5), 983-1004. https://doi.org/10.1016/0378-4266(92)90036-Y

26. Chow, E. H., & Chen, H.-L. (1998). The determinants of foreign exchange rate exposure: Evidence on Japanese firms. *Pacific-Basin Finance Journal, 6*(1-2), 153-174. https://doi.org/10.1016/S0927-538X(97)00020-6

27. Chow, E. H., Lee, W. Y., & Solt, M. E. (1997). The exchange-rate risk exposure of asset returns. *Journal of Business, 70*(1), 105-123. https://doi.org/10.1086/209710

28. Creal, D., Koopman, S. J., & Lucas, A. (2011). A dynamic multivariate heavy-tailed model for time-varying volatilities and correlations. *Journal of Business and Economic Statistics, 29*(4), 552-563. https://doi.org/10.1198/jbes.2011.10070

29. Dash, M., & Sahu, A. K. (2018). A study of the interaction between exchange rates and stock market prices. *International Journal of Economics and Business Research, 15*(4), 541-549. https://doi.org/10.1504/IJEBR.2018.092142

30. Dhaoui, A., & Khraief, N. (2014). *Empirical linkage between oil price and stock market returns and volatility: Evidence from international developed markets* (Economics Discussion Paper No. 2014-12).

31. Doidge, C., Griffin, J., & Williamson, R. (2006). Measuring the economic importance of exchange rate exposure. *Journal of Empirical Finance, 13*(4-5), 550-576. https://doi.org/10.1016/j.jempfin.2005.12.003

32. El-Masry, A. A. (2006). The exchange rate exposure of UK nonfinancial companies: Industry level analysis. *Managerial Finance, 32*(2), 115-136. https://doi.org/10.1108/03074350610641190

33. El-Masry, A. A., Olugbode, M., & Pointon, J. (2010). The exposure of shipping firms' stock returns to financial risks and oil prices: A global perspective. *Maritime Policy and Management, 37*(5), 453-473. https://doi.org/10.1080/03088839.2010.503713

34. Elyasiani, E., & Mansur, I. (1998). Sensitivity of the bank stock returns distribution to changes in the level and volatility of interest rate: A GARCH-M model. *Journal of Banking and Finance, 22*(5), 535-563. https://doi.org/10.1016/S0378-4266(98)00003-X

35. Engle, R. F., & Ng, V. K. (1993). Measuring and testing the impact of news on volatility. *The Journal of Finance, 48*(5), 1749-1778. https://doi.org/10.1111/j.1540-6261.1993.tb05127.x

36. English, W. B., Van den Heuvel, S. J., & Zakrajšek, E. (2018). Interest rate risk and bank equity valuations. *Journal of Monetary Economics, 98,* 80-97. https://doi.org/10.1016/j.jmoneco.2018.04.010

37. Espinoza, R., Fornari, F., & Lombardi, M. J. (2012). The role of financial variables in predicting economic activity. *Journal of Forecasting, 31*(1), 15-46. https://doi.org/10.1002/for.1212

38. Faff, R. W., Hillier, D., & Hillier, J. (2000). Time varying beta risk: An analysis of alternative modelling techniques. *Journal of Business Finance and Accounting, 27*(5-6), 523-554. https://doi.org/10.1111/1468-5957.00324

39. Fang, W. S., & Thompson, H. (2004). Exchange rate risk and export revenue in Taiwan. *Pacific Economic Review, 9*(2), 117-129. https://doi.org/10.1111/j.1468-0106.2004.00216.x

40. Fang, W. S., Lai, Y. H., & Thompson, H. (2007). Exchange rates, exchange risk, and Asian export revenue. *International Review of Economics and Finance, 16*(2), 237-254. https://doi.org/10.1016/j.iref.2004.12.011

41. Fayyad, A., & Daly, K. (2011). The impact of oil price shocks on stock market returns: Comparing GCC countries with the UK and USA. *Emerging Markets Review, 12*(1), 61-78. https://doi.org/10.1016/j.ememar.2010.12.001

42. Franck, P., & Young, A. (1972). Stock price reaction of multinational firms to exchange realignments. *Journal of Financial Management, 1*(3), 66-73. https://doi.org/10.2307/3665374

43. Glosten, L., Jagannathan, R., & Runkle, D. E. (1993). On the relationship between the expected value and the volatility on the nominal excess returns on stocks. *Journal of Finance, 48*(5), 1779-1801. https://doi.org/10.1111/j.1540-6261.1993.tb05128.x

44. Gómez, J. P., & Zapatero, F. (2003). Asset pricing implications of benchmarking: A two-factor CAPM. *The European Journal of Finance, 9*(4), 343-357. https://doi.org/10.1080/1351847021000025768

45. Halim, M., Lean, H., & Wong, W. (2006). Impacts of crises on dynamic linkages between Financial and capital markets. *Labuan Bulletin of International Business and Finance, 4,* 45-62. Retrieved from https://www.researchgate.net/publication/236031864_Impacts_of_Crises_on_Dynamic_Linkages_between_Financial_and_Capital_Markets

46. Hammoudeh, S., & Aleisa, E. (2004). Dynamic relationships among GCC stock markets and Nynex Oil Futures. *Contemporary Economic Policy, 22*(2), 250-269. https://doi.org/10.1093/cep/byh018
47. Hammoudeh, S., & Choi, K. (2006). Behaviour of GCC stock markets and impacts of US oil and financial markets. *Research in International Business and Finance, 20*(1), 22-44. https://doi.org/10.1016/j.ribaf.2005.05.008
48. Hammoudeh, S., & Li, H. (2005). Oil sensitivity and systematic risk in oil-sensitive stock indices. *Journal of Economics and Business, 57*(1), 1-21. https://doi.org/10.1016/j.jeconbus.2004.08.002
49. Hammoudeh, S., & Li, H. (2008). Sudden changes in volatility in emerging markets: The case of Gulf Arab stock markets. *International Review of Financial Analysis, 17*(1), 47-63. https://doi.org/10.1016/j.irfa.2005.01.002
50. Harvey, A., & Sucarrat, G. (2014). EGARCH models with fat tails, skewness and leverage. *Computational Statistics and Data Analysis, 76*, 320-338. https://doi.org/10.1016/j.csda.2013.09.022
51. Huang, R. D., Masulis, R. W., & Stoll, H. R. (1996). Energy shocks and financial markets. *Journal of Futures Markets, 16*(1), 1-27. https://doi.org/10.1002/(SICI)1096-9934(199602)16:1<1::AID-FUT1>3.0.CO;2-Q
52. Iqmal, F. M., & Putra, I. G. S. (2020). Macroeconomic factors and influence on stock return that impact the corporate values. *International Journal of Finance and Banking Studies, 9*(1), 2147-4486. https://doi.org/10.20525/ijfbs.v9i1.667
53. Islamic Financial Services Board. (IFSB). (2019). *Islamic financial services industry stability report.* Retrieved March, 1, 2019, from: https://www.ifsb.org/sec03.php
54. Jones, C. M., & Kaul, G. (1996). Oil and the stock markets. *The Journal of Finance, 51*(2), 463-491. https://doi.org/10.1111/j.1540-6261.1996.tb02691.x
55. Joseph, N. L. (2002). Modelling the impacts of interest rate and exchange rate changes on UK stock returns. *Derivatives Use, Trading and Regulation, 7*(4), 306-323.
56. Joseph, N. L., & Vezos, P. (2006). The sensitivity of US banks' stock returns to interest rate and exchange rate changes. *Managerial Finance, 32*(2), 182-199. https://doi.org/10.1108/0307435061064193
57. Kilian, L., & Lewis, L. T. (2011). Does the Fed respond to oil price shocks? *The Economic Journal, 121*(555), 1047-1072. https://doi.org/10.1111/j.1468-0297.2011.02437.x
58. Kim, J.-M., & Jung, H. (2018). Dependence structure between oil prices, exchange rates, and interest rates. *The Energy Journal, 39*(2). https://doi.org/10.5547/01956574.39.2.jkim
59. Koutmos, G., & Martin, A. D. (2007). Modelling time variation and asymmetry in foreign exchange exposure. *Journal of Multinational Financial Management, 17*(1), 61-74. https://doi.org/10.1016/j.mulfin.2006.03.004
60. Lardic, S., & Mignon, V. (2008). Oil prices and economic activity: An asymmetric cointegration approach. *Energy Economics, 30*(3), 847-855. https://doi.org/10.1016/j.eneco.2006.10.010
61. Lee, J., Milesi-Ferretti, G. M., Ostry, J., Prati, A., & Ricci, L. A. (2008). *Exchange rate methodologies: CGER assessments* (IMF Occasional Paper No. 261). Washington, D.C.: International Monetary Fund. https://doi.org/10.5089/9781589066380.084
62. Léon, N. K. (2008). The effects of interest rates volatility on stock returns and volatility: Evidence from Korea. *International Research Journal of Finance and Economics, 14*(14), 285-290.
63. Lizardo, R. A., & Mollick, A. V. (2010). Oil price fluctuations and U.S. dollar exchange rates. *Energy Economics, 32*(2), 399-408. https://doi.org/10.1016/j.eneco.2009.10.005
64. Maghyereh, A., & Al-Kandari, A. (2007). Oil prices and stock markets in GCC countries: New evidence from nonlinear cointegration analysis. *Managerial Finance, 33*(7), 449-460. https://doi.org/10.1108/03074350710753735
65. Maheshwari, Y. (2020). The long run relationship between stock indices and macroeconomic variables. *International Journal of Banking and Finance, 11*, 81-96. http://e-journal.uum.edu.my/index.php/ijbf/article/view/8484
66. Marcel, V., & Mitchell, J. (2006). *Oil titans: National oil companies in the Middle East.* Washington, D.C.: Brookings Institution Press.
67. Masih, R., Peters, S., & De Mello, L. (2011). Oil price volatility and stock price fluctuations in an emerging market: Evidence from South Korea. *Energy Economics, 33*(5), 975-986. https://doi.org/10.1016/j.eneco.2011.03.015
68. Mishra, A. K. (2004). Stock market and foreign exchange market in India: Are they related? *South Asia Economic Journal, 5*(2), 209-232. https://doi.org/10.1177/139156140400500202
69. Mollick, A. V., & Sakaki, H. (2019). Exchange rates, oil prices and world stock returns. *Resources Policy, 61*, 585-602. https://doi.org/10.1016/j.resourpol.2018.07.007
70. Murtagh, J., & Bessler, W. (2003). *Interest rate and exchange rate risk in financial and non-financial industries: An international study* (Working Paper). New York: Rensselaer Polytechnic Institute.
71. Nordin, N., Nordin, S., & Ismail, R. (2020). The impact of commodity prices, interest rate and exchange rate on stock market performance: An empirical analysis from Malaysia. *Malaysian Management Journal, 18*, 39-52.
72. Nydahl, S. (1999). Exchange rate exposure, foreign involvement and currency hedging of firms: Some Swedish evidence. *European Financial Management, 5*(2), 241-257. https://doi.org/10.1111/1468-036X.00091
73. Papaioannou, M. G. (2006). *Exchange rate risk measurement and management: Issues and approaches for firms* (IMF Working Paper, WP/06/255). International monetary fund. https://doi.org/10.5089/9781451865158.001
74. Papapetrou, E. (2001). Oil price shocks, stock market, economic activity and employment in Greece. *Energy Economics, 23*(5), 511-532. https://doi.org/10.1016/S0140-9883(01)00078-0
75. Parab, N., & Reddy, Y. V. (2020). The dynamics of macroeconomic variables in Indian stock market: A Bai-Perron approach. *Macroeconomics and Finance in Emerging Market Economies, 13*(1), 89-113. https://doi.org/10.1080/17520843.2019.1641533
76. Prasad, A. M., & Rajan, M. (1995). The role of exchange and interest risk in equity valuation: A comparative study of international stock markets. *Journal of Economics and Business, 47*(5), 457-472. https://doi.org/10.1016/0148-6195(95)00038-0
77. PWC. (2019). *GCC capital markets watch 2018.* Retrieved March 2, 2019, from: https://www.pwc.com/m1/en/publications/documents/ipo-market/q4-2018-ipo-watch-en.pdf
78. PWC. (2020). *Foreign investment: GCC raises ownership limits to catalyse diversification.* Retrieved April 20, 2020, from: https://www.pwc.com/m1/en/publications/middle-east-economy-watch/foreign-investment-june-2018.html

79. Ramady, M. A. (2015). Effective regulatory regimes: A comparative analysis of GCC financial regulators. *Journal of Financial Regulation and Compliance, 23*(1), 2-17. https://doi.org/10.1108/JFRC-09-2013-0032
80. Reuters. (2016, October 31). *Gulf single currency inevitable – Oman Central Bank Chief quoted*. Retrieved March 1, 2019 from: https://www.reuters.com/article/oman-gulf-currency/gulf-single-currency-inevitable-oman-c-bank-chief-quoted-idUSL8N1D11O1
81. Richards, N. D., Simpson, J., & Evans, J. (2009). The interaction between exchange rate and stock prices: An Australian Context. *International Journal of Economics and Finance, 1*(1), 3-23. https://doi.org/10.5539/ijef.v1n1p3
82. Rostamy, A. A. A., Hosseini, G., & Bakhshitakanlou, F. (2013). Oil price, exchange rate, interest rate, and market return relationships with industries stock returns: Evidence from Iranian Stock Exchange. *Research and Applications in Economics, 1*(1), 6-12.
83. Ryan, S. K., & Worthington, A. C. (2004). Market, interest rate and foreign exchange rate risk in Australian banking: A GARCH-M approach. *International Journal of Applied Business and Economic Research, 2*(2), 81-103. Retrieved from http://eprints.qut.edu.au/2327/1/2327.pdf?ref=Guzels.TV
84. Sadorsky, P. (1999). Oil price shocks and stock market activity. *Energy Economics, 21*(5), 449-469. https://doi.org/10.1016/S0140-9883(99)00020-1
85. Sadorsky, P. (2001). Risk factors in stock returns of Canadian oil and gas companies. *Energy Economics, 23*(1), 17-28. https://doi.org/10.1016/S0140-9883(00)00072-4
86. Sadorsky, P. (2008). Assessing the impact of oil prices on firms of different sizes: It's tough being in the middle. *Energy Policy, 36*(10), 3854-3861. https://doi.org/10.1016/j.enpol.2008.07.019
87. Singhal, S., Choudhary, S., & Biswal, P. C. (2019). Return and volatility linkages among International crude oil price, gold price, exchange rate and stock markets: Evidence from Mexico. *Resources Policy, 60,* 255-261. https://doi.org/10.1016/j.resourpol.2019.01.004
88. Statista. (2019a, March 2). *GCC crude oil industry – Statistics & facts*. Retrieved from: https://www.statista.com/topics/4546/gcc-crude-oil-industry/
89. Statista. (2019b, June 2). *Global oil reserves – Share of leading countries 2018*. Retrieved from: https://www.statista.com/statistics/237065/share-of-oil-reserves-of-the-leading-ten-countries/
90. Verdelhan, A. (2010). A habit-based explanation of the exchange rate risk premium. *The Journal of Finance, 65*(1), 123-146. https://doi.org/10.1111/j.1540-6261.2009.01525.x
91. Wetmore, J. L., & Brick, J. R. (1994). Commercial bank risk: Market, interest rate, and foreign exchange. *Journal of Financial Research, 17*(4), 585-596. https://doi.org/10.1111/j.1475-6803.1994.tb00167.x
92. Willett, T. D. (2003). Fear of floating needn't imply fixed rates: An OCA approach to the operation of stable intermediate currency regimes. *Open Economies Review, 14*(1), 71-91. https://doi.org/10.1023/A:1021251303089
93. Wong, V. S., & ElMassah, S. (2018). Recent evidence on the oil price shocks on Gulf Cooperation Council stock markets. *International Journal of the Economics of Business, 25*(2), 297-312. https://doi.org/10.1080/13571516.2017.1379216
94. Wu, M.-H., & Ni, Y.-S. (2011). The effects of oil prices on inflation, interest rates and money. *Energy, 36*(7), 4158-4164. https://doi.org/10.1016/j.energy.2011.04.028
95. Zhang, C., & Chen, X. (2011). The impact of global oil price shocks on China's stock returns: Evidence from the ARJI(-h_t)-EGARCH model. *Energy, 36*(11), 6627-6633. https://doi.org/10.1016/j.energy.2011.08.052

APPENDIX A. DESCRIPTIVE STATISTICS

Table A.1. Descriptive statistics of listed firms' returns in the GCC market

Country	Mean	Max	Min	Std. Dev*	Skewness	Kurtosis
Bahrain	-0.0315	29.2691	-31.4212	2.231	1.1575	165.3491
Kuwait	-0.0006	0.2161	-0.2358	0.0259	-0.1013	57.9988
Oman	0.0002	0.3162	-0.3135	0.0303	1.612	122.7259
Qatar	0.0273	26.99	-28.123	2.8392	0.0487	46.4839
Saudi Arabia	-0.0049	10.5734	-16.117	2.5851	-1.0935	29.1764
United Arab Emirates	0.0051	4.3511	-4.0016	0.5043	-0.1825	36.7262

*Note: * this is a standard deviation. The table reports a summary of the descriptive statistics of the listed firms in the GCC countries for the period of 2007 to 2012.*

Table A.2. Descriptive statistics of independent variables in GCC countries

Panel A: Bahrain						
	Mean	**Max**	**Min**	**Std. Dev***	**Skewness**	**Kurtosis**
Market	-0.0819	6.3089	-18.3786	1.2245	-3.5293	48.6998
OIL	0.0469	13.6874	-12.3077	2.2427	-0.0072	6.9555
AED	0.0000	0.4340	-0.3927	0.0396	0.4072	43.9785
EUR	0.0021	2.9389	-3.9678	0.6822	-0.3285	5.9945
GBP	0.0318	20.9145	-3.8776	0.8740	9.8021	234.1856
JPY	-0.0298	5.4512	-3.3847	0.7348	0.1410	7.0571
USD	0.0000	0.5377	-0.5714	0.0582	1.0431	49.8590
IR	-0.1608	13.6434	-49.1408	2.1490	-12.1165	240.3303
Panel B: Kuwait						
	Mean	**Max**	**Min**	**Std. Dev***	**Skewness**	**Kurtosis**
Market	-0.0004	0.0746	-0.0752	0.0116	-0.3103	9.6564
OIL	0.0005	0.1369	-0.1231	0.0224	-0.0072	6.9555
AED	0.0000	0.0570	-0.0572	0.0031	-0.5282	165.7119
CNY	-0.0001	0.0264	-0.0311	0.0028	-1.2297	34.5215
EUR	0.0000	0.1296	-0.1293	0.0085	0.0091	79.6788
USD	0.0000	0.0280	-0.0287	0.0025	0.6045	36.9221
JPY	-0.0003	0.0639	-0.0573	0.0078	0.1328	12.1141
IR	-0.0012	0.2097	-0.1466	0.0145	0.5383	53.4196
Panel C: Oman						
	Mean	**Max**	**Min**	**Std. Dev***	**Skewness**	**Kurtosis**
Market	0.0001	0.0804	-0.0870	0.0142	-1.1204	15.2901
OIL	-0.0002	0.1008	-0.1231	0.0222	-0.0858	6.8829
AED	0.0029	2.1631	-0.0263	0.0794	26.9404	733.4805
EUR	-0.0001	0.0242	-0.0289	0.0071	-0.0749	4.7992
GBP	0.0002	0.0342	-0.0230	0.0067	0.5269	5.9156
JPY	-0.0004	0.0551	-0.0336	0.0078	0.1825	8.2192
USD	0.0000	0.0044	-0.0027	0.0005	1.2865	24.4869
IR	0.0003	1.0427	-1.2809	0.1744	-0.5315	14.3251
Panel D: Qatar						
	Mean	**Max**	**Min**	**Std. Dev***	**Skewness**	**Kurtosis**
Market	0.0244	11.2587	-13.1730	1.6582	-0.8373	16.7980
OIL	0.0469	13.6874	-12.3077	2.2427	-0.0072	6.9555
CNY	-0.0144	0.7220	-0.6231	0.1146	-0.0856	6.8341
EUR	0.0021	2.9731	-3.8959	0.6801	-0.3087	5.8355
INR	0.0155	2.5383	-3.2050	0.5095	0.1855	6.2134
JPY	-0.0299	3.0255	-4.8812	0.7110	-0.3759	7.4070
KRW	0.0159	10.2568	-13.2500	0.9866	-0.7150	38.3226
IR	-0.1360	220.6074	-175.7858	28.7505	0.2480	12.0138
Panel E: Saudi Arabia						
	Mean	**Max**	**Min**	**Std. Dev***	**Skewness**	**Kurtosis**
Market	-0.0015	9.0874	-10.3285	1.6232	-0.7081	11.8580
OIL	0.0492	13.6874	-12.3077	2.2460	-0.0106	6.9617
CNY	-0.0150	0.7383	-0.7014	0.1165	-0.0986	7.8306
EUR	0.0011	2.9569	-3.9593	0.6837	-0.3073	6.0092
JPY	-0.0293	3.0267	-5.0034	0.7114	-0.3755	7.5847
KRW	0.0156	10.0437	-13.1908	0.9888	-0.7513	37.2223
USD	0.0000	0.4133	-0.5251	0.0468	-0.8219	34.2198
L-IR	-0.0433	14.3101	-17.4041	2.6972	-0.1658	7.9068
S-IR	-0.1163	8.0162	-23.1050	1.4794	-9.2596	122.0733
Panel F: United Arab Emirates						
	Mean	**Max**	**Min**	**Std. Dev***	**Skewness**	**Kurtosis**
Market	-0.0004	0.1163	-0.1174	0.0135	-0.6377	20.4082
OIL	0.0005	0.1369	-0.1231	0.0224	-0.0072	6.9555
CNY	-0.0001	0.0071	-0.0057	0.0011	-0.0572	7.0453
EUR	0.0000	0.0384	-0.0274	0.0071	0.0436	4.6563
INR	-0.0014	0.0254	-2.1631	0.0579	-37.0308	1383.1270
JPY	-0.0003	0.0367	-0.0366	0.0072	-0.0239	5.9351
KRW	0.0006	6.8931	-6.9004	0.2698	0.1880	611.5450
IR	-0.0008	0.1387	-0.1774	0.0104	-2.6210	105.2670

*Note: * this is standard deviation. The tables report a summary of the descriptive statistics of the independent variables in each GCC country for the period from 2007 to 2012.*

APPENDIX B. CORRELATION COEFFICIENTS OF EXPLANATORY VARIABLES

Table B.1. Correlation coefficient for Bahrain

Bahrain	6MLB	EUR	BHD	AED	JPY	GBP	OIL	USA
6MLB	1.0000							
EUR	-0.0304	1.0000						
BHA	0.0361	-0.0738	1.0000					
AED	-0.0170	0.0322	0.0001	1.0000				
JPY	-0.0253	0.1552	0.0372	-0.0113	1.0000			
GBP	-0.0029	0.1282	-0.0316	0.0254	-0.0431	1.0000		
OIL	0.0150	-0.3880	0.1281	-0.0107	0.1139	-0.1050	1.0000	
USA	-0.0353	0.0046	-0.0158	-0.0724	-0.0249	-0.0034	0.0052	1.0000

Notes: Table B.1 presents the correlation coefficient in actual changes in the explanatory variables.
6MLB is the 6 months labour rate; EUR presents the exchange rate return EURO/BHD; BHD presents Bahrain market index; AED exchange rate AED/BHD; JPY is the exchange rate change JPY/BHD; GBP presents the change between GBP and BHD GBP/BHD; OIL presents the change in return of crude oil; USA presents USD/BHD.

Table B.2. Correlation coefficient for Kuwait

Kuwait	CNY	INT6M	JPY	KUW	OIL	USD	AED	EUR
CNY	1.0000							
INT6M	0.0472	1.0000						
JPY	0.0907	0.0113	1.0000					
KUW	0.0126	-0.0397	0.0732	1.0000				
OIL	0.0056	0.0419	0.1182	0.0544	1.0000			
USD	-0.3868	-0.0382	-0.2117	-0.0168	-0.1120	1.0000		
AED	0.3007	0.0276	-0.0051	0.0106	0.0872	-0.3119	1.0000	
EUR	0.0589	0.0044	-0.0536	0.0158	0.2106	0.0902	-0.2986	1.0000

Notes: Table B.2 presents the correlation coefficient between the actual independent variables.
CNY is CNY/KWD, represents CNY; INT6M represents the 6 months inter bank loan; JPY/KWD represented the JPY exchange rate; KUW – the Kuwait market index, oil price exchange return of crude oil; USD/KWD represent USD, AED is the changes in AED/KWD and EUR changes in EUR/ KKWD.

Table B.3. Correlation coefficient for Oman

Oman	AED	EUR	GBP	JPY	OIL	OMAN	ORL	USD
AED	1							
EUR	0.048495	1						
GBP	0.027394	0.668228	1					
JPY	-0.02156	0.101869	-0.08881	1				
OIL	-0.0417	-0.3601	-0.3604	0.086438	1			
OMAN	-0.01508	-0.12259	-0.10353	0.097414	0.180758	1		
ORL	0.019713	0.071987	0.013656	-0.01719	-0.06864	0.04885	1	
USD	-0.02376	0.023402	0.01908	0.00071	-0.02178	0.0014	-0.00841	1

Notes: Table B.3 presents the correlation coefficient for explanatory variables for Oman market.
AED is the changes in the AED/OR exchange rate; EUR is the changes EUR/OR exchanges rate; GBP is the changes in the GBP/OR exchanges rate; JPY is the changes JPY/OR exchanges rate; OIL is the crude oil changes returns; ORL is the changes in the ORL/OR exchanges rate and USD is the changes in the USD/OR exchanges rate.

Table B.4. Correlation coefficient for Qatar

Qatar	INR	EUR	JPY	KRW	OIL	QAT	SGD	6MD
INR	1							
EUR	0.341633	1						
JPY	-0.13301	0.134447	1					
KRW	0.37828	0.26898	-0.16797	1				
OIL	-0.27513	-0.38715	0.152864	-0.23386	1			
QAT	-0.17375	-0.10933	0.112908	-0.2906	0.118736	1		
SGD	0.412444	0.613308	0.004827	0.444006	-0.33511	-0.08697	1	
6MD	-0.02381	0.040365	0.01037	-0.02716	-0.01497	0.043562	0.002159	1

Notes: Table B.4 presents the correlation coefficient for independent variables in Qatar model.
INR represents the INR/QR; EUR/QR represents EUR exchange rate; JPY/QR is present exchange rate JPY; KRW presents KRW/QR exchange rate; OIL presents the return in Crude oil; QAT – Qatar market index; SGD is the changes in SGD/QR; 6MD is present six months deposit.

Table B.5. Correlation coefficient for Saudi Arabia

KSA	10YINR	6MINR	CNY	EUR	KRW	JPY	OIL	SAUDI	USD
10YINR	1								
6MINR	0.067195	1							
CNY	0.019092	0.020598	1						
EUR	0.040817	-0.00833	0.152735	1					
KRW	-0.01597	0.017533	0.05681	0.273637	1				
JPY	0.128308	0.018514	0.025554	0.139065	-0.1644	1			
OIL	0.115447	-0.00721	-0.03424	-0.21616	-0.12907	0.127435	1		
SAUDI	0.047771	-0.02762	-0.04395	-0.17689	-0.30472	0.141714	0.166686	1	
USD	-0.06292	-0.03639	0.15032	0.02441	-0.07039	0.038331	0.008232	0.036349	1

Notes: The Table B.5 presents the correlation coefficient of the explanatory variables in Saudi Arabia.
10YINR represents the changes in 10 years treasury bills; 6MINR represents the changes in 6 months interbank loan; CNY is the changes in CNY/SR exchange rate; EUR is the changes in EUR/SR exchange rate; KRW is the changes in KRW/SR exchange rate; JPY is the changes in JPY/SR exchange rate; OIL change in Crude oil price; SAUDI is the changes in Saudi Market and USD is the changes in USD/SR exchange rate.

Table B.6. Correlation coefficient for United Arab Emirates

UAE	6MINT	CNY	EMART	EUR	INR	JPY	KRW	OIL
6MINT	1							
CNY	0.007394	1						
EMART	-0.13066	-0.03605	1					
EUR	-0.01514	-0.08763	0.053769	1				
INR	0.0028	-0.03442	-0.01229	0.005207	1			
JPY	-0.02932	0.02785	0.08436	-0.11553	0.013584	1		
KRW	0.002253	0.02532	-0.00649	0.029884	-0.21454	-0.0098	1	
OIL	-0.02691	-0.06919	0.19384	0.295553	0.007851	0.095248	-0.02274	1

Notes: Table B.6 presents the correlation coefficient of the explanatory variables in the United Arab Emirates.
6MINT presents the 6 months inter bank loan; CNY is the changes in CNY/AED exchange rate; EMART is the change in Emirate market; EUR is the changes in EUR/AED; INR is the changes in INR/AED exchange rate; JPY is the changes in JPY/AED exchange rate; KRW is the changes in KRW/AED exchange rate; OIL is the changes in crude oil.

APPENDIX C. EGARCH-M RESULTS

Table C.1. The EGARCH-M results of the exchange rate risk exposure of listed firm in the GCC countries

Panel A: Bahrain					
	AED	EUR	GBP	JPY	USA
NO SIG[a]	5(10.42%)[b]	8(16.67%)	3(6.25%)	5(10.42%)	5(10.42%)
POSITIVE-SIG[c]	3(60%)	4(50%)	2(66.67%)	2(40%)	3(60%)
NEGATIVE-SIG[c]	2(40%)	4(50%)	1(33.33%)	3(60%)	2(40%)
Panel B: Kuwait					
	AED	CNY	EUR	GBP	JPY
NO SIG	26(16.99%)	14(9.15%)	20(13.07%)	22(14.38%)	14(9.15%)
POSITIVE-SIG	20(76.92%)	11(78.57%)	5(25%)	16(72.23%)	5(35.71%)
NEGATIVE-SIG	6(23.08%)	3(21.43%)	15(75%)	6(37.5%)	9(64.29%)
Panel C: Oman					
	AED	EUR	GBP	JPY	USD
NO SIG	30(26.32%)	18(15.79%)	18(15.79%)	19(16.67%)	26(22.81%)
POSITIVE-SIG	12(40%)	12(66.67%)	8(44.44%)	10(52.63%)	11(42.31%)
NEGATIVE-SIG	18(60%)	6(33.33%)	10(55.56%)	9(47.37%)	15(57.69%)
Panel D: Qatar					
	CNY	EUR	INR	JPY	KRW
NO SIG	4(11.43%)	4(11.8%)	5(14.29%)	15(42.86%)	13(37.14%)
POSITIVE-SIG	0(0%)	2(50%)	2(40%)	15(100%)	0(0%)
NEGATIVE-SIG	4(100%)	2(50%)	3(60%)	0(0%)	13(100%)
Panel E: Saudi Arabia					
	CNY	EUR	JPY	KRW	USA
NO SIG	7(7.61%)	12(13.04%)	5(5.43%)	23(25%)	11(11.96%)
POSITIVE-SIG	5(71.43%)	10(83.33%)	0(0%)	1(4.35%)	8(72.73%)
NEGATIVE-SIG	2(28.57%)	2(16.67%)	5(100%)	22(95.65%)	3(27.27%)
Panel F: United Arab Emirates					
	CNY	EUR	INR	JPY	KRW
NO SIG	9(13.64%)	11(16.7%)	9(13.6%)	25(37.88%)	17(25.76%)
POSITIVE-SIG	4(44.44%)	7(63.64%)	6(66.67%)	21(84%)	12(70.59%)
NEGATIVE-SIG	5(55.56%)	4(36.36%)	3(33.33%)	4(16%)	5(29.41%)

Notes: a) NO SIG. refers to the number of firms which were statistically significantly exposed to changes in the exchange rates; b) The results are presented as number of firms and as percentage of population for each country for each currency, e.g., 5 (10.42%) in Bahrain for AED implies that 5 firms (which is 10.42% of 48 firms) were significant affected by changes in the AED to the Bahraini Dinar; c) POSITIVE-SIG and NEGATIVE-SIG refers to the number of firms that were positively significantly affected and negatively significantly affected by changes in the currencies to the local currency respectively and the percentages in brackets representing the proportion out of the significantly affected firms for each currency, e.g., in Bahrain, out of the 5 firms (10.42%) significantly exposed to the AED, 60% or 3 firms were positively exposed.

Table C.2. EGARCH-M result of interest rate risk in GCC listed firm

Interest rate risk/EGARCH-M		Number of significant[a]	No. of Positive sig.[c]	No. of Negative sig.[c]
Bahrain		5(10.42%)[b]	0(0%)	5(100%)
Kuwait		16(10.46%)	8(50%)	8(50%)
Oman		12(10.53%)	8(66.67%)	4(33.33%)
Qatar		1(2.86%)	1(100%)	0(0%)
Saudi Arabia	*Long term*	4(4.35%)	0(0%)	4(100%)
	Short term	8(8.70%)	0(0%)	8(100%)
United Arab Emirates		8(12.12%)	1(12.5%)	7(87.5%)

Notes: a) Number of significant refers to the number of firms which were found as statistically significantly exposed to changes in the interest rates; b) The results are presented as number of firms and as percentage of population for each country, e.g., 5 (10.42%) in Bahrain implies that 5 firms, which is 10.42 per cent of the population, were significant affected by changes in the interest rates; c) No. of Positive sig. and No. of Negative sig. refers to the number of firms that were positively significantly affected and negatively significantly affected by changes in the interest rates in each country respectively and the percentages in brackets represent the proportion out of the significantly affected firms for each country, e.g., in Bahrain, out of the 5 firms (10.42%) significantly exposed, 100% or 5 firms were negatively exposed.

Table C.3. Significant exposure to oil price risk of listed firms in the GCC stock market

Oil price exposure (EGARCH-M)	Number of Significant[a]	No. of Positive sig.[c]	No. of Negative sig.[c]
Bahrain	6(12.5%)[b]	3(50%)	3(50%)
Kuwait	20(13.07%)	13(65%)	7(35%)
Oman	14(12.28%)	9(64.29%)	5(35.71%)
Qatar	6(17.14%)	6(100%)	0(0%)
Saudi Arabia	3(3.26%)	2(66.67%)	1(33.33%)
United Arab Emirates	13(19.7%)	11(84.62%)	2(15.38%)

Notes: a) Number of significant refers to the number of firms which were found as statistically significantly exposed to changes in the oil prices; b) The results are presented as number of firms and as percentage of population for each country, e.g., 6 (12.5%) in Bahrain implies that 6 firms, which is 12.5 per cent of the population, were significant affected by changes in the oil prices; c) No. of Positive sig. and No. of Negative sig. refers to the number of firms that were positively significantly affected and negatively significantly affected by changes in the oil prices in each country respectively and the percentages in brackets represent the proportion out of the significantly affected firms in each country, e.g., in Bahrain, out of the 6 firms (12.5) significantly exposed, 50% or 3 firms were positively exposed.

Table C.4. EGARCH-M result of market risk exposure of the GCC listed firms

Market Risk (EGARCH-M)	Number of Significant[a]	No. of Positive sig.[c]	No. of Negative sig.[c]
Bahrain	9(18.75%)[b]	5(55.56%)	4(44.44%)
Kuwait	74(48.37%)	71(95.95%)	3(4.05%)
Oman	48(42.11%)	43(89.58%)	5(10.42%)
Qatar	30(85.71%)	30(100%)	0(0%)
Saudi Arabia	88(95.65%)	88(100%)	0(0%)
United Arab Emirates	34(51.52%)	34(100%)	0(0%)

Notes: a) Number of significant refers to the number of firms which were found as statistically significantly exposed to market risk in the GCC countries; b) The results are presented as number of firms and as percentage of population for each country, e.g., 9 (18.75%) in Bahrain implies that 9 firms, which is 18.75 per cent of the population, were significant exposed to market risk; c) No. of Positive sig. and No. of Negative sig. refers to the number of firms that were positively significantly exposed and negatively significantly exposed to market risk in each country respectively and the percentages in brackets represent the proportion out of the significantly affected firms for each country, e.g., in Bahrain, out of the 9 firms (18.75%) significantly affected, 55.56% or 5 firms were positively exposed.

APPENDIX D

Table D.1. The variance equation of GCC listed firm

Country	α[a]	Negative % (positive %)[b]	(ARCH)[c]	Negative % (positive %)[d]	(GARCH)[e]	Negative % (positive %)[f]	Risk and return[g]	Negative % (positive %)[h]
Bahrain	40%	18.75(81.25)	42.50%	29.41(70.59)	90%	19.44(80.56)	35%	71.43%(28.57%)
Qatar	79.41%	0(100)	32.35%	45.45(54.55)	94.12%	3.13(96.88)	23.53%	87.51%(12.49%)
Kuwait	61.07%	1.1(98.9)	28.19%	50(50)%	88.59%	5.3(94.7)	17.45%	38.45%(61.55%)
Oman	58.51%	12.73(87.27)	43.62%	31.71(92.68)	88.30%	19.28(92.77)	30%	42.57%(57.13%)
Saudi Arabia	94.51%	0(100)	31.87%	0(100)	97.80%	0(100)	40.45%	100%(0%)
UAE	64.62%	0(100)	27.69%	33.33(66.67)	92.31%	5(91.67)	22%	41.95%(55.95%)

Notes: a) α is the coefficient denoting the asymmetric impact of past innovations on current volatility. The significantly exposed firms are shown and the proportion of these with negative (positive) exposure coefficient are given in column b). Column c) shows the ARCH parameter coefficient results with the proportion of firms with significant negative (positive) exposure given in the column d). The GARCH parameter coefficient results are shown in column e) and the proportion of firms with negative (positive) significant exposure given in f).The risk-return trade-off parameter coefficient results are shown in g) and the proportion of negative (positive) given in h).