

**GLOBAL AND REGIONAL EFFECTS ON  
SECTORAL RETURNS VOLATILITY AMONG  
GULF COOPERATION COUNCIL (GCC)  
COUNTRIES**

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by

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## LIST OF ABBREVIATIONS

ADX	Abu Dhabi Stock Exchange
OPEC	Organization of the Petroleum Exporting
AIC	Akaike Information Criterion
APT	Arbitrage Pricing Theory
ARCH	Autoregressive Conditional Heteroscedasticity
ARDL	Autoregressive Distributed Lag
ARMA	Autoregressive Moving Average Model
CAPM	Capital Asset Pricing Model
CASE	Cairo and Alexandria Stock Exchanges
DCC- GARCH	Dynamic Conditional Correlation Generalized Autoregressive Conditional Heteroscedasticity
DFM	Dubai Financial Market
DGCX	Dubai Gold and Commodities Exchange
DIFX	Dubai International Financial Exchange
ECM	Error Correction Model
ECT	Error Correction Term
ETF	Exchange-traded fund
ECB	European Central Bank
ESCA	Emirates Security and Commodities Authority
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GFC	Global Financial Crisis
HQIC	Hanna-Quinn Information Criterion
ICAPM	International Capital Asset Pricing Model
IMF	International Monetary Fund

IRF	Impulse Response Function
MENA	Middle East and North Africa
MSCI	Morgan Stanley Capital International
NASDAQ	National Association of Securities Dealers Automated Quotation
NYSE	New York Stock Exchange
OECD	Organisations for Economic Co-operation and Development
OLS	Ordinary Least Square
OPEC	Organisation of the Petroleum Exporting Countries
PP	Phillips-Perron
PPP	Purchasing Power Parity
S&P	Standard & Poor's
SAMA	Saudi Arabian Monetary Agency
SBIC	Schwartz Bayesian Information Criterion
Tadawul	Saudi Arabia Stock Exchange
UAE	United Arab Emirates
UK	United Kingdom
US	United States
VAR	Vector Autoregressive
VD	Variance Decomposition
VECM	Vector Error Correction Model
MENA	Middle East and North Africa
OPC	Oil price crash

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**KESAN- KESAN SEJAGAT DAN WILAYAH TERHADAP KEMERUAPAN  
PULANGAN SEKTORAL DI ANTARA NEGARA-NEGARA MAJLIS  
KERJASAMA TELUK**

**ABSTRAK**

Disebabkan oleh pergantungan tunggal kepada minyak di negara-negara Majlis Kerjasama Teluk (GCC), sebarang turun naik atau kejutan dalam sektor minyak boleh menjejaskan peluang pelaburan di antara dan dalam sektor. Walaupun terdapat banyak kajian mengenai portfolio pulangan saham, tetapi masih sedikit kajian empirikal mengenai ketidakstabilan dalam pasaran saham ditahap yang dapat dipisahkan. Terdapat juga jurang teori dalam ketidakstabilan turun naik antara pulangan di dalam intra dan di antara sektor. Terdapat lanjutan bukti teori dalam sastera mengenai kestabilan turun naik adalah penting untuk mengkaji saling kebergantungan di dalam pulangan intra dan di antara sektor pada tiga tahap berbeza. Tahap ini termasuklah pasaran saham domestik, serantau dan antarabangsa. Kajian ke atas ketiga-tiga peringkat ini adalah sangat penting. Pertama sekali, adalah sangat berhemah untuk menyiasat kesan kestabilan limpahan turun naik antara pulangan sektor di setiap negara di bawah GCC. Kedua, haruslah memeriksa kesan limpahan kestabilan turun naik serantau GCC pada pulangan sektor di setiap negara GCC. Ketiga, mestilah menilai kesan limpahan turun naik global terhadap pulangan sektor di setiap negara GCC. Kajian tersebut haruslah menggunakan pendekatan kuantitatif melalui reka bentuk penyelidikan yang berterusan untuk menyiasat kestabilan limpahan turun naik pulangan di dalam intra dan antara sektor di negara GCC serta pulangan antara sektor serantau dan Dunia. Ia mesti mengambil sampel sehingga enam bursa saham GCC iaitu (Bursa Saham Tadawul, Bursal Bursal Kuwait, Pasaran

Sekuriti Muscat, bursa saham Qatar, Bursa Sekuriti Abu Dubai dan The Bahrain Bourse) di dalam empat sektor iaitu (Kewangan, Hartanah, Minyak dan Gas, dan Telekomunikasi). Kajian baru ini adalah contoh yang terbaik yang mengambil sampel data indeks harga harian dari 2 Januari 2007 hingga 29 Ogos 2019. Kajian itu memperoleh data daripada pangkalan data Refinitiv Datastream. Walau bagaimanapun, teknik GARCH multivariate (MGARCH) membantu untuk menguji hipotesis yang dirumuskan. Ia juga menerapkan tiga ujian diagnostik termasuk autokorelasi bersiri LM, korelogram dan kenormalan. Kajian itu mewujudkan sokongan untuk teori portfolio untuk penyepaduan sektor, analisis pendedahan risiko, dan sektor lead-lag. Ia menghasilkan penemuan campuran dengan kesan kestabilan limpahan di dalam intra yang ketara dan kesan limpahan kestabilan turun naik rentas sektor dalam kalangan pulangan sektor domestik, serantau dan global di negara-negara GCC. Ia juga membuktikan bahawa kestabilan limpahan turun naik daripada sektor minyak dan gas boleh menjejaskan pulangan sektor kewangan dan hartanah lebih daripada sektor telekomunikasi merentas bursa saham domestik dan serantau. Walau bagaimanapun, analisis mendapati keputusan sektor Bahrain tidak terjejas oleh turun naik sebelumnya. Dalam erti kata lain, pulangan sektor Bahrain tidak bertindak balas kepada kejutan turun naik domestik. Kajian itu juga memberikan implikasi teori untuk intersektoral dan pulangan intersektoral serta limpahan kestabilan turun naik untuk memajukan teori kepelbagaian portfolionya. Penemuan ini memperoleh implikasi praktikal untuk peserta pasaran saham, pelabur dan penggubal dasar. Peserta pasaran saham dan pelabur boleh memberi lebih perhatian kepada kestabilan limpahan turun naik sector yang berbeza. Pelabur boleh mendapat manfaat daripada kepelbagaian portfolio dalam kalangan indeks antara sektor. Hasilnya boleh membantu penggubal dasar, dan pengamal pasaran tempatan, serantau dan antarabangsa untuk memahami



gelagat turun naik pasaran saham di dalam dan antara negara serta di dalam dan antara sektor serantau dan global.

**GLOBAL AND REGIONAL EFFECTS ON SECTORAL RETURNS  
VOLATILITY AMONG GULF COOPERATION COUNCIL (GCC)  
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**ABSTRACT**

Due to the mono-dependence on oil in the Gulf Cooperation Council (GCC) countries, any volatilities or shocks in the oil sector may undermine investment opportunities between and within sectors. While there has been much research on the portfolio of stock return, there are fewer empirical studies on volatility spillover in stock markets at the disaggregated level. There is also a theoretical gap in volatility spillover between intra and inter-sectoral returns. Since there is extending theoretical evidence in volatility literature, it is crucial to examine the interdependency among intra and intersectoral returns at three different levels. These levels include domestic, regional, and international stock markets. Investigating these three levels is immensely vital. First, it would be prudent to investigate the intra-volatility spillover effect among the sectoral returns in each GCC country. Second, you ought to examine the GCC regional-volatility spillover effect on the sectoral returns in each GCC country. Third, you must assess the global-volatility spillover effect on the sectoral returns in each GCC country. The study should adopt a quantitative approach through a continuing research design to investigate the volatility spillover among intra and inter-sectoral returns in GCC countries as well as regional and World inter-sectoral returns. It must sample up to six GCC stock exchanges (Tadawul Stock Exchange, Bursal Kuwait Stock Exchange, Muscat Securities Market, Qatar stock exchange, Abu Dubai Securities Exchange, and The Bahrain Bourse) in four sectors (Financial, Real Estate, Oil and Gas, and Telecommunication). A good example is a recent study that sampled

daily price indexes data from 2 January 2007 to 29 August 2019. The study sourced data from the Refinitiv Datastream database. In any case, the multivariate GARCH (MGARCH) technique helped to test the formulated hypotheses. It also adopted three diagnostics tests including serial autocorrelation LM, correlogram, and normality. The study established support for the portfolio theory for sectoral integration, risk exposure analysis, and lead-lag sectors. It resulted in mix-findings with significant intra-volatility spillover effects and cross-sector volatility spillover effects among sectorial returns in domestic, regional, and global sectorial returns in GCC countries. It also established that the volatility spillover from the oil and gas sector can affect the sectorial returns of the financial and real estate sectors more than the telecommunication sectors across domestic and regional stock exchanges. However, the analysis found that Bahrain's sectoral results were not affected by prior volatility. In other words, Bahrain's sectorial returns do not respond to domestic volatility shocks. The study also provided theoretical implications for intersectoral & intersectoral returns and volatility spillover to advance its portfolio diversification theory. The findings have practical implications for the stock market participants, investors, and policymakers. Stock market participants and investors could pay more attention to different sectorial volatility spillover behaviours. Investors could benefit from portfolio diversification among intra- inter-sectoral indices. The results could help policymakers, and local, regional & international market practitioners to understand the behaviour of stock market volatilities within and between countries as well as within and between regional and global sectors.

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

The global financial crisis that began in the United States in 2007-2008 caused severe shocks in the world's financial markets (Hammoudeh, Kang, Mensi, & Nguyen, 2016). This crisis, as well as other regional financial crises (such as the European sovereign debt crisis collapse and both the Gulf Cooperation Council-GCC crisis oil price shock 2008-2009 and the Qatar diplomatic crisis in 2017), has diminished the importance of emerging and frontier stock exchanges to market participants who seek risk diversification and return enhancement, typically during financial crisis periods. Scholars contend that several factors, including advanced stock-trading technologies and a geriatric population, have had an impact on developed stock markets in the wake of the financial crisis. (Balli, Basher, & Rana, 2014).

Complex factors such as the Eurozone's structural issues, the global financial crisis, trade imbalances, real estate bubbles, the global recession, fiscal policy choices related to government revenues and expenses, and the 2008–2012 global recession all contributed to the European sovereign debt crisis (Ruščáková & Semančíková, 2016). In addition to these causes, the increased interest in alternative investments, the reduction of constraints on capital movements, and the decline in the cost of doing business have resulted in significant changes in global wealth in developing economies (Kearney & Lucey, 2004).

Despite the U.S. global effect on the Eurozone, GCC and African exchange markets, the European zone has a deep and rich history, resources, infrastructure, human capital as well as diversity. However, due to a complicated set of local factors and dynamics, the global financial crisis of 2008 has taken hold of Europe.

The global financial crisis has worsened due to the lack of strong fiscal and political policy, and the inability to comprehend and consolidate the district's financial and political assorted variety into the European Central Bank (ECB's) approach decisions (Esposito et al., 2014). Additionally, volatility spillovers from global markets most severely hit African markets, especially in the short and medium run. For instance, during the global financial crisis, the spillover of shocks around 2008–2009 occurred mainly from South Africa and Nigeria. These markets were distinguished as the most sensitive to regional and global shock contagion compared to other African stock markets (Boako & Alagidede, 2018). They are rampant to the limited budgetary and institutional space available to Sub-Saharan African (fragile countries) policymakers in times of crisis (Allen & Giovannetti, 2011).

For instance, the aggregated spillover effects of European countries on the African markets exceeded the corresponding impact of the United States, even in the wake of the U.S. financial crisis (Mensi, Hammoudeh, Nguyen, & Kang, 2016). In the short run, the beginning of the European debt crisis is described by an inevitable rise in spillovers toward African markets. Nonetheless, a surge of spillovers in the medium and long run is occurring gradually (Gourène, Mendy, & N'Gbo Ake, 2019).

As a result of the global financial crisis's severe impact on oil-producing countries, the price of Brent crude oil plunged from above USD 150 per barrel in mid-2008 to under USD 40 per barrel at the turn of 2009. The nearly 70% decline spelt the

end of the fast-growing oil price trend that began in the early 2000s. For example, the consequences of the 2008–2009 oil price shocks slowed economic growth in the Gulf Cooperation Council region and generated volatility across various sectors. When it comes to portfolio selection and asset management, and the pricing of primary and derivative assets, the ability to foresee financial market volatility is essential (Engle & Ng, 1993). Besides, it has resulted in a greater emphasis on the region's stock markets and considerable portfolio diversification prospects, notably in the Gulf Cooperation Council (GCC) countries, which are important oil price determiners of stock markets and potential chances for portfolio diversification (Al-Yahyaee, Mensi, Sensoy, & Kang, 2019; Mokni & Youssef, 2019; Ulussever & Demirer, 2017).

The oil-rich Gulf Cooperation Council (GCC) nations are among the emerging and frontier stock exchanges. After a unified agreement among Qatar, Bahrain, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates, the GCC was created in 1981. The GCC bloc's objective is to ensure proper coordination, integration, and cooperation in various economic aspects. Recently, Morgan Stanley Capital International (MSCI) classified half of the GCC financial markets as emerging such as (Saudi Arabia, Qatar, and UAE) and the frontier (Kuwait, Bahrain, and Oman) as stock markets. Despite this establishment, the majority of the GCC bloc members put varying limitations on local- international and foreign ownerships in their stock exchanges to shield themselves from the effects of worldwide volatility spillover transmission.

The economic system implementation in the GCC countries is dependent on oil (Mokni & Youssef, 2019) since GCC members are oil producers and are founding members of the Organization of the Petroleum Exporting Countries (OPEC). The economies of the Gulf Cooperation Council (GCC) are heavily reliant on oil

production and export, with little economic diversification into other viable economic sectors. For instance, the GCC bloc possesses 47% of proven world oil resources, produces nearly 20% of all global oil deposits, and manages 36% of total world oil exportations. Saudi Arabia (KSA), Kuwait, and the UAE are the three largest GCC economies due to their oil exportation and sales of oil proceeds (OPEC, 2018). Thus, government revenues and corporate profitability in the GCC countries are often affected by oil prices, which are primarily dependent on global economic growth factors (Alhayki, 2014).

The oil market has witnessed at least seven price crises since 1970 in 1973, 1979, 1986, 1997, and 2008-2009, when oil prices rose to an unprecedented level of \$141.72 per barrel. The main logic behind the increase in oil prices in 2008 was the vast volumes of institutional and individual investors' investments in the crude-oil market (Park & Ratti, 2008). Meanwhile, following the declining value of the US dollar, there was a sharp increase in the market demand for oil from Asia, thus resulting in off-production from the Organisation of the Petroleum Exporting Countries (OPEC). However, in 2014, the price of oil fell to \$22.48 per barrel following several external factors, which concerned either growth in economies or the consequent increase in demand. Alternatively, supply-side factors such as the inability of investment growth to keep up with the growth pattern (Akoum, Graham, Kivihaho, Nikkinen, & Omran, 2012) of oil demand add to the non-economic causes of oil prices. Thus, the demand and supply-side factors of oil resulted in local, regional, and global portfolio diversification (Balcılar, Demirer, & Hammoudeh, 2015).

Moreover, the GCC economies and global financial markets are interconnected with the U.S. market (Alotaibi & Mishra, 2015) as the GCC, and most countries' exchange rates are attached to the U.S. dollar and monetary system. Consequently, it

followed any news and shocks related to the U.S. monetary system and other global stock markets that may influence the GCC stock markets through the individual sector indices. The U.S. financial crisis is one of the crises that has affected the GCC countries through their two major sectors: oil and gas and real estate, and as such, market segmentation has been proposed to hedge against any international financial shocks (Alotaibi & Mishra, 2017). Such a strategy as market segmentation is important to market participants and global portfolio investors as an approach to diversifying their investment portfolios.

Consequently, the effect of the financial crisis has been dramatic in GCC countries, many developed countries, and other emerging economies. For example, between 2006 and 2018, the GCC countries recorded an unstable annual ratio growth rate of GDP at market prices due to the oil price shock and other factors. Oil revenue, trade openness, turnover, market capitalization ratio, and inflation are all factors to consider (Alotaibi & Mishra, 2017). The global financial crisis struck Kuwait's economy twice in the same month in 2008. Kuwait faced a decline in stock trading on November 13, 2008, which was followed by the Supreme Court's order to suspend all equity market trading. Again, in Kuwait on November 17, 2008, market trading was suspended due to the disagreement of day trading among traders (Kuwait Finance 2020).

Besides, the United Arab Emirates' economy was affected in the second half of 2008 by the global financial crisis and political turmoil. Thus, the UAE's economy slowed down between 2009 and 2017. In Kuwait, the United Arab Emirates, and Saudi Arabia, there was a sharp decline in the gross domestic product from 2007 to 2009, from 5% in 2007, 7% in 2008, and 6% in 2009. This sharp decline in GDP among these three countries was also recorded in 2012, 2014 and 2017 (Sabri, 2008). This



sharp decline in GDP per capita growth percentage among these three countries was also recorded in 2012, 2014 and 2017. In Kuwait (0.87%, -3.98%, and -7.043%) for the United Arab Emirates (2.26%, 4.10%, and 1.01%) and Saudi Arabia (2.22%, 0.75%, and -2.75%) respectively. Given recent structural changes in the global oil market and commodity sectoral price fluctuations, energy reform and economic and financial diversification are critical responses for market participants, especially in the GCC countries (Shehabi, 2020b).

In particular, the portfolio diversification theory (developed by Markowitz in 1952) is suitable in practice for avoiding market imperfections such as macroeconomic indicators, financial globalisation following the United States' global financial crisis, and the oil price crisis, all of which have caused an increase in the rate of volatility in both commodity prices and sectoral indices. In the theory of portfolio diversification (Markowitz, 1952), the process of selecting a portfolio can be divided into two stages. The first stage starts with observation and experience and ends with beliefs about the future performance of available securities. The second stage starts with the relevant beliefs about future performances and ends with the choice of a portfolio. In any case, the most challenging decision for investors and stock traders is how they manage the portfolio between different sectoral indices at different times. If sectoral returns are perfectly correlated, no amount of diversification can influence risk. In global investing, portfolio supervisors or managers follow a top-down strategy, usually by first choosing a country's stock exchange and then sectoral indices.

Following the theoretical submission of Prasad, Rogoff, Wei, and Kose (2005), financial globalisation causes capital market liberalisation through the demands and supply of goods and services, resulting in financial market co-movement and stock market interdependency (Bekaert & Harvey, 1997a; Umutlu, Akdeniz, & Altay-Salih,

2010). With the drop in the price of oil in the Gulf Cooperation Council countries, there was a substantial impact on financial market participants (Al-Yahyaee et al., 2019). Investors or traders in the financial market face a wide array of possibilities in their investment decisions, either internationally or locally. Frequently, market participants have many factors to consider before proceeding with investment decisions. Investors do pay attention to the different shock transmissions and uncertainties of the sectoral indices. Therefore, the portfolio theory suggests that regional and international markets are more crucial to investors than the local market because of the risk reduction that they derive from the low correlation between the assets of different countries (Elfakhani, Arayssi, & Smahta, 2008).

However, one of the most important features for investors in financial markets is how to understand the behaviour of markets and sectors. Many investigations have shown that predicting stock market returns is a difficult task (Avramov & Chordia, 2006; Bannigidadmath & Narayan, 2016; Q. Kang, Liu, & Qi, 2010). Predicting the market is difficult since the future is inherently uncertain. Short-term traders are often better served by waiting for confirmation that a reversal is imminent rather than attempting to predict when a reversal will occur in the future. While it is impossible to foresee the stock market, its moves do tend to reverberate over time (Sahni, 2018). The storey of fundamental analysis and technical analysis is the starting point for the endeavour. Fundamental analysis examines the stock price based on its inherent worth, i.e., fair value, whereas technical analysis solely uses charts and trends. Experienced technical indicators can be used as hand-crafted attribute values for machine learning and deep learning methods.

Figure 1.1 shows that the shock transmission to the GCC countries is different across countries. For example, the dramatic collapse in oil prices from a peak of \$115 per barrel on June 20, 2014, to less than \$35 at the end of January 26, 2016, suggests a significant drop in market capitalization for all countries as a result of the oil price crisis (OPEC). Additionally, the nonlinear and non-stationary characteristics of the stock markets make it a complex system (Bisoi & Dash, 2014; Farias Nazário, e Silva, Sobreiro, & Kimura, 2017).

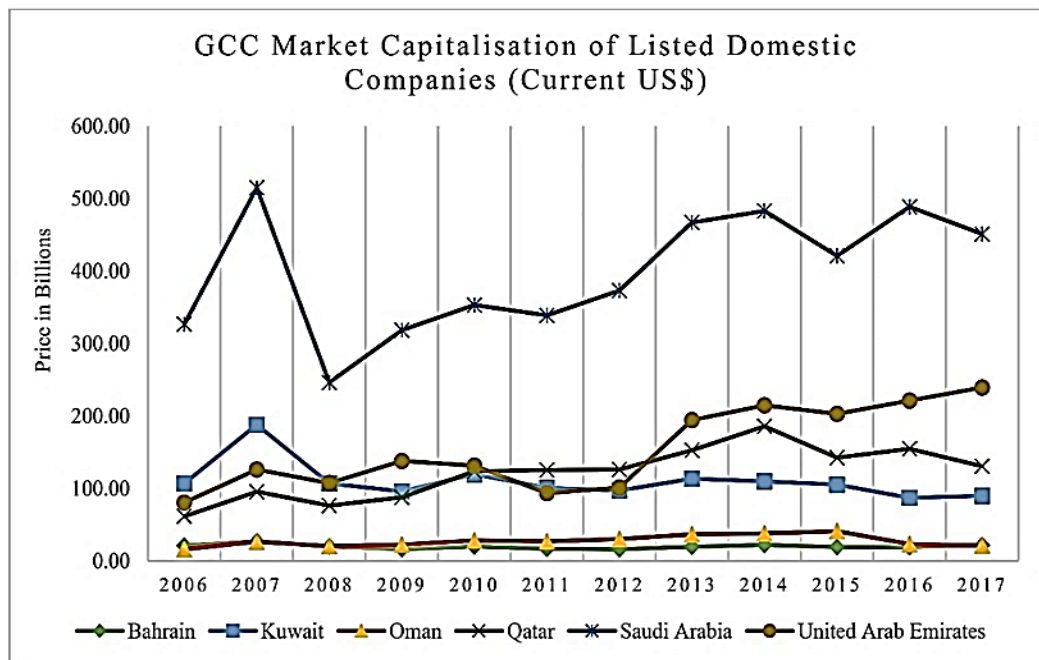


Figure 1.1 GCC market capitalisation of listed domestic companies (current US\$)

Despite political and economic uncertainties in the region and around the world, the Gulf Cooperation Council (GCC) has risen to become a global commercial epicentre. The GCC states have developed some of the world's foremost hubs across many industries, from the UAE's globally recognise logistics hubs to Saudi Arabia's revolutionary advancements in renewable energy (Ziad Awad, 2018).

These are the four sectors where GCC countries are setting innovative, world-leading standards. They include oil and gas, financial service, real estate, and telecommunications. Saudi Aramco is headquartered in the GCC (Weijermars & Al-Shehri, 2022). The oil and gas firm are the most valuable and the greatest in terms of revenue in the world. With a keen understanding of the region's finite oil supply, it has also invested in the growth of the renewable energy sector. Oil prices have a beneficial impact on bank indexes until they reach the \$95 per barrel threshold. After \$95 has been reached, the impact turns negative. On the other hand, bank asset growth continues to be strong, with double-digit growth of 12.8%. Increased lending, which increased by 11.8%, fueled the expansion. The bank indices, however, will benefit from higher oil prices, according to Alqahtani, Samargandi, and Kutan (2020), as long as oil prices continue to be over \$95 per barrel. When the amount of \$95 is reached, the impact becomes negative. Market players who are attempting to manage their portfolios may face additional hurdles as a result of this.

The GCC region is widely recognized for its ambitious real estate projects, which meet the demand for both commercial space and housing. Emaar, the developer, and real estate company behind Dubai Mall, is one of the largest in the world, with a market capitalization of \$14.6 billion in 2017. Majid Al Futtaim, another major participant in the real estate and consumer retail markets, has a presence in the Middle East and Africa, owns 21 shopping malls in 15 markets and employs 40,000 people(Ziad Awad, 2018).

According to research by Kuwait and the Middle East Financial Investment Company (KMEFIC Research, 2009), the GCC has 235 telecom firms. The GCC business includes sub-industries ranging from basic phone dealers to big infrastructure suppliers, according to the 2009 KMEFIC research. Saudi Arabia has 89 firms,

followed by the UAE with 86 firms, Kuwait with 29 firms, and Oman, Bahrain, and Qatar with 31 firms. The GCC has 12 listed telecom firms. This ranges from 0% (Zain-Saudi Arabia) to 84% (Saudi Telecom Company Co.) according to the 2009 KMEFIC research. Usually, GCC governments participate in telecom businesses via pension funds, sovereign wealth funds, ministries, and other state-owned institutions. Meanwhile, corporate ownership levels vary. For example, four of the twelve listed telecom businesses have no corporate owners, while the other eight have corporate ownership ranging from 16% (Zain-Kuwait) to 55%. (Nawras-Oman).

Saudi Arabia's STC, the UAE's Etisalat, Qatar's QTEL, and Omantel are the only ones without corporate investors. They, together with UAE's DU and Batelco of the UAE, have a government ownership percentage above the GCC average of 40%, the survey added. Most GCC telecom equities have declined in value over the last 7 years, with CAGRs ranging from 19.4% to 5%. Nawras, STC, and DU all had double-digit reductions. Only two equities, Wataniya and Vodafone Qatar, defied the trend and increased throughout the time, the research claimed.

The most active 12 GCC telecom businesses are valued at \$90.8 billion. Seven of the twelve stocks had a weighted market value of less than 5%; the lowest was Nawras (1%) and Batelco (2%) and Vodafone Qatar (2.3%). According to the description, just two businesses had a weighted market capitalization above 20%, STC (23.6%) and Etisalat (20.7%)(KMEFIC, 2019).

Considering different levels (domestic, regional, and global) of sectoral returns for the similar sectors (Financial Sectoral Index (FIN), Real Estate Sectoral Index (RE), Oil and Gas Sectoral Index (OG) and Telecommunications Sectoral Index (TEL)), this study chosen these sectors to respond to the dynamic volatility spillover

in intra-inter sectoral returns. The reason for these sectors is that they are the most active in terms of market capitalization and trade value, and they are the same in terms of sectoral classification throughout all GCC members. Besides, international portfolio diversification in the GCC markets is a unique and very promising opportunity.

Second, it is also ambiguous how returns in the GCC's many sectors are linked to regional returns for local, regional, and even global market participants. Third, the global sectoral indices have had an impact on the sectoral indices in specific GCC nations, as previously stated. For example, the real estate crisis in the United States in 2007-2008 had an impact on world stock markets, including those in the GCC countries, and particularly the banking industry. Holding a varied mix of stocks considered representative of a particular sector may be the best approach to investing in that sector in the long run. For example, the real estate sector deserves special attention due to its close relationship to both economic and population growth. In recent years, GCC markets have seen investment volume triple or even quadruple, and their real estate sectors have been estimated to be the fastest-growing in the world (Cheikh, Naceur, Kanaan, & Rault, 2018).

This approach is the most straightforward method for most investors, who can do so by purchasing shares of a sector mutual fund or exchange-traded fund (ETF). There is a lack of information available for investors in this area regarding which sectors they should select for their portfolios and how they should limit volatility spillover effects, particularly in the GCC sectoral indexes.

Besides, fundamental and technical approaches are available to understand stock market behaviour. However, it has not been easy for investors or traders to predict future stock behaviours. This situation is mainly due to the unstable behaviour

of the financial markets and the phenomenon of global equity market return and volatility within the sectoral indices since pricing changes are random. It implies that buyers and sellers who are willing to invest in the stock markets must make a good strategy for investment. This condition showcase that investors should be able to explain the mimicry bias across different sectoral indices, mostly the oil and gas price (Farias Nazário et al., 2017). According to Chang and Lee (2017), investors should formulate trading strategies (buy or sell) and correct timing (portfolio adjustment) to invest. They must search and can choose the optimal stock selection strategy and capital allocation to solve the portfolio problem and improve their return on investment.

Moreover, from the early 1975s until now, many studies have investigated oil prices concerning economic growth (Hamilton, 1983; McKie, 1973). For example, Mork (1989) studied the volatility of international oil price fluctuations on individual macroeconomic variables, such as economic growth rate, exchange rates, inflation, and found that oil price volatility reduces the growth of local and regional financial markets. Therefore, a negative shock to oil prices will intuitively affect stock market indices and the overall real economy (Li , Zhu , & Yu 2012).

In respect of sectoral performance, some sectors of the stock market are firmly associated with the price of the commodity (Al-Yahyaee et al., 2019), especially oil price. However, it depends on the structure of the sectoral equity markets and the country's financial system. For example, the transportation sector is one of the sectors that have a strong relationship with gas and oil prices. Logically, when the price of oil goes up, then the cost of fuel rises, due to the fuel consumption by transportation firms.

According to Mokni and Youssef (2019), their findings show that since the 2014 oil price drop, there has been an increase in dependency between oil and the six GCC stock markets, meaning that the GCC stock market is firmly linked to oil prices. As a result, because the market composite is comprised of several sectoral indices, it is highly dependent on the structure of the various GCC stock markets, which implies that these sectors are closely related to the price of oil and natural gas. Thus, investors, stock traders, and institutions might want to consider selling their stocks in the corporate transportation sector when the oil and gas price is high. In contrast, it is possible to buy when the oil and gas price is low.

Indeed, short-term events do not mean a major translate to a major change in the financial markets. A thorough awareness of how the dynamic stock market operates, behaves, and reacts to numerous occurrences throughout the world, particularly at the sectoral level, is required. Traders distinguish themselves in this sense by striving to codify the capacity to see the broad picture, to understand where a hit or wave originates from and what causes it. Hedgers, speculators, arbitrageurs, and margin investors have been striving to understand and explain the behaviour of stock market dynamic systems ever since. Such systems are, in general, random, but not entirely random.

Therefore, businesses and investors around the world will have to think about the above dissection. While the GCC economy is modest in comparison to the global economy, some GCC enterprises can have a considerable effect on their suppliers' and partners' performance. This influence is both financial and reputational, given their huge resources and high prominence in their respective fields. This will mostly affect fledgling businesses with access to renowned and well-funded clientele. Many capital-hungry entrepreneurs come to the Middle East seeking financing or consumers. While



being given the option to join a successful foreign firm may be attractive, Gulf investors and international visitors should be wary of "negative selection." In this scenario, "negative selection" means being targeted by a company or sector that is unable to attract consumers or investors locally.

Besides, the most challenging decision for any investors and stock traders is how they manage the portfolio between different sectoral indices at different times. As such, the association between oil, gas prices and sectoral stock index yields could be considered from the aspects of financial markets risk management, dynamics, volatility spillovers and portfolio diversification (Tiwari, Jena, Mitra, & Yoon, 2018).

Meanwhile, it is confusing to traditional traders, investors, and institutions on how to be up to date, about the connection inter and intra dynamics occurring among domestic, regional, and global sectoral equity indices which establishes a spillover analysis. The most challenging part of investment for stock market traders is how to differentiate homogenous and heterogenous linkages or shock transmissions between or across the intra-sectoral indices (Boamah, 2017). Thus, both local, regional, and international stock market participants seek to get the best market opportunities to allocate their capital investments across developing and developed financial markets. To this end, they are trying to expand their investments globally and maximise profits while minimising the associated risk (S. M. Hammoudeh, Y. Yuan, & M. McAleer, 2009; Rizvi & Arshad, 2018).

Furthermore, when price shock information affects a market, its price changes correspondingly. Meanwhile, it will send the price-changing signal to the appropriate equity market (Ji, Marfatia, & Gupta, 2018). The price spillover effect is typically measured using the return series. The volatility spillover relates to the effects of one

market price's (or sectors') variance change on the variance change of other market prices (or sectors), and it is assessed by the volatility series and the second-moment price (or return) series. Volatility is a measure of information flow and an indication of information transfer from large to small enterprises, according to Ross (1989) and (Conrad, Gultekin, & Kaul, 1991). In addition, overnight information has an impact on financial market volatility during the day (Masulis & Ng, 1992). As a result, volatility spillover is also known as risk spillover, and it is used to characterise the risk transmission relationship between markets.

Moreover, spillover effects are events that occur as a result of something in a seemingly unrelated situation. In the financial markets, it refers to events that transpire in one stock market or sector index that influence happenings in another. The phrase is typically used in a negative context. Positive spillover effects certainly exist, but they are not as heavily emphasised. The market is said to be the net transformer if the net volatility spillover is positive, and the market is said to be the net receiver if it is negative (Panda, Panda, Nanda, & Parad, 2021). What is more, volatility is the most fundamental statistical risk indicator. It can be used to assess the market risk of a single instrument or the risk of a whole portfolio of instruments. While volatility can be stated in a variety of ways, statistically, a random variable's volatility is its standard deviation. In everyday practice, volatility is measured for a wide range of random financial variables, including stock returns, interest rates, portfolio market value, and so on. The random unpredictability of stock returns is measured by stock return volatility. In a summary, stock return volatility is the variance in the stock return over time. It is the standard deviation of daily stock returns around the mean value, while market volatility is the return volatility of the total market portfolio. Stock return volatility has primarily been examined in advanced economies.

Much of the empirical work since Engle's (1982) pioneering work on the Autoregressive Conditional Heteroscedasticity (ARCH) model and its generalised variant (GARCH) by Bollerslev (1986) has employed these models and their expansions. These terms are compatible with volatility clustering (high volatility persistence) and have been extended to account for volatility asymmetry, or the leverage effect, which is found in equity markets as a negative correlation between today's return and tomorrow's volatility. In their study, Engle, and Rothschild (1992) showed that individual stock return volatility is driven by stock market volatility, with individual stock return premiums being impacted by the predictable market volatility.

Moreover, theoretical submissions on local and regional equity indices as well as global GCC-wide sectoral indices support the research findings on general dynamic spillover analysis of sectoral equity indices (Alotaibi & Mishra, 2015; Balçılar et al., 2015). Besides, it is still not clear how worldwide investors can achieve significant benefits from universal portfolio diversification benefits in different sectoral indices, especially in the GCC zone.

The theoretical models of portfolio selection developed by Harry Markowitz and James Tobin provide an actual description and regulating rules for the diversification of risky assets. Although the extent to which diversification can reduce risk depends simultaneous on the correlations between sectoral indices returns. Portfolio collection would match an analogue to the removal of risks in the sectoral indices. Otherwise, if sectoral returns are perfectly correlated, no amount of diversification can influence risk (Levy & Sarnat, 1970).

The purpose of this research is to examine the intra-volatility spillover effect at three different levels and determine whether there is a link between volatility in one sector and volatility in another. In other words, the research attempts to demonstrate the extent to which changes in sector returns in one market influence opening returns in the next market to trade, as well as whether changes in volatility returns in one sector are positively related to changes in volatility returns in the next market to trade at three different levels (domestic, regional, and international). As a consequence, the effects of volatility surprises in one sector on volatility returns in other sectors are being examined. This is because return spillovers within or across markets have significant consequences for portfolio selection and risk management. This investigation is crucial because sectoral markets tend to move together at roughly the moments when investors do not want them to (i.e., when volatility is high), decreasing the benefits of regional and international portfolio diversification. As a result of analysing the volatility spillover among sectoral stock market volatility returns, investors will be able to find an effective approach to limit their risk from global and regional diversification portfolios.

Portfolio supervisors or managers use the best strategy in global investing, typically by selecting a country's stock exchange first, followed by sectoral indices. Even the most knowledgeable market players desire sector indexes without paying much thought to the intercommunications and volatility transmissions among sectors at different levels of the economy. However, in frontier and emerging financial markets such as the GCC markets characterised as rich oil-producing countries, investing in sectoral indices has not achieved similar popularity, and their equity markets lack organised sectoral indices (Díaz & Jareño, 2009). While many scholars have explored the transmission of returns between individual sectoral indices within

the stock markets, there is less research on how volatility spillovers transmit between different sectors in multivariate settings such as (Azar & Chopurian, 2018; Balcilar et al., 2015; Balli, Basher, & Jean Louis, 2013; S. M. Hammoudeh et al., 2009)

According to Moerman (2008) and the other academics mentioned above, the findings of their investigation at the sectoral level will result in more efficient portfolios than the findings of this examination at the aggregate stock market level. Some researchers (Hammoudeh et al., 2009; and (Ductor & Grechyna, 2015; Mensi, 2019) noted that investment in sectoral indices in the GCC stock exchanges has not approached the standard of sophistication, but their developed country counterparts have. Investing in the GCC sectors has become convenient after the GCC bloc members have recently rearranged and reorganised their sectoral indices with much higher details than the earlier sectoral classification (the new sectoral indices classification matches the Thomson Reuters Business Classification System). The sector-level strategy allows an exciting dimension of diversification as it covers various characteristics of the macro-economy, especially in the context of dynamic volatility and volatility transmission, as utilised in this study.

Furthermore, at the domestic, regional, and global levels, this study establishes the volatility spillover for each sectoral index (intra) and conditional cross-sectoral (inter) volatility transmission of the four key equity sector indices on the six different GCC stock exchanges. Several methods have been used to examine volatility spillover in the Bivariate Generalized Autoregressive Conditional Heteroscedastic (GARCH) model, a family of statistical methods pioneered by Engle (1982) and Bollerslev (1983). (1986). Multivariate BEKK-GARCH was proposed by Baba, Engle, Kraft, and Kroner (1990) and Engle and Kroner (1995).

In addition, numerous researchers (Mensi, Hammoudeh, Al-Jarrah, Al-Yahyaee, & Kang, 2019) utilised the DECO-FIGARCH approach and the risk spillover indicator developed by Diebold and Yilmaz (2012, 2014). MGARCH is a method for estimating the parameters of multivariate generalised autoregressive conditional-heteroskedasticity (MGARCH) models. Both the conditional mean and the conditional covariance can be dynamic in MGARCH models. Because the broad MGARCH model is so flexible, it's not like all parameters can be evaluated. As a result, several MGARCH models parameterize the problem more parsimoniously. The diagonal vech model, the constant conditional correlation model, the dynamic conditional correlation model, and the time-varying conditional correlation model are all implemented by MGARCH.

The modern version of the MGARCH DVECH estimator is used to estimate the parameters of diagonal vech (DVECH) multivariate generalised autoregressive conditionally heteroskedastic (MGARCH) models in which each element of the conditional correlation matrix is parameterized as a linear function of its past and previous shocks.

In conclusion, grounded in portfolio diversification theory, this study sought to investigate the volatility spillover between local, regional, and global sectoral indices in GCC countries as evidence on this objective is still understudied. This study examines the local, regional, and global sectoral indices at sectoral levels as against past studies that did a composite stock market analysis.

## 1.2 Problem Statement

The economic and financial system in the Gulf Cooperation Council (GCC) is being hampered by three primary challenges: the transition away from oil and gas to non-hydrocarbon sectors and industries, as well as accomplishing effective structural transformation; youth unemployment difficulties; and labour market imbalances. The correlation structure among asset returns, on the other hand, is the foundation of both portfolio risk management decisions. Consequently, for market participants, understanding the dynamics of the interaction between the oil and gas sector returns in stock markets, particularly at the sectoral level, continues to be a key issue to consider.

This study addresses three main research problems concerning sectoral stock market volatility spillover.

First and foremost, different sectors have been affected in different ways by sectoral return modifications in specific GCC nations. In the case of oil price fluctuations, the fact that various sectors can be affected differently Mensi (2019) by oil price changes highlights the heterogeneity of sector sensitivities to oil price swings, which has important implications for asset allocations and portfolio risk assessment.

As several real-world examples have revealed, sectoral returns are widely heterogeneous. When it comes to trading activity in Kuwait, the financial sector dominates with 62% of all trades, followed by the real estate sector (18% of total deals), the oil and gas business (6.6% of total trades), and the telecommunications sector (1.6% of total trades) (5.6% of the total trades). Next comes the banking and financial industries (which account for 23.03% of total commerce), followed by the insurance, telecommunications, and other sectors (which account for the remainder of

total trade) (7.54% of the total trades and 4.74% of the total trades, respectively). As a result of the disparities in sectoral indices among GCC countries, various factors such as costs, competition, and government regulation can have varying effects on the returns of various industries (Mohanty, Nandha, Turkistani & Alaitani, 2011). However, these variances or heterogeneity in stock returns necessitate more investigation into the spillover of indices among and then within sectors. In contrast, foreign investors can take advantage of the openness of the Gulf Cooperation Council market as a means of diversifying their investment portfolios (Collet & Ielpo, 2018; Shahzad, Aloui, & Jammazi, 2019; Zhen et al., 2019).

The challenges of inter-sectoral adjustments in the Saudi Arabian stock market have affected investors (Rahman, Chowdhury, & Shibley Sadique, 2015). Hence, it has led to an inappropriate long-term development strategy. Generally, the Saudi Arabia stock market has had a volatile year in 2018. Both index providers, FTSE Russell and MSCI upgraded the largest market in the GCC region to "Emerging Market" status, which boosted the Tadawul index's start. However, the market quickly lost ground as a sharp drop in oil prices, combined with political uncertainties, significantly slowed the pace of the stock market's rise, forcing it to settle for a yearly gain of 8.31% (Markaz, 2019b). For the first nine months of 2018, corporate earnings growth was flat compared to the same period last year. The banking and telecommunications sectors gained 28.9% and 26.6%, respectively. In an environment of rising interest rates, the banking sector's profitability increased. With the sharp drop in oil prices, the worst performing sector was Real Estate, down 30.1%.



In addition, Abu Dhabi and Dubai markets moved in opposite directions. In 2018, Abu Dhabi's markets rose 11.7%, second only to Qatar in the GCC. The rise in oil prices and the government's economic stimulus aided growth in all sectors. In contrast, Dubai's markets have posted a negative annual return of 24.9%, the lowest since 2018. The emirate's performance has been hampered by a slowing economy and a weak real estate market(Kapar, Olmo, & Ghalayini, 2020). The Dubai financial market was the worst-performing market in the Gulf Cooperation Council (GCC), with a year-to-date loss of 24.93%. All of the sectors performed poorly, with financial services posting the worst result of the group, a 44% decline. A 39% decline in the real estate sector, which accounts for the majority of the DFM General Index's value, has been recorded in 2018(Markaz, 2019b).

The fundamental cause of the market's continuous decline can be linked back to the real estate sector, where the increasing supply of housing continues to outstrip the increasing demand in the market. The real estate market in the Emirates is experiencing price pressure. Since the collapse of oil prices approximately four years ago, the real estate market has been in a downward spiral due to an oversupply of properties and a scarcity of affordable homes. According to early October 2018 statistics from Smith Travel Research (STR), hotel occupancy in Dubai decreased from 4.3% to 75.2% over the same period last year.

A similar pattern was observed on the Oman stock exchange, which closed the year with a loss of 15.2%, while the Bahrain stock exchange managed to post a modest gain of 0.4%. In addition, Qatar's most important trading partners are Japan, South Korea, China, and India, which together account for more than 70% of Qatar's total exports of natural gas, all of which are located outside of the politically dangerous Middle East. In early 2019, the real estate sector, which was under significant pressure

last year, experienced a strong resurgence, with the sector rising 14.2 percent in 2018. Several factors, including government support and legislative changes on the ownership of properties by foreign investors, are expected to spur further growth in Qatar's real estate sector, particularly in the first quarter of early 2019. These factors include increased foreign investment, increased government support, and increased government support.

Moreover, in 2018, the Bourse Kuwait sectoral market activity by sectors was expressed as a percentage. Financial services are the most active sector, accounting for 9.90 percent of Bourse Kuwait, followed by telecommunications and real estate, accounting for 9.50 and 5.80 percent, respectively. Kuwait is attempting to insulate itself from future uncertainties in the form of losses due to a drop in oil prices as well as geopolitical uncertainties by having the greatest fiscal buffers among its GCC counterparts as well as a very low fiscal breakeven oil price. However, dropping oil prices, along with insufficient market liquidity, will continue to put pressure on the market.

Moreover, except for Saudi Arabia's stock market, Hammoudeh and Aleisa (2004) found that the GCC markets are less dependent on oil exports and more impacted by internal variables. Investors are still perplexed about the impact of volatility on other sectors in the GCC. However, there is currently a paucity of research on the heterogeneity of sector sensitivities to distinct sectoral returns in the finance literature. There is still little evidence of inter-and intra-sectoral index spillovers. As a result, there is a research gap in the area of stock return volatility spillovers. Past studies on sectoral indices have been on the impact of global U.S. oil on sectoral returns. Fenech and Vosgha (2018) examined oil price dependence on stock indices in the GCC using copula models. Using the wavelet technique, Hamdi, Aloui, Alqahtani,

and Tiwari (2019) studied the relationship between oil price volatility and sectoral stock markets in the GCC using the wavelet technique. Moreover, Mensi, Hammoudeh, Al-Jarrah, Al-Yahyaee, and Kang (2019) investigate risk spillovers and hedging effectiveness between significant commodities, and Islamic and conventional GCC banks using the DECO-FIGARCH model and the spillover index of the Diebold and Yilmaz (2012, 2014).

However, these analyses are restricted to oil price swings alone, with no consideration given to swings or changes in sectoral sensitivity across different sectoral indexes. Portfolio transparency is a major issue for market participants. They should clearly understand what each element of their portfolio is, and what the interaction among them is. When it comes to portfolio diversification among investors, the relevance of sectoral interrelationships in the GCC cannot be overstated. The sectoral interrelationships are also a critical component of the portfolio risk management decision, as they help to determine the correlation structure between asset returns (Alandejani & Asutay, 2017).

Knowing how sectoral returns throughout GCC stock markets are linked together dynamically, particularly at the sectoral level, remains a key problem for market participants. Indeed, over the last decade, sectoral equity markets have emerged as the preferred method for investors to manage their portfolios in the most efficient manner (Mensi, 2018).

Are the GCC countries experiencing a similar problem? Of course not, the performance of the GCC stock markets in 2017, as measured by the growth rate of the capital market index, differed by country. While the Kuwait and Bahrain markets improved by 11.5 percent and 9.1 percent, respectively, compared to 2016, the markets