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Statement of Authentication

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text and where due reference is made. I hereby declare that I have not submitted this material, either in whole or in part, for a degree at this or any other institution. From the research conducted in this thesis, I have published part of Chapter 3 as a book chapter:


Abdullah R. Alotaibi

2014
Abstract

This thesis studies international financial integration in the Gulf region. It develops measures of international financial integration for the Gulf Cooperation Council (GCC) countries, investigates the drivers of financial integration, and examines volatility spillovers from regional (Saudi) and global (US) markets to GCC stock markets.

The GCC was established in 1981, when a unified economic agreement between six countries, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates, was signed with the objective of realising coordination, integration, and cooperation in various aspects of economic affairs. Understanding of the drivers of international financial integration will provide important insight into the process of monetary and financial integration and of shaping policy decisions in the GCC region. The overall contribution of this thesis is to provide a careful review and understanding of the financial integration, and offer valuable information for policy makers in the GCC region.

In this regard, the thesis analyses the degree of international financial integration of the GCC member countries with the rest of the world by employing several quantity measures for international financial integration based on foreign assets and liabilities. The thesis develops time-varying measures of international financial integration of GCC countries based on the international asset pricing theory by employing the multivariate DCC-GARCH model of Engle (2002). The thesis examines the drivers and impact of global financial crisis on GCC countries’ international financial integration. The thesis employs three different bivariate GARCH(1,1) models in symmetric and asymmetric cases (constant
correlation (CCC), dynamic correlation (DCC), and BEKK models) to examine the volatility spillover effects from global (US) and regional (Saudi) stock markets to the other five GCC stock markets by allowing the unexpected returns of any particular GCC stock market be driven by three sources of shock: local, regional from Saudi Arabia and global from the United States. The thesis investigates the determinants of volatility spillovers from the Saudi to the GCC stock markets. The findings have strong implications for policy makers of GCC countries.

The thesis makes several significant contributions by analysing international financial integration in the GCC region. This is the first study that focuses on the development of measures of international financial integration of GCC member countries with the rest of the world based on external asset and liability positions, and the first to empirically examine the drivers influencing international financial integration between the GCC countries and the rest of the world. This is the first study to develop a time-varying financial integration index for GCC stock markets based on the international asset pricing theory, by employing a multivariate DCC-GARCH model and examines drivers of the stock market integration index. This is also the first study to investigate the effects of spillovers from the US and Saudi stock markets to GCC stock markets by considering innovations from the Saudi and US markets as regional and global shocks respectively, and examines the determinants of volatility spillovers from Saudi Arabia to GCC markets. No previous study has so far explored the impact of spillovers from global (US) and regional (Saudi) stock markets to GCC stock markets.

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<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>ADX</td>
<td>Abu Dhabi Securities Exchange</td>
</tr>
<tr>
<td>AMEDA</td>
<td>Africa &amp; Middle East Depositories Association</td>
</tr>
<tr>
<td>BHB</td>
<td>Bahrain Bourse</td>
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<tr>
<td>BIS</td>
<td>Bank for International Settlements</td>
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<td>BSE</td>
<td>Bahrain Stock Exchange</td>
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<tr>
<td>CBB</td>
<td>Central Bank of Bahrain</td>
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<tr>
<td>CEE</td>
<td>Central and Eastern Europe</td>
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<tr>
<td>CMA</td>
<td>Capital Market Authority</td>
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<tr>
<td>DFM</td>
<td>Dubai Financial Market</td>
</tr>
<tr>
<td>DSM</td>
<td>Doha Securities Market</td>
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<tr>
<td>EM</td>
<td>Emerging Markets</td>
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<tr>
<td>EMU</td>
<td>European Monetary Union</td>
</tr>
<tr>
<td>ESCWA</td>
<td>Economic and Social Commission for Western Asia</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
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<tr>
<td>FEAS</td>
<td>Federation of Euro-Asian Stock Exchanges</td>
</tr>
<tr>
<td>GAFTA</td>
<td>Greater Arab Free Trade Area</td>
</tr>
<tr>
<td>GCC</td>
<td>Cooperation Council for the Arab States of the Gulf</td>
</tr>
<tr>
<td>IFS</td>
<td>International Financial Statistics</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>KSA</td>
<td>Kingdom of Saudi Arabia</td>
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<tr>
<td>KSE</td>
<td>Kuwait Stock Exchange</td>
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<tr>
<td>MENA</td>
<td>Middle East and North Africa</td>
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<tr>
<td>MSCI</td>
<td>Morgan Stanley Capital International</td>
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<td>MSM</td>
<td>Muscat Securities Market</td>
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<tr>
<td>MU</td>
<td>Monetary Union</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OPEC</td>
<td>Organization of the Petroleum Exporting Countries</td>
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<tr>
<td>QE</td>
<td>Qatar Exchange</td>
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<tr>
<td>QIA</td>
<td>Qatar Investment Authority</td>
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<tr>
<td>SAMA</td>
<td>Saudi Arabian Monetary Agency</td>
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<tr>
<td>TADAWUL</td>
<td>Saudi Stock Exchange</td>
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<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
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<tr>
<td>US</td>
<td>United States of America</td>
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<tr>
<td>WDI</td>
<td>World Development Indicators</td>
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<td>WTO</td>
<td>World Trade Organization</td>
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Chapter 1  Introduction

1.1 Background

Well functioning financial markets are essential for the growth and development of any economy. Countries with developed and integrated financial markets have greater levels of investment, more dynamic business environments, more highly skilled work forces and higher standards of living (Levine, Loayza & Beck 2000). Financial markets provide a channel through which investors can direct their money to the most productive users of their capital. As financial markets develop, a greater number of suppliers and users of capital connect at lower costs, increasing both the overall level of investment in an economy and the productivity of the investments. Furthermore, a more developed financial market enriches the economy as a whole through faster growth, greater diversity and stability. Integrated developed financial markets on a regional or global basis extend and enhance these benefits.

The process of reform and development of local securities markets over the past three decades has been one of the most important catalysts for integration of international financial markets. Foreign investment barriers have been lowered, country funds have been floated and firms have been cross listed on stock markets in an effort to increase foreign equity flows. Several empirical studies have identified the potential welfare gains from market integration in terms of risk-sharing benefits (Lewis 2000; Obstfeld 1994) and in terms of investment activity, stock market development and overall economic growth (Bekaert & Harvey 1995, 2000; Kim & Singal 2000; Levine & Zervos 1998). The process of stock market integration is
usually part of a major reform effort that includes the financial sector and the
economy as well as the political process; thus it has implications beyond traditional
issues in investments and corporate finance, and deserves further study.

Since the early 1980s, emerging markets have played an active role in the
integration process in terms of diversification benefits (Bailey & Stulz 1990; Bekaert
& Urias 1996; Divecha, Drach & Stefek 1992; Errunza & Padmanabhan 1988;
Lagoarde-Segot & Lucey 2007). As emerging markets mature and become
increasingly integrated with global markets, their sensitivity to the volatility
spillovers of stock markets increases, their portfolio diversification ability decreases,
and they become more vulnerable to external shocks. Understanding the sources of
volatility is critical for providing insight into the process of monetary and financial
integration. In imperfectly integrated markets, regional factors are necessarily
considered when shaping policy decisions and developing various regulatory
requirements like capital requirements or capital controls.

In 1981, the Gulf Cooperation Council (GCC) was established, and the unified
economic agreement between the six countries involved was signed with the
objective of realising coordination, integration, and cooperation in various aspects of
economic affairs.1 The GCC also signed a preferential trade arrangement that led to
the creation of a free trade agreement in agricultural and industrial products (but not
petroleum products) and free movement of the factors of production. In 2002, the
GCC decided to implement gradually a unified economic agreement toward
establishing a single market and forming a monetary union at a certain stage. In

1 The Gulf Cooperation Council (GCC) consists of six member countries: Bahrain, Kuwait, Oman,
Qatar, Saudi Arabia and United Arab Emirates.
2010, the member countries approved the Statute of the Monetary Council of the Cooperation Council for the Arab States of the Gulf, which focuses on the development and coordination of the monetary and exchange rate policies for national currencies until establishment of the GCC central bank, preparation for the issuance of the banknotes and coins of the single currency, and development of a uniform framework for its introduction and circulation.²

Of the several expected benefits of such a move, stock market integration is a major possible consequence: the introduction of a single currency unit will standardise the pricing of financial assets, improve transparency of financial markets and reduce investors’ information and transaction costs, thus removing barriers to GCC portfolio allocation. Another implication of a common single currency will be the elimination of currency risk premiums within the GCC region, so that investors will not have to hold different portfolios across the various countries in order to hedge against unanticipated currency risk.

The rapid increase in international capital flows (foreign direct investment and portfolio investment) is one of the most significant developments among the member countries of the GCC, whose financial systems are dominated by commercial banks which limit the importance of cross-border equity flows. Member countries have taken steps to improve the size and quality of their capital markets. Significant

² Stock market integration is a possible outcome of a single currency area. The introduction of a single currency unit will standardise the pricing of financial assets, improve transparency of financial markets and reduced investors’ information and transaction costs, thus removing barriers to GCC portfolio allocation. Another implication of the common single currency is the elimination of currency risk premiums in the GCC region, implying that investors do not have to hold different portfolios across countries in order to hedge against currency risk.
privatisations have occurred, and several countries have built independent and
dedicated capital market regulators. In addition, a number of initiatives have been
launched to improve the level of integration among stock markets. Progress has also
been made in regional economic integration: GCC countries have largely unrestricted
intraregional mobility of goods, services, national labour and capital. In 2003, a GCC
single common external tariff (CET) rate of five per cent was implemented and in
early 2008 a common market was established although not fully implemented. Full
implementation of the common market will require changes to national laws,
including those pertaining to limits on company ownership by foreigners.

Financial markets also have experienced impressive growth in recent decade
among the member countries of the GCC. This has been led largely by the stock
markets, and signs point to further growth going forward. Today, GCC stock markets
are among the highest capitalised in the world relative to the size of their economies.
However, despite their size they still fall short of international financial market
development standards in terms of product, quality of information and efficiency. For
instance, GCC stock markets are classified by Morgan Stanley Capital International
(MSCI3) as frontier markets because of a number of market and institutional issues
including liquidity, lack of effectiveness of their delivery versus payment settlement
system, and ownership limits on foreign investments. Several GCC governments
have already initiated efforts to address these shortcomings, and officials, aware of
the important role stock markets play in the growth and health of their economies, act

3 The MSCI Emerging Market Index is a free float-adjusted market capitalisation index that is
designed to measure equity market performance and is expressed in US dollars.
to ensure that the markets are strong and stable and provide full benefits to local investors and companies.

There is a strong desire among GCC policy makers to integrate regional markets with each other fully, in line with GCC agreements. Their goal is to create broad and liquid markets where prices are based on fundamental analyses reflecting the true value and risk of an issuer, where all investors are treated equally and their rights are protected. To develop and integrate such stock markets, they focus on opening all securities offered in any GCC country to investors from all other GCC countries, through one local account with a local broker, in order to provide a balance of depth and liquidity. They have also taken, or are currently taking, steps to set appropriate rules to raise the quality of regulations and improve enforcement, in order to increase transparency and investor protection. This will strengthen each individual market and make the entire region a more attractive destination for regional capital, relative to external investment options.

To sum up the above background, measuring the degree of financial integration in the GCC region is essential for further growth and development of GCC financial sector and economy. A well integrated financial market will facilitate the smooth implementation of monetary policy and the balanced transmission of its effects throughout the GCC region. An integrated financial market will be a natural precursor to the planned GCC monetary union. Financial integration will contribute to financial stability by creating larger, more liquid and competitive markets which offer increased possibilities for risk diversification.

The degree to which financial markets in GCC are integrated with each other and with the rest of the world is of concern to GCC policy makers and economists
for several reasons. Although financial integration promotes economic growth, since the efficiency of the markets increase, there are dangers: countries which are closely linked financially may expose themselves to spillovers from financial crises. In addition, monetary and fiscal policies are constrained by the interregional mobility of capital, and the efficiency of the financial system is affected by the degree to which it is integrated into international capital flows.

1.2 Objective of the Thesis

The objective of this thesis is to analyse financial integration in the GCC region, and in particular to investigate the measurement and drivers and provide policy implications. The overall contribution of this thesis is therefore to provide a careful review and understanding of financial integration in the GCC region. This will offer valuable information for policy makers who adjust current policies or implement new policies in the GCC region.

In this regard, the thesis analyses the degree of international financial integration of GCC member countries with the rest of the world by employing several quantity-based indicators of international financial integration, based on foreign assets and liabilities. The thesis examines the impact of global financial crisis on GCC financial integration; it also investigates the determinants of the GCC’s international financial integration. It assesses the degree of stock market integration for GCC countries with the world portfolio, and each country’s diversification portfolio, based on the international asset pricing theory, by employing both a global systematic risk and a local market risk. The thesis develops a financial integration index for GCC stock markets and studies what drives their integration. Further, it examines the spillover effects from global (US) and regional (Saudi) stock markets
to GCC markets, and investigates the determinants of volatility spillovers from the Saudi to GCC stock markets. The thesis concludes by providing findings which have implications for policy makers of GCC countries.

Based on the objectives stated above, the thesis contributes to the literature by addressing the following research questions:

i. What are the quantity-based measures of financial integration?

ii. What are the drivers of international financial integration across GCC countries?

iii. What is the impact of global financial crisis on GCC’s financial integration?

iv. What is the magnitude of financial integration in each GCC stock market with the world’s and GCC market portfolios?

v. What are the determinants of a financial integration index for GCC stock markets?

vi. What are the magnitude and changing nature of return spillovers from Saudi Arabia and the United States to other GCC stock markets?

vii. What are the determinants of volatility spillovers from Saudi Arabia to the other GCC markets?

viii. What are the policy implications deriving from the findings regarding monitoring stock market integration and stability?

1.3 Significance of the Study

By analysing these questions, the study contributes to the literature in several significant ways. First, this is the first study to focus on the development of measures of international financial integration of GCC member countries with rest of the world based on external asset and liability positions, and empirically examines the drivers
influencing the international financial integration between the GCC countries and the rest of the world. Second, this is the first study to investigate the degree of stock market integration among GCC countries with the world portfolio and each country’s diversification portfolio (GCC market portfolio) by developing a financial integration index for GCC stock markets and examining the drivers of the market integration index by employing dynamic panel estimation techniques. Third, this is the first study to investigate the effects of spillovers from the US and Saudi stock markets to other GCC stock markets by considering innovations from the Saudi and US markets as regional and global shocks respectively; and to analyse the impact of determinants of volatility spillovers from Saudi Arabia to the GCC markets. No study so far appears to have explored the impact of spillovers from global (US) and regional (Saudi) stock markets to GCC markets.

1.4 Research Methodology

Research in this thesis employs several following methodologies to address the research questions. First, the thesis investigates the degree of international financial integration of GCC member countries with the rest of the world by constructing several quantity based measures of financial integration. The thesis uses various indicators derived from the literature, including indicators of financial depth, trade openness, economic development, and banking sector development. It employs linear dynamic GMM panel estimation techniques (Arellano Bond and Arellano–Bover/Blundell–Bond) to study the impact of various indicators on quantity based measures of financial integration.

Second, to study the degree of stock market integration in the six member countries of the GCC, the thesis employs an international asset pricing model
(IAPM) of time-varying market integration, based on Errunza and Losq (1985), that accommodates the evolving market structure from segmentation to integration. The model assumes a two-country world and two sets of securities. A useful feature of the Errunza and Losq model is that it delivers an aggregate measure of substitution, the integration index, which features the two extreme cases of integration and segmentation. This thesis employs a system of equations to examine time-varying integration: the first equation in the system is a pricing equation for the local market index, where the factors of world market covariance risk and super risk premium are priced, proportional to the conditional local risk. The second equation prices the GCC market portfolio using the world covariance risk; the last equation is the pricing equation for the world index portfolio. The prices of global and local risk are specified as a non-linear function of a set of global and local information variables, respectively. The law of motion for the time-varying conditional covariance matrix of excess returns in the system of the equations is parameterised using the multivariate DCC-GARCH model by Engle (2002). Finally, the study estimates i separate trivariate GARCH systems, one for each GCC market at a time and proceeds in two steps: first, the world return equation of the system is estimated. This provides us with estimates of the time-varying world price of risk and of the coefficients of the time-varying world variance; then these estimates are imposed in the i country estimations.

Third, in order to investigate the volatility spillover effects from a regional factor (Saudi) and global factor (United States) to GCC stock markets, the thesis allows the unexpected returns of any particular GCC stock market be driven by three sources of shocks: local, regional from Saudi Arabia, and global from the United
States. The thesis constructs a bivariate GARCH(1,1) model for the Saudi and US returns. The estimated innovations for the Saudi and US are then used as inputs for the univariate volatility spillover GARCH model for the GCC stock markets. To capture the leverage effect found in the returns of many stock indices, and to avoid imposing non-negativity restrictions on the values of the GARCH parameters to be estimated, the thesis employs the exponential GARCH (EGARCH) representation developed by Nelson (1991), where conditional variance depends on both the sign and the size of lagged residuals. The model is explicitly capable of capturing any asymmetric impact of shocks on volatility.

Finally, to investigate the determinants of volatility spillovers from Saudi Arabia to GCC economies, the thesis employs the GMM estimation technique (Arellano–Bover/Blundell–Bond) to alleviate bias caused by data, model specification and endogeneity issues.

1.5 Source of Data

- The data on weekly stock market indices in terms of US dollars is from Morgan Stanley Capital International (MSCI). The stock market indices data is for the six member countries of GCC (Bahrain, Kuwait, Oman, Qatar, Saudi, and UAE), the GCC regional market index, and the US global market index.

- The data on foreign assets and liabilities is derived from Lane & Milesi-Ferretti’s (2001, 2007) *External wealth of nations* (EWN) updated dataset and International Financial Statistics (IFS).

- The data on trade openness and M2 is from the World Bank’s world development indicators.
1.6 Plan of the Thesis

This thesis is presented in six chapters. The current chapter provides the background to the research topic, and outlines the objectives, methodology and organisation of study. Chapter 2 outlines the main concepts that undergird this thesis and provides the basis of the analytical framework of the chapters that follow. This chapter provides some background information about the establishment of Gulf Cooperation Council (GCC) and briefly describes the main three governance and decision-making bodies of the GCC. The chapter summarises the development of the GCC’s economic integration project since its inception in 1981 and provides the salient characteristics of GCC countries’ populations, identifies key economic indicators over the past decade, studies specific characteristics of GCC stock markets, and highlights impacts of the global financial crisis on the GCC. The chapter selectively surveys the literature on international finance and reviews the
issue of financial integration and the volatility of stock market returns. Finally, the chapter discusses the statement of the problem, and concludes.

Research in Chapter 3 fills a gap in the financial integration literature by analysing the quantity based degree of financial integration of GCC member countries with the rest of the world. The chapter focuses on the development of measures of financial integration in the GCC region, based on foreign assets and liabilities. It employs several indicators of international financial integration including financial depth, trade openness, economic development, and banking sector development. The chapter examines the impact of global financial crisis on quantity based measures of financial integration by employing several interaction variables to capture the change in financial integration measures due to financial depth, trade openness, GDP per capita and domestic credit, and employs linear dynamic GMM panel estimation techniques (Arellano Bond and Arellano–Bover/Blundell–Bond) to study the impact of various indicators on measures of financial integration. Finally, it provides implications for policy makers of GCC countries.

Chapter 4 assesses the time-varying degree of stock market integration for all members of the GCC, analysing their stock market integration with the world portfolio and each country’s diversification portfolio (GCC market portfolio) based on the international asset pricing model, and provides some insight into the empirical features of the determinants of the degree of stock market integration. This fills a gap in the financial integration literature by investigating the degree of stock market integration in GCC countries by employing both a global systematic risk and a local market risk. First, the chapter allows conditionally expected returns in any GCC
country to be affected by their covariance with the world and by the variance of the
country returns. Then it uses the multivariate DCC-GARCH model of Engle (2002)
to estimate the integration index for each country in the GCC and the rest of the
world. The model allows for a differing price of variance risk across countries, which
depends only on country-specific information, and a world price of covariance risk,
which depends only on global information. The chapter contributes to the existing
literature by developing a financial integration index for GCC stock markets over the
period from June 2002 to Oct 2013. The chapter next uses the pre-estimated index of
integration by DCC-GARCH model as dependent variable to study drivers of
financial integration index employing Arellano Bond and Arellano–Bover/Blundell–
Bond linear dynamic panel estimation techniques. Again, it provides policy
implications for GCC countries.

Chapter 5 examines the spillover effects from global (US) and regional (Saudi)
stock markets to the five GCC stock markets (Bahrain, Kuwait, Qatar, Oman and
UAE), using MSCI weekly stock market indices data from June 2005 to May 2013.
The chapter employs the EGARCH model to account for asymmetries in the
spillover volatility transmission mechanism by considering innovations from the
Saudi and US stock markets as regional and global shocks respectively. The chapter
analyses how much of the return volatility of any particular market in the GCC is
driven by a global factor and how much is left to be explained by a regional factor. It
also investigates the determinants of volatility spillovers from the Saudi stock market
to other GCC markets. Research on volatility spillovers in the GCC region is scarce,
and the chapter’s findings contribute to macroeconomic policy dimensions.
Finally, chapter six concludes the thesis summarising the main empirical findings and policy implications.
Chapter 2  Financial Integration in the GCC Region

The objective of this chapter is to outline the main concepts that undergird this thesis and, more specifically, provide the basis of the analytical framework that is applied in the chapters that follow. It provides information about the establishment of the GCC, briefly states the three main governance and decision-making bodies of the GCC, and summarises the development of the GCC’s economic integration project since its inception in 1981. It reviews the salient characteristics of the GCC countries' population, illustrates the key economic indicators of the past decade, studies specific characteristics of the GCC stock markets, and highlights the impacts of the global financial crisis on the GCC. The chapter selectively surveys the literature on international financial integration. Finally, the chapter discusses the statement of the problem and concludes.

This chapter is organised as follows: Section 1 outlines the definition, benefits and measures of financial integration. Section 2 presents general features of the GCC countries and summarises the key demographic and economic indicators. Section 3 presents an overview of the stock markets in the six GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE). Section 4 discusses the impact and response of financial crisis on the GCC region. Section 5 presents brief literature review. Section 6 discusses the statement of the problem and finally, section 7 concludes.
2.1 Definition, Benefits and Measures of Financial Integration

2.1.1 Definition of Financial Integration

There are various definitions of financial integration. Adam et al. (2002) state that financial markets are integrated when the law of one price holds. This means that assets generating identical cash flows command the same return, regardless of the domicile of the issuer and of the asset holder. Baele et al. (2004) state that the market for a given set of financial instruments and/or services is fully integrated if all potential market participants with the same relevant characteristics (i) face a single set of rules when they decide to deal with those financial instruments or services, (ii) have equal access to the set of financial instruments and/or services, and (iii) are treated equally when they are active in the market.4

This definition of financial integration by Baele et al. (2004) contains three important features. First, it is independent of the financial structures within regions. Financial structures encompass all financial intermediaries, institutions or markets, including how they relate to each other with respect to the flow of funds to and from households, governments and corporations. It is not unusual for regions to develop different financial structures before integration takes place. Second, frictions in the process of intermediation—that is, access to or investment of capital either through institutions or markets—can persist after financial integration is completed. The definition emphasises that financial integration is not about removing frictions that

4 Garcia-Herrero and Wooldridge (2007) state that the process of cross-border financial integration involves opening a country’s financial markets and institutions to foreign players and permitting local market participants to invest abroad by removing barriers to capital flow, removing obstacles and discrimination of foreign players, and harmonization of standards and laws.
hamper the optimal allocation of capital: rather, it is concerned with the symmetric or asymmetric effects of existing frictions in different areas. In other words, even in the presence of frictions, several areas can be financially integrated as long as the frictions affect the areas symmetrically.

Third, this definition of financial integration separates the two constituents of a financial market, namely the supply of and the demand for investment opportunities. Full integration requires the same access to banks or trading, and clearing and settlement platforms for both investors and firms regardless of their region of origin. Once access has been granted, full integration requires that there is no discrimination among comparable market participants based solely on their location of origin. When a structure systematically discriminates against foreign investment opportunities due to, say, national legal restrictions, then the area is not financially integrated.5

The definition also encompasses the law of one price, which states that if assets have identical risks and returns, then they should be priced identically regardless of where they are transacted. In other words, if a firm issues bonds in two countries or regions, it must pay the same interest rate to both sets of bondholders (Jappelli & Pagano, 2008). If the law of one price does not hold, then there is room for arbitrage opportunities.

2.1.2 Benefits of Financial Integration

Several empirical studies have identified the potential welfare gains from financial integration in terms of risk-sharing benefits (Lewis 2000; Obstfeld 1994) and of investment activity, stock market development and overall economic growth

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5 See Baele et al. (2004).
Risk-sharing literature argues that financial integration should offer additional opportunities to share risk and to smooth consumption inter-temporally. Obstfeld (1994) finds that financial integration facilitates risk-sharing and thereby should enhance production specialisation and capital allocation. Given their relatively low endowment of physical capital and inherently greater consumption volatility, developing economies in particular seem to gain most from the process of financial integration.

Kalemli-Ozcan, Sørensen & Yosha (2003) provide empirical evidence that sharing risk across regions enhances specialisation in production and, ultimately, economic growth. According to Baele et al. (2004), increases in the set of financial instruments and in cross-ownership of assets resulting from financial integration should offer additional possibilities to diversify portfolios and share idiosyncratic risk across regions. Kim, Moshirian & Wu (2005) find evidence that financial market integration promotes risk sharing benefits through asset markets, and that may create economic incentives for countries to join a currency union and give up control of their monetary policy.

Another implication of financial integration, linked to the effects of risk sharing, is additional economic growth. Economic growth can be influenced by financial integration through several channels, like reductions of the cost of capital, development of the local financial sector, institutions’ quality, and specialisation. It is also influenced by development of banking and the stock market. Greenwood and Jovanovic (1990) find that producing information through intermediaries causes a greater and better allocation of capital, contributing to economic growth. Levine and Zervos (1998), focusing on equity markets, find that the initial level of stock market
liquidity and banking development is significantly and positively correlated with the future growth rate. Levine, Loayza & Beck (2000) find a strong relationship between financial intermediary development and long-term economic growth. Bekaert, Harvey & Lumsdaine (2002) find that equity market liberalisation, defined as the right given to foreign investors to trade in domestic securities and to domestic investors to trade in foreign securities, increases average annual real economic growth; while Rousseau (2002) provides empirical evidence that financial development promotes investment and business by reallocating capital. This highlights the importance of financial integration as an additional step toward financial development, and thus to greater economic growth.

2.1.3 Measures of Financial Integration

Financial markets are integrated if the returns of identical assets that are issued in various countries command the same returns. If this is not the case, it indicates that there are barriers to capital movement hampering market integration. Adam et al. (2002) define four broad categories where various indicators can be applied to assess the degree and speed of financial market integration: (i) indicators of credit and bond market integration; (ii) indicators of stock market integration; (iii) indicators of integration based on the economic decisions of households and companies; and (iv) indicators of institutional differences that may induce financial market segmentation.

The first category of measures are indicators of credit and bond market integration. Interest rate differentials are the most common measure of credit market integration. Credit market integration indicators are especially well applicable in a common currency area, as no exchange rate risk exists: in a common currency,
interest rates for assets of the same maturity and the same credit risk class should be identical.

Adam et al. (2002), Baele et al. (2004) and Jappelli and Pagano (2008) use interest rate differentials to analyse the degree of convergence in the interbank market, the government bond market, and corporate loan markets in the euro area. Adam et al. (2002) use the concepts of beta convergence and sigma convergence to demonstrate the process of financial market integration in the euro area countries. The concept of beta convergence enables identification of the speed at which shocks are eliminated in the individual financial markets. A negative beta coefficient signals the existence of convergence, and the magnitude of the beta coefficient expresses the speed of convergence: the higher the absolute value of the beta coefficient, the higher the speed of convergence. The concept of sigma convergence captures the differences between the yields on identical assets in different countries at a given time.

Another set of indicators is based on the shares of foreign liabilities and assets held by the national bank sector, and considers cross-border lending and borrowing as an alternative way of achieving credit market integration. Adam et al. (2002) analyse the shares of foreign assets and liabilities held by each national banking sector and evaluate them relative to a benchmark portfolio to assess the degree of the home bias in these portfolios. Overall, this set of indicators by Adam et al. suggests that convergence is achieved in the money market and government bond market in European Union countries.

The second category of measures are indicators of stock market integration. A simple yet possibly misleading indicator for stock market integration is taken from
the dynamics of the correlation of stock market returns. An important note is that increased correlations are not necessarily a proof of financial integration, as they may reflect changes in the correlation of real and policy shocks in individual countries. This indicator would be relevant in measuring the degree of financial integration only to the extent that the stochastic process of common shocks is constant over time.

Ayuso and Blanco (2001) measure to what extent the returns on other markets can help to explain the returns on a particular market. They compare the squared residuals of a simple univariate autoregressive model for each return and the squared residuals of a vector autoregressive model for the returns of all the countries considered. As the sum of squared residuals is reduced when other market returns are taken into account to explain the behaviour of stock returns, it can be interpreted as a sign of increased financial linkage.

Fratzscher (2002) measures the degree of market integration by the extent to which domestic returns depend on contemporaneous world market shocks, and when domestic returns are expressed as a function of available information from the past and contemporary innovations in domestic as well as foreign markets. Baele et al. (2004) apply a ‘news-based’ measure of integration to the equity markets. They assume that local equity returns react to two common factors, innovations in the aggregate euro area and in US equity markets, which serve as a proxy for global factors. While all country returns share the same factors, they are allowed to have different sensitivities, or betas, to common shocks. These betas measure the intensity by which euro area and world return shocks are transmitted to local equity markets. They interpret the part of local returns not explained by common factors as the return reaction to purely local news.
Asset pricing models are used to estimate and compare ex-ante returns in various markets because ex-post returns are poor measures of equity premium. According to the Capital Asset Pricing Model (CAPM), in the presence of fully integrated stock markets only covariance risk with the world portfolio is priced in ex-ante returns and country-specific risk is not priced, since it is diversified through international investments (Stulz 1999). According to Bekaert and Harvey (1995), the CAPM offers three testable indicators of segmentation: first, if a country’s beta with the world market does not fully capture the risk premium that is observed on its equity market; second, if the real rate of return on the risk free asset differs across countries; and third, if the component of country specific risk that could be diversified internationally has explanatory power for expected returns.

The third category of indicators is based on the economic decisions of households and companies and particularly their choices between foreign and domestic assets. One of the classic tests of financial integration is based on the saving–investment correlation. Feldstein and Horioka (1980) suggest that this correlation can measure the degree of regional capital segmentation. Under perfect capital mobility and unchanged investment opportunities, an increase in the saving rate in one region will cause an increase in investment in all regions. Large correlations between national saving and investment indicate strong segmentation. The Feldstein–Horioka test measures the extent to which a higher domestic saving rate in a country associates with a higher rate of domestic investment. In the case of perfect world capital mobility, there should be no relation between domestic saving and domestic investment, because the saving decision in each country is a response
to worldwide opportunities for investment, and investment is financed by a worldwide pool of capital.

Jappelli and Pagano (2008) apply the Feldstein–Horioka (1980) test to interpret the evolution of financial integration over time by employing year-by-year regressions. Their study shows that EU member countries perform better than the OECD countries in the test. Further insight into the saving–investment correlation is offered by Thiel (2001), who plots the ratio of investment and savings on GDP with the 45 per cent degree line that shows equality and a sign of a closed economy. The illustration suggests that the European Union as whole is a closed economy, whereas individual EU member countries are visibly more open.

Another indicator of financial integration that relies on consumer choices is based on the idea that integrated financial markets should allow for international risk sharing. To test if financial markets facilitate full risk sharing to consumers located in different countries, the covariance of consumption across different regions or countries is studied. An overall indicator of risk sharing is obtained by regressing the growth rate of consumption on the growth rate of GDP as a proxy for country’s idiosyncratic risk. Adam et al. (2002) compute a yearly indicator of risk sharing by estimating a separate cross sectional regression of the growth rate of consumption on the growth rate of GDP for each year and they reject the null hypothesis of perfect risk sharing for each EU member country for years from 1980 to 2000.

Finally, the integration of financial markets has an impact on the corporate financing decisions of companies. With financial market integration, firms previously restricted to domestic financing choices have now a choice of a wider menu of instruments at the same standard terms corresponding to their risk grade but
 irrespective of their nationality. Danthine, Giavazzi & von Thadden (2001) find that that the private bond market has shown impressive growth after the introduction of the euro, in aggregate volumes as well as in size of the largest issues.

The fourth category of financial integration measures are based on indicators of institutional differences in the way the legal system, and the corporate governance arrangements work. The indicators based on legal institutions do not check whether financial markets are segmented or integrated; rather, they identify reasons for segmentation. For example, if persistent interest rate differentials of identical financial instruments are observed in two countries, institutional characteristics can verify whether the reason for the segmentation lies in the different tax codes of the two countries.

Djankov et al. (2001) construct two indicators of efficiency of the legal system: an aggregate index of regulation of dispute resolution and the expected duration of the procedure for 105 countries. They find that, within the EU, civil law countries are more heavily regulated than common law countries. Large differences also exist across civil law countries, depending on legal traditions. Other important legal barriers may arise from heterogeneous bankruptcy laws across countries, as well as from large differences in taxation of income and capital.

2.2 The Gulf Cooperation Council

2.2.1 Institutional and Economic Integration in the GCC

The Gulf Cooperation Council, established in May 1981 by signing the Charter of the Cooperation Council, was mainly motivated by the desire to enhance external security. The GCC consists of six countries: Kuwait, Bahrain, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE). The Charter stipulates the main three
governance and decision-making bodies of the GCC and lays down their functions and their mutual relations; they are the Supreme Council, the Ministerial Council, and the Secretariat General.

The Supreme Council is the GCC’s highest authority and main decision-making body. It consists of the heads of the Gulf states; its presidency is rotated annually. It meets once a year, with the option of extraordinary sessions at the request of individual member states. The Supreme Council’s main tasks are to provide policy direction, review reports and recommendations submitted by subsidiary bodies, and appoint the Secretary General of the GCC. Its resolutions are passed with a unanimous vote for substantial matters and a majority vote for procedural issues. Agreements signed between member states are classified as mandatory or non-mandatory.

The Ministerial Council is composed of foreign ministers or other ministers as delegated by member states. It proposes policies and prepares recommendations, studies and projects in all fields. The Ministerial Council holds quarterly meetings, with the option of extraordinary sessions at the request of member states. At the ministerial level, a number of specialised committees are also established, of which the most important in respect to economic integration is the Committee for Financial and Economic Cooperation, which is composed of the Ministers of Finance and Economics. Ministerial committees prepare studies and submit recommendations to the Supreme Council through the Ministerial Council. Another important institution is the Committee of the Governors of Monetary Agencies and Central Banks which meets twice a year and reports to the Financial and Economic Cooperation
Committee; its technical subcommittees include the Banking Supervision Committee, the Payment Systems Committee and the Monetary Union Committee.

The Secretariat General is the institution with the most pronounced supranational character. It is the administrative and executive body, responsible for preparing the meetings of the Supreme and Ministerial Councils, as well as providing background materials and requested studies. It prepares studies and reports and monitors implementation of past decisions. The Secretariat General is located in Riyadh with a staff of approximately 500, and is headed by the Secretary General, who serves a three-year term. The Secretary General nominates the Assistant Secretaries General, who are appointed by the Ministerial Council for renewable three-year terms. The Secretariat General consists of six Directorates (Economic Affairs, Military Affairs, Political Affairs, Environmental and Human Resources, Legal Affairs and Financial and Administrative Affairs) and an information centre.

The GCC has also set up a number of specialised agencies in charge of designing and implementing technical standards, undertaking commercial arbitration, and registering patents. These agencies are headed by a board of directors composed of representatives of the member states, and have their own permanent technical staff. Among these agencies are the Standardization and Metrology Organization for GCC, the Technical Telecommunications Bureau, the Regional Committee for Electrical Energy Systems registered, and the Patent Office.

In November 1981, GCC leaders signed the Unified Economic Agreement with the objective of realising coordination, integration and cooperation among member states in various aspects of economic affairs. During the first two decades of its establishment, when the GCC focused on coordinating policies in specified areas, the
institutional mechanisms remained fairly stable. By 1983, the GCC had implemented the exemption of most domestic products from customs duties and simplified customs procedures and travel among GCC states. A preferential trade arrangement led to the creation of a free trade agreement in agricultural and industrial products (though not petroleum products) and free movement of the factors of production. Retail and wholesale trade opened up to any GCC national in 1990.

Progress has been made in regional economic integration. GCC countries have largely unrestricted intraregional mobility of goods, services, national labour and capital, along with full national treatment in any GCC country regarding ownership and economic activity.

The Unified Economic Agreement remained the legal basis for much of the GCC’s integration process until it was replaced in 2001 by the new Economic Agreement between the States of the Cooperation Council, which brought a renewed focus on trade, investment and other economic issues. The new Agreement sets ambitious targets for the next stage of the integration process, drawing up a map for the creation of a fully integrated common market and the preparation of a monetary union. In 2002, the GCC decided on the gradual implementation of a unified economic agreement aimed at establishing a single market, and of forming a monetary union at a certain stage.

A Customs Union Agreement was signed in January 2003, and a single common external tariff of five per cent implemented. The agreement aims to remove restrictions on internal trade, and to establish common external tariffs and unified customs code. The member states have agreed to eliminate the use of tariff escalation for industry protection, switching instead to exemptions for imports of intermediate
inputs and equipment for domestic production and export industries. This is an important landmark in the GCC’s efforts to promote the free movement of goods and to foster trade integration among member states.

In May 2007, the GCC member states agreed upon the following monetary and fiscal convergence criteria: (i) the inflation rate should be no higher than the weighted average of all members plus two percentage points; (ii) the interest rate should not exceed the average of the lowest three interbank rates plus two percentage points; (iii) there should be a minimum four months reserves coverage in terms of imports; (iv) fiscal deficits should not exceed three per cent of GDP; and (v) public debt should be lower than 60 per cent of GDP.

To grant GCC citizens equal treatment in all economic activities, the GCC declared common market status in 2008. The GCC common market aims to create a single environment where citizens of member countries enjoy equal rights and privileges, including the rights to move, settle and work, to receive social protection, retirement, health, education and social services, and to engage in various economic activities and services. It also calls for unrestricted rights of property ownership and capital movement, and similar tax treatment and stock ownership, among others. Full implementation of the common market will require changes to national laws, including those pertaining to limits on company ownerships by nationals.

In 2010, the GCC member countries approved the Statute of the Monetary Council of the Cooperation Council for the Arab States of the Gulf, which focuses on the development and coordination of the monetary and exchange rate policies for national currencies until the establishment of the Central Bank; preparation for the issuance of the banknotes and coins of the single currency, and development of a
uniform framework for the introduction and circulation of the single currency in the single currency area. Given this sequence, the process of economic integration in the GCC is designed as an incremental approach, and it is intended that monetary union shall be established only after considerable groundwork in terms of economic integration has been laid.

2.2.2 GCC Key Characteristics

The GCC countries share several homogeneous aspects such as a common language, culture, and religious heritage, and comparable economic structures; these have been the main drivers behind the creation of the GCC by its six member countries. There are also important differences. The GCC comprises one country of moderate size (Saudi Arabia, with an area of 2,150,000 sq. km) and five smaller ones. Bahrain is the smallest, with 712 sq. km. Similarly, the population of Saudi Arabia surpasses that of any other GCC country, and its economy produces nearly half the total output of the GCC (Table 2.1). Saudi Arabia is, therefore, the dominant regional power, and has indeed played the central role in establishing and developing regional cooperation in the GCC.

All GCC currencies except for the Kuwaiti dinar are pegged to the US dollar. The Kuwaiti dinar is managed with respect to a basket of currencies in which the weight of the dollar is substantial. As GCC currencies are firmly pegged to the US dollar, currency diversification is not a central determinant of investments in the region, and the exchange-rate risk exposure for issuers from issuing in US dollar, in particular, is negligible.
<table>
<thead>
<tr>
<th>Country</th>
<th>Overview</th>
<th>Capital</th>
<th>Currency</th>
<th>Area (sq. km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>The Kingdom of Bahrain is an island country in the Arabian Gulf and is relatively highly diversified away from oil.</td>
<td>Manama</td>
<td>Bahraini Dinar Pegged to USD = 0.376 dinar</td>
<td>712</td>
</tr>
<tr>
<td>Kuwait</td>
<td>Kuwait is slowly beginning to diversify its economy, with the hope of reducing dependency on oil revenue.</td>
<td>Kuwait</td>
<td>Kuwaiti Dinar Pegged to a currency basket USD = 0.282</td>
<td>17,818</td>
</tr>
<tr>
<td>Oman</td>
<td>Oman is regarded as one of the more conservative and traditional GCC states, where the local citizens are still a majority of the total population.</td>
<td>Muscat</td>
<td>Omani Riyal Pegged to USD = 0.385 riyal</td>
<td>309,500</td>
</tr>
<tr>
<td>Qatar</td>
<td>Qatar has one of the highest levels of GDP per capita in the world, mainly driven by oil and natural gas.</td>
<td>Doha</td>
<td>Qatari Riyal Pegged to USD = 3.641 riyal</td>
<td>11,521</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>KSA is one of the largest economies in the world, accounting for 55% of total GDP of GCC countries.</td>
<td>Riyadh</td>
<td>Saudi Riyal Pegged to USD = 3.745 riyal</td>
<td>2,150,000</td>
</tr>
<tr>
<td>UAE</td>
<td>UAE is a federation of seven emirates, of which Abu Dhabi is the largest in area.</td>
<td>Abu Dhabi</td>
<td>UAE Dirham Pegged to USD = 3.675 dirham</td>
<td>83,600</td>
</tr>
</tbody>
</table>

Source: Deloitte (2013).

2.2.3 Economic Features of the GCC

The economic structures of GCC countries are very similar. Oil and gas remain the region’s most important products. Reliance on non-citizen labour and expatriate workers account for about two-thirds of the private sector in most GCC countries. Five currencies of GCC countries are pegged to the dollar with monetary policy directed at maintaining a stable exchange rate and controlling inflation. In addition, non-oil taxation is low, consisting mainly of income tax on foreign corporations.
The global importance of the GCC member states comes from the fact that they jointly account for 34 per cent of global proven oil reserves, and around 21 per cent of global natural proven gas reserves. At the present production levels of about 21 per cent of global oil and 8.4 per cent of global gas, the GCC’s reserves are being exhausted two to three times more slowly than those of other oil and gas producers. This suggests that the GCC countries will be among only a few remaining suppliers of oil in the 22nd century. The amount of wealth that is generated from oil and gas exports allows GCC economies to surpass unprecedented development, with high standards of living and modern physical infrastructure.

Saudi Arabia is the world’s largest oil producer, with an average production of 9.75 million barrels per day in 2012. UAE and Kuwait are also among the top ten world oil producers, respectively producing 3.1 and 2.7 million barrels per day in 2012. Saudi Arabia holds more than 265 billion barrels of global oil reserves and accounts for more than 53 per cent of all oil reserves in GCC countries. Qatar is the third largest natural gas reserve worldwide after Russia and Iran, and holds nearly 11 per cent of the world’s proven reserves and 50 per cent of all gas reserves in GCC countries. Oil and gas resources in Oman and Bahrain are considerably lower than in other GCC countries; they produced 0.9 and 0.05 million barrels of oil per day in 2012, respectively.

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### Table 2.2 GCC economic indicators for 2012

<table>
<thead>
<tr>
<th></th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
<th>GCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal GDP (billions)</td>
<td>27.117</td>
<td>184.54</td>
<td>78.29</td>
<td>192.402</td>
<td>711.05</td>
<td>383.799</td>
<td>1,577</td>
</tr>
<tr>
<td>GDP per capita (thousands)</td>
<td>23.55</td>
<td>48.76</td>
<td>25.35</td>
<td>104.75</td>
<td>24.52</td>
<td>43.77</td>
<td>45.12</td>
</tr>
<tr>
<td>Oil reserves (billion barrels)</td>
<td>0.12</td>
<td>101.50</td>
<td>5.50</td>
<td>25.24</td>
<td>265.85</td>
<td>97.80</td>
<td>496.01</td>
</tr>
<tr>
<td>Gas reserves (billion cubic)</td>
<td>0</td>
<td>1,784</td>
<td>950</td>
<td>25,069</td>
<td>8,235</td>
<td>6,091</td>
<td>42,129</td>
</tr>
<tr>
<td>Government gross debt (% of GDP)</td>
<td>39.10</td>
<td>7.69</td>
<td>3.25</td>
<td>27.70</td>
<td>6.08</td>
<td>18.11</td>
<td>16.99</td>
</tr>
</tbody>
</table>

Source: International Monetary Fund, World Economic Outlook Database, October 2013.

GCC countries have experienced strong real GDP growth since 2003. For the GCC as a whole, real GDP has increased by 6.9 per cent per year on average over the last ten years. In 2012, the real GDP growth was 5.28 per cent; the highest growth was 6.28 per cent in Qatar, 6.18 per cent in Kuwait and 5.12 per cent in Saudi Arabia. The high oil prices of recent years have significantly increased GCC member states’ nominal GDP and GDP per capita. The total nominal GDP of GCC economies has more than doubled from 678 billion in 2005 to 1.57 trillion in 2012. Nominal GDP growth has increased at almost 16 per cent per year on average since 2003; in 2012, the nominal GDP growth was nine per cent. Individual member states differ significantly in terms of nominal GDP: for instance, Saudi Arabia is by far the largest representing about 45 per cent of the total; UAE comes next with about 24 per cent. Bahrain is smallest with about two per cent, as shown in Figure 2.1.
Figure 2.1 Share of GCC nominal GDP by country in 2012
Source: International Monetary Fund October 2013, *World economic outlook database*.

Between 2003 and 2012, GDP per capita for the GCC as a whole increased by 127 per cent, with Qatar experiencing the strongest increase at 219 per cent. The significant growth in GDP per capita in Qatar is due to the development of the gas sector, combined with a relatively low population growth. In 2012, GDP per capita ranged from about US$ 23,554 in Bahrain to US$ 104,756 in Qatar. GDP per capita in Kuwait and UAE was US$ 48,761 and US$ 43,773, respectively, and was lower in Oman (US$ 25,536) and Saudi Arabia (US$ 24,523). Average GDP per capita in GCC countries stands at US$ 45,120.

The GCC countries have accumulated large fiscal and current account surpluses in recent years. Part of the surplus is used to retire domestic and external debt, resulting in a decline in general government gross debt from 41 per cent of GDP in 2001 to 17 per cent in 2012 (Table 2.2).
2.2.4 Demographic Features of the GCC

In 2012, the total population of the six GCC member states was 47.6 million, which is an increase of about three per cent from the estimated population of 2011. Saudi Arabia is by far the largest of the GCC countries, with an estimated population of about 28.9 million people, around 61 per cent of the total population (Table 2.3). Of the other five countries, UAE is the second most populated state with an estimated 8.7 million people, about 18 per cent of the GCC’s total population. Kuwait comes third with an estimated 3.7 million, followed by Oman and Qatar with 3.1 and 1.8 million people, respectively. Bahrain is the smallest GCC country with an estimated population of 1.2 million people, accounting for around three per cent of the GCC population.

Table 2.3 GCC population (millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
<th>GCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>0.720</td>
<td>2.754</td>
<td>2.570</td>
<td>0.761</td>
<td>22.560</td>
<td>3.761</td>
<td>33.126</td>
</tr>
<tr>
<td>2005</td>
<td>0.734</td>
<td>2.991</td>
<td>2.618</td>
<td>0.888</td>
<td>23.330</td>
<td>4.106</td>
<td>34.667</td>
</tr>
<tr>
<td>2006</td>
<td>0.749</td>
<td>3.183</td>
<td>2.670</td>
<td>1.042</td>
<td>24.122</td>
<td>5.012</td>
<td>36.778</td>
</tr>
<tr>
<td>2007</td>
<td>0.764</td>
<td>3.400</td>
<td>2.726</td>
<td>1.226</td>
<td>24.941</td>
<td>6.219</td>
<td>39.276</td>
</tr>
<tr>
<td>2008</td>
<td>0.779</td>
<td>3.442</td>
<td>2.785</td>
<td>1.448</td>
<td>25.787</td>
<td>8.074</td>
<td>42.315</td>
</tr>
<tr>
<td>2010</td>
<td>1.107</td>
<td>3.582</td>
<td>2.519</td>
<td>1.686</td>
<td>27.137</td>
<td>8.264</td>
<td>44.995</td>
</tr>
<tr>
<td>2011</td>
<td>1.129</td>
<td>3.682</td>
<td>2.993</td>
<td>1.708</td>
<td>28.370</td>
<td>8.512</td>
<td>46.394</td>
</tr>
<tr>
<td>2012</td>
<td>1.151</td>
<td>3.785</td>
<td>3.088</td>
<td>1.837</td>
<td>28.994</td>
<td>8.768</td>
<td>47.623</td>
</tr>
</tbody>
</table>

Source: International Monetary Fund, World Economic Outlook Database, October 2013.

The population growth of the GCC represents an increase of more than 44 per cent during the last ten years, and shows significant growth at four per cent on average per year between 2004 and 2012. This population growth is associated with both high birth rates and the inflow of expatriate labour in the wake of the
educational and technical skills necessary for private sector employment. Labour inflows are particularly pronounced in UAE, Qatar, and Kuwait. A number of policies have been established to nationalise the labour force in order to reduce imbalance in the population structure, but despite them the expatriate labour force has continued to grow rapidly. In 2010, non-citizen labour accounted for 43 per cent of the total GCC population, rising from 66 per cent in 2009 to 68 per cent of the total labour force (Table 2.4).

Table 2.4 GCC population and labour force in 2010 (%)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>54</td>
<td>76</td>
</tr>
<tr>
<td>Kuwait</td>
<td>60</td>
<td>83</td>
</tr>
<tr>
<td>Oman</td>
<td>29</td>
<td>75</td>
</tr>
<tr>
<td>Qatar</td>
<td>85</td>
<td>94</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>31</td>
<td>55</td>
</tr>
<tr>
<td>UAE</td>
<td>89</td>
<td>96</td>
</tr>
</tbody>
</table>


2.3 Features and Characteristics of the GCC Stock Markets

The year of inception of stock markets in the GCC region differs, but the real beginning of these markets occurred in the 1980s and 1990s. The process of trading shares of companies with the public in Kuwait and Saudi Arabia has quite a long history, and can be traced back to the 1950s when several joint stock companies were established. The Kuwait and Saudi stock markets began to emerge in the late 1970s when the number of joint stock companies increased considerably. In 1977, the first stock exchange was inaugurated, and is referred to as the Kuwait Stock Exchange
(KSE). In the following decade, the government of Kuwait issued a number of laws and rules to regulate stock trading activities, culminating in August 1983 with the issuance of an Amiri Decree establishing the KSE as an independent financial institution. The Saudi market remained informal until early 1984, when the government started to form a regulated market for trading, along with the necessary systems. The other GCC stock markets were established in the 1980s. Bahrain’s was established in 1987, but organised and regulated trading started in 1989. Similarly, Oman’s stock market was established in 1988 and activities started in 1989, while Qatar established its stock market in 1995 and officially started operations in May 1997. The most recently established markets are the Abu Dhabi securities exchange and Dubai financial market in 2000.

Table 2.5 GCC stock markets

<table>
<thead>
<tr>
<th>Year</th>
<th>Stock Market</th>
<th>Year of establishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>Bahrain Bourse (BHB)</td>
<td>1987</td>
</tr>
<tr>
<td>Kuwait</td>
<td>Kuwait Stock Exchange (KSE)</td>
<td>1977</td>
</tr>
<tr>
<td>Oman</td>
<td>Muscat Securities Market (MSM)</td>
<td>1988</td>
</tr>
<tr>
<td>Qatar</td>
<td>Qatar Exchange (QE)</td>
<td>1995</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>Saudi Stock Exchange (Tadawul)</td>
<td>1984</td>
</tr>
<tr>
<td>UAE</td>
<td>Abu Dhabi Securities Exchange (ADX)</td>
<td>2000</td>
</tr>
<tr>
<td>UAE</td>
<td>Dubai Financial Market (DFM)</td>
<td>2000</td>
</tr>
</tbody>
</table>

Source: GCC Stock Market Websites.

Stock markets in the GCC region are classified as frontier markets by global index compiler MSCI, due to a number of market and institutional issues including

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8 The MSCI market classification framework consists of three criteria: economic development, size and liquidity, and market accessibility.
liquidity, lack of effectiveness of their delivery versus payment settlement system, ownership limits on foreign investments, and other reasons. Frontier markets are those in which regional factors dominate over global factors (Balcilar, Demirer & Hammoudeh 2013). They are investable, but have lower market capitalisation and liquidity than more developed emerging markets. Frontier stock markets typically attract investors seeking high, long-term returns and low correlations with other markets. The MSCI Frontier Markets Index rose 21 per cent in 2013.9

The GCC stock markets have improved in the last decade for several reasons, including the achievement of higher economic growth, monetary stability, stock market reforms, and privatisation. Index compiler MSCI has consequently upgraded Qatar and UAE to emerging market from frontier market status, effective from May 2014. Qatar and UAE have made considerable efforts on the regulatory front to gain this status upgrade. MSCI decided to upgrade Qatar to emerging market because of its efforts to raise foreign ownership limits for stocks, as well as its reforms to settlement systems and trading facilities. UAE’s current foreign ownership limit of 49 per cent is satisfactory to meet MSCI criteria and there is an expectation that it will be further relaxed in coming years.

The upgrade to emerging market from frontier market status is seen as a milestone for financial markets in both countries, and is an important development for all GCC countries. This will mark a new era for their capital flows and facilitate more access to funds from around the globe. It is also likely to strengthen the appeal of the markets to a broader range of investors to whom the relatively strong growth,
solid public finances and sizeable currency reserves of the GCC region are already looking attractive.

As shown in Table 2.6, the number of listed companies in the stock markets in the GCC countries in 2003 reached 363, with total market capitalisation equivalent to US$ 288.5 billion. By 2012 the number of listed companies reached 658, with total market capitalisation of around US$ 701 billion, of which the Saudi equity market accounts for 53 per cent, followed by the Qatar at 18 per cent, Kuwait at 14 per cent and UAE at ten per cent. During the same period, Kuwait recorded the largest increase in listings with 92 joint stock companies, followed by Saudi Arabia with 88 companies. Market capitalisation as a share of GDP at end-2012 amounted to 44 per cent, with Qatar’s highest at 66 per cent, followed by Bahrain at 59 per cent and Kuwait at about 53 per cent. The volume of shares traded in the GCC soared during the boom years, from about $214 billion in 2003 to a peak of $1.6 trillion in 2006, at which stage most markets experienced a bubble associated with the oil boom; they levelled off at $573 billion in 2012.

**Table 2.6 Key stock market indicators**

<table>
<thead>
<tr>
<th>Year</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
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<td>42</td>
<td>47</td>
<td>49</td>
<td>43</td>
<td>45</td>
<td>49</td>
<td>44</td>
<td>44</td>
<td>43</td>
</tr>
<tr>
<td>Kuwait</td>
<td>97</td>
<td>113</td>
<td>143</td>
<td>163</td>
<td>181</td>
<td>202</td>
<td>207</td>
<td>215</td>
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<tr>
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<td>96</td>
<td>96</td>
<td>96</td>
<td>124</td>
<td>120</td>
<td>122</td>
<td>120</td>
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<td>42</td>
<td>48</td>
<td>43</td>
<td>42</td>
<td>42</td>
</tr>
<tr>
<td>Saudi</td>
<td>70</td>
<td>73</td>
<td>77</td>
<td>86</td>
<td>111</td>
<td>127</td>
<td>135</td>
<td>146</td>
<td>150</td>
<td>158</td>
</tr>
<tr>
<td>UAE</td>
<td>30</td>
<td>50</td>
<td>79</td>
<td>81</td>
<td>90</td>
<td>96</td>
<td>95</td>
<td>101</td>
<td>104</td>
<td>102</td>
</tr>
</tbody>
</table>

| Market capitalisation of listed companies (billions US$) |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |

38
### Market capitalisation of listed companies (% of GDP)

<table>
<thead>
<tr>
<th>Year</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>99.53</td>
<td>124.09</td>
<td>23.27</td>
<td>113.46</td>
<td>73.31</td>
<td>30.36</td>
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<td>2004</td>
<td>120.27</td>
<td>116.70</td>
<td>25.64</td>
<td>167.25</td>
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<td>55.49</td>
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<td>2005</td>
<td>129.00</td>
<td>160.99</td>
<td>49.41</td>
<td>202.87</td>
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<td>115.95</td>
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<tr>
<td>2006</td>
<td>133.22</td>
<td>126.96</td>
<td>43.90</td>
<td>201.76</td>
<td>123.85</td>
<td>115.95</td>
</tr>
<tr>
<td>2007</td>
<td>152.29</td>
<td>163.91</td>
<td>55.04</td>
<td>120.04</td>
<td>98.88</td>
<td>121.11</td>
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<td>2008</td>
<td>96.68</td>
<td>72.70</td>
<td>24.62</td>
<td>66.34</td>
<td>73.13</td>
<td>80.74</td>
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<td>2009</td>
<td>87.65</td>
<td>90.58</td>
<td>36.92</td>
<td>90.03</td>
<td>67.09</td>
<td>70.77</td>
</tr>
<tr>
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<td>79.45</td>
<td>99.74</td>
<td>34.46</td>
<td>98.78</td>
<td>71.33</td>
<td>77.08</td>
</tr>
<tr>
<td>2011</td>
<td>59.05</td>
<td>62.69</td>
<td>28.18</td>
<td>73.14</td>
<td>50.62</td>
<td>71.33</td>
</tr>
<tr>
<td>2012</td>
<td>59.24</td>
<td>52.61</td>
<td>25.68</td>
<td>65.68</td>
<td>52.51</td>
<td>67.95</td>
</tr>
</tbody>
</table>


### Stocks traded, total value (billion US$)

<table>
<thead>
<tr>
<th>Year</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>0.27</td>
<td>52.73</td>
<td>1.25</td>
<td>0.00</td>
<td>159.06</td>
<td>1.00</td>
</tr>
<tr>
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<td>1.79</td>
<td>0.00</td>
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<tr>
<td>2005</td>
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<td>94.01</td>
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<td>143.13</td>
</tr>
<tr>
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<td>1.43</td>
<td>55.89</td>
<td>3.21</td>
<td>20.57</td>
<td>1403.03</td>
<td>113.00</td>
</tr>
<tr>
<td>2007</td>
<td>1.63</td>
<td>120.70</td>
<td>3.32</td>
<td>25.51</td>
<td>679.84</td>
<td>150.34</td>
</tr>
<tr>
<td>2008</td>
<td>2.96</td>
<td>122.74</td>
<td>5.43</td>
<td>25.51</td>
<td>524.72</td>
<td>144.89</td>
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<tr>
<td>2009</td>
<td>0.86</td>
<td>69.93</td>
<td>8.40</td>
<td>18.31</td>
<td>336.98</td>
<td>85.71</td>
</tr>
<tr>
<td>2010</td>
<td>0.29</td>
<td>41.81</td>
<td>5.83</td>
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<td>203.20</td>
<td>27.44</td>
</tr>
<tr>
<td>2011</td>
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<td>3.42</td>
<td>15.32</td>
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<td>15.82</td>
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<td>23.00</td>
<td>2.58</td>
<td>17.64</td>
<td>514.42</td>
<td>17.64</td>
</tr>
</tbody>
</table>


### 2.3.1 Stock Market in Bahrain

The first Bahraini Public Shareholding Company was established in 1957. Since then, more local public shareholding companies have begun to operate, reaching their peak in the beginning of the 1980s when shares of public shareholding companies were actively traded in a non-official market called Al Jowhara. When the market collapsed at the beginning of the 80s, the Bahraini Government established the Bahrain Stock Exchange (BSE) in 1987 according to Amiri Decree No. 4. The exchange officially commenced operations in June 1989 with a listing of 29 Bahraini shareholding companies, and traded in common shares.
At the BSE’s establishment in 1989, trading was conducted manually by a system called the auctional trading system. In 1999, the BSE implemented the automated trading system (ATS) to carry out all transactions electronically, replacing the old manual system. In 1999, the government relaxed ownership restrictions within the market, allowing GCC nationals to own up to 100 and foreign investors up to 49 per cent of a local company’s shares; seven companies are open to 100 per cent ownership for foreign investors. In 2002, the legislative and regulatory authority and supervision of BSE was transferred from the Ministry of Commerce to the Central Bank of Bahrain (CBB), which now regulates and supervises all the BSE’s activities.

With the development of the BSE, government institutions and companies started issuing several investment instruments, taking advantage of the legislative and technical infrastructure established by the bourse. Since then, the bourse has witnessed the listing and registration of preferred shares, bonds, sukuk, and mutual funds, making it the first in the region to list such instruments.\textsuperscript{10}

In 2010, Bahrain Bourse (BHB) was established as a shareholding company to replace the BSE. Since its establishment, BHB has joined several regional and international organisations such as the Union of Arab Stock Exchanges, Federation of Euro-Asian Stock Exchanges, World Federation of Exchanges, Africa and Middle East Depositories Association, and Association of National Numbering Agencies. Joining such organisations keeps the bourse updated on legislative, technical, and administrative developments in the capital markets sector.

\textsuperscript{10} See Bahrain Stock Exchange website (www.bahrainbourse.com.bh).
In 2012 there were 43 companies listed on the Bahraini stock exchange. Listed companies are generally subject to a 49 per cent foreign ownership limit; some are fully open or fully closed to foreign investment. The total market capitalisation of the BSE increased by nearly 67 per cent from $9.7 billion in 2003 to $16.1 billion in 2012. The total volume of shares traded in 2012 rose by 13 per cent to reach $0.31 billion, as compared to $0.27 billion in 2003.

### 2.3.2 Stock Market in Kuwait

Kuwaiti investors were introduced to trading in stocks with the creation of the National Bank of Kuwait in 1952, the first Kuwaiti shareholding company. In 1962, the government issued a number of laws and rules to regulate stock trading activities. In 1977 the Kuwait Stock Exchange (KSE) was formed, and in 1983 KSE began operations as an independent financial institution. In November 1995, KSE implemented its first electronic trading system to allow higher trading volumes, and in November 2003 online trading started. On 28th February 2010, the regulatory responsibilities of KSE were transferred to the Capital Markets Authority.

The number of listed companies on the Kuwait stock exchange has increased by 95 per cent in the past ten years, from 97 in 2003 to 189 in 2012. The banking industry is subject to a 49 per cent foreign ownership limit; this limitation affects more than 23 per cent of the Kuwaiti equity market. The total market capitalisation of the KSE has increased by nearly 63 per cent, from $59.4 billion in 2003 to $97.1 billion in 2012. The total volume of shares traded in 2012 reached $23 billion, up seven per cent from $21.4 billion in 2011.

11 See Kuwait Stock Exchange website (www.kuwaitse.com).
2.3.3 Stock Market in Oman

The Muscat Securities Market (MSM) was established on 21 June 1988 to regulate and control the Omani securities market and to participate effectively with other organisations to set up the infrastructure of the Sultanate’s financial sector. On November 1998 a new Capital Market Law was promulgated, providing for the establishment of two separate entities: the MSM, an exchange where all listed securities are traded; and the Capital Market Authority (CMA) as the regulator. The MSM is a governmental entity, financially and administratively independent of the regulatory arm but subject to its supervision. The securities industry in Oman has been established to enhance investors’ confidence, by developing and improving all the processes related to the stock market. The number of listed companies on the MSM increased by 30 per cent in the past ten years, to 124 in 2012 from 96 in 2003. Listed companies are in general subject to a foreign ownership limit of 70 per cent, but companies may choose to set a lower limit. The total market capitalisation of the MSM increased by 300 per cent from $5 billion in 2003 to $20.1 billion in 2012. The total volume of shares traded in 2012 reached $2.65 billion, up 112 per cent from the reported volume of $1.25 billion in 2003.

2.3.4 Stock Market in Qatar

The Doha Securities Market (DSM) was established in 1995. DSM officially started operations in 1997 with 17 companies. Since then the exchange has grown to become one of the leading stock markets in the GCC. In June 2009, Qatar Holding, the strategic and direct investment arm of the Qatar Investment Authority (QIA), and

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NYSE Euronext, the world’s leading exchange group, signed an agreement to form a major strategic partnership to establish the exchange as a world-class market. The DSM was renamed the Qatar Exchange (QE). The number of listed companies on the exchange increased by 50 per cent in the past ten years, from 28 in 2003 to 42 in 2012; listed companies are in general subject to a foreign ownership limit of 25 per cent. The total market capitalisation of the QE has increased by nearly 373 per cent, from $26.7 billion in 2003 to $126.4 billion in 2012. The total volume of shares traded in 2012 reached $15.3 billion.

2.3.5 Stock Market in Saudi Arabia

Saudi joint stock companies had their beginnings in the mid 1930s with the establishment of the Arab Automobile company as the first joint stock company. In 1954 the Arabian Cement Company was privatised, and this was followed by the privatisation of three electricity companies. In response to the needs of the economic development of that period, many joint stock companies were established, and by 1975 there were about 14 public companies. Rapid economic expansion, plus the Saudisation of part of foreign banks’ capital in the 1970s, led to the establishment of a number of large corporations and joint stock banks.

The market remained informal until the early 1980s, when the government embarked on forming a regulated market for trading together with the required systems. In 1984 a ministerial committee composed of the Ministry of Finance and National Economy, Ministry of Commerce, and Saudi Arabian Monetary Agency...
(SAMA) was formed to regulate and develop the market. SAMA was charged with regulating and monitoring market activities until the Capital Market Authority (CMA) was established in July 2003 under the Capital Market Law (CML) by Royal Decree. The CMA is the sole regulator and supervisor of the capital market. It issues the required rules and regulations to protect investors and ensure fairness and efficiency in the market. On 19 March 2007, the Council of Ministers approved the formation of the Saudi Stock Exchange (Tadawul) in accordance with Capital Market Law, establishing Tadawul as a joint stock company.

The Saudi stock market is by far the largest in the GCC, accounting for 53 per cent of total GCC market capitalisation. The market capitalisation of the Tadawul increased by 137 per cent, from $157.3 billion in 2003 to $373.4 billion in 2012. The number of listed companies on the Tadawul increased by 126 per cent over the past ten years, from 70 in 2003 to 158 in 2012. CMA rules allow 100 per cent ownership in all listed companies for GCC nationalities; only Saudi residents and GCC investors are allowed to invest in the Saudi stock market. The total volume of shares traded in 2012 reached $514 billion, increasing by 223 per cent compared with the reported volume of $159 billion in 2003 and accounting for 89 per cent of the total GCC market volume.

2.3.6 Stock Market in UAE

The Dubai Financial Market (DFM) was established as a public institution with its an independent corporate body by a Resolution of the Ministry of Economy in...
2000\textsuperscript{15}, and Abu Dhabi Securities Exchange (ADX) was established in November 2000.\textsuperscript{16} DFM and ADX operate as a secondary market for the trading of securities issued by public joint stock companies, bonds issued by the federal government or any of the local governments, public institutions in the country; units of investment funds and any other financial instruments, local or foreign, are accepted by the market. The number of listed companies on the both DFM and ADX has increased by 240 per cent over the past ten years, from 30 in 2003 to 102 in 2012. Listed companies are in general subject to a foreign ownership limit of 49 per cent, but may choose to set a lower limit. The combined market capitalisation of the DFM and ADX increased by 124 per cent, from $30.3 billion in 2003 to $68 billion in 2012. The total volume of shares traded in 2012 reached $17.6 billion, up 1600 per cent compared with the reported volume of $1 billion in 2003, accounting for three per cent of the total GCC market volume.

2.4 Global Financial Crisis and the GCC

2.4.1 Financial Integration and Crises

The degree of financial integration around the world has increased significantly, especially in the last two decades. It is due to the increased globalisation of investments seeking higher rates of return and the opportunity to diversify risk internationally.\textsuperscript{17} Many countries have encouraged inflows of capital

\textsuperscript{15}See Dubai Financial Market website (www.dfm.ae).
\textsuperscript{16}See Abu Dhabi Securities Exchange website (www.adx.ae).
\textsuperscript{17}The financial integration is due to pull and push factors: pull factors include the openness of domestic financial markets to foreign investors, removal of controls on capital outflows and the liberalization of restrictions on foreign direct investment, as well as privatisation programs, while
by lifting restrictions on international financial transactions, relaxing regulations on
the operation of domestic financial markets and improving their economic
environment and prospects by introducing market-oriented structural reforms.

Moving away from regimes of financial repression aims to increase the
financial openness of domestic markets to foreign investors. Financial openness is
often regarded as providing important potential benefits. As noted earlier, access to
world financial markets expands investors’ opportunities for portfolio diversification
and provides the potential to achieve higher rates of return. From the point of view of
the recipient country, there are potentially large benefits as well. Obstfeld (1994)
argues that access to world capital markets allows countries to borrow to smooth
consumption in the face of adverse shocks, and that the potential growth and welfare
gains resulting from such international risk sharing can be large.

At the same time, however, increased financial integration may also potentially
increase the speed and the number of channels through which financial crises in
general may breed across countries. In fact, cross border capital flows between
countries are sensitive to macroeconomic and financial conditions, and the
transmission of shocks through financial channels is much quicker than through real
channels. For example, a shock in income growth in a developed country may have a
gradual impact on a developing country through trade channels, but could have a
much quicker effect on the economic activity of that country through correlations in
stock market fluctuations (Cali, Massa & te Velde 2008).

push factors include the increase of institutional investors (mutual funds, hedge funds, etc.), the
spread of depositary receipts and cross listings.
2.4.2 Impact of Financial Crisis on the GCC Region and Policy Responses

The GCC’s financial integration has been ongoing during the last decade and has made substantial progress. Prior to the financial crisis, optimism prevailed regarding the dynamism and growth prospects of GCC economies and their financial sectors. GCC economies expanded at rates well above the global average, and financial sectors experienced double digit growth; however, they did not escape the global downturn that followed in 2008.

The financial crisis that began in the US mortgage market in late 2007 spread quickly to become global, affecting both financial systems and economic activity in all countries. The transmission of the crisis from the United States to the rest of the world came through a number of channels, the two main financial channels through which the recent financial crisis in the United States has spread to other countries: (i) net private equity flows, which includes foreign direct investment (FDI), and (ii) net private debt flows which includes short, medium, and long term debt flows.

![Debt liabilities Stock (in million US$)](image)

*Figure 2.2 Debt liabilities Stock (in million US$)*


47
Like other emerging markets, the impact of the crisis on the GCC manifested itself in plunging stock markets, lower growth of foreign direct investment, and a higher stock of debt liabilities. Figure 2.2 illustrates the total foreign debt in GCC countries, increasing from US$ 499 billion in 2007 to US$ 525 billion in 2008.

Figure 2.3 shows that the growth of foreign direct investment (FDI) net inflows as per cent of GDP for GCC countries declined from 5.8 per cent in 2007 to 1.5 per cent in 2011. Inflows to GCC countries have continued to suffer, an effect of the cancellation of large investment projects because of the drying up of project finance after the financial crisis.
Figure 2.4 Market capitalisation of listed companies
Note: x-axis represents years and y-axis illustrates market capitalisation of listed companies.

Figure 2.4 shows that stock prices in the GCC declined rapidly; the total stock market capitalisation fell from US$ 971 billion in 2007 to US$ 534 billion in 2008: about 45 per cent of the combined GCC market value in 2007. With an increasing shortage of global liquidity, international financial institutions and banks became more risk averse and the cost of borrowing in GCC increased sharply. GCC banks in general were relatively less affected by the crisis than other emerging economies because of the ample financial resources of the GCC region, combined with the support measures taken by the authorities which helped mitigate the adverse impact of the crisis.
Figure 2.5 Inflation in GCC

Note: x-axis represents years and y-axis illustrates inflation, consumer prices (annual %).

Figure 2.5 shows that one positive outcome of the global financial crisis was the reversal of rising inflationary trends. In 2012, Kuwait’s inflation rate was 2.9 per cent, far below the record inflation level of 10.5 per cent in 2008. In 2012, Oman’s inflation rate was 2.9 per cent; it was 12.5 per cent in 2008. In 2012, inflation in the United Arab Emirates was 0.71 per cent, compared with the record high of 12.25 per cent in 2008. Qatar and Saudi Arabia also recorded low level of inflation, at 1.8 and 2.8 per cent respectively, down from 15 and 9.8 per cent in 2008.

To offset the shocks brought on by the crisis, GCC governments maintained high levels of spending and introduced exceptional financial measures, including capital and liquidity injections. GCC governments also provided direct liquidity injections via the placement of long-term deposits. Central banks in GCC region have reacted to global financial crisis by injecting funds and providing credit facilities to maintain the liquidity of the banking sector. Central banks also cut interest rates and reduced reserve requirements in an attempt to ease funding.
pressure. These measures helped sustain growth in the GCC (Kumah et al. 2010).

The GCC countries’ responses to the financial crisis are set out in Table 2.7.

<table>
<thead>
<tr>
<th>Country</th>
<th>Deposit Guarantees</th>
<th>Central Bank Liquidity Support</th>
<th>Long-term Government Deposits</th>
<th>Capital Injection</th>
<th>Stock Market Purchases</th>
<th>Monetary Easing</th>
</tr>
</thead>
<tbody>
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<td>Bahrain</td>
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<tr>
<td>Kuwait</td>
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<td>Oman</td>
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<td>Qatar</td>
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<td>Saudi Arabia</td>
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<td>UAE</td>
<td>√</td>
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</tr>
</tbody>
</table>

Source: Kumah et al. 2010.

Figure 2.6 illustrates that the GDP growth of GCC countries has been increasing since hitting a low in 2009 in the wake of the global financial crisis. In 2011, overall GDP growth for the GCC reached 7 percent due to combination of historically high oil prices and expanded oil production. The abundance of financial resources for GCC and the initial macro intervention policies taken by GCC governments helped to mitigate the adverse impact of the financial crisis.

Figure 2.6 GDP growth in GCC countries
Note: x-axis represents years and y-axis illustrates GDP growth (annual %). Source: World Bank 2013, World development indicators.
2.5 Literature Review


Levine (1997) examines if financial development induces economic growth. He finds that financial development is strongly correlated with growth in investment, standards of living and the efficiency with which economies employ physical capital. He also finds that financial development is a good predictor of future rates of economic growth, investment and economic efficiency improvements. Portes and Rey (1999) study the determinants of bilateral gross cross-border equity flows. They offer substantial empirical evidence of positive linkage between such flows and various measures of country size (GDP, market capitalisation or financial wealth) and sophistication of the market, and negative linkage with transaction costs and informational frictions. Edison et al. (2002) investigate the impact of international financial integration on economic growth and assess whether the international
financial integration-growth relationship depends on level of economic development, educational attainment, financial development, legal system development, government corruption, and macroeconomic policies. The paper finds that international financial integration is positively associated with real per capita GDP, educational attainment, banking sector development, stock market development and government integrity.

Herrmann and Jochem (2003) study the covered interest parity in new euro area countries and provide a quantitative assessment of the factors driving systematic deviations from parity. They find that money markets in the new member countries show an increase in the degree of integration with the euro area. Lane & Milesi-Ferretti (2003) provide a detailed discussion of international financial integration, characterising its salient features over the last two decades, and examine the relation between foreign assets and liabilities on one side and a set of various regressors on the other side: GDP per capita, trade openness, financial depth, external liberalisation, privatisation revenues and stock market capitalisation. They state that international trade and stock market capitalisation are the most important variables influencing international balance sheets.

Pungulescu (2003) and Dvorak and Geiregat (2004) find evidence for a broader range of financial market segments in new members of EU, covering corporate bond, government and money, deposit markets and loan. The paper analyses the dynamics of interest rate spreads between eight new Central European member countries and the euro area, and report a continuing decrease of the margins over time. Dvorak and Geiregat (2004) also study the impact of local (country) and common (industry) factors as determinants of equity returns in new members and find that the role of the
common factors has increased over time, suggesting deeper integration. Kim, Lucey & Wu (2006) employ a dynamic cointegration and time-varying conditional correlation to assess time-varying properties of government bond market integration between three major new member countries and a subset of old EU member states. They find weak linkages between bond markets in the new and old EU member states. In addition, they report that these financial linkages have not strengthened over time, which suggests that there is no evidence of growing integration.

Kim, Lee & Shin (2006) examine the degree of regional vs. global financial integration of East Asian countries. First they compare the size of cross-border assets such as securities and bank claims, then estimate the gravity model of bilateral financial asset holdings. Finally, they estimate a consumption risk sharing model. Their findings suggest that East Asian financial markets, compared with European ones, are relatively less integrated with each other than with global markets. They also find relatively more evidence of regional financial integration in bank claim markets than in portfolio asset markets. Their results suggest low financial integration within East Asia, which is attributed to low incentives for portfolio diversification within the region, a low degree of development and deregulation of financial markets, and instability in monetary and exchange rate regime. Abiad, Leigh, & Mody (2007) examine the link between capital flow and growth. They find that poor countries which are more integrated run higher current account deficits and so borrow more, while rich countries that are highly integrated run higher surpluses and so lend more. Increasing incomes mean larger surpluses, but higher financial integration keeps the deficit unchanged. They also find that in Europe, other than
elsewhere in the world, current account deficits are significant for growth. A larger current account deficit accelerates the convergence process.

Bonfiglioli (2008) tries to disentangle the effects of financial integration on the two main determinants of economic performance: productivity and investment. The paper provides empirical evidence using a sample of 70 countries observed from 1975 to 1999. Results suggest that financial integration has a positive direct effect on productivity, but does not directly affect capital accumulation. The study controls for indirect effects of financial globalisation through financial development and banking and currency crises. While financial integration does not systematically increase domestic financial depth, it may raise the likelihood of banking crises, though only to a minor extent: the overall effect of financial liberalisation remains positive for productivity and negligible for investment. Dees el al. (2007) present a quarterly global model combining individual country vector error-correction models in which the domestic variables are related to the country-specific foreign variables. The global VAR (GVAR) model is estimated for 26 countries in the euro area over the period 1979–2003. The paper provides a theoretical framework where the GVAR is derived as an approximation of a global unobserved common factor model using average pair-wise cross-section error correlations; the approach is shown to be quite effective in dealing with the common factor interdependencies and international co-movements of business cycles. Finally, the paper develops a sieve bootstrap procedure for simulation of the GVAR as a whole, which is then used in testing the structural stability of the parameters and for establishing bootstrap confidence bounds for the impulse responses.
Lane & Milesi-Ferretti (2007) measure the degree of international financial integration. They construct estimates of external assets and liabilities and show that the degree of international financial integration has grown dramatically over the last eighteen years in both industrialised and developing countries. Komarkova and Komarek (2008) focus on the degree of integration of financial markets (money, foreign exchange, bond and stock-exchange markets) in five new EU member states (Czech Republic, Hungary, Poland, Slovakia and Slovenia) and three older members (Germany, Austria, Portugal). They adopt a methodology proposed by Adam et al. (2002) to test for the existence and determination of the degree of financial integration among these countries relative to the euro area, and find evidence of financial integration in all markets, strongest in the bond market followed by the foreign exchange, money and stock markets. Ingianni and Zdarek (2009) analyse the process of real convergence of the new member states of the EU. They focus on countries involved in the fifth European enlargement, excepting Cyprus and Malta. The paper investigates whether countries with different starting levels of GDP per capita converge in the long run, and whether new members converge during the enlargement process. The assumptions are investigated empirically by a comparison of beta and sigma-convergence analysis with time-series based on stationarity and cointegration tests, and the results show that, although positive signs are visible, it is difficult to find a strong empirical argument in support of or against integration-led convergence.

Another aspect that has drawn great attention is the degree of stock market integration and the volatility of stock market returns, because of its important implications for investor contemplating international portfolio diversification and
market efficiency, and also for policy initiatives. There are many studies using econometric techniques to assess the degree of integration in stock markets, particularly the use of the GARCH model and cointegration approach. Kasa (1992) examines the co-movement in the stock markets of five major industrialised countries and finds that stock markets are perfectly correlated over long horizons, which implies that there is no gain from international diversification. Lin, Engle & Ito (1994) examine volatility spillovers between the stock markets of the United States and Japan from October 1985 to December 1989 using a GARCH-M model. They find bidirectional spillovers between daily returns in one market and overnight returns in the other. Their findings suggest that these two stock markets are integrated, with the global news relevant for both markets being generated both in Japan and the United States.

Susmel and Engle (1994) study the stock markets of the United Kingdom and the United States from January 1987 to February 1989 using GARCH model. They examine volatility spillovers between the two stock markets and find no significant evidence of volatility spillovers between them. Choudhury (1996) investigates the time-varying risk premium and persistence of volatility in six emerging stock markets: Thailand, Zimbabwe, Mexico, India, Argentina and Greece. He employs GARCH-M for monthly data from January 1976 to August 1994 and finds evidence of changes in the ARCH parameters, volatility persistent in these stock markets and the risk premium. However, these changes are not consistent and fluctuate between individual markets.

Chan, Gup & Pan (1997) investigate the long-run relationships among 18 developed and emerging stock markets. Using monthly stock market indices from
January 1961 to December 1992, they apply Johansen’s cointegration tests; their results indicate that only a small number of stock markets show evidence of long-run relationships. They also show that international portfolio diversification between stock markets is effective because there is no long-run co-movement among the stock markets. Choudhury (1997) examines the long-run relationship between six stock market indices in Latin American and the United States. He employs unit root test, Johansen method of cointegration tests, and error correction models. The results from the unit root tests show evidence of a stochastic trend in all indices. The cointegration tests indicate presence of a long-run relationship between the six Latin American indices. The error correction results also prove significant causality among the stated indices.

Kanas (1998a) applies a multivariate approach to test for cointegration among six major European stock markets and the United States. His results suggest that the United States stock market is not cointegrated with any of the largest European stock markets, and imply that there is a potential long-run benefit in risk reduction from diversifying in the United States and any of the largest European stock markets. Masih & Masih (2002) examine the long- and short-term dynamic linkages among two developed stock markets and six Asian emerging stock markets, and quantify the extent of Asian stock market fluctuations from February 1992 to January 1997. They apply the Vector Error Correction Model, level VAR model including integrated and co-integrated processes of arbitrary orders. Their results confirm the leadership of the United States over both the short and long term, and the existence of a significant relationship between the OECD and the six Asian emerging markets. Their findings
support the view that fluctuations in all the Asian markets are explained by their regional markets, rather than by the advanced market.

Darrat, Elkhal & Hakim (2000) use the Johansen-Juselius cointegration approach to explore the pattern and extent to which the three MENA emerging stock markets (Egypt, Morocco and Jordan) are linked among themselves and with international stock markets. They find that these countries are segmented globally and integrated regionally. Fratzscher (2002) analyses the integration process of European equity markets since the 1980s in 16 OECD countries, using a trivariate GARCH model and daily data covering the period from January 1986 to March 2000. His results show that European equity markets have become highly integrated only since 1996. Neaime (2002) uses the Engle-Granger cointegration approach to analyse stock market integration among MENA stock markets and between these markets and developed markets; he finds a weak integration among MENA markets and strong integration between them and developed markets.

Simpson and Evans (2004) use Johansen (1991) to examine both short- and medium-term relationships among the GCC stock markets during the period 2000 to 2003. They find that the Saudi and Kuwait markets are the major drivers of other GCC markets. Syriopoulos (2004) examines the long-run dynamic linkages among stock market indices of two developed countries and major emerging Central European countries. The multivariate cointegration test results find a stationary long-run dynamic linkages among these countries and individual Central European stock markets.

Marashdeh (2005) uses the ARDL approach to examine financial integration in the MENA region. His results show that there are long-run equilibrium relationships among all stock markets in the MENA region, but not with developed markets. Phylaktis and Ravazzolo (2005) examine dynamic linkages among Pacific Basin markets; their results show no evidence of long-run relationship among the stock markets under study. Their findings also indicate that international investors have opportunities for portfolio diversification by investing in most Asian stock markets. Al-Khazali, Darrat & Mohsen (2006) use the Johansen–Juselius (1990) method to examine the regional integration of the GCC exchange markets of Saudi Arabia, Oman, Bahrain and Kuwait. Their results suggest the existence of a common stochastic trend that binds together the four stock markets over the long run. Onour (2009) employs a nonparametric test to investigate nonlinearity in the long-run equilibrium relationship between GCC stock market returns and finds strong evidence of bivariate and multivariate cointegration between five GCC stock markets.
Espinoza, Prasad & Williams (2011) investigate the extent of regional financial integration in the member countries of the GCC. They find that development of stock markets in the region will improve the extent of financial integration. Ravichandran and Maloain (2010) find that the GCC stock markets are not integrated with the oil and developed markets as represented by the US and European markets. On the other hand, the empirical evidence indicates that the long- and short-run relationships among the GCC markets represent more integration regionally and globally after a crisis than before it. Jouini (2013) investigates long-run links between GCC stocks and three global factors: oil price, the MSCI world index and the US interest rate. He finds that there is strong evidence of nonlinear long-run relationship between the variables of interest when there is dependence between countries, and indicates that the global factors have a predictability effect on most GCC stock markets.

On issues relating to the volatility of stock market returns, there is literature that examines the volatility of stock market returns across GCC markets. Abraham and Seyyed (2006) examine the flow of information among the Gulf stock markets of Saudi Arabia and Bahrain and find asymmetric volatility spillovers from the smaller but accessible Bahrain market to the larger but less accessible Saudi market. Hammoudeh and Choi (2007) use the univariate GARCH model with two volatility regimes of the Markov switch to examine the volatility behaviour of the transitory and permanent components of each GCC stock market. Malik and Hammoudeh (2007) examine volatility and shock transmission mechanism among US equity, global crude oil market, and the equity markets of Saudi Arabia, Kuwait and Bahrain. In all cases, the Gulf equity markets receive volatility from the oil market but only in the case of Saudi Arabia is there found a significant volatility spillover
from the Saudi market to the oil market. Hammoudeh and Li (2008) investigate sudden changes in volatility for five GCC stock markets using the iterated cumulative sums of squares algorithm, and analyse their effects on the estimated persistence of volatility; they find that GCC stock markets are more sensitive to major global factors than to local and regional factors. Yu and Hassan (2008) apply EGARCH-M models with a generalised error distribution and find large and predominantly positive volatility spillovers and volatility persistence in conditional volatility between MENA and world stock markets. They find volatility spillovers within the MENA region to be higher than cross-volatility spillovers for all the markets.

Hammoudeh, Yuan & McAleer (2009) use a multivariate VAR-GARCH to examine the dynamic volatility and volatility transmission of the service, financial and industrial sectors of Kuwait, Qatar, Saudi Arabia and UAE. They suggest that past idiosyncratic volatilities matter more than past shocks, and that there are moderate volatility spillovers between the sectors within the individual countries, with the exception of Qatar. They also find that the optimal portfolio weights favour the financial sector for Qatar, Saudi Arabia and UAE, and the industrial sector for Kuwait. Arouri and Nguyen (2010) investigate the existence of short- and long-term relationships between oil prices and GCC stock markets. Concerning the short-term analysis, they find strong positive linkages between oil price changes and stock markets in Qatar, Saudi Arabia and UAE. Their results indicate that when causality exists, it generally runs from oil prices to stock markets. Their long-term analysis provides no evidence of long-term link between oil prices and stock markets in the
GCC countries, except for Bahrain where the relationship between oil prices and stock market is positive and oil price fluctuations drive changes in the stock market.

A recent study by Balli, Basher & Louis (2013) examines the spillover effects of local and global shocks on GCC-wide sector equity returns and find that these returns have asynchronous responses to global and regional shocks. There is evidence that the GCC-wide sector equity markets are driven by their own volatilities. They indicate that the effect of global shocks on the volatility of GCC sector returns has been decreasing, whereas regional shocks have been affecting the sector indices with a positive and significant trend. Naifar and Al-Dohaiman (2013) investigate the impact of changes and volatility in oil prices on stock market returns under crisis and non-crisis regime shifts for the GCC stock markets. They also investigate the nonlinear relationship among oil prices, interest rates and inflation rates before and after the subprime crisis, using the copula approach. Their results suggest that the relationship between GCC stock market returns and OPEC oil volatility is regime-dependent, and the dependence structure between inflation rates and crude oil prices is asymmetric and is orientated toward the upper side during the global financial crisis.

2.6 Statement of the Problem

Although a number of studies have investigated the issue of financial integration and volatility of stock market returns, the main focus has been on North American, European and Asian-Pacific markets. There are very few studies on frontier stock markets, particularly those operating in the GCC region. Moreover, most studies of GCC stock markets focus on the investigation of the first moment interaction among GCC countries, the integration with other developed markets such
as the United States, market efficiency, and the impact of oil volatility on stock market returns. A few studies focus on how a single international market influences GCC stock markets, but do not distinguish regional versus global market factors. Nevertheless, in recent years the focus of policy makers in GCC countries to integrate their financial markets toward establishment of a single market, and to form a monetary union at a certain stage, has attracted the attention of researchers. Despite the increasing interest in GCC financial markets, there are few studies. Those that exist either do not cover the financial integration and volatility of stock market returns in all the GCC member countries in depth, or cover a short period, or use conventional approaches.

There is no systematic study characterising GCC member countries’ integration with rest of the world based on external asset and liability positions. There is no study which analyses stock market integration in GCC countries based on the international asset pricing theory, employing both a global systematic risk and a local market risk. Furthermore, there is no study that focuses on volatility spillovers from Saudi Arabia as a regional market and the United States as a global market, on GCC stock markets.

This thesis tries to fill some of these gaps in existing research related to GCC stock market integration and volatility spillovers. The study contributes to the literature in several ways. First, it is the first study to focus on the development of measures of financial integration of the GCC member countries with rest of the world, based on external asset and liability positions; it empirically identifies the drivers influencing the international financial integration between the GCC countries and the rest of the world. Second, the research in this thesis investigates the degree of
stock market integration in GCC countries with the world portfolio and each country’s diversification portfolio (GCC market portfolio) by constructing a financial integration index for GCC stock markets, and studies what drives market integration by employing dynamic panel estimation techniques. This is the first study to construct a financial integration index for GCC countries.

Third, this study also investigates the effects of spillovers from the US and Saudi stock market to GCC stock markets by considering innovations from the Saudi and US markets as regional and global shocks respectively. The study analyses the impact of several determinants (trade, turnover, inflation, domestic credit, oil production, institutional quality) of volatility spillovers from Saudi Arabia to GCC markets. No known study has explored the impact of spillovers from global (US) and regional (Saudi) stock markets to GCC stock markets.

Fourth, the study contributes to the existing literature by examining the impact of the global financial crisis on financial integration measures. Research in this thesis covers all stock markets in the GCC region, and employs a longer time series than have previous studies. The study employs a system GMM Arellano–Bover/Blundell–Bond\textsuperscript{18} econometric estimation to investigate the determinants for international financial integration, stock market integration index, and volatility spillovers.

The findings of this thesis will provide useful information for GCC central banks and policy makers regarding monitoring regional financial integration and coordination of the monetary policies in the ongoing integration process. GCC policy makers and central banks require adequate information regarding financial

\textsuperscript{18} The technique alleviates bias caused by data, model specification and endogeneity issues.
integration and volatility spillovers for various reasons. First, well functioning financial markets are vital for the growth and development of an economy (Levine, 2001). Second, since financial markets in GCC countries are in different stages of development, it is important to measure accurately the state of integration in various segments of the market so that areas where further initiatives are required can be identified. Third, regional financial integration is crucial for both the effective transmission of monetary policy and the efficient channelling of savings to investment. Finally, understanding the drivers of financial integration is critical for providing important insight into the process of monetary and financial integration. In imperfectly integrated markets, regional factors are important in shaping GCC policy decisions and developing various regulatory requirements, like capital requirements or capital controls.

2.7 Summary and Concluding Remarks

This chapter outlines the main concepts that undergird this study and, more specifically, provides the basis of the analytical framework that is applied in the work that follows. The chapter begins with definition, benefits and measures of financial integration. Next, it provides an overview of the GCC and its governance and decision-making bodies. It reviews the relevant demographics and economic characteristics of GCC countries over the past ten years and briefly discusses the history of individual GCC stock markets and their development. The chapter also discusses the impacts and responses of the global financial crisis on the GCC stock markets. The chapter briefly reviews the literature on financial integration and the volatility of stock market returns. Finally, it states the research problem and discusses about the relevant contribution and policy implications.
Chapter 3 Determinants of International Financial Integration of GCC

3.1 Introduction

The rapid increase in international capital flows (foreign direct investment and portfolio investment) is one of the most significant developments among the member countries of the Gulf Cooperation Council (GCC) namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates (UAE). For instance, in the GCC region between 1980 and 2011, cross-border portfolio equity assets increased from US$ 4,528 million to US$ 501,487 million; FDI assets increased from US$ 1,186 million to US$ 191,026 million; and total external assets increased from US$ 238,349 million to US$ 2,561,286 million.19

The Gulf cooperation council (GCC) was established in 1981 with the objective of realizing coordination, integration, and cooperation among member states in various aspects of economic affairs. The GCC signed a preferential trade arrangement that lead to the creation of a free trade agreement in agricultural and industrial products (though not petroleum products) and free movement of factors of production. In 2002, GCC decided on implementing gradually a unified economic agreement towards establishing a single market, and forming monetary union at a certain stage. The financial systems in the GCC are dominated by commercial banks, which limit the importance of cross-border equity flows. Up to now, member countries of the GCC have taken, or are currently taking, important steps to improve

the size and quality of their capital markets. Significant privatisations have occurred, and several countries have built independent and dedicated capital market regulators. In addition, a number of initiatives have been launched to improve the level of integration among stock markets that will strengthen each individual market and make the whole region a more attractive destination for regional capital, relative to external investment options. Progress has also been made in regional economic integration, with largely unrestricted intraregional mobility of goods, services, national labour and capital. In 2003 a GCC single common external tariff (CET) rate of five per cent was implemented and in early 2008, a common market was established although not fully implemented, granting GCC citizens equal treatment in all economic activities, capital movement, tax treatment and stock ownership, among others. Full implementation of the common market will require changes to national laws, including those pertaining to limits on company ownership by foreigners. The GCC countries have agreed upon following convergence criteria but not fully adopted: (i) inflation rate should be no higher than the weighted average of all members plus two percentage points; (ii) interest rate should not exceed the average of the lowest three interbank rates plus two percentage points; (iii) there should be minimum four months reserves coverage in terms of imports; (iv) fiscal deficits should not exceed 3 percent of GDP; and (v) there should be a maximum public debt of 60 percent of GDP. In 2010, the GCC member countries approved the Statute of the Monetary Council of the Cooperation Council for the Arab States of the Gulf, which focuses on the development and coordination of the monetary policies and exchange rate policies for national currencies until establishment of the Central Bank; preparation for the issuance of the banknotes and coins of the single currency
and development of a uniform framework for the introduction and circulation of the single currency in the GCC area.

As indicated earlier, there has not been a systematic study characterising GCC member countries’ integration with rest of the world by analysing external asset and liability positions. This study fills in the gap in financial integration literature by analysing the degree of financial integration of the GCC member countries with the rest of the world. The study focuses on the development of measures of financial integration in GCC region, based on foreign assets and liabilities. This chapter employs several quantity based proxies of international financial integration over the time period from 1980 to 2011. The chapter also contributes to the existing literature by examining the impact of the global financial crisis on financial integration measures. On the econometric front, the study employs system GMM Arellano–Bover/Blundell–Bond estimation technique to alleviate bias caused by data, model specification and endogeneity issues.

The chapter tries to answer the following research questions: (i) What are the quantity based measures of financial integration? (ii) What are the drivers of financial integration?

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20 It is important to develop measures of financial integration that are relatively easy to construct and interpret, based on available data over time. Understanding a country’s relative position with respect to the composition of foreign assets and liabilities is important for a number of reasons. First, the composition of foreign assets and liabilities may affect a country’s macroeconomic adjustment to shocks. In particular, countries’ holdings of foreign assets and liabilities may reduce the volatility of national income by generating investment income streams that are imperfectly correlated with domestic output fluctuations. Second, the size of countries’ gross international investment position can be regarded as a volume-based measure of financial openness, or the level of integration into international capital markets. Here, the level of financial openness may be important in the diffusion of new financial technologies and in determining the level of productivity in the domestic financial sector (Grossman & Helpman 1991). Third, a high volume of international asset trade may constrain a country’s ability to tax mobile capital and the financial sector (Lane 2000).
international financial integration across GCC countries? (iii) What is the impact of global financial crisis on GCC’s financial integration? (iii) What are the policy implications deriving from the sharp trend toward increasing cross-border asset trade?

The results provide strong evidence that trade openness is an important determinant of international financial integration in GCC countries. The results also provide strong evidence that indicators such as financial openness and domestic credit have positive and significant impact on GCC countries’ international financial integration. The change in financial integration measures due to trade openness and domestic credit depending on global financial crisis is negative and significant.

The chapter is structured as follows: Section 2 provides a brief literature review. Section 3 discusses measures of international financial integration, data and stylised facts. Section 4 discusses theoretical issues related to international financial integration, determinants of international financial integration, the impact of the global financial crisis on GCC countries, and responses to the crisis. The section further discusses summary statistics and correlation, methodology, empirical specifications, and test results. Finally, section 5 concludes and furnishes policy implications.

3.2 Literature Review of Financial Integration

Bekaert and Harvey (2000) employ asset-pricing model to study the integration of emerging market stock exchanges into the global market. Agenor (2003) discusses the benefits and costs of international financial integration. Lane & Milesi-Ferretti (2003) provide a detailed discussion of international financial integration, characterising its salient features over the last two decades, and examine the relation
between foreign assets and liabilities on one side and a set of various regressors on the other side; GDP per capita, trade openness, financial depth, external liberalisation, privatisation revenues, stock market capitalisation. They state that international trade and stock market capitalisation are the most important variables influencing international balance sheets. Baele et al. (2004) propose integration measures to quantify the state and evolution of financial integration in the various segments of euro area including money market, corporate bond market, government bond market, credit market and capital market. Mishra and Daly (2006) analyse the broad trends in international financial integration for 13 industrial countries. Guerin (2006) finds that the geographical location of a country has a significant role in explaining the spatial allocation of portfolio investment, foreign direct investment and trade flows, and in determining the degree of financial integration into the world economy. Lane & Milesi-Ferretti (2007) construct estimates of external assets and liabilities and show that the degree of international financial integration has grown dramatically over the last eighteen years in both industrialised and developing countries. Baltzer et al. (2008) assess the degree of financial integration of the new EU member states and show that financial markets in the new EU member states are significantly less integrated than those of the euro area. Nevertheless, there is strong evidence that the process of integration is well under way and accelerated following accession to the EU. According to the indicators used, money and banking markets are becoming increasingly integrated, both among themselves and vis-à-vis the euro area. Lane & Milesi-Ferretti (2008a) state that GDP per capita and domestic financial development is stronger for external assets than for liabilities. Faria and Mauro (2009) find that equity as a share of countries’ total external liabilities is positively
and significantly associated with indicators of educational attainment, openness, natural resource abundance and institutional quality. Kucerová (2009) analyses the degree of financial integration of the EU-8 countries with the rest of the world by using quantity based measures of financial integration derived from the countries’ international investment positions. The findings suggest a significant linkage between EU-8 foreign assets and liabilities and EU-8 foreign trade. Espinoza, Prasad & Williams (2011) investigate the extent of regional financial integration in the member countries of the Gulf Cooperation Council. The results suggest the development of stock markets in the region will improve the extent of financial integration. Interest rate data shows that convergence exists and that interest rate differentials are relatively short-lived—especially compared to the Eastern Caribbean Currency Union (ECCU), another emerging market region sharing a common currency. Equities data using cross-listed stocks confirms that stock markets are fairly integrated compared to other emerging market regions, although financial integration is hampered by market illiquidity. Cavoli, McIver & Nowland (2011) present both stylised facts and panel data analysis examining relationships between the proportion of foreign listings and other measures of integration in a sample of Asian markets. The results find that higher trade openness, higher output growth and lower inflation are associated with a greater proportion of foreign listings. They also find that FDI openness has a negative relationship to the proportion of foreign listings, suggesting that these aspects of financial integration are substitutes. In addition, the results indicate that unless the appropriate financial liberalisation policies are in place, countries may find it difficult to simultaneously attract foreign listings to enhance development of their stock market and to grow their real economy.
through FDI. Borensztein and Loungani (2011) compare trends in financial integration within Asia with those in industrialised countries and other regional groups. The findings suggest that Asian integration increases when cross-country dispersion in equity returns and interest rates declines. There has been an increase in cross-border equity and bond holdings, and Asian countries are more financially integrated with major countries outside the region than with those within the region.

3.3 Measures of International Financial Integration

There are three broad categories of measures of integration: price based, news based, and quantity based measures. The price based measures focus on discrepancies in prices or returns on assets caused by the geographic origin of the assets. These measures can be used to check the law of one price. The cross sectional variation of interest rates spreads or asset return differentials can be used as an indicator of the deviation of markets from full integration. The speed at which markets integrate can be measured through beta convergence criteria.

News based measures of integration are based on the notion that the degree of systematic risk is identical across assets in different countries. These measures are designed to distinguish between the information effects and other frictions. Regional news is expected to have little impact on prices as compared to global news.

Quantity based measures focus on the effects of frictions faced by the demand for and supply of investment opportunities. These measures are based on asset quantities and flows. Research in this chapter employs quantity based measures of integration.

The first measure of international financial integration ($IFIA_{it}$) is an asset-based measure:
\[ IFIA_{it} = \frac{FA_{it}}{GDP_{it}} \]  

(1)

where \( FA_{it} \) is the total foreign assets in time \( t \), and \( GDP_{it} \) is the nominal GDP of country \( i \) in time \( t \), where \( i \) represents the particular GCC country. I use GDP as denominator to allow for country size. The ratios relative to GDP enable a direct comparison of countries.

The second is \( (IFIL_{it}) \) a liability-based measure of international financial integration:

\[ IFIL_{it} = \frac{FL_{it}}{GDP_{it}} \]  

(2)

where \( FL_{it} \) is the total foreign liabilities in time \( t \). The third is a broad indicator of international financial integration based on a volume measure:

\[ IFIT_{it} = \frac{FA_{it} + FL_{it}}{GDP_{it}} \]  

(3)

The fourth measure of international financial integration \( (IFIEDQ_{it}) \) is an investment based measure of financial integration. It contains only FDI and portfolio investments (equity and debt securities). The other categories are dropped from this measure because they are either volatile (other investments) or financial derivatives data may not be available for GCC countries.

\[ IFIEDQ_{it} = \frac{FDIA_{it} + PEQA_{it} + PDQIA_{it} + FDIL_{it} + PEQL}_{GDP_{it}} + PDQL_{it} \]  

(4)

where \( FDIA_{it} \) is the stock of FDI assets of country \( i \) abroad in time \( t \), \( FDIL_{it} \) is the stock of FDI liabilities of the rest of the world in country \( i \) in time \( t \), \( PEQA_{it} \) is the
stock of portfolio equity assets of country $i$ abroad in time $t$, $PDQA_i$ is the stock of portfolio debt assets of country $i$ abroad in time $t$, $PEQL_i$ is the stock of portfolio equity liabilities of the rest of world in country $i$ in time $t$, and $PDQL_i$ is the stock of portfolio debt liabilities of the rest of the world in country $i$ in time $t$.

The international financial integration measures capture the size of foreign investment globally that is appropriately scaled and consistent over time. The measure of the activity in the global capital market is to consider the total stock of overseas investment at a point in time. The foreign capital stock at each point in time should be normalised by some measure of the size of the world economy, by a denominator in the form of nominal size index. A suitable denominator would probably be the total stock of capital, whether financial or real, because the numerator is the stock of foreign owned capital. The problem with using financial capital measures is that they have greatly multiplied over the long run with the rise in numerous financial intermediaries and financial development has expanded the number of balance sheets in the economy (Goldsmith 1985). This trend could happen at any point in time without any underlying change in the extent of foreign asset holdings. The problem with using real capital stocks is that only a few countries have reliable data from which to estimate capital stocks. Most of these estimates are accurate only at benchmark censuses, and in between census dates they rely on combinations of interpolation and estimation based on investment flow data and depreciation assumptions. Most of these estimates are calculated in real (constant price) rather than nominal (current price) terms, which make them disproportionate with the nominally measured foreign capital data. This chapter utilises a readily
available size of an economy, namely the level of output \( (GDP) \) measured in current prices in a common currency unit (Obstfeld & Taylor 2003).

### 3.3.1 Data and Stylised Facts

The data employed in this research is derived from Lane & Milesi-Ferretti (2001, 2007) the External Wealth of Nations (EWN) dataset and International Financial Statistics. The EWN dataset is for 145 countries and the euro area. The main sources of EWN dataset: International Monetary Fund’s Balance of Payments Statistics (BOPs), International Financial Statistics (IFS), Coordinated Portfolio Investment Survey (CPIS), The World Bank’s Debt Tables, Global Development Finance, OECD statistics on external indebtedness, and the Bank for International Settlements’ data on banks’ assets and liabilities by creditor and debtor (BIS). The EWN dataset is based on the 5th revision of the Balance of Payments Manual (IMF 1993) methodology. The dataset reports total holdings by domestic residents of financial claims on the rest of the world (external assets) and non residents’ claims on the domestic economy (external liabilities). The external liabilities are divided into five main categories: portfolio equity investment, portfolio debt investment, foreign direct investment, other investment (debt instruments: loans, deposits, trade credits), and financial derivatives. External assets are divided into six categories: five categories the same as external liabilities, plus reserve assets. I investigate the level of financial integration and the trend of integration over the period 1980 to 2011 among the Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates (GCC) and the rest of the world.
Figure 3.1 Evolution of International Financial Integration, 1980-2011

Note: $IFIT = \sum_{i=1}^{6} IFIT_{it}$. $i$ denotes individual GCC country. $IFIT_{it} = \frac{FA_{it} + FL_{it}}{GDP_{it}}$. $FA_{it}$ is the total foreign assets of country $i$ in time $t$, $FL_{it}$ is the total foreign liabilities of country $i$ in time $t$, $GDP_{it}$ is the nominal GDP of country $i$ in time $t$. GCC countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates.

Figure 3.1 plots the evolution of the international financial integration measure ($IFIT_{it}$) for the GCC over the years 1980 to 2011. The international financial integration measure rises over the period 1980 to 1989, then drops in 1991. The drop in 1991 is due to the Gulf War which took place in Kuwait (August 1990 to March 1991). The decline in 2001 reflects the steep fall in world stock markets. The decline in the period 2007 to 2008 indicates the effect of the global financial crisis in GCC.

In Figure 3.2, the investment measure (ratio of portfolio plus FDI assets and liabilities to GDP) increases over the period from 1980 to 1989 and then drops in 1991. The fall in investment measure over the 1990 to 1991 period is due to the Gulf
War. Again the decline in 2001 reflects the fall in world stock markets. The decline in the period 2007 to 2008 indicates the impact of global financial crisis in GCC.

Figure 3.2 Investment based measure of international financial integration, 1980-2011

Note: $IFIEDQ = \sum_{i=1}^{6} IFIEDQ_{it}$. $i$ denotes individual GCC country. There are six GCC countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates.

$IFIEDQ_{it} = \frac{FDIA_{it} + PEQA_{it} + PDQA_{it} + FDIL_{it} + PEQL_{it} + PDQL_{it}}{GDP_{it}}$.

$FDIA_{it}$ is the stock of FDI assets of country $i$ abroad in time $t$, $PEQA_{it}$ is the stock of portfolio equity assets of country $i$ abroad in time $t$, $PDQA_{it}$ is the stock of portfolio debt assets of country $i$ abroad in time $t$, $FDIL_{it}$ is the stock of FDI liabilities of the rest of the world in country $i$ in time $t$, $PEQL_{it}$ is the stock of portfolio equity liabilities of the rest of world in country $i$ in time $t$, $PDQL_{it}$ is the stock of portfolio debt liabilities of the rest of the world in country $i$ in time $t$, $GDP_{it}$ is the nominal GDP of country $i$ in time $t$.

Overall stylised facts indicate that the GCC region has improved its net external position. Equity instruments (especially FDI) now account for a much larger share of external liabilities, such that domestic production risks are now shared to a much greater degree with outside investors. The considerable variation in cross-
border positions means that the international financial transmission mechanism is quite complex, with a local shock in one economy having a differential impact on partner countries, according to the level and composition of bilateral investment positions and the nature of co-movements between home and partner financial returns. The heterogeneity in the bilateral transmission of shocks is reinforced by the asymmetries between international financial linkages and international trade linkages, with the degree of trade integration between the GCC and the world relatively stronger than the degree of financial integration.

3.4 Analysis of Determinants of International Financial Integration in the GCC

This section discusses the theoretical issues related to international financial integration, impact of global financial crisis on GCC countries, response to global financial crisis, determinants of international financial integration. The section further discusses summary statistics and correlation, methodology, empirical specification, and test results.

3.4.1 Theoretical Issues

International Parity theory suggests that in a world with no borders, the allocation of international asset holdings would take place with no transactions costs; here it is assumed that complete global financial market integration exists. Each country would hold a very high level of foreign assets and liabilities, in line with full diversification. However, in the actual world there are implicit and explicit barriers to full integration and in the gains to international diversification. Martin and Rey (2000, 2004), develop a theoretical model that assumes that investors are risk averse,
the number of financial assets are endogenous, assets are imperfect substitutes, and cross border asset trade entails transactions costs. Under these assumptions, a reduction in international transaction costs stimulates an increase in the demand for (and supply of) assets and an increase in asset prices, leading to higher cross border diversification. Our empirical specification will be based on identification of a set of country characteristics that may influence international asset trade.

3.4.2 Impact of Global Financial Crisis on GCC Countries

During the global financial crisis, the GCC countries have been hit by a decline in oil prices and production, as well as by liquidity shortages in global financial markets. GCC region’s stock market capitalisation fell by 41 per cent ($400 billion) between September 2008 and end-2008, and volatility increased (IMF 2010). On average, the stock market indices of Arab countries crashed by more than 50 per cent between their peak in mid-2008 and their low in early 2009, thereby causing losses of something between US$ 200 billion and US$ 600 billion (Brach & Loewe 2010). The main channels of the transmission of the crisis is due to reduction in foreign investment and exports (IMF 2009).

At the end of 2006, UAE sovereign funds were about 400 per cent of the country’s GDP. The sovereign funds of Kuwait and Saudi Arabia had foreign assets of about 142 and 64 per cent of GDP. At least 30 per cent of these assets were temporarily lost during the financial crisis. According to Deutsche Bank and Forbes estimates, the losses of Arab sovereign funds accounted for over US$ 450 billion, while private investors lost another US$ 300–500 billion. The losses were very unevenly distributed across the region. The sovereign funds of Kuwait and UAE (especially Dubai) had invested large shares of their capital in emerging market
stocks and bonds, and as a consequence they experienced particularly large losses. The sovereign funds of Saudi Arabia followed a much more conservative investment strategy and therefore fared much better. Out of some US$ 60 billion accumulated until 2008, Qatar’s sovereign wealth fund lost US$ 10 billion during the crisis (Brach & Loewe 2010).

GCC financial systems are heavily regulated by state-owned banks, and most banks have easy access to domestic sources of finance. In Bahrain two banks ran into financial difficulties, but the central bank took control of them to prevent other banks being affected by their problems (Lidstone 2009; Wigglesworth 2009a). In Saudi Arabia, several banks were at risk of insolvency (Wigglesworth 2009b). In Kuwait two investment companies defaulted; however, they reached a restructuring agreement with their creditors. Credit rating agencies have taken several negative rating actions on GCC banks (IMF 2010).

3.4.2.1 Response to the Global Financial Crisis

In general, all GCC countries have focussed on stabilising their financial sectors. The GCC have responded forcefully to the adverse developments brought about by the crisis. Their responses took three main forms: financial, monetary and fiscal. On the financial front, central banks across the GCC region have infused liquidity into the financial system through repos and placement of long-term deposits to strengthen bank operations and stabilise the financial system. GCC governments injected capital into stressed institutions: for example, Kuwait has established a fund to assist private enterprises when necessary (Smith 2009). GCC governments also have increased deposits with financial institutions and provided emergency credit facilities to banks, and all GCC countries have pumped liquidity into local financial markets. Table 3.1 shows some of the financial responses of GCC countries to the financial crisis.
### Table 3.1 Financial Response to the Crisis

<table>
<thead>
<tr>
<th>Country</th>
<th>Financial response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>• Government deposits of US$ 150 million in banks</td>
</tr>
<tr>
<td></td>
<td>• Provision of a penalty-free credit facility of a short-term dollar swap to banks</td>
</tr>
<tr>
<td></td>
<td>• Raising of the commercial bank deposit guarantee from 15,000 Bahraini dinars to 20,000 Bahraini dinars</td>
</tr>
<tr>
<td>Kuwait</td>
<td>• Government deposits of US$ 1.68 billion in banks</td>
</tr>
<tr>
<td></td>
<td>• Provision of a credit facility of US$ 13.8 billion to local firms with a 50 per cent guarantee</td>
</tr>
<tr>
<td></td>
<td>• Provision of government loan facilities to investment firms</td>
</tr>
<tr>
<td></td>
<td>• Easing of the loan-to-deposit ratio from 80 per cent to 85 per cent, along with an increase in the cap on credit growth</td>
</tr>
<tr>
<td></td>
<td>• Investment in the stock market by the Kuwait Investment Authority through mutual funds</td>
</tr>
<tr>
<td></td>
<td>• Full protection of customer deposits in local banks</td>
</tr>
<tr>
<td>Oman</td>
<td>• Increase of 30 per cent in government deposits</td>
</tr>
<tr>
<td></td>
<td>• Provision of a credit facility of US$ 2 billion to local banks</td>
</tr>
<tr>
<td></td>
<td>• Loosening of the loan-to-deposit ratio from 85 per cent to 87.5 per cent</td>
</tr>
<tr>
<td></td>
<td>• Establishment of a US$ 400 million facility to support the stock market</td>
</tr>
<tr>
<td>Qatar</td>
<td>• Increased government deposits in the banking sector</td>
</tr>
<tr>
<td></td>
<td>• Capital injection of US$ 1 billion in listed banks by Qatar Investment Authority</td>
</tr>
<tr>
<td></td>
<td>• Capital injection by the government of US$ 70 million in investment firms</td>
</tr>
<tr>
<td></td>
<td>• Purchase of bank investment portfolios valued at US$ 2 billion and real estate portfolios valued at US$ 4 billion</td>
</tr>
<tr>
<td></td>
<td>• Removal of the ceiling on deposit guarantees</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>• Government deposits of US$ 36 billion in banks</td>
</tr>
<tr>
<td></td>
<td>• Provision of a credit facility through repurchase agreements</td>
</tr>
<tr>
<td></td>
<td>• Government lending of US$ 2.67 billion in credit to low-income citizens</td>
</tr>
<tr>
<td></td>
<td>• Provision of deposit guarantees by the Supreme Economic Council</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>• Government deposits of US$ 18.7 billion in banks</td>
</tr>
<tr>
<td></td>
<td>• Provision of an emergency credit facility of US$ 13.6 billion</td>
</tr>
<tr>
<td></td>
<td>• Progressive increase in the capital adequacy ratio to 12 per cent</td>
</tr>
<tr>
<td></td>
<td>• Capital injection of US$ 4.4 billion by Abu Dhabi government to recapitalise five banks</td>
</tr>
<tr>
<td></td>
<td>• Government commitment to at least US$ 17 billion to support Dubai government in restructuring the debt of their companies.</td>
</tr>
<tr>
<td></td>
<td>• Government guarantee of all deposits and interbank lending for 3 years</td>
</tr>
</tbody>
</table>

Source: Economic and Social Commission for Western Asia, 2009.
On the monetary front, central banks across the GCC region have used monetary policy tools to ease credit and ensure that liquidity does not dry up. Some actions have included a reduction of overnight and repurchase rates, and a lowering of reserve requirement ratios. Bahrain have reduced the reserve requirement rate from seven per cent to five per cent. The Central Bank of UAE has also engaged in open market operations by entering into a US$ 20 billion bond program and buying the first tranche of US$ 10 billion. Most GCC countries have strengthened their financial market regulations and relaxed monetary policies: reduced key interest rates and minimum reserve requirements (IMF 2009; Siddiqi 2009). Table 3.2 shows some of the GCC monetary responses to the financial crisis.

**Table 3.2 Monetary Response to the Crisis**

<table>
<thead>
<tr>
<th>Country</th>
<th>Monetary response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>• Reduction of the reserve requirement rate from 7 per cent to 5 per cent</td>
</tr>
<tr>
<td></td>
<td>• Reduction of the one-week deposit rate by 25 bps and the overnight repurchase rate by 125 bps</td>
</tr>
<tr>
<td>Kuwait</td>
<td>• Reduction of the repurchase rate by 150 bps and the discount rate by 125 bps</td>
</tr>
<tr>
<td>Oman</td>
<td>• Reduction of the reserve requirement from 8 per cent to 5 per cent to release 270 million Omani rials into the banking system</td>
</tr>
<tr>
<td></td>
<td>• Reduction of the repurchase rate by 220 bps</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>• Reduction of the reserve requirement on current accounts from 10 per cent to 7 per cent</td>
</tr>
<tr>
<td></td>
<td>• Lowering of the overnight repurchase rate by 150 bps</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>• Reduction of the repurchase rate by 50 bps</td>
</tr>
<tr>
<td></td>
<td>• Launch of a US$ 20 billion bond programme and sale of the first tranche of US$ 10 billion to the central bank</td>
</tr>
</tbody>
</table>

Source: Economic and Social Commission for Western Asia, 2009.

Finally, on the monetary front, fiscal authorities in GCC countries have responded in the form of high levels of spending. Saudi Arabia introduced the largest stimulus package of $400 billion investment plan over five years, to contribute to the global effort to revive demand (IMF 2010). In conclusion, all GCC member
countries intervened to counteract the possible negative effects of the global financial crisis, and their fiscal responses to the financial crisis are set out in Table 3.3.

**Table 3.3 Fiscal Response to the Crisis**

<table>
<thead>
<tr>
<th>Country</th>
<th>Fiscal response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait</td>
<td>• Plans to increase government spending by approximately US$ 104 billion during the period 2010-2014s</td>
</tr>
<tr>
<td>Oman</td>
<td>• Increase in government spending in 2009 by 11 per cent compared with the previous year</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>• Reduction of the reserve requirement on current accounts from 10 per cent to 7 per cent</td>
</tr>
<tr>
<td></td>
<td>• Plans to implement the largest expansionary fiscal stimulus package of US$ 400 billion on development projects</td>
</tr>
</tbody>
</table>

Source: Economic and Social Commission for Western Asia, 2009.

### 3.4.3 Variables

**Trade Openness:**

Trade openness is sum of imports and exports normalised by GDP. Mishra (2007) and Lane & Milesi-Ferreti (2008b) state that bilateral equity investment is strongly correlated with underlying patterns of trade. Investors are better able to attain accounting and regulatory information on foreign markets through trade and thereby invest in foreign assets. Default risk is also ameliorated by tighter trade integration. Finally, trade transactions may directly generate cross-border financial flows including trade credits, export insurance and payment facilitation. The data on trade openness is from World Bank’s World Development Indicators.

**Financial Depth:**

Financial depth is the ratio of money supply (M2) to GDP. Money supply (M2) is money and quasi money which comprises of the sum of currency outside banks,
demand deposits other than those of the central government, time savings, and foreign currency deposits of resident sectors other than the central government. The ratio of M2 to GDP is often used as a measure of the size and liquidity of the financial intermediary sector (King & Levine 1993). In addition, M2 to GDP, as the inverse value of the velocity of circulation of money, corresponds to the cash holding coefficient and, as such, indicates the confidence that economic agents have in the domestic currency and the banking system. M2 corresponds to lines 34 and 35 in the IMF’s International Financial Statistics. GDP data is from the IMF’s World Economic Outlook database.

*Domestic Credit:*

Domestic credit is the ratio of domestic credit provided by the banking sector to the GDP. Levine, Loayza & Beck (2000) employ this measure in their study related to financial intermediation and growth. They find higher levels of domestic credit to indicate higher levels of financial services and therefore greater financial intermediary growth. The development of domestic financial markets facilitates asset trade among local residents and thereby potentially diminishes the role of external financial intermediaries in linking domestic agents. However, domestic financial development may be spurred by foreign investment in the domestic financial system, and the creation of domestic financial products also facilitates foreign demand for domestic liabilities (Martin & Rey 2004) thus suggesting a positive correlation between financial development and financial globalisation. The institutional capability accumulated by investing in domestic markets lowers the barrier to acquiring foreign assets, implying potentially strong complementarities between growth of domestic financial positions and external financial positions.
**GDP per capita:**

The level of economic development is an important factor in explaining domestic residents’ propensity to engage in cross-border asset trade. In the presence of fixed costs or less-than-proportional learning costs of international asset trade, higher international financial integration in wealthier economies should be expected (Mulligan & Sala-i-Martin 1996). GDP per capita data is from the IMF’s World Economic Outlook database.

### 3.4.4 Summary Statistics and Correlation

**Table 3.4 Summary Statistics of variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Observations</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset measure</td>
<td>192</td>
<td>3.740</td>
<td>4.060</td>
<td>0.289</td>
<td>17.769</td>
</tr>
<tr>
<td>Liability measure</td>
<td>192</td>
<td>1.636</td>
<td>3.444</td>
<td>0.061</td>
<td>16.382</td>
</tr>
<tr>
<td>Volume measure</td>
<td>192</td>
<td>5.376</td>
<td>7.041</td>
<td>0.463</td>
<td>34.151</td>
</tr>
<tr>
<td>Investment measure</td>
<td>192</td>
<td>0.791</td>
<td>0.835</td>
<td>0.000</td>
<td>3.999</td>
</tr>
<tr>
<td>Financial depth</td>
<td>192</td>
<td>104.562</td>
<td>91.425</td>
<td>5.433</td>
<td>321.656</td>
</tr>
<tr>
<td>Trade openness</td>
<td>192</td>
<td>107.877</td>
<td>38.421</td>
<td>56.47</td>
<td>251.14</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>192</td>
<td>18554.18</td>
<td>15063.16</td>
<td>4600</td>
<td>89736</td>
</tr>
<tr>
<td>Domestic credit</td>
<td>192</td>
<td>40.856</td>
<td>18.296</td>
<td>6.815</td>
<td>94.517</td>
</tr>
</tbody>
</table>

**Note:** Asset measure is ratio of external assets to GDP. Liability measure is ratio of external liabilities to GDP. Volume measure is ratio of sum of external assets and liabilities to GDP. Investment measure is sum of FDI and portfolio assets and liabilities to GDP. Financial depth is ratio of M2 to GDP. Trade openness is ratio of sum of imports and export to GDP. GDP per capita is in US$. Domestic credit is ratio of domestic credit provided by banking sector to GDP.

Table 3.4 illustrates summary statistics of variables. Asset measure (ratio of external assets to GDP) ranges from 0.289 to 17.769 and has a mean value of 3.74. Investment measure (ratio of sum of FDI and portfolio assets and liabilities to GDP) ranges from 0 to 3.99 and has a mean value of 0.791. Financial depth (ratio of M2 to GDP) has a mean value of 104.562, and domestic credit (ratio of domestic credit provided by banking sector to GDP) has a mean value of 40.856.
Table 3.5 Correlation Matrix

<table>
<thead>
<tr>
<th>Asset measure</th>
<th>Liability measure</th>
<th>Volume measure</th>
<th>Investment measure</th>
<th>Financial depth</th>
<th>Trade openness</th>
<th>GDP per capita</th>
<th>Domestic credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset measure</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liability measure</td>
<td>0.759</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume measure</td>
<td>0.948</td>
<td>0.926</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment measure</td>
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<td>0.528</td>
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<td>Financial depth</td>
<td>0.015</td>
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<td>-0.128</td>
<td>0.466</td>
<td>-0.167</td>
<td>1.000</td>
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<tr>
<td>Trade openness</td>
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<td>0.505</td>
<td>0.420</td>
<td>0.176</td>
<td>-0.167</td>
<td>1.000</td>
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</tr>
<tr>
<td>GDP per capita</td>
<td>-0.029</td>
<td>-0.081</td>
<td>-0.056</td>
<td>0.290</td>
<td>0.310</td>
<td>0.029</td>
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</tr>
<tr>
<td>Domestic credit</td>
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<td>0.171</td>
<td>0.216</td>
<td>0.249</td>
<td>0.016</td>
<td>0.361</td>
<td>0.345</td>
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</tbody>
</table>

Note: Asset measure is ratio of external assets to GDP. Liability measure is ratio of external liabilities to GDP. Volume measure is ratio of sum of external assets and liabilities to GDP. Investment measure is sum of FDI and portfolio assets and liabilities to GDP. Financial depth is ratio of M2 to GDP. Trade openness is ratio of sum of imports and export to GDP. GDP per capita in US$. Domestic credit is ratio of domestic credit provided by banking sector to GDP. Financial depth, trade openness and domestic credit are expressed in per cent.

Table 3.5 illustrates correlation matrix of measures and variables. There is high correlation between measures and therefore they are not taken together in regressions. The correlation matrix indicates that variables are not highly correlated with each other and neither with measures.

3.4.5 Methodology and Empirical Specification

Financial integration measure may be dynamic in nature, and the econometric treatment of dynamic nature of financial integration measure includes lagged values of financial integration measure among the explanatory variables.

\[ y_{it} = \delta y_{i,t-1} + x_{it}' \beta + u_{it} \quad i = 1, \ldots, N \quad t = 2, \ldots, T \]  

(5)

where \( \delta \) is a scalar, \( x_{it}' \) is a \( 1 \times K \) vector of explanatory variables and \( \beta \) is a \( K \times 1 \) vector of parameters to be estimated. The error term \( u_{it} \) is composed of an unobserved effect and time-invariant effect \( \mu_i \) and random disturbance term \( \nu_{it} \).
\[ u_t = \mu_i + v_{it} \]  \hspace{1cm} (6)

where \( \mu_i \sim IID(0, \sigma^2_\mu) \) and \( v_{it} \sim IID(0, \sigma^2_v) \) independent of each other and among themselves. The dynamic panel data regressions described in above equations (5) and (6) are characterised by two sources of persistence over time i.e. autocorrelation due to the presence of a lagged dependent variable among the regressors, and individual effects characterising the heterogeneity among the individuals. Since \( y_{it} \) is a function of \( \mu_i \), this implies that \( y_{t,i,-1} \) is also a function of \( \mu_i \). Therefore, \( y_{t,i,-1} \) is correlated with the error term through the presence of \( \mu_i \). The OLS estimator for equation (5) is biased and inconsistent even if the \( v_{it} \) are not serially correlated. The fixed effect estimator of (5), which eliminates the individual effects \( \mu_i \), produces biased and inconsistent estimates (Kiviet 1995; Nickell 1981). Anderson and Hsiao (1982) suggest first differencing the model to get rid of the \( \mu_i \) and then using

\[ \Delta y_{t,i,-2} = (y_{t,i,-2} - y_{t,i,-3}) \]

as an instrument for

\[ \Delta y_{t,i,-1} = (y_{t,i,-1} - y_{t,i,-2}) \]

These instruments will not be correlated with \( \Delta v_{it} = v_{t,i} - v_{t,i,-1} \), so far as the \( v_{it} \) themselves are not serially correlated. This instrumental variable (IV) estimation method leads to consistent but not necessarily efficient estimates of the parameters in the model because it does not make use of all available moment conditions (Ahn & Schmidt 1995) and it does not take into account the differenced structure on residual disturbances \( \Delta v_{it} \). Arellano (1989) states that for simple dynamic error components models, the estimator that uses differences \( \Delta y_{t,i,-2} \) rather than levels \( y_{t,i,-2} \) for instruments has a singularity point and very large variances over a significant range of parameter values. On the other hand, the estimator that uses
$y_{it-2}$ has no singularities and much smaller variances. Arellano and Bond (1991) propose a generalised method of moments (GMM) estimator of the first differenced model that brings about significant efficiency gains as compared to the estimator by Anderson and Hsiao (1982) through exploiting additional orthogonality conditions associated with higher lags of the endogenous variable in the set of instruments.

Arellano and Bond (1991) derive one-step and two-step GMM estimators using moment conditions in which lagged levels of the dependent and predetermined variables are instruments for the differenced equations. Blundell and Bond (1998) show that the lagged-level instruments in the Arellano–Bond estimator become weak as the autoregressive process becomes too persistent or the ratio of the variance of the panel-level effect to the variance of the idiosyncratic error becomes too large. Linear dynamic panel data models include $p$ lags of the dependent variable on covariates and contain unobserved panel level effects, fixed or random. Arellano and Bover (1995) develop a framework for efficient instrumental variable estimators of random effects models with information in levels which can accommodate predetermined variables. Building on the work of Arellano and Bover (1995), Blundell and Bond (1998) propose a system estimator that uses moment conditions in which lagged differences are used as instruments for the level equation in addition to the moment conditions of lagged levels as instruments for the differenced equation. This estimator is designed for datasets with many panels and few periods. The method assumes that there is no autocorrelation in the idiosyncratic errors and requires the initial condition that the panel-level effects be uncorrelated with the first difference of the first observation of the dependent variable. In a dynamic panel data GMM estimation, the number of moment conditions increases with $T$. The moment
conditions employed by the Arellano Bover/Blundell method are valid only if there is no serial correlation in the idiosyncratic error. The Arellano Bond test is a test for no autocorrelation in linear dynamic panel models. I perform Arellano and Bond test for serial correlation in the first differenced errors at order $m$.

To deal with basic problems of endogeneity between variables the regression equation will be based on the Arellano–Bover/Blundell–Bond linear dynamic panel-data estimation. A variable or parameter is said to be endogenous when there is a correlation between the variable and the error term. Endogeneity can arise as a result of measurement error, autoregression with autocorrelated errors, simultaneity and omitted variables. The determinants of financial integration will be investigated by estimating several empirical specifications. A benchmark specification that includes financial integration variables is given by the following relationship:

$$y_{it} = \delta y_{i,t-1} + x_{it}' \beta + u_{it}$$

where $y_{it}$ is measure of financial integration as per equations (1) to (4); $x_{it}'$ includes various country characteristics including trade, GDP per capita, ratio of liquid liabilities to GDP, and ratio of domestic credit provided by the banking sector to GDP and $u_{it}$ is the error term.

### 3.4.6 Stationarity Tests

In the presence of nonstationarity, I could end up with spurious regressions. Therefore, to detect nonstationarity, I use panel unit root tests. The first test is the Levin, Lin, and Chu (LLC) unit root test, which assumes identical first-order autoregressive coefficients across countries. The test involves the following regression equation:
\[ \Delta y_{it} = \alpha_i + \gamma_i y_{i,t-1} + \sum_{j=1}^{k} \alpha_j \Delta y_{i,t-j} + \epsilon_{it} \]  

(8)

The subscripts \( i \) and \( t \) are country time indicators with \( i = 1, \ldots, N \) and \( t = 1, \ldots, T \). The null hypothesis \( H_0 : \gamma_i = \gamma = 0 \) for all \( i \), against the alternative hypothesis \( H_1 : \gamma_i = \gamma_2 = \ldots = \gamma_N < 0 \) for all \( i \), with the test based on statistics \( t_\gamma = \hat{\gamma} / s.e.(\hat{\gamma}) \). I also use the Im, Pesaran, and Shin (IPS) W-stat test, which relaxes the assumption of the identical first-order autoregressive coefficients of the LLC test and allows the first-order autoregressive coefficients \( \gamma \) to vary across countries under alternative hypotheses. IPS test the null hypothesis of \( H_0 : \gamma_i = 0 \) for all \( i \), against the alternate of \( H_1 : \gamma_i < 0 \) for all \( i \).

**Table 3.6 Panel unit root tests**

<table>
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<tr>
<th>Variable</th>
<th>Variable form</th>
<th>LLC</th>
<th>IPS</th>
<th>Decision</th>
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<td>-0.5821</td>
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</tr>
<tr>
<td></td>
<td>Difference</td>
<td>-3.9097***</td>
<td>-7.0764***</td>
<td>Stationary</td>
</tr>
<tr>
<td>Liability measure</td>
<td>Level</td>
<td>-1.4226</td>
<td>-1.2345</td>
<td>Nonstationary</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>-3.9117***</td>
<td>-7.0957***</td>
<td>Stationary</td>
</tr>
<tr>
<td>Volume measure</td>
<td>Level</td>
<td>-1.3408</td>
<td>-1.4057</td>
<td>Nonstationary</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>-4.300***</td>
<td>-7.2728***</td>
<td>Stationary</td>
</tr>
<tr>
<td>Investment measure</td>
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<td>0.5027</td>
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</tr>
<tr>
<td></td>
<td>Difference</td>
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<td>-7.4067***</td>
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<tr>
<td>Financial depth</td>
<td>Level</td>
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<td>-3.6157</td>
<td>Nonstationary</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>-6.4986***</td>
<td>-8.4495***</td>
<td>Stationary</td>
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<tr>
<td>Trade openness</td>
<td>Level</td>
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<td>Nonstationary</td>
</tr>
<tr>
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<td>Difference</td>
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<td>-6.8628***</td>
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<td>GDP per capita</td>
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<td>5.6438</td>
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<td>Difference</td>
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<td>-5.5194***</td>
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<td>-0.406</td>
<td>Nonstationary</td>
</tr>
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<td>-3.1067***</td>
<td>-5.2258***</td>
<td>Stationary</td>
</tr>
</tbody>
</table>

Notes: LLC tests for common unit root, while IPS test for individual unit roots. *, **, *** denote significance at 10%, 5% and 1%.

The panel unit root test results are reported in Table 3.6. All financial integration measures are nonstationary in the levels. Financial depth, trade openness,
GDP per capita and domestic credit are nonstationary in level. The LLC test indicates their stationarity based on a rejection of the null hypothesis of a common unit root in the panel of all countries. IPS tests, on the other hand, fail to reject the null hypothesis of individual unit roots. However, the two tests do indicate the stationarity of all the variables in difference form. I therefore use the above variables in difference form.

3.4.7 Empirical Results

This section presents the Arellano–Bover/Blundell–Bond tests (Tables 3.7 to 3.9) regression results upon estimating equation (7). Columns (1) to (4) illustrate results over the period from 1980 to 2007, and columns (5) to (8) illustrate the results over the period 1980 to 2011 (taking into account global financial crisis).

Table 3.7 illustrates the regression results when the external asset normalised by GDP ($IFIA_{it}$) is a dependent variable. Financial depth appears to be positive and highly significant. This implies that economic agents have confidence in the domestic currency and the banking system. Over the period 1980 to 2007 (columns (1) to (4)), a 1 percentage point increase in financial depth increases $IFIA_{it}$ on average by 2.11 percentage points. Over the period 1980 to 2011 (columns (5) to (8)), a 1 percentage point increase in financial depth increases $IFIA_{it}$ on average by 1.79 percentage points. Trade openness is positive and significant. Trade openness enables investors to have better accounting and regulatory information on foreign markets and thereby invest in foreign assets. In columns (2) to (4), a 1 percentage point increase in trade openness increases $IFIA_{it}$ on average by 2.44 percentage points. Over the period 1980 to 2011, a 1 percentage point increase in trade openness

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increases $IFIA_{it}$ on average by 2.31 percentage points. GDP per capita is negative and statistically significant. One possible explanation is that an increase in the GDP per capita lowers the rate of return and flow of FDI.

Domestic credit appears to be positive and significant. The banking institutional capability accumulated by investing in domestic markets lowers the barrier to acquiring foreign assets, implying potentially strong complementarities between growth of domestic financial positions and external financial positions. One percentage point increase in domestic credit, increases $IFIA_{it}$ on average by 2 percentage points over the period 1980 to 2007. One percentage point increase in domestic credit, increases $IFIA_{it}$ on average by 1.94 percentage points over the period 1980 to 2011. The Arellano–Bond test for serial correlation in the first differenced errors indicates that there is no autocorrelation of the second order.

Table 3.8 illustrates the regression results when the external asset and liability normalised by GDP ($IFIT_{it}$) is a dependent variable. $IFIT_{it}$ is the volume based measure of financial integration. Table 3.9 illustrates the regression results when the sum of portfolio and FDI assets and liabilities normalised by GDP ($IFIEDQ_{it}$) is the dependent variable. $IFIEDQ_{it}$ is the investment based measure of financial integration. In Tables 3.8 and 3.9, financial openness, trade openness and domestic credit are positive and significant. GDP per capita is negative and significant.
Table 3.7 Asset Measure

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<td>Financial Depth</td>
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<td>1.792***</td>
<td>1.562***</td>
<td>2.076***</td>
<td>2.109***</td>
<td>1.662***</td>
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<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.003)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.007)</td>
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<td>Trade Openness</td>
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<td>2.389*</td>
<td>2.675*</td>
<td>2.127*</td>
<td>2.127*</td>
<td>2.262**</td>
<td>2.529**</td>
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<td>(0.083)</td>
<td>(0.076)</td>
<td>(0.056)</td>
<td>(0.063)</td>
<td>(0.044)</td>
<td>(0.044)</td>
<td>(0.031)</td>
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<td>GDP per capita</td>
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<td>-0.972***</td>
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<td>-0.619***</td>
<td>-0.613***</td>
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<td>Domestic Credit</td>
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</tr>
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<td>Wald Chi²</td>
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<td>22.27</td>
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<td>156</td>
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<tr>
<td>Arellano Bond test</td>
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<td>-0.980</td>
<td>-0.968</td>
<td>-0.966</td>
<td>-0.876</td>
<td>-0.925</td>
<td>-0.915</td>
<td>-0.928</td>
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<tr>
<td>AR(2) p-value</td>
<td>(0.354)</td>
<td>(0.326)</td>
<td>(0.332)</td>
<td>(0.333)</td>
<td>(0.381)</td>
<td>(0.354)</td>
<td>(0.360)</td>
<td>(0.353)</td>
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</table>

Note: Asset measure (Ratio of external assets to GDP) is dependent variable. Columns (1) to (4) indicate results over the period 1980 to 2007 and columns (5) to (8) indicate results over the period 1980 to 2011. Arellano–Bover/Blundell–Bond estimation with lags(1) and AR(2) tests. Arellano Bond test for no auto correlation. Lag value of the dependent variable is not reported. P-values in brackets. Constant is not reported. Financial depth is ratio of M2 to GDP. Trade openness is ratio of sum of imports and export to GDP. GDP per capita in US$. Domestic credit is ratio of domestic credit provided by banking sector to GDP. *,**,*** denote significance at 10%, 5% and 1%.
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<td>2.733***</td>
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<td>4.377*</td>
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**Note:** Volume measure (ratio of sum of external assets and external liabilities to GDP) is a dependent variable. Columns (1) to (4) indicate results over the period 1980 to 2007 and columns (5) to (8) indicate results over the period 1980 to 2011. Arellano–Bover/Blundell–Bond estimation with lags(1) and AR(2) tests. Arellano Bond test for no auto correlation. Lag value of the dependent variable is not reported. Constant is not reported. P-values in brackets. Financial depth is ratio of M2 to GDP. Trade openness is ratio of sum of imports and exports to GDP. GDP per capita in US$. Domestic credit is ratio of domestic credit provided by banking sector to GDP. *,**,*** denote significance at 10%, 5% and 1%. 

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Table 3.9 Investment Measure

<table>
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<tr>
<td>Arellano Bond test</td>
<td>-0.966</td>
<td>-1.024</td>
<td>-1.026</td>
<td>-1.032</td>
<td>-0.958</td>
<td>-1.007</td>
<td>-1.007</td>
<td>-1.006</td>
</tr>
<tr>
<td></td>
<td>(0.333)</td>
<td>(0.305)</td>
<td>(0.304)</td>
<td>(0.301)</td>
<td>(0.337)</td>
<td>(0.313)</td>
<td>(0.313)</td>
<td>(0.314)</td>
</tr>
</tbody>
</table>

Note: Investment measure (ratio of sum of FDI, portfolio assets and liabilities to GDP) is the dependent variable. Columns (1) to (4) indicate results over the period 1980 to 2007 and columns (5) to (8) indicate results over 1980 to 2011. Arellano–Bover/Blundell–Bond estimation with lags(1) and AR(2) tests. Arellano Bond test for no auto correlation. Lag value of the dependent variable is not reported. Constant is not reported. P-values in brackets. Financial depth is ratio of M2 to GDP. Trade openness is ratio of sum of imports and export to GDP. GDP per capita in USS. Domestic credit is ratio of domestic credit provided by banking sector to GDP. *, **, *** denote significance at 10%, 5% and 1%. 

96
### Table 3.10 Robustness Test (1980-2011)

<table>
<thead>
<tr>
<th></th>
<th>Arellano–Bover/Blundell–Bond</th>
<th>Arellano Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Financial Depth</td>
<td>1.308***</td>
<td>1.368***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Trade Openness</td>
<td>2.645*</td>
<td>4.788*</td>
</tr>
<tr>
<td></td>
<td>(0.055)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>-0.010***</td>
<td>-0.0109***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Domestic Credit</td>
<td>2.177***</td>
<td>2.840***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Dummy</td>
<td>-0.230</td>
<td>-0.814</td>
</tr>
<tr>
<td></td>
<td>(0.625)</td>
<td>(0.404)</td>
</tr>
<tr>
<td>Dummy* Financial Depth</td>
<td>0.303</td>
<td>0.665</td>
</tr>
<tr>
<td></td>
<td>(0.201)</td>
<td>(0.157)</td>
</tr>
<tr>
<td></td>
<td>(0.034)</td>
<td>(0.020)</td>
</tr>
<tr>
<td>Dummy*GDP per capita</td>
<td>0.006**</td>
<td>0.006**</td>
</tr>
<tr>
<td></td>
<td>(0.037)</td>
<td>(0.034)</td>
</tr>
<tr>
<td>Dummy*Domestic Credit</td>
<td>-1.314***</td>
<td>-1.748***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Wald Chi²</td>
<td>151.49</td>
<td>342.27</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Observations</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>Arellano Bond test</td>
<td>-0.978</td>
<td>-1.036</td>
</tr>
<tr>
<td>AR(2) p-value</td>
<td>(0.327)</td>
<td>(0.300)</td>
</tr>
</tbody>
</table>

**Note:** In columns (1) and (4), asset measure (ratio of sum of external assets to GDP) is the dependent variable. In columns (2) and (5), volume measure (ratio of sum of external assets and external liabilities to GDP) is the dependent variable. In columns (3) and (6), investment measure (ratio of sum of FDI, portfolio assets and liabilities to GDP) is the dependent variable. Columns (1) to (3) indicate results for the Arellano–Bover/Blundell–Bond estimation. Columns (4) to (6) indicate results for the Arellano Bond estimation. Lags(1) and AR(2) tests. Arellano Bond test for no auto correlation. Lag value of the dependent variable is not reported. Constant is not reported. P-values in brackets. Financial depth is ratio of M2 to GDP. Trade openness is ratio of sum of imports and exports to GDP. GDP per capita in US$. Domestic credit is ratio of domestic credit provided by banking sector to GDP. Dummy is dummy=1 for global financial crisis period, otherwise 0. Dummy* Financial Depth is an interaction between Dummy and Financial Depth. Dummy* Trade Openness is an interaction between Dummy and Trade Openness. Dummy*GDP per capita is an interaction between Dummy and GDP per capita. Dummy*Domestic Credit is an interaction between Dummy and Domestic Credit. *,**,*** denote significance at 10%, 5% and 1%.
Table 3.10 illustrates the results upon taking into account recent impact of global financial crisis on financial integration measures of the GCC. Columns (1) to (3) illustrate the Arellano–Bover/Blundell–Bond estimation results, and columns (4) to (6) illustrate Arellano Bond estimation results as a robustness check. In columns (1) and (4), dependent variable is asset based financial integration measure (ratio of external assets to GDP). In columns (2) and (5), dependent variable is volume based financial integration measure (ratio of sum of external assets and liabilities to GDP). Finally in columns (3) and (6), dependent variable is investment based financial integration measure (ratio of sum of FDI, portfolio assets and liabilities to GDP). I introduce a GFC dummy variable which takes the value of 1 over the period of the global financial crisis (2008 to 2011), otherwise 0. I construct several interaction variables to capture the effect of change in financial integration measures due to (financial depth, trade openness, GDP per capita, domestic credit) depending on the global financial crisis. The interaction variable between GFC and trade openness (GFC*Trade Openness) determines the change in financial integration measures due to trade openness, depending on the global financial crisis. I expect the interaction variable to be negative due to decline in trade openness during global financial crisis, resulting in lower values of integration measures. I find the interaction variable (GFC*Trade Openness) to be negative and significant.21

---

21 During the period of the global financial crisis (2008 to 2009), exports in goods and services fell in GCC countries. For Bahrain, from 2008 to 2009 trade openness as a % of GDP fell from 171.16 to 166.72; Kuwait 92.08 to 90.932, Oman 97.24 to 92.56, Qatar 81.92 to 77.97, Saudi Arabia 104.88 to 96.50 and UAE 158.13 to 155.45. Data on trade openness as a % of GDP is from World Bank World Development Indicators.
The coefficient of the interaction variable between GFC and domestic credit (GFC*Domestic Credit) determines the change in financial integration measures that happens in GCC countries due to domestic credit depending on the global financial crisis. I expect the interaction variable to be negative, resulting in lower values of integration measures. I find the interaction variable (GFC*Domestic Credit) to be negative and significant.

The interaction variable between GFC and financial depth (GFC*Financial Depth) and GFC and GDP per capita (GFC*GDP per capita) determine the change in financial integration measures that happens in GCC countries during the global financial crisis. The interaction variable GFC*Financial Depth is insignificant in all regressions. The interaction variable GFC*GDP per capita is insignificant in Arellano Bond regression results (columns (4) to (6)).

Overall findings in Tables 3.7 to 3.10 indicate that financial depth, trade openness and domestic credit have a positive and significant impact on measures of financial integration. The change in financial integration measures due to trade openness and domestic credit depending on global financial crisis is negative and significant.

3.5 Conclusions and Policy Implications

This chapter sheds light on the determinants of the degree of the GCC’s international financial integration. I investigate the degree of international financial integration of the GCC member countries with the rest of the world by constructing several quantity based measures of financial integration. I use various indicators based on related literature including indicators of financial depth, trade openness,
economic development and banking sector development. I employ linear dynamic GMM panel estimation techniques (Arellano Bond and Arellano–Bover/Blundell–Bond) to study the impact of various indicators on measures of financial integration.

The results provide strong evidence that trade openness is an important determinant of international financial integration in GCC countries. The positive and significant trade openness implies that those factors that stimulate trade in goods and services also stimulate trade in assets. Trade in goods and services and trade in assets are complementary activities.

The results also provide strong evidence that indicators such as financial openness and domestic credit have a positive and significant impact on GCC countries’ international financial integration. During the process of integration, the size of national financial markets should increase (relative to domestic GDP), starting with those countries with less developed financial markets. Financial integration is likely to increase the efficiency of the financial intermediaries and the markets of less financially developed countries by stimulating the demand for funds and for financial services. There will be increased competition, with more sophisticated and cheaper financial intermediaries, associated with financial integration. The competition from these intermediaries may reduce the cost of financial services to the firms and households of countries with less developed financial systems, and thus expand the quantity of the local financial markets.

I use a global financial crisis dummy that takes value 1 during financial crisis period (2008 to 2011), otherwise 0. I employ several interaction variables to capture the change in financial integration measures due to financial depth, trade openness, GDP per capita and domestic credit depending on global financial crisis. I find a
negative change in financial integration measures due to trade openness and domestic credit depending on the global financial crisis.

This study has strong policy implications for GCC countries. In 2002, the GCC decided on implementing gradually a unified economic agreement towards establishing a single market, and forming monetary union at a certain stage. Understanding the drivers of international financial integration will provide important insight into the process of monetary and financial integration. In imperfectly integrated markets, regional factors are important in shaping the policy decisions and structures of financial markets differ across countries.

The future path for international financial integration in the GCC depends on the deepening of domestic financial systems and overall economic development, as well as the pace of trade integration. The GCC’s financial integration may require improvements in national regulation i.e. accounting standards, securities law, bank supervision and corporate governance to bring it in line with best practice regulation in the integrating area. On the public sector front, there is a need for better corporate governance of state-owned/affiliated enterprises, with greater attention given to managing quasi-sovereign balance-sheet risks, transparency, and excessive leverage. A more sophisticated domestic financial sector will give rise to greater private sector capability in the acquisition of foreign assets and sustainable issuance of foreign liabilities.

The development of local debt markets could reduce reliance on banks in financing projects and help lower funding costs. Developing the corporate bond market would help banks reduce their asset/liability maturity mismatches. Harmonisation of regulation and supervision within the GCC will also be essential to
avoid regulatory arbitrage in both offshore and onshore banking activities. GCC countries may have to attain significant progress in terms of regulation of financial markets and the development of robust risk management tools (IMF 2010).
Chapter 4  Financial Integration Index for GCC Stock Markets

4.1 Introduction

The process of reform and development of local securities markets over the past three decades has been one of the most important catalysts for integration of international financial markets. Foreign investment barriers have been lowered, country funds floated, and firms cross listed on stock markets in an effort to increase foreign equity flows. Several empirical studies have identified the potential welfare gains from market integration in terms of risk-sharing benefits (Lewis 2000; Obstfeld 1994) and in terms of investment activity, stock market development and overall economic growth (Bekaert & Harvey 1995, 2000; Kim & Singal 2000; Levine & Zervos 1998). Thus, stock market integration has implications beyond traditional issues in investments and corporate finance, and deserves further study.

The process of stock market integration is usually part of a major reform effort that includes the financial sector and the economy as well as the political process. Since the early 1980s, emerging markets have played an active role in the integration process in terms of diversification benefits (Bailey & Stulz 1990; Bekaert & Urias 1996; Divecha, Drach & Stefek 1992; Errunza & Padmanabhan 1988; Lagoarde-Segot & Lucey 2007; Phylaktis & Ravazzaolo 2005).

GCC stock markets are classified as frontier markets due to a number of market and institutional issues including liquidity, lack of effectiveness of their delivery versus payment settlement system, ownership limits on foreign investments, ownership limits on foreign investments,  

22 All GCC markets are frontier markets which aspire to be upgraded to the emerging market status as defined by the MSCI index provider.
etc (Balcilar, Demirer & Hammoudeh 2013). In 1981, the unified economic agreement between the countries of the Gulf Cooperation Council (GCC) was signed with the objective of realizing coordination, integration, and cooperation among member countries in various aspects of economic affairs. In 2002, GCC decided on implementing gradually a unified economic agreement towards establishing a single market, and forming monetary union at a certain stage. Furthermore, in 2010, the GCC member countries approved the Statute of the Monetary Council of the Cooperation Council for the Arab States of the Gulf, which focuses on the development and coordination of the monetary policies and exchange rate policies for national currencies until establishment of the GCC Central Bank.

This chapter aims to assess the degree of stock market integration and to gain insights on its variation through time for the six member countries of GCC; Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE. As indicated earlier, there has been no systematic study analysing stock market integration in GCC countries based on the international asset pricing theory that employs both a global systematic risk and a local market risk. This study fills the gap in financial integration literature by investigating the degree of stock market integration in GCC countries with the world portfolio and country’s diversification portfolio (GCC market portfolio). First I allow

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23 Gulf Cooperation Council (GCC) consists of six member countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates.

24 Stock market integration is a possible consequence of the single currency area. The introduction of a single currency unit will standardize the pricing of financial assets, improved transparency of financial markets and reduced investors’ information and transaction costs, thus, removing barriers to GCC portfolio allocation. Another implication of the common single currency will be the elimination of currency risk premium within GCC region, implying that investors do not have to hold different portfolios across countries in order to hedge against unanticipated currency risk.
conditionally expected returns in any country to be affected by their covariance with the world and by the variance of the country returns. Then I use the multivariate DCC-GARCH model of Engle (2002), based on the international asset pricing theory of Errunza and Losq (1985). The model allows for a differing price of variance risk across countries depending only on country-specific information, and a world price of covariance risk depending only on global information. The chapter contributes to the existing literature by developing a financial integration index for GCC stock markets over the period from June 2002 to Oct 2013. I also study what drives market integration by employing the Arellano Bond and Arellano–Bover/Blundell–Bond linear dynamic panel estimation techniques. The chapter tries to answer the following questions: (i) What is the magnitude of financial integration in each GCC stock market with the rest of the world and GCC market portfolio? (ii) What are the determinants of financial integration index for GCC stock markets? (iii) What are the policy implications deriving from the findings regarding stock market integration?.

The chapter is structured as follows: Section 2 provides a review of relevant literature. Section 3 offers a brief overview of the GCC stock markets. Section 4 describes the model and empirical methodology. Section 5 describes the data, and provides some descriptive statistics, and Section 6 contains the main empirical results. Finally, section 7 concludes.

25 This study uses a model prediction that if markets are perfectly integrated, only the global systematic risk is priced, whereas under completely segmented markets, only the local market risk is priced.
4.2 Literature Review

The field of international finance has developed different methodologies to test stock market integration. Most tests have evolved out of the asset pricing literature, such as Capital Asset Pricing Models (CAPM), International Capital Asset Pricing Models (IAPM) and Arbitrage Pricing Theory (APT). Stock markets are considered to be integrated if the reward investors receive for an investment made in securities with similar risk structures is the same in every market: in other words, the law of one price must hold for all securities (Baele et al. 2004). Early research classifies market integration studies in three categories: completely segmented markets, perfectly integrated markets, or partially segmented markets (Bekaert and Harvey 1995). The first category, which assumes completely segmented markets, is one that tests the Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965). A market completely segmented from the rest of the world provides country-specific returns to investors because it is solely influenced by local information, and its covariance with a common world factor may have no ability to explain its expected return.

The second category of the studies assumes that world capital markets are perfectly integrated. These include studies of a world CAPM (Harvey, 1991), a CAPM with exchange risk (Dumas & Solnik 1995), consumption based model (Wheatley 1988), arbitrage pricing theory (Solnik 1983), multi beta models (Ferson & Harvey 1993) and latent factor models (Campbell & Hamao 1992). In contrast to segmented markets, when a local market is integrated with foreign markets, its conditional mean and variance should be influenced by global information. In order
for a market to be integrated, there need to be no barriers to investment across countries.

The third class of market studies fall between the two extremes of segmented and integrated markets, and assumes that some markets are partially segmented and become more integrated through time (Errunza, Losq & Padmanabhan 1992). Furthermore, Bekaert and Harvey (1995) combine both extremes of asset pricing framework in a model to allow for time-varying integration.

To test for the benefits obtained from diversification across different countries, Solnik (1974) constructs several portfolios of the same size, calculates the average risk of the portfolio, and then repeats this procedure by increasing the size of the portfolio gradually. He focuses on seven European stock markets. He also reports evidence for the United States as a comparison. Eun and Janakiramanan (1986) derive a closed form of asset pricing model in a two country framework where foreign investors have access to all securities in the market while domestic investors are limited to invest on foreign market at most a fixed fraction of all available foreign securities. They find that the domestic securities are priced as if the markets are not segmented. Jorion and Schwartz (1986) propose a model in which perfect integration and complete segmentation are the two extreme cases. They conduct tests for integration between the Canadian and US stock markets using both domestic and inter-listed Canadian stocks. They do find results in favour of integration which they attribute to legal restrictions.

Harvey (1991) employs a conditional framework using monthly returns on a number of MSCI stock indexes and allows the expected excess index returns, their betas, and even the world market price of risk to vary over time. He employs GMM
estimation techniques with local and world instrumental variables and finds that a global version of the CAPM cannot be rejected in almost all developed country equity markets. Dumas and Solnik (1995) support empirically the existence of a foreign exchange risk premium by using a conditional approach that allows for time variation in the rewards for exchange rate risk.

Some papers analyse the impact of market integration on interest rate. Basak (1996) solves an intertemporal model of international capital market segmentation where interest rate is treated as an endogenous variable. He shows that interest rate will increase as markets integrate. Sellin and Werner (1993), in a two country one good model, analyse changes in the riskless interest rate for two specific types of investment barriers. They find that the interest rate decreases as markets become partially segmented or interest rate increases as markets move from partially segmented to integrated case. Errunza and Losq (1989) investigate the impact of integration of a partially segmented market on interest rate via the introduction of a fixed-income security. They find that the direction of change in the nominal interest rate depends on the covariances between the exchange rate and two specially designed asset portfolios.

A number of studies establish a multi-beta model, such as the APT or intertemporal CAPM, which can hold internationally, assuming a perfect market model with identical consumption and investment opportunity sets across countries. Cho, Eun & Senbet (1986) are the first to provide tests of the international APT. They employ factor analysis with monthly stock returns from 11 countries and find that three or four factors are reliably identified; however, the cross-sectional tests lead them to reject international market integration and the APT. Their results are not
sensitive to the currency denomination of the returns and the model holds reliably for certain pairs of country groupings. Wheatley (1988) develops a test for integration using a consumption based asset pricing model. The model predicts that each country has an asset pricing line and when securities lie at a significant distance from this line, the joint hypothesis is rejected. Campbell and Hamao (1992) study the integration of the long-term capital markets of the United States and Japan using a latent variable model wherein they make the assumption that the assets have constant betas with an unobserved benchmark portfolio. Ferson and Harvey (1993) show how one can use a single aggregate exchange risk factor to proxy for deviations from PPP.

Stehle (1977) is the first to test market integration based on both the domestic asset pricing model and the international asset pricing model. He finds that risk, which can only be diversified away through international diversification, should be priced if international markets are integrated. Errunza and Losq (1985) develop a model that tackles the “pricing implications” of barriers to international investment. The specific barrier they examine is the inability of some investors to trade in a particular class of securities. Their mild segmentation hypothesis prices the eligible securities as if they are priced in an integrated market and provides super risk premiums for ineligible securities as the market for securities is segmented. They classify the investors from less developed countries as unrestricted investors and US investors as restricted investors. The test results provide support for their hypothesis of mild segmentation. Bailey and Jagtiani (1994) investigate the determinants of the premium of shares available to foreign investors and show how that premium varies over time. Stulz and Wasserfallen (1995) expand models with barriers to international investment to take into account the downward sloping demand curves
for domestic securities from foreign investors. They find supportive evidence for Switzerland.

Errunza, Losq & Padmanabhan (1992) investigate the two polar cases as well as the intermediate case of mild segmentation for a group of securities from eight emerging markets (EMs). Their tests are not designed to capture the apparently changing degree of market integration through time. On the other hand, Bekaert and Harvey (1995) extend the conditional regime switching model to combine the two polar specifications of full integration and complete segmentation and assess the time-varying probability that markets conform to one of the two regimes. Their specification investigates the impact of barriers to free flow of portfolio capital within a one factor model framework. Their results indicate that a number of emerging stock markets display time-varying integration. Some stock markets appear more integrated than one might expect based on previous knowledge of investment restrictions. In a similar approach, Cumby and Khanthavit (1998) use a regime switching model to study integration. They find an increase in integration between the Thai and world equity markets in the late 1980s and mid-1990s.

Fratzscher (2002) investigates the integration process among European stock markets using a trivariate GARCH model. The empirical results reveal that the European stock markets have increased in importance in world financial markets since the mid-1990s, while the degree of integration has been highly volatile over the years. Adler and Qi (2003) generalise the model of Bekaert and Harvey (1995) to study the integration of Mexico into the North-American market while controlling for the peso/dollar exchange rate risk. They show that integration measure experienced a drop during crisis periods and began to rise in the early 2000s.
Carriero, Errunza & Hogan (2007) study the integration of eight emerging markets to the world market by using GARCH-in-mean methodology based on the international asset pricing theory of Errunza and Losq (1985). Chambet and Gibson (2008) estimate a multifactor asset pricing model of partial integration for 25 emerging markets, based on Errunza and Losq (1985). They find that some markets remain segmented and country risk is relevant. They also find evidence of increased market integration through time. Pukthuanthong and Roll (2009) suggest a measure of financial integration based on the adjusted coefficient of determination ($R^2$) of a multifactor asset pricing model for 82 developed and emerging markets. They find a general trend of an increase in financial integration for majority of markets over last three decades but the extent of the changes varies considerably among the markets.

Guesmi and Nguyen (2011) evaluate the time-varying integration of emerging markets from a regional perspective, based on a conditional version of the ICAPM with DCC-GARCH parameters that allows for dynamic changes in the degree of market integration, global market risk premium, regional exchange-rate risk premium and local market risk premium. They find that the time-varying degree of integration is explained by the regional level of trade openness and the term premium of US interest rates. Guesmi and Nguyen (2014) investigate the dynamics of regional financial integration and its determinants in the context of an ICAPM, accounting for deviations from PPP as well as temporal variations in both regional and local sources of risk. They employ data from four major countries of southeast Europe and find that trade openness and stock market developments explain changes in degree of regional integration.
4.3 A Brief Overview of the GCC Stock Markets

Developing stock markets has been a policy priority in the GCC region over the past decade in light of contemporary challenges to pursue an integrated market, which forms part of the single market project adopted by the GCC in 2000. Member countries of the GCC have taken, or are currently taking, important steps to improve the size and quality of their capital markets. Significant privatisations have occurred, and some member states have built independent and dedicated capital market regulators. In addition, a number of initiatives have been launched to improve the level of integration among stock markets. This will strengthen each individual market and make the entire GCC region a more attractive destination for regional capital relative to external investment options.

The GCC countries’ trading volumes and equity issuance started to rise in the early 2000s, and stock markets experienced double digit growth. The global financial crisis interrupted a decade of this growth in 2008 for the GCC stock markets, compared with earlier periods\(^\text{26}\); their stock market indices declined by 50% to 66% between early 2007 and late 2008. GCC stock markets have stabilised since then. The value of listed companies on GCC stock markets declined dramatically in 2008 compared with immediate pre crisis levels.

\(^\text{26}\) The global financial crisis put pressure on the MENA region, contributing to rapid declines in their stock markets and GDP growth rates (Neaime 2012).
Table 4.1 Market capitalisation of listed companies (US$ billion)

<table>
<thead>
<tr>
<th>Year</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
<th>GCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>10</td>
<td>59</td>
<td>5</td>
<td>27</td>
<td>157</td>
<td>30</td>
<td>288</td>
</tr>
<tr>
<td>2004</td>
<td>14</td>
<td>69</td>
<td>6</td>
<td>53</td>
<td>306</td>
<td>94</td>
<td>542</td>
</tr>
<tr>
<td>2005</td>
<td>17</td>
<td>130</td>
<td>15</td>
<td>87</td>
<td>646</td>
<td>226</td>
<td>1,122</td>
</tr>
<tr>
<td>2006</td>
<td>21</td>
<td>129</td>
<td>16</td>
<td>62</td>
<td>327</td>
<td>139</td>
<td>693</td>
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<tr>
<td>2007</td>
<td>28</td>
<td>188</td>
<td>23</td>
<td>95</td>
<td>515</td>
<td>225</td>
<td>1,075</td>
</tr>
<tr>
<td>2008</td>
<td>21</td>
<td>107</td>
<td>15</td>
<td>76</td>
<td>246</td>
<td>98</td>
<td>564</td>
</tr>
<tr>
<td>2009</td>
<td>17</td>
<td>96</td>
<td>17</td>
<td>88</td>
<td>319</td>
<td>110</td>
<td>646</td>
</tr>
<tr>
<td>2010</td>
<td>20</td>
<td>120</td>
<td>20</td>
<td>124</td>
<td>353</td>
<td>105</td>
<td>742</td>
</tr>
<tr>
<td>2011</td>
<td>17</td>
<td>111</td>
<td>20</td>
<td>126</td>
<td>339</td>
<td>127</td>
<td>740</td>
</tr>
<tr>
<td>2012</td>
<td>16</td>
<td>97</td>
<td>20</td>
<td>127</td>
<td>373</td>
<td>128</td>
<td>761</td>
</tr>
</tbody>
</table>

Note: Columns (1) to (6) illustrate market capitalisation of listed companies in GCC countries. Column (7) illustrates listed companies in GCC. Source: World Bank.


In a global comparison with other developed and emerging stock markets, GCC markets remain relatively small in term of size and volume of financial assets. The GCC countries’ share in global financial markets is only 2.6% on 2011. Morgan Stanley Capital International (MSCI) classifies GCC markets as frontier markets based on the size and liquidity as well as market accessibility measures. Foreign investment activity in the GCC has remained highly limited. The lack of market breadth, and low liquidity as well as the lack of hedging instruments and existing
ownership structures, have discouraged more active engagement so far. GCC local banks are mainly owned by local investors: Bahrain and Oman are the most open banking markets, where foreign investors hold between 30% and 40% of domestic banking assets.  

4.4 Methodology

4.4.1 The Model

To study the degree of capital market integration in the six member countries of the GCC, I employ an international asset pricing model (IAPM) of time-varying market integration based on Errunza and Losq (1985) that accommodates the evolving market structure from segmentation to integration as well as intermediate cases, depending on the existence of barriers to investments and the availability of substitute assets. The model assumes a two-country world and two sets of securities. All securities traded in the foreign market are eligible for investment by all investors. Securities traded in the domestic market are ineligible and can be held only by domestic investors. Thus, foreign investors can invest only in foreign eligible stocks, while domestic investors can invest in their local ineligible stocks as well as foreign stocks.

27 Foreign investment ceilings for listed stocks in GCC markets: Bahrain: 49% in general; 10% for a single entity; some banks & insurance companies are 100% open to foreign ownership; 100% in general for GCC nationals. Kuwait: 100% in general, 49% some banks. Oman: 100% in general. Qatar: 25% in general. Saudi Arabia: 25% for GCC nationals; other foreign investors may access market via mutual funds managed by Saudi banks. UAE: 49% in general, although different restrictions may apply to individual companies; 100% for GCC nationals with company’s approval. (Standard & Poor’s global stock markets factbook 2012).
The expected return $E(R_i)$ on the $i^{th}$ security that belongs to $I^{th}$ market that is accessible only to its nationals is given by:

$$E(R_i) = R_f + AM \text{cov}(R_i, R_w) + (A_u - A)M \text{cov}(R_i, R_j | R_e)$$

where $R_f$ is the risk free rate, $A(A_u)$ is the aggregate risk aversion coefficient for all $(I^{th})$ market investors, $R_w(R_i)$ is the return on the world $(I^{th})$ market portfolio, $M(M_i)$ is the market value of the global $(I^{th})$ market portfolio, and $R_e$ is the vector of returns on all securities that can be bought by all investors irrespective of their nationality. Thus, the expected return on the $i^{th}$ security commands a global risk premium, and a super risk premium that is proportional to the conditional market risk. Securities that can be bought without restriction by any investor will be priced as if the markets are completely integrated. Equation (1) can be expressed in terms of the ineligible security market index by aggregating over the ineligible set of securities yielding the following equation:

$$E(R_i - R_f) = AM \text{cov}(R_i, R_w) + (A_u - A)M \text{var}(R_i | R_e)$$

One feature of the EL model is that it delivers an aggregate measure of substitution, the Integration Index ($II$), which features the two extreme cases of integration and segmentation within equation (2) for the market as a whole:

$$II = 1 - \frac{\text{var}[R_i | R_e]}{\text{var}[R_i]}$$

By definition, this index lies within the range $(0,1)$. For the case of complete integration: $II = 1$, i.e. $\text{var}[R_i | R_e] = 0$. In this case, there exists an eligible security whose return is perfectly correlated with the return on the market portfolio of ineligible securities. In such a case no super-premium would exist and the two...
segments of the market would be effectively integrated. In particular, the required return on the market portfolio of ineligible securities would be determined exclusively by the world risk coefficient and the systematic risk of the ineligible securities,

\[ E(R_i) = R_f + AM \text{cov}(R_i, R_w) \]  \hspace{1cm} (4)

For the special case of complete segmentation: \( II = 0 \), i.e. \( \text{var}(R_i \mid R_e) = \text{var}[R_f] \). In this case, the unconditional and conditional variances to be equal, there is no correlation between the return on the market portfolio of ineligible securities and the return on any eligible security: \( \text{cov}[R_i \mid R_e] = 0 \), \( e = 1, \ldots, E \). Thus,

\[ E(R_i) = R_f + A_e M_i \text{var}(R_i) \]  \hspace{1cm} (5)

In such a case, the expected return on the portfolio of ineligible securities would be determined only by the variance of the returns and not by the covariance with the return on the world market portfolio.

### 4.4.2 The Estimation Method

In my application, the set of eligible securities for each country is represented by the excess return of GCC market portfolio, which represents the universe of companies in all six GCC equity markets: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates. The GCC market portfolio is the portfolio of eligible securities that is most highly correlated with the market portfolio of ineligible securities. I also employ the excess return of world index as second set of portfolio of eligible securities. The following system of equations holds at any point in time for each country \( i \),
where $r_{i,t}$ is the country index excess return, $r_{GCC,t}$ is the excess return index of GCC, and $r_{W,t}$ is the world index excess return. The first equation in the system is the pricing equation for the local market index, where two factors are priced: the world market covariance risk, and the super risk premium that is proportional to the conditional local risk $\text{var}_{t} [r_{i,t} | r_{GCC,t}]$. The second equation in the system prices the GCC market portfolio with just the covariance risk with the world, and the last equation is the pricing equation for the world index portfolio.

I write the previous system for estimation as:

$$
E_{t-1}[r_{i,t}] = \delta_{W,t-1} \text{cov}_{t-1}[r_{i,t}, r_{W,t}] + \lambda_{i,t-1} \text{var}_{t-1}[r_{i,t} | r_{GCC,t}],
$$

$$
E_{t-1}[r_{GCC,t}] = \delta_{W,t-1} \text{cov}_{t-1}[r_{GCC,t}, r_{W,t}],
$$

$$
E_{t-1}[r_{W,t}] = \delta_{W,t-1} \text{var}_{t-1}[r_{W,t}],
$$

where $r_{i,t}$ is the country index excess return, $r_{GCC,t}$ is the excess return index of GCC, and $r_{W,t}$ is the world index excess return. The first equation in the system is the pricing equation for the local market index, where two factors are priced: the world market covariance risk, and the super risk premium that is proportional to the conditional local risk $\text{var}_{t-1}[r_{i,t} | r_{GCC,t}]$. The second equation in the system prices the GCC market portfolio with just the covariance risk with the world, and the last equation is the pricing equation for the world index portfolio.

I write the previous system for estimation as:

$$
r_{i,t} = \delta_{W,t-1} h_{i,W,t} + \lambda_{i,t-1} h_{i,GCC,t} + \varepsilon_{i,t},
$$

$$
r_{GCC,t} = \delta_{W,t-1} h_{GCC,W,t} + \varepsilon_{GCC,t},
$$

$$
r_{W,t} = \delta_{W,t-1} h_{W,t} + \varepsilon_{W,t},
$$

where $\delta_{W,t-1}$ and $\lambda_{i,t-1}$ are time-varying prices of global risk and local risk, respectively; $h_{j,t}$ are the elements of $H$, the $3 \times 3$ conditional covariance matrix of the assets in the system, $h_{i,W,t}$ is time-varying covariance between excess return index of each country and the excess return index of world portfolio, $h_{i,GCC,t}$ is the time-varying covariance between the excess return index of each country and the excess return index of GCC market portfolio, $h_{GCC,W,t}$ is the time-varying covariance between excess return index of the GCC market portfolio and the excess return index of the world market portfolio, and $h_{W,t}$ is the time-varying variances of the excess return index of world market portfolio. I specify the price of global and local risk as a
non linear function of a set of information variables as implied by the theoretical model\textsuperscript{28}:

\[
\delta_{w,t-1} = \exp(k_w'Z_{w,t-1})
\]

(8)

\[
\lambda_{i,t-1} = \exp(k_i'Z_{i,t-1}) \quad i = 1, \ldots, I,
\]

(9)

where \(Z_{w,t-1}\) and \(Z_{i,t-1}\) are respectively the set of global and local information variables. The set of local information variables includes a constant and the local stock market return in excess of the eurodollar rate. The global information variables include a constant, the world market dividend yield in excess of the 30-day eurodollar rate, the default spread (Moody’s Baa minus Aaa bond yields), and the change in the 30-day eurodollar rate.

The law of motion for the time-varying conditional covariance matrix of excess returns, \(H_t\), is parameterised using the multivariate DCC-GARCH model of Engle (2002). The model assumes that each conditional variance follows a univariate GARCH process and the conditional correlation matrix is (essentially) allowed to follow a univariate GARCH equation. The DCC approach makes it possible to estimate covariance with large number of assets without complex computation. The DCC model also includes conditions that make the covariance matrix positive definite at all points in time, and the process covariance stationary. The conditional variance-covariance matrix \(H_t\) is written as:

\[
H_t = D_t R_t D_t
\]

(10)

\textsuperscript{28} Prices of risk are time-varying (De Santis & Gerard 1997)
where \( D_t \) is a diagonal matrix of conditional variances,

\[
D_t = \text{diag}(h_{11}^{1/2}, \ldots, h_{NN}^{1/2})
\]  

and each \( h_{ii} \) is described by a univariate GARCH model. Further,

\[
R_t = \text{diag}(q_1^{1/2}, \ldots, q_{NN}^{1/2})Q_t \text{diag}(q_1^{1/2}, \ldots, q_{NN}^{1/2})
\]  

where \( Q_t = (q_{ii}) \) is the \( N \times N \) symmetric positive definite matrix which has the form:

\[
Q_t = (1 - \alpha - \beta) \bar{Q} + \alpha u_{t-1}u_{t-1}' + \beta Q_{t-1}
\]

Here, \( u_t = \epsilon_t / \sqrt{h_{ii}} \), \( \alpha \) and \( \beta \) are non-negative scalars that \( \alpha + \beta < 1 \), \( \bar{Q} \) is the \( N \times N \) unconditional variance matrix of \( u_t \). Equations (7) and (10) give the model for estimation. Assuming a normal conditional density, the log likelihood function is written as

\[
\ln L(\theta) = -\frac{T}{2}\ln 2\pi - \frac{1}{2} \sum_{i=1}^{T} [\ln |H_i(\theta)| + \epsilon_i(\theta)H_i^{-1}(\theta)\epsilon_i(\theta)]
\]

where \( \theta \) is the vector of unknown parameters in the model. The estimation is performed using the BFGS (Broyden et al. 1985) algorithm. Under regularity conditions, the quasi-maximum likelihood estimator of \( \theta \) is generally consistent and asymptotically normal for GARCH models, as shown in Bollerslev and Wooldridge (1992).

I estimate \( i \) separate trivariate systems, one for each GCC market at a time. I proceed in two steps: first I estimate the world return equation of the system (7). This provides us with estimates of the time-varying world price of risk and of the

---

\[29\] The theory predicts that the world price of risk will be the same for each country.
coefficients of the time-varying world variance. Then I impose these estimates in the
$i$ country estimations.

### 4.5 Data and Summary Statistics

The empirical analysis is conducted for the six member countries of GCC; Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates. The indices obtained from Morgan Stanley Capital International (MSCI)\(^{30}\). The indices are market value weighted and expressed in US dollar terms. I use the weekly return of the MSCI World Index as benchmark for world integration from June 1995 to Oct 2013. I employ weekly market returns for GCC countries over the period of June 2002 to Oct 2013. I use the weekly return of MSCI GCC index as the eligible set for GCC countries over the same period.

In my estimations, I use two sets of information variables used widely in previous research. The set of local information variables includes a constant and the local stock market return in excess of the Eurodollar rate. The global information variables include a constant, the world market dividend yield in excess of the 30-day Eurodollar rate, the default spread (Moody’s Baa minus Aaa bond yields), and the change in the 30-day eurodollar rate. These variables are designed to capture fluctuations in expectations of the world business cycle. All the information variables are lagged. The data of world market dividend yield, 30-day Eurodollar rate, Moody’s Baa, and Aaa bond yields, is from DataStream.

\(^{30}\) MSCI Emerging Market Index is a free float-adjusted market capitalization index that is designed to measure equity market performance and expressed in U.S. dollar terms.
Table 4.2 reports descriptive statistics for weekly stock market returns. Panel A reports the first four moments, i.e., mean, standard deviation, skewness and kurtosis. GCC countries’ weekly returns on average are larger than the world return except for Bahrain and Kuwait. The GCC weekly returns display higher volatility than the world. Skewness and Kurtosis are the third and fourth standardised moments, which measure the degree of symmetry and shape of the probability distribution, respectively. The data shows negative skewness and a high level of kurtosis, implying that the returns are skewed to the left with a higher peak and thin tails compared with a normal distribution.

To check the null hypothesis of normal distribution, I calculate the Jarque–Bera (J–B) test statistic. The J–B test shows large statistic for all returns, which rejects the null hypothesis of normality in all instances; thus, all stock market returns are not normally distributed. The independence assumption in each of the return series is tested by calculating up to twelfth order autocorrelation coefficients. I compute Ljung–Box test statistic for the level and the square for each return series. The Ljung-Box test statistics for each return series are greater than the 1% critical value, suggesting that the hypothesis of independence in weekly returns should be rejected. Furthermore, Ljung–Box LB(12) test statistic for the squared return series also indicate a high autocorrelation in all instances. Panel B of Table 4.2 reports pairwise correlations between each country index with the GCC index and the world index.

31 The J–B test is a type of Lagrange multiplier test, which tests normality, heteroskedasticy and serial correlation (Jarque & Bera 1980).
As expected, for the country indices correlations with the GCC index are remarkably higher than those with the world index.

Table 4.2 Summary Statistics for Stock Market Returns

<table>
<thead>
<tr>
<th>Panel A: Distributional Statistics</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
<th>GCC</th>
<th>World</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>-0.047</td>
<td>0.092</td>
<td>0.137</td>
<td>0.239</td>
<td>0.159</td>
<td>0.248</td>
<td>0.162</td>
<td>0.097</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>2.527</td>
<td>2.489</td>
<td>2.297</td>
<td>3.300</td>
<td>3.647</td>
<td>3.915</td>
<td>3.022</td>
<td>2.337</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.97***</td>
<td>-0.73***</td>
<td>-0.37***</td>
<td>-1.05***</td>
<td>-1.65***</td>
<td>-1.59***</td>
<td>-1.68***</td>
<td>-0.74***</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>9.63***</td>
<td>5.10***</td>
<td>5.48***</td>
<td>10.62***</td>
<td>12.17***</td>
<td>14.16***</td>
<td>10.69***</td>
<td>7.24***</td>
</tr>
<tr>
<td>N</td>
<td>596</td>
<td>596</td>
<td>596</td>
<td>596</td>
<td>596</td>
<td>596</td>
<td>596</td>
<td>961</td>
</tr>
<tr>
<td>J–B</td>
<td>1186***</td>
<td>163***</td>
<td>167***</td>
<td>1553***</td>
<td>2362***</td>
<td>3348***</td>
<td>1755***</td>
<td>811***</td>
</tr>
<tr>
<td>LB(12)</td>
<td>108.0***</td>
<td>66.2***</td>
<td>133.3***</td>
<td>47.3***</td>
<td>27.1***</td>
<td>105.9***</td>
<td>41.4***</td>
<td>32.4***</td>
</tr>
<tr>
<td>LB2(12)</td>
<td>97.1***</td>
<td>195.1***</td>
<td>116.2***</td>
<td>194.2***</td>
<td>176.3***</td>
<td>162.4***</td>
<td>223.4***</td>
<td>297.1***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: Pairwise Correlations for Stock Market Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country index and World</td>
</tr>
<tr>
<td>Bahrain</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>0.15</td>
</tr>
<tr>
<td>Country index and GCC</td>
</tr>
<tr>
<td>Bahrain</td>
</tr>
<tr>
<td>0.34</td>
</tr>
<tr>
<td>GCC index and World</td>
</tr>
</tbody>
</table>

**Note:** All weekly percentages of GCC market returns are calculated in US dollars over the period June 2002 to Oct 2013 for a total of 596 observations. Std. Dev. is standard deviation of estimated residuals. Skewness and kurtosis assess the shape and overall patterns of the distribution of residuals; skewness measures the degree of symmetry and kurtosis measures the degree of peakedness. J–B is a Jarque–Bera test statistic to check the null hypothesis of normal distribution. LB(12) and LB2(12) are the Ljung–Box statistics with twelfth lags. *** denotes significance at the 1% level.

### 4.6 Empirical Results

#### 4.6.1 Tests for the Asset Pricing Model

As discussed in the model section 4.4.1, the model explains asset returns as a function of two risk premiums, a global risk premium, and a super risk premium which is proportional to the conditional local risk. If markets were completely integrated, only global risk would be relevant while some form of segmentation would imply relevance of country-specific risk. I first estimate only the world equation of the system (7). The average of the estimated world price of risk 0.37 is a
significant time variation, and all GARCH coefficients for time variation in second moments are significant.

Figure 4.1 Time-variation in the world price of risk

I then estimate the equation of the system (7) for each GCC country to obtain covariance with the world returns. For each country, I report robust Wald test for time variation in the local price of risk. Panel A of Table 4.3 contains these results. The hypothesis that the local price of risk is constant is rejected in all cases, which implies that there is significant time variation in returns that can be explained by local risk. All estimated models provide strong evidence that the asset returns follow a GARCH process. The GARCH coefficients are highly significant and indicate high persistence for all countries. Appendix A illustrates results for GARCH estimation.
Table 4.3 The model

Panel A: Specification Tests

<table>
<thead>
<tr>
<th>Wald: Null Hypothesis</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time-varying local risk</td>
<td>ki,j =0, for j&gt;1</td>
<td>0.000</td>
<td>0.001</td>
<td>0.002</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Panel B: Diagnostics for the Residuals

<table>
<thead>
<tr>
<th></th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Std. Dev.</td>
<td>2.536</td>
<td>2.491</td>
<td>2.295</td>
<td>3.340</td>
<td>3.699</td>
<td>4.044</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.98***</td>
<td>-0.79***</td>
<td>-0.41***</td>
<td>-1.20***</td>
<td>-1.83***</td>
<td>-1.19***</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>9.62***</td>
<td>5.48***</td>
<td>5.46***</td>
<td>10.98***</td>
<td>12.96***</td>
<td>15.44***</td>
</tr>
<tr>
<td>J–B</td>
<td>1184***</td>
<td>216***</td>
<td>168***</td>
<td>1724***</td>
<td>2797***</td>
<td>4205***</td>
</tr>
<tr>
<td>LB(12)</td>
<td>117.2***</td>
<td>66.48***</td>
<td>139.7***</td>
<td>70.1***</td>
<td>30.6***</td>
<td>195.5***</td>
</tr>
<tr>
<td>LB2(12)</td>
<td>98.89***</td>
<td>182.9***</td>
<td>129.1***</td>
<td>219.7***</td>
<td>178.7***</td>
<td>258.5***</td>
</tr>
<tr>
<td>Asym-</td>
<td>0.031</td>
<td>0.056</td>
<td>-0.065</td>
<td>-0.021</td>
<td>-0.016</td>
<td>0.014</td>
</tr>
<tr>
<td>Asym+</td>
<td>-0.076</td>
<td>0.041</td>
<td>-0.007</td>
<td>-0.004</td>
<td>-0.019</td>
<td>0.038</td>
</tr>
</tbody>
</table>

Panel C: Estimated Integration Index

<table>
<thead>
<tr>
<th></th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall mean</td>
<td>GCC</td>
<td>0.631</td>
<td>0.481</td>
<td>0.562</td>
<td>0.537</td>
<td>0.324</td>
</tr>
<tr>
<td></td>
<td>World</td>
<td>0.854</td>
<td>0.780</td>
<td>0.717</td>
<td>0.728</td>
<td>0.756</td>
</tr>
<tr>
<td>After 2008</td>
<td>GCC</td>
<td>0.589</td>
<td>0.460</td>
<td>0.462</td>
<td>0.404</td>
<td>0.275</td>
</tr>
<tr>
<td></td>
<td>World</td>
<td>0.785</td>
<td>0.724</td>
<td>0.591</td>
<td>0.570</td>
<td>0.602</td>
</tr>
</tbody>
</table>

Note: Std. Dev. is standard deviation of estimated residuals. Skewness and kurtosis assess the shape and overall patterns of the distribution of residuals; skewness measures the degree of symmetry and kurtosis measures the degree of peakedness. J–B is a Jarque–Bera test statistic to check the null hypothesis of normal distribution. LB(12) and LB2(12) are the Ljung–Box statistics with twelfth lags. Asym- and Asym+ are respectively the Engle–Ng negative size bias and positive size bias test on the squared residuals. *** denotes significance at the 1% level.

A variety of diagnostic tests on the estimated residuals are reported in panel B of Table 4.3. The skewness and kurtosis measures indicate that residuals for all countries exhibit deviations from normality. I calculate the Jarque–Bera (J–B) test for normality based on excess skewness and kurtosis. The J–B tests show large statistic for all residuals, which rejects the null hypothesis of normality in all
instances. I calculate the Ljung–Box statistics for level and the squared residuals, to examine possible autocorrelation of order 12 for the residuals. The L–B test statistics for each residual series are greater than the 1% critical value, suggesting evidence of autocorrelation in both level and squared residuals. Finally, I examine the ability of the models to deal with potential biases and to identify potential misspecification of the conditional variance. I conduct two tests proposed by Engle and Ng (1993), the negative size bias test and the positive size bias test, on the squared residuals. The Engle–Ng statistics show evidence of insignificant negative and positive asymmetry for all countries. This implies that no consistent evidence of asymmetry will be found in the relation between conditional second moments and innovations.

### 4.6.2 Time-varying Integration

The main advantage of the fully parameterised methodology adopted for estimation is the ability to provide all the relevant estimates of the conditional second moments. This allows us to construct an estimate of the integration index and gain insights on the degree of market integration and its variation through time. As shown in Section 4.4.1, the integration index should be one under complete integration, and zero under complete segmentation. Panel C in Table 4.3 contains statistics regarding the integration indices estimated from the model. The overall integration index mean with the world indicates a high level in the degree of integration for all GCC countries, ranging from 0.85 for Bahrain, the most integrated among the GCC countries, to 0.71 for Oman. In Bahrain, local financial sectors play a significant role, and its share in GDP amounts to 23%. Bahrain has the most open banking markets.
among GCC countries, where foreign investors hold between 30% and 40% of domestic banking assets.

![Figure 4.2 Integration Index (Bahrain)](image1)

![Figure 4.3 Integration Index (Kuwait)](image2)
Figure 4.4 Integration Index (Oman)

Figure 4.5 Integration Index (Qatar)
Figure 4.6 Integration Index (Saudi)

Figure 4.7 Integration Index (UAE)
The averages for the integration indices for the subperiod after the financial crisis show a decrease in the degree of integration in all cases. On the other hand, the overall mean values with the GCC indicate different levels in the degree of integration among the GCC countries, ranging from 0.63 for Bahrain, the most integrated among the GCC countries, to 0.32 for Saudi Arabia, the most segmented. The Saudi stock market is the largest in terms of market capitalisation in the GCC, but is also the less accessible.\textsuperscript{32} In all cases, the subperiod averages after 2008 for the indices suggest a decline in the degree of integration. Figures 4.2 to 4.7 plot the integration indices of each GCC stock market with respect to the GCC market portfolio and world market portfolio. Figures provide valuable insights into the trending behaviour in market integration across GCC countries. Following September 2008, the impact of the financial crisis on the GCC countries manifested itself in plunging stock markets, and the GCC’s stock market capitalisation fell by 40 per cent after the collapse of Lehman Brothers. Volatility increased, where the standard deviation of daily average returns doubled between August 2008 and February 2009, compared with the period January 2007 to August 2008 (Kumah et al. 2010).

To offset these shocks brought on by the crisis, GCC authorities maintained high levels of spending and introduced exceptional financial measures, including

\textsuperscript{32} The stock market of Saudi Arabia appears to be segregated from the rest of the world, it can still offer portfolio diversification potentials to international and regional non-GCC MENA investors through mainly mutual funds, as well as being a safe haven that can shield international investors from financial contagion in the instance of a new financial crisis erupting in more mature financial markets (Neaime 2012).
capital and liquidity injections. In particular, Saudi Arabia adopted the largest fiscal stimulus investment plan among the GCC countries in terms of share to GDP. To ease domestic credit conditions, GCC countries lowered interest rates and eased liquidity through direct injections in the money market, including reductions in reserve requirements and relaxation of prudential loan to deposit ratios. GCC stock markets have stabilised since then, and the growth in GCC market capitalisation has been increasing 7% on average since hitting the low in 2008 in the wake of the global financial crisis (Table 4.1). In 2012, the overall growth for the GCC reached 4%. The large financial resources of the GCC and the initial macro intervention policies taken by authorities helped to mitigate the adverse impact of the financial crisis.

4.6.3 Determinants of Financial Integration of GCC Stock Markets

This section seeks to study what drives stock market integration in GCC. Based on previous studies of financial integration (Alotaibi & Mishra 2014; Bekaert & Harvey 1995; Bhattacharya & Daouk 2002; Carrieri, Errunza & Hogan 2007), I employ trade openness, market capitalisation, inflation, turnover and stock traded as determinants of financial integration.

Investors may be inclined to hold securities of close trading partners for various reasons, including hedging, familiarity with host country’s products or spillovers of information. Investors are better able to attain accounting and regulatory information on foreign markets through trade in goods. Lane & Milesi Feretti (2008) and Mishra (2007) state that bilateral equity investment is strongly correlated with underlying patterns of trade in goods and services. Inflation is the annual percentage
change in the consumer price index, and is expected to have a negative impact on the integration index. Market capitalisation is the ratio of market capitalisation of listed companies and GDP. This is a proxy for equity market development. More developed financial markets are generally more diversified and better integrated with world financial markets than smaller markets, and hence likely to share information more intensively (Levine & Zervos 1998). Market capitalisation is expected to have a positive impact on the integration index. Turnover is the total value of shares traded during the period divided by the average market capitalisation during the period, and is expected to have a positive impact on the integration index. The global financial crisis is dummy=0 over the years 2002 to 2006 and dummy=1 for the years 2007 to 2013. During global financial crisis, the GCC region’s stock market capitalisation fell by 41 per cent ($400 billion) between September 2008 and end-2008 and volatility increased (IMF 2010). On average, stock market indices of the Arab countries crashed by more than 50 per cent between their peak in mid-2008 and their low in early 2009, thereby causing losses of something between US$ 200 billion and US$ 600 billion (Brach & Loewe 2010).

4.6.3.1 Methodology

The integration index may be dynamic in nature, and the econometric treatment of dynamic nature of integration index includes lagged values of the integration index among the explanatory variables.

\[ y_{it} = \delta y_{it-1} + x_{it}^\prime \beta + u_{it} \quad i = 1, \ldots, N \quad t = 2, \ldots, T \]  

\[ (12) \]
where $\delta$ is a scalar, $x_{it}' \beta$ is a $1 \times K$ vector of explanatory variables and $\beta$ is a $K \times 1$ vector of parameters to be estimated. The error term $u_{it}$ is composed of an unobserved effect and time-invariant effect $\mu_i$ and random disturbance term $\nu_{it}$.

$$u_{it} = \mu_i + \nu_{it}$$

(13)

where $\mu_i \sim IID(0, \sigma^2_{\mu})$ and $\nu_{it} \sim IID(0, \sigma^2_{\nu})$ independent of each other and among themselves. The dynamic panel data regressions described in equations (12) and (13) are characterised by two sources of persistence over time i.e. autocorrelation due to the presence of a lagged dependent variable among the regressors, and individual effects characterising heterogenuity among the individuals. Since $y_{it}$ is a function of $\mu_i$, this implies that $y_{i,t-1}$ is also a function of $\mu_i$, and $y_{i,t-1}$ is correlated with the error term through the presence of $\mu_i$. The OLS estimator for equation (12) is biased and inconsistent even if the $\nu_{it}$ are not serially correlated. The fixed effect estimator of (13), which eliminates the individual effects $\mu_i$, produces biased and inconsistent estimates (Kiviet 1995; Nickell 1981). Anderson and Hsiao (1982) suggest first differencing the model to get rid of $\mu_i$ then using $\Delta y_{i,t-2} = (y_{i,t-2} - y_{i,t-3})$ as an instrument for $\Delta y_{i,t-1} = (y_{i,t-1} - y_{i,t-2})$. These instruments will not be correlated with $\Delta \nu_{it} = \nu_{i,t} - \nu_{i,t-1}$, insofar as the $\nu_{it}$ themselves are not serially correlated. This instrumental variable (IV) estimation method leads to consistent but not necessarily efficient estimates of the parameters in the model because it does not make use of all available moment conditions (Ahn & Schmidt 1995) and does not take into account the differenced structure on residual disturbances $\Delta \nu_{it}$. Arellano (1989) states that
for simple dynamic error components models, the estimator that uses differences $\Delta y_{t,t-2}$ rather than levels $y_{t,t-2}$ for instruments has a singularity point and very large variances over a significant range of parameter values. On the other hand, the estimator that uses $y_{t,t-2}$ has no singularities and much smaller variances. Arellano and Bond (1991) propose a generalised method of moments (GMM) estimator of the first differenced model that brings about significant efficiency gains, as compared to the estimator by Anderson and Hsiao (1982) through exploiting additional orthogonality conditions associated with higher lags of the endogenous variable in the set of instruments. Blundell and Bond (1998) show that the lagged-level instruments in the Arellano-Bond estimator become weak as the autoregressive process becomes too persistent or the ratio of the variance of the panel-level effect to the variance of the idiosyncratic error becomes too large. Linear dynamic panel data models include $p$ lags of the dependent variable on covariates and contain unobserved panel level effects, fixed or random. Arellano and Bover (1995) develop a framework for efficient instrumental variable estimators of random effects models with information in levels that can accommodate predetermined variables. Building on the work of Arellano and Bover (1995), Blundell and Bond (1998) propose a system estimator that uses moment conditions in which lagged differences are used as instruments for the level equation in addition to the moment conditions of lagged levels as instruments for the differenced equation; this estimator is designed for datasets with many panels and few periods. The method assumes that there is no autocorrelation in the idiosyncratic errors, and requires the initial condition that the
panel-level effects be uncorrelated with the first difference of the first observation of the dependent variable.

The moment conditions employed by the Arellano–Bover/Blundell method are valid only if there is no serial correlation in the idiosyncratic error. I perform Arellano Bond test for serial correlation in the first differenced errors at order $m$. The Arellano Bond test is a test for no autocorrelation in linear dynamic panel models, and examines for serial correlation in the first differenced errors.

### 4.6.3.2 Estimation Results

Table 4.4 illustrates the results upon estimating various versions of equation (12). Columns (1) to (6) exhibit results for the Arellano Bond estimation and columns (7) to (12) illustrate results for the Arellano–Bover/Blundell–Bond estimation. The dependent variable in columns (1) to (3) and columns (7) to (9) is the integration index based on the GCC market portfolio. The dependent variable in columns (4) to (6) and columns (10) to (12) is the integration index based on the world market portfolio. The trade variable is positive and significant in all regressions, implying that GCC markets’ trade enhances the degree of integration. Result is in accordance with Alotaibi and Mishra (2014). Inflation is negative and significant, implying lower integration. Market capitalisation appears to be positive and significant, implying that a higher financial market development is linked to a higher degree of integration. Result is in accordance to Carriero, Errunza & Hogan (2007). Turnover has a significant and positive impact, implying that higher trading relative to the size of an economy is linked to a higher degree of financial integration. The global financial crisis had a significant and negative impact,
implying a lower degree of integration. The estimated mean integration index based on the GCC market portfolio and the world market portfolio, decreased after the global financial crisis: for instance, the overall mean integration index is Bahrain 0.631; Kuwait 0.481; Oman 0.562; Qatar 0.537; Saudi Arabia 0.324; UAE 0.596; after global financial crisis mean integration index decreases to Bahrain 0.589; Kuwait 0.460; Oman 0.462; Qatar 0.404; Saudi Arabia 0.275; and UAE 0.553.\textsuperscript{33}

\textsuperscript{33} See Panel C of Table 4.3.
Table 4.4 Determinants of integration index

<table>
<thead>
<tr>
<th></th>
<th>Arellano Bond (Integration Index GCC)</th>
<th>Arellano Bond (Integration Index World)</th>
<th>Arellano–Bover/Blundell–Bond (Integration Index GCC)</th>
<th>Arellano–Bover/Blundell–Bond (Integration Index World)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade openness</td>
<td>0.144*** 0.194*** 0.114**</td>
<td>0.082*** 0.146*** 0.095***</td>
<td>0.128*** 0.177*** 0.126***</td>
<td>0.060* 0.082* 0.065**</td>
</tr>
<tr>
<td></td>
<td>(0.000) (0.000) (0.026)</td>
<td>(0.000) (0.000) (0.000)</td>
<td>(0.007) (0.000) (0.001)</td>
<td>(0.084) (0.081) (0.040)</td>
</tr>
<tr>
<td>Inflation</td>
<td>-0.013* -0.012** -0.009**</td>
<td>-0.012*** -0.014*** -0.012***</td>
<td>-0.010* -0.010* -0.013*</td>
<td>-0.015*** -0.014*** -0.012***</td>
</tr>
<tr>
<td></td>
<td>(0.095) (0.015) (0.025)</td>
<td>(0.000) (0.000) (0.001)</td>
<td>(0.098) (0.066) (0.081)</td>
<td>(0.000) (0.000) (0.000)</td>
</tr>
<tr>
<td>Market capitalisation</td>
<td>0.0009**</td>
<td>0.0009***</td>
<td>0.0009***</td>
<td>0.001***</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.000)</td>
<td>(0.003)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Turnover</td>
<td>0.0003**</td>
<td>0.0003*</td>
<td>0.0005***</td>
<td>0.000*</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.086)</td>
<td>(0.003)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>Global financial crisis</td>
<td>-0.1490**</td>
<td>-0.0497**</td>
<td>-0.087*</td>
<td>-0.061**</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.022)</td>
<td>(0.076)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Observations</td>
<td>49 47 49</td>
<td>49 47 49</td>
<td>55 53 55</td>
<td>55 53 55</td>
</tr>
<tr>
<td>Wald Chi²</td>
<td>582.4*** 450.9*** 550.2***</td>
<td>368.5*** 845.6*** 270.1***</td>
<td>303.9*** 107.6*** 257.2***</td>
<td>355.3*** 900.8*** 301.9***</td>
</tr>
<tr>
<td></td>
<td>(0.000) (0.000) (0.000)</td>
<td>(0.000) (0.000) (0.000)</td>
<td>(0.000) (0.000) (0.000)</td>
<td>(0.000) (0.000) (0.000)</td>
</tr>
<tr>
<td>Arellano Bond test m1</td>
<td>-1.7558*  -1.931*  -2.006**</td>
<td>-1.615**  -1.891*  -1.901*</td>
<td>-1.8228*  -1.918*  -2.022**</td>
<td>-1.740*  -2.161**  -2.184**</td>
</tr>
<tr>
<td></td>
<td>(0.079) (0.053) (0.044)</td>
<td>(0.010) (0.058) (0.057)</td>
<td>(0.068) (0.055) (0.043)</td>
<td>(0.081) (0.030) (0.029)</td>
</tr>
<tr>
<td>Arellano Bond test m2</td>
<td>0.477  0.696  -0.136</td>
<td>-1.546  0.551  0.564</td>
<td>0.5224   0.648  0.712</td>
<td>-1.609  0.272  0.753</td>
</tr>
<tr>
<td></td>
<td>(0.633) (0.485) (0.891)</td>
<td>(0.122) (0.581) (0.572)</td>
<td>(0.601) (0.516) (0.476)</td>
<td>(0.107) (0.785) (0.451)</td>
</tr>
</tbody>
</table>

Note: Columns (1) to (6) illustrate results with Arellano Bond estimation technique and columns (7) to (12) illustrate results with Arellano–Bover/Blundell–Bond estimation technique. In columns (1) to (3) and columns (7) to (9), dependent variable is integration index with respect to GCC. In columns (7) to (9) and columns (10) to (12), dependent variable is integration index with respect to World. Arellano Bond and Arellano–Bover/Blundell–Bond Estimation with lags(1) and AR(2) tests. Arellano Bond test for no auto correlation. Trade openness is sum of exports and imports of goods and services measured as a share of gross domestic product. Inflation is measured by the consumer price index and reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Market capitalisation (%) is ratio of market capitalisation of listed companies and GDP. Turnover ratio (%) is total value of shares traded during the period divided by the average market capitalisation during the period. Global financial crisis is dummy=0 over the years 2002 to 2006 and dummy=1 for the years 2007 to 2013.
4.7 Conclusion

The chapter studies all six stock markets in GCC region over the period from Jun 2002 to Oct 2013, and provides insights into the empirical features of the determinants of the degree of stock market integration. I use DCC-GARCH methodology to estimate each country’s degree of integration with the GCC region and the rest of the world by using two pre-estimated indexes of market integration as dependent variables, based on the international asset pricing model of Errunza and Losq (1985). The results suggest that both local risk and global risk are relevant factors in explaining the time-variation of GCC returns. There is significant time variation in GCC returns that can be explained by local risk. The global risk is also conditionally priced for GCC countries.

There are wide ranges in the degree of integration of GCC countries, and none appears to be under complete segmentation. Bahrain is the most integrated whereas Saudi Arabia is the most segmented of the GCC stock markets. Neaime (2012) states that the stock market of Saudi Arabia appears to be segregated from the rest of the world, it can still offer portfolio diversification potentials to international and regional non-GCC MENA investors, mainly through mutual funds, as well as safe haven that can shield international investors from financial contagion in the instance a new financial crisis erupting in the more mature financial markets.

I examine the determinants of the integration index by employing Arellano Bond and Arellano–Bover/Blundell–Bond dynamic panel estimation techniques. I find that trade openness, market capitalisation and turnover have significant and
positive impacts while inflation and the global financial crisis have significant and negative impacts on integration index. These findings have policy implications.

GCC countries should increase cross border trade through lifting of trade and capital barriers. Some steps have already been taken by GCC to integrate into the global economy, such as the inclusion of Saudi Arabia in the World Trade Organization in December 2004, ratification of EU/GCC Free Trade Area agreements, Greater Arab Free Trade Area (GAFTA) and GCC trade agreements.

The GCC relies mainly on the banking sector as the main source of financing private sector activity. Firms find it difficult to raise capital domestically, as stock and bond markets are not well developed; GCC countries should focus on the development of financial markets. A more liquid capital market would offer lower borrowing costs for GCC corporate sectors wishing to raise funds locally, and would lower its exposure to short-term speculative capital inflows. The GCC has already taken some steps toward harmonisation of investment laws and stock market regulation.

While prospects for the GCC are favourable, important challenges remain. The experience of the recent financial crisis has led GCC policy makers to recognise that, in addition to the potential benefits it offers, financial integration may also generate significant costs. In fact, the benefits of capital inflows can be completely offset by large and sudden outflows that may put an already weak local financial system under stress. Therefore, GCC policy makers need to be aware of the possible transmission channels through which global shocks may affect the local economy.

The size and impact of future external shocks, and their persistence in GCC stock markets, will depend on future policies and the prevention of the transmission
of international shocks to the local economies. The key issue for GCC policy makers is to design policies that help minimise the short-term risks and maximise the longer-run gains of financial integration. They should also focus on cross border coordination and supervision among the GCC countries to minimise any adverse effects of financial integration. This may require financial market, monetary and fiscal reforms. For instance, maintaining a monetary policy consistent with low inflation, limiting fiscal imbalances, and preventing an excessive build-up of local debt, are all preventive measures that are likely to reduce the risk that sudden changes in market sentiment may turn into large capital outflows and trigger a financial crisis.
Chapter 5  Global and Regional Volatility Spillovers to GCC Stock Markets

5.1  Introduction

In the past 20 years GCC countries have gone through a period of important steps to improve economic and monetary integration with the intent of establishing a single market and forming monetary union. Significant progress has been made in strengthening and deepening the various GCC financial markets. As emerging markets mature and become increasingly integrated with global markets, their sensitivity to the volatility spillovers of stock markets increases, their portfolio diversification ability decreases, and they become more vulnerable to external shocks. This chapter focuses on the impact of regional and global volatility spillovers on the frontier GCC markets.

GCC stock markets are classified as frontier markets due to a number of market and institutional issues including liquidity, lack of effectiveness of their delivery versus payment settlement system, and ownership limits on foreign investments, etc. GCC markets are all frontier markets, in which regional factors dominate global factors (Balcilar, Demirer & Hammoudeh 2013). Most previous studies on mean and volatility spillovers focus on how a single international market

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34 GCC markets account for 40% and 23% of global proven oil and gas reserves respectively; sovereign wealth is estimated to be more than US$ 1 trillion in size and financial systems are dominated by commercial banks (Espinoza, Prasad & Williams 2011).

35 Marashdeh and Shrestha (2010) state that GCC markets are not fully integrated and are not integrated with developed markets as represented by the US and European markets. The findings imply that there is a more profitable opportunity of portfolio diversification between the GCC and developed countries than between the more integrated GCC markets.
influences GCC stock markets but do not distinguish regional versus global market factors. This study distinguishes volatility spillovers from a regional (Saudi) and a global (United States) market to GCC markets. There has been no study that focuses on volatility spillovers from Saudi Arabia as a regional market and US as a global market, on GCC stock markets. Understanding the sources of volatility is critical for providing important insight into the process of monetary and financial integration. In imperfectly integrated markets, regional factors are important in shaping policy decisions and developing various regulatory requirements, like capital requirements or capital controls. The findings of this chapter can provide useful information for GCC central banks and policy makers regarding monitoring stock market stability, and the development and coordination of monetary policies during the on-going integration process. The research in this chapter analyses the impact of the determinants (trade, turnover, inflation, domestic credit, oil production and institutional quality) of volatility spillovers from Saudi Arabia to the other GCC markets.

This chapter also studies the effects of spillovers from the US and Saudi stock market to GCC stock markets in Bahrain, Kuwait, Oman, Qatar, and UAE. By considering innovations from the Saudi and US markets as regional and global shocks respectively, I analyse how much of the return volatility of any particular market in the GCC is driven by a global factor and how much is left to be explained by a regional one. The chapter tries to answer the following questions: (i) What are the magnitude and changing nature of return spillovers from Saudi Arabia and US to GCC stock markets? (ii) What are the policy implications deriving from the findings
regarding monitoring stock markets stability? (iii) What are the determinants of volatility spillovers from Saudi Arabia to GCC markets?

The chapter is structured as follows: Section 2 provides a literature review. Section 3 describes the data on the six GCC stock markets, together with the United States, and offers some descriptive statistics. Section 4 discusses the econometric models of volatility spillovers and specification tests, and Section 5 reports the empirical results. Finally, Section 6 concludes and provides policy implications.

5.2 Literature Review

The literature comprises of a number of alternative frameworks to analyse and model financial asset volatility spillovers. Engle (1982) introduces the autoregressive conditional heteroskedasticity (ARCH) model to describe UK inflationary uncertainty. However, the ARCH model has subsequently found wide use in characterising time-varying financial market volatility. Since the work of Engle (1982), traditional time series tools such as autoregressive moving average models for the mean have been extended to essentially similar models for the variance. Bollerslev (1986) provides generalised autoregressive conditional heteroskedasticity (GARCH) model. Under this specification, volatility depends on both previous shocks and past conditional variances. To model the leverage (asymmetric) effect, Glosten, Jagannathan, & Runkle (1993) develop the threshold GARCH (GJR) model, which measures the additional contribution of negative shocks to volatility. To account for the effect of conditional variance on asset returns, Engle, Lilien and Robins (1987) introduce the ARCH in mean (ARCH-M) model to measure the risk premium of volatility.
Bollerslev, Engle, and Wooldridge (1988) extend the generalised autoregressive conditional heteroskedasticity (GARCH) into the multivariate vectorisation (VECH) model. The main disadvantage of VECH is possible violation of positive definite covariance matrix constraints and the neglect of possible dynamic dependence between volatility series. Furthermore, in the case where the cross-section dimension of the data is large, estimating and evaluating the conditional covariance matrix is difficult because of the high dimensionality of the problem to be estimated by maximum likelihood. A significant simplification is the diagonal VECH model (DVECH), which allows for non-zero parameters only on own lagged effects and cross products, reducing the numbers of parameters under estimation.

To overcome the issue of dimensionality, Bollerslev (1990) provides a new multivariate GARCH specification model: constant conditional correlation (CCC), which models each time series as a univariate GARCH process, and uses standardised residuals to estimate the correlation in the conventional closed form of maximum likelihood estimation formulation. Engle and Kroner (1995) develop a quadratic form for the equation of conditional covariance (BEKK) equation that eliminates the problem of assuring the positive definiteness of the conditional covariance estimate in the original VECH model. However, the BEKK model parameters grow rapidly with lags and number of series, which inevitably increases the difficulty in estimating the model. Furthermore, in addition to the large number of parameters required to be estimated, the exact interpretation of the individual coefficients is not straightforward.

Engle (2002) proposes a new class of multivariate models called dynamic conditional correlation models (DCC), which captures the dynamics of the
correlations structure independently of the volatility structure. DCC models have the flexibility of univariate GARCH models coupled with parsimonious parametric models for the correlations. They are not linear, but can often be estimated very simply with univariate or two-step methods based on the likelihood function. This is accomplished in a two-step procedure, in which first the volatility structure is modelled by a series of univariate GARCH estimations and then the covariance structure is modelled in the second step.

GARCH models are now commonly used to model and analyse changes in the volatility of financial assets. Hamao, Masulis and Ng (1990) examine the short-run interdependence of prices and price volatility across Tokyo, London, and New York stock markets using daily opening and closing prices and employing GARCH model. They find evidence of price volatility spillovers from New York to Tokyo, London to Tokyo, and New York to London, but no price volatility spillover effects in other directions are found for the pre-October 1987 period. Lin, Engle and Ito (1994) examine volatility spillovers between the stock markets of Japan and the United States using a GARCH-M model. The empirical results find negative spillovers between daytime returns in one market and overnight returns in the other.

Susmel and Engle (1994) study the stock markets of the United Kingdom and the United States. Using several GARCH models to examine volatility spillovers, they find no significant evidence of volatility spillovers between these markets. Choudhury (1996) investigates the volatility, time-varying risk premium and persistence of volatility in six emerging stock markets, Argentina, Greece, India, Mexico, Thailand and Zimbabwe, using GARCH-M model. They find evidence of changes in the ARCH parameters, the risk premium and volatility persistence in
these stock markets. Bekaert and Harvey (1997) consider twenty emerging markets and examine stock return volatility before and after liberalisation. Using a multifactor threshold GARCH model to accommodate asymmetries in the volatility of stock returns, they find in all cases that, on average, liberalisation decreases volatility.

Kanas (1998b) provides an empirical investigation of volatility spillovers across London, Paris and Frankfurt stock markets using the multivariate exponential GARCH model. Kanas finds evidence of asymmetric volatility spillovers between these stock markets. Christofi and Pericli (1999) examine short-run dynamics in returns and volatility among five Latin American stock markets, using an exponential GARCH model. They find evidence of first and second moment interactions between the five stock markets examined. They also find that volatility spillovers are more common in these markets than in other regional stock markets.

Fratzscher (2002) investigates the integration process among European stock markets using a trivariate GARCH model with time-varying coefficients. The empirical study yields three key results: first, European equity markets have become highly integrated only since 1996. Second, the euro area market has gained considerably in importance in world financial markets and has taken over from the United States as the dominant market in Europe. Third, the integration of European equity markets is in large part explained by the drive toward the euro, and in particular by the elimination of exchange rate volatility and uncertainty in the process of monetary unification.

Kim and In (2002) investigate the impact of major stock markets (United Kingdom, United States and Japan) and of domestic US macroeconomic news
announcements on Australian financial markets. Using a bivariate GJR-GARCH model, they examine dynamic integration between Australian futures markets and the Australian stock market. Their results indicate that the movements of the three major foreign stock markets, and some macroeconomic news, has significant effects on the Australian markets. Mukherjee and Mishra (2008) examine return and volatility spillover among Indian stock market with 12 other developed and emerging Asian countries by applying the multivariate GARCH model. Results show that stock markets in Hong Kong, Korea, Pakistan, Singapore, Sri Lanka and Thailand are strongly influenced by movements in the Indian market.

Bhar and Nikolova (2009) use bivariate EGARCH model to examine the level of integration and the dynamic relationship between BRIC countries, their respective regions, and the world. They find that India shows the highest level of regional and global integration among the BRIC countries, followed by Brazil, Russia and lastly China. There is a negative relationship between the location conditional volatility of India with that of the Asia-Pacific region and of China with the world, which indicates a presence of diversification opportunities for portfolio investors. Beirne et al. (2010) examine global mature market and regional emerging market spillovers in local emerging stock markets. They estimate trivariate VARGARCH-in-mean models for 41 emerging market economies (EMEs) in Asia, Europe, Latin America and the Middle East. Their models capture a range of possible transmission channels: spillovers in mean returns, volatility, and cross-market GARCH-in-mean effects. Results suggest that spillovers from regional and global markets are present in the vast majority of EMEs. There is also some evidence of cross-market GARCH-in-mean effects. Balcilar, Demirer and Hammoudeh (2013) propose a dynamic herding
approach which takes into account herding under different market regimes, with concentration on the Gulf Arab stock markets – Abu Dhabi, Dubai, Kuwait, Qatar and Saudi Arabia. Results support the presence of three market regimes (low, high and extreme or crash volatility) in those markets with the transition order ‘low, crash and high volatility’, suggesting that these frontier markets have a different structure than developed markets. Results also yield evidence of herding behaviour under the crash regime for all the markets except Qatar, which herds under the high volatility regime. Chiang, Chen and Lin (2013) investigate the spillover effects of returns and volatility in the US stock market on the markets of Brazil, Russia, India, China and Vietnam (BRICVs) in the aftermath of the sub-prime mortgage crisis, employing an ARJI (autoregressive conditional jump intensity) model. They find that the greatest contagious effects of returns and volatility from the US market before the crisis were felt by Russia; however, following the crisis, the most intense spillover effects were found in Vietnam. Zheng and Zuo (2013) examine the volatility spillover effect between selected developed markets including the United States, United Kingdom, Germany, Japan and Hong Kong over the sample period from 1996 to 2011, using the Markov switching causality method. They find evidence of the existence of spillover effects among most markets, and the bilateral volatility spillover effects over crisis episodes during the Asian and subprime mortgage crises.

There are several empirical studies examining the spillover effect from the United States to other stock markets. Ng (2000) examines the magnitude and changing nature of volatility spillovers from Japan and the United States to six Pacific Basin equity markets by extending the world factor model of Bekaert and Harvey (1997) to a two factor model. The study constructs a volatility spillover
model which allows the unexpected return of any particular Pacific Basin market to be driven by a local idiosyncratic shock, a regional shock from Japan, and a global shock from the United States. The study finds significant spillovers from the region to many of the Pacific Basin countries. Baele (2005) investigates the magnitude and time-varying nature of volatility spillovers from the US market and aggregate European market to 13 local European equity markets. To account for time-varying integration, Baele allows the shock sensitivities to change through time by means of a regime switching model. His study finds that both EU and US shock spillover intensity has increased substantially over the 1980s and 1990s. There is evidence of contagion from the US market to a number of local European equity markets during periods of high world market volatility. Wang and Shih (2013) investigate time-varying world and regional integration in emerging European markets. Categorising global and regional effects into return and volatility spillovers, they also examine the impact of time variation in these spillover effects based on the conditions of economic growth. The results show that growth and currency depreciation can predict the degree of integration and spillover effects for these markets.

There are several empirical studies on MENA and the GCC region using GARCH type modelling. Abraham and Seyyed (2006) examine the flow of information among the Gulf stock markets of Saudi Arabia and Bahrain and find asymmetric volatility spillovers from the smaller but accessible Bahrain market to the larger but less accessible Saudi market. Hammoudeh and Choi (2007) use the univariate GARCH model with two volatility regimes of Markov switch to examine the volatility behaviour for the transitory and permanent components of each GCC stock market. Malik and Hammoudeh (2007) examine the volatility and shock
transmission mechanisms among US equity, the global crude oil market, and the equity markets of Saudi Arabia, Kuwait and Bahrain. In all cases, Gulf equity markets receive volatility from the oil market, but only in the case of Saudi Arabia is there a significant volatility spillover from the Saudi market to the oil market. 

Hammoudeh and Li (2008) investigate sudden changes in volatility for five GCC stock markets using the iterated cumulative sums of squares algorithm, and analyse their effects on the estimated persistence of volatility. They find that GCC stock markets are more sensitive to major global factors than to local and regional factors. 

Yu and Hassan (2008) apply the EGARCH-M models with a generalised error distribution. They find large and predominantly positive volatility spillovers and volatility persistence in conditional volatility between MENA and world stock markets. They find volatility spillovers within the MENA region to be higher than cross-volatility spillovers for all the markets. Hammoudeh, Yuan & McAleer (2009) use a multivariate VAR-GARCH to examine the dynamic volatility and volatility transmission for the service, financial and industrial sectors of Kuwait, Qatar, Saudi Arabia and UAE. They suggest that past idiosyncratic volatilities matter more than past shocks, and that there are moderate volatility spillovers between the sectors within the individual countries, with the exception of Qatar. They also find that the optimal portfolio weights favour the financial sector for Qatar, Saudi Arabia and UAE, and the industrial sector for Kuwait. Arouri and Nguyen (2010) investigate the existence of short- and long-term relationships between oil prices and GCC stock markets. Concerning the short-term analysis, strong positive linkages between oil price changes and stock markets are found in Qatar, Saudi Arabia and UAE. Their results indicate that when causality exists, it generally runs from oil prices to stock markets.
The long-term analysis provides no evidence of a long-term link between oil prices and stock markets in the GCC countries, except for Bahrain where the relationship is positive and oil price fluctuations drive changes in the stock market. Balli, Basher and Louis (2013) examine the spillover effects of local and global shocks on GCC-wide sector equity returns. They find GCC-wide sector returns have asynchronous responses to global and regional shocks. There is evidence that the GCC-wide sector equity markets are driven by their own volatilities. They indicate that the effect of global shocks on the volatility of GCC sector returns has been decreasing, whereas regional shocks have been affecting the sector indices with a positive and significant trend.

Most of the studies on GCC stock markets have focused on the investigation of the first moment interaction among GCC countries, integration with other developed markets such as the United States, market efficiency, and the impact of oil volatility on stock market returns. A few studies on volatility spillovers focus on how a single international market influences GCC stock markets, but do not distinguish regional versus global market factors. No known study has explored the impact of spillovers from global (US) and regional (Saudi) stock markets to GCC stock markets.

5.3 Data Description

The data employed are weekly equity indices in terms of US dollars, provided by Morgan Stanley Capital International (MSCI) over the period from June 2005 to May 2013. The MSCI Emerging Markets Index is a free float-adjusted market capitalisation index designed to measure equity market performance in the global
emerging markets. I use weekly returns to avoid the problems of non-synchronous trading and the day of the week effects associated with daily data.\textsuperscript{36} I use the US dollar denominated return to eliminate the impact of exchange rates and to ease the comparison across countries. The stock market indices used are for the six GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi, and UAE), and the United States.

I use Saudi Arabia as a regional market since it is the largest in the GCC in terms of market capitalisation, with half the volume concentrated in the Saudi market. Even more extreme, more than 80% of all share trading in terms of value takes place in Saudi Arabia (Kern 2012).

Hammouech and Aleisa (2004) use linear VEC models for the daily period February 25, 1994 to December 25, 2001 and find that Saudi Arabia plays a leading role in moving over GCC markets without being responsive to their shocks. Assaf (2003) states that Saudi Arabia is more segmented and closed market lagging in receiving shocks from other markets.

Saudi Arabia has been one of the best performing G-20 economies in recent years. Real GDP growth averaged 6½ per cent per annum during 2008–12, with the non-oil sector growing at average rate of 7¼ per cent. It is the largest crude oil exporter, and the only producer with significant spare capacity. In 2011, Saudi Arabia formally committed through the G-20 to use its systemic position in the oil market to promote global stability. It has committed financial support to a number of countries in transition (Egypt, Jordan, Yemen and Morocco) and to other GCC countries (Bahrain and Oman) (IMF Country Report 13/229); over the period 1985–

\textsuperscript{36} Since stock returns have more attractive statistical properties than prices, such as stationary and periodicity, I use continuously compounded weekly stock returns for all stock market indices.
2009, Saudi Arabia’s outward gross FDI to Arab countries amounted to about $20 billion. In many cases, Saudi Arabia’s FDI has represented over 40 per cent of Arab countries’ total FDI receipts from other Arab countries. Saudi Arabia’s International Investment Position indicates that foreign assets amounted to 157 per cent of GDP in 2010 while external liabilities amounted to 47 percent (IMF Country Report 12/272).

To investigate the determinants of volatility spillovers from Saudi Arabia to GCC economies, the study uses the following variables: trade is sum of exports and imports as a percent of GDP from the World Bank’s World Development Indicators. Turnover is total value of shares traded during the period divided by the average market capitalisation during the period from Standard & Poor’s global stock market factbook. GDP per capita is from the World Bank’s World Development Indicators. Control of corruption index focuses on the measure of corruption within the political system, the rate of severity of corruption within the state, the intrusiveness of the country’s bureaucracy, corruption among public officials and so forth. Regulatory quality consists of indicators related to the regulation of exports, imports, business ownerships, equities ownerships, banking, foreign investment, price controls, tariffs, unfair competitive practices etc. Control of corruption and regulatory quality are governance variables from World Bank’s Worldwide Governance Indicators.

Table 5.1 presents summary statistics on the weekly returns of five GCC markets (Bahrain, Kuwait, Oman, Qatar, UAE), a regional market (Saudi Arabia) and a global market (United States). The mean returns for all stock markets are negative except for Oman and the United States. Volatility for the GCC markets ranges from 2.33% (Bahrain) to 5.27% (UAE) as shown by the standard deviation. To check the overall degree of the residual autocorrelations, the Ljung–Box statistics
indicate the persistence of linear dependency of market returns in Bahrain, Kuwait and Oman. For the squared returns, the Ljung–Box statistics show strong evidence of non-linear dependency in the returns of all markets. This implies correlation in the variance process, and is an indication that returns is a candidate for conditional heteroskedasticity modelling. The residual of return series usually has an ARCH effect, namely, the large changes tend to be followed by large changes, of either sign, and small changes tend to be followed by small changes. The Engle (1982) ARCH test of order five rejects the null hypothesis of no ARCH effects for all the markets. The ARCH test reveals that all returns exhibit conditional heteroscedasticity. Appendix B illustrates a qualitative check for correlation in the return series and the squared returns.

Table 5.1 Summary statistics for weekly equity market returns

<table>
<thead>
<tr>
<th></th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>-0.129</td>
<td>-0.039</td>
<td>0.059</td>
<td>-0.006</td>
<td>-0.132</td>
<td>-0.205</td>
<td>0.081</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>2.333</td>
<td>3.206</td>
<td>2.873</td>
<td>4.090</td>
<td>4.251</td>
<td>5.276</td>
<td>2.560</td>
</tr>
<tr>
<td>ρ</td>
<td>0.088</td>
<td>0.047</td>
<td>-0.021</td>
<td>-0.039</td>
<td>0.056</td>
<td>0.022</td>
<td>-0.049</td>
</tr>
<tr>
<td>ARCH(5)</td>
<td>24.604***</td>
<td>88.302***</td>
<td>52.693***</td>
<td>54.590***</td>
<td>40.714***</td>
<td>59.152***</td>
<td>39.373***</td>
</tr>
<tr>
<td>LB(5)</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
</tr>
<tr>
<td>LB2(5)</td>
<td>[17.416***]</td>
<td>[17.843***]</td>
<td>8.913</td>
<td>4.328</td>
<td>4.501</td>
<td>5.179</td>
<td></td>
</tr>
<tr>
<td>Kurtosis</td>
<td>28.723***</td>
<td>117.155***</td>
<td>82.133***</td>
<td>84.978***</td>
<td>60.056***</td>
<td>89.437***</td>
<td>57.128***</td>
</tr>
<tr>
<td>Observations</td>
<td>415</td>
<td>415</td>
<td>415</td>
<td>415</td>
<td>415</td>
<td>415</td>
<td>415</td>
</tr>
</tbody>
</table>

Note: All weekly percentage returns are calculated in US dollars over the period June 2005 to May 2013. Mean is mean return. Std. Dev. is standard deviation of return. Min is minimum value of return. Max is maximum value of return. ρ is the first-order serial correlation of returns. ARCH(5) is a standard LM test for autoregressive conditional heteroskedasticity of order five. LB(5) is Ljung–Box statistics with five lags. LB2(5) is squared value of Ljung–Box statistics with five lags. p-values are given in brackets. *, **, *** denote significance at 1, 5 and 10 per cent level, respectively.
I assess the shape and overall patterns of the distribution of returns by looking at the measures of skewness and kurtosis. Skewness measures the degree of symmetry, and kurtosis measures the degree of peakedness. All the stock markets are negatively skewed, with values ranging from -0.89 to -1.78, implying that the return series has a distribution skewed to the left. High positive Kurtosis value is reported for all stock market returns, implying that there is a high peak at the centre of the returns and the distribution of returns has fatter tails than a normal distribution. Ideally, for the distribution to be symmetrical or normal, skewness should be very close to zero and kurtosis equal to three.

5.4 The Model

In this chapter I aim to analyse how much of the return volatility of any particular market in the GCC is driven by a global factor (US) and how much is left to be explained by a regional factor (Saudi). Bekaert and Harvey (1997) develop a model that allows the impact of world and local factors on volatility to be time-varying. Ng (2000) employs the same approach but extends into a two factor model in which unexpected returns on any particular market are influenced not only by news impact effects from home but also by two foreign shocks: a regional shock and a global shock. In this section, I allow the unexpected returns of any particular GCC stock market be driven by three sources of shock: local, regional from Saudi, and global from the United States. In order to investigate the volatility spillover effects from Saudi Arabia and the United States to the GCC stock markets, I construct a bivariate GARCH(1,1) model for the Saudi and US returns. The estimated innovations for Saudi Arabia and the United States are then used as input for the
univariate volatility spillover model for the GCC stock markets, which is presented in this section. I also discuss the estimation procedure and the specification tests.

5.4.1 Bivariate Model for Saudi Arabia and the United States

The joint process for Saudi and US returns in bivariate GARCH(1,1) model is:

\[
\begin{pmatrix}
R_{sa,t}^s \\
R_{us,t}^s
\end{pmatrix} = \begin{pmatrix}
\alpha_{sa,0} \\
\alpha_{us,0}
\end{pmatrix} + \begin{pmatrix}
\alpha_{sa,1} & \alpha_{sa,2} \\
\alpha_{us,1} & \alpha_{us,2}
\end{pmatrix} \begin{pmatrix}
R_{sa,t-1}^s \\
R_{us,t-1}^s
\end{pmatrix} + \begin{pmatrix}
\epsilon_{sa,t}^s \\
\epsilon_{us,t}^s
\end{pmatrix}
\]

\( \epsilon_t | \mathbf{I}_{t-1} \sim N(0, H_t) \) (1)

Where \((R_{sa,t}, R_{us,t})\) represents the return of respectively the aggregate Saudi and US markets, \([\alpha_{sa,1}, \alpha_{sa,2}; \alpha_{us,1}, \alpha_{us,2}]\) is a matrix of parameters linking lagged returns in the Saudi and US markets to expected returns, and \((\epsilon_{sa,t}^s, \epsilon_{us,t}^s)\) is their vector of innovations. \(H_t\) is the conditional variance-covariance matrix.

Standard GARCH models assume that positive and negative error terms have a symmetric effect on volatility: in other words, good news and bad news have the same effect on the volatility. This assumption, known as leverage effect (Black 1976), is frequently violated in that volatility increases more after bad news than after good news, i.e., volatility is higher after negative shocks than after positive shocks of same magnitude. To allow for leverage effect on volatility in the conditional variance \(H_t\), the GJR-GARCH model proposed by Glosten, Jagannathan & Runkle (1993) is used to extend symmetric models to allow for asymmetry. I examine three different bivariate specifications for the conditional variance-covariance matrix \(H_t\) with and without asymmetric effects: (1) a constant correlation model, (2) a dynamic correlation model, and (3) a BEKK model.
5.4.1.1 Bivariate Constant Correlation Model (CCC)

The constant correlation model is derived by Bollerslev (1990); in which the conditional correlations are constant and thus the conditional covariances are proportional to the product of the corresponding conditional standard deviations. The conditional variance-covariance matrix is given by

\[ H_t = D_t^{1/2} RD_t^{1/2} \]  

(2)

where \( R \) is a symmetric positive definite matrix of time-invariant unconditional correlations of the standardised residuals,

\[ R = \begin{bmatrix} 1 & \rho_{12} \\ \rho_{12} & 1 \end{bmatrix} \]

\( \rho_{12} \) represents the correlation coefficient and \( D_t \) is a diagonal matrix of conditional variances,

\[ D_t = \begin{bmatrix} \sigma_{1,t}^2 & 0 \\ 0 & \sigma_{2,t}^2 \end{bmatrix} \]

and thus the bivariate conditional variance-covariance matrix \( H_t \) is

\[ \begin{bmatrix} \sigma_{11,t} & \sigma_{12,t} \\ \sigma_{12,t} & \sigma_{22,t} \end{bmatrix} = \begin{bmatrix} \sqrt{\sigma_{11,t}} & 0 \\ 0 & \sqrt{\sigma_{22,t}} \end{bmatrix} \begin{bmatrix} 1 & \rho_{12} \\ \rho_{12} & 1 \end{bmatrix} \begin{bmatrix} \sqrt{\sigma_{11,t}} & 0 \\ 0 & \sqrt{\sigma_{22,t}} \end{bmatrix} \]

(3)

in which each \( \sigma_{i,t}^2 \) is a univariate symmetry GARCH model:

\[ \sigma_{i,t}^2 = \alpha_{i,0} + \sum_{j=1}^{q} \alpha_j \sigma_{i,j-1} + \sum_{i=1}^{p} \beta_i \sigma_{i,t-j}^2 \]  

(4)

Following Glosten, Jagannathan & Runkle (1993) to allow for asymmetric effects, the univariate GARCH model is
\[ \sigma_{i,t}^2 = c_{i,0} + \sum_{i=1}^{q} \alpha_i \varepsilon_{i,t-1}^2 + \sum_{i=1}^{p} \beta_i \sigma_{i,t-1}^2 + \gamma \varepsilon_{i,t-1}^2 d_{t-1} \] (5)

where \( \alpha_i \) are ARCH parameters, \( \beta_i \) are GARCH parameters, \( d_i = 1 \) if \( \varepsilon_t < 0 \) and \( d_i = 0 \) otherwise. The effect of the shock \( \varepsilon_{i,t-1}^2 \) on the conditional variance \( \sigma_{i,t}^2 \) is different according to the sign of \( \varepsilon_t \). This means good news (\( \varepsilon_t > 0 \)) has an impact of \( \alpha \), while bad news (\( \varepsilon_t < 0 \)) has an impact of \( \alpha + \gamma \), i.e., volatility increases more in response to a negative \( \varepsilon_t \) than to a positive \( \varepsilon_t \).

5.4.1.2 Bivariate Dynamic Correlation Model (DCC)

Engle (2002) proposes a generalisation of the CCC model by making the conditional correlation matrix time-dependent. The model is then called a dynamic conditional correlation (DCC) model. The model assumes that each conditional variance follows a univariate GARCH process and the conditional correlation matrix is (essentially) allowed to follow a univariate GARCH equation. The conditional variance-covariance matrix \( H_t \) is written as

\[ H_t = D_t^{1/2} R_t D_t^{1/2} \] (6)

where \( R_t \) is a time-dependent matrix of conditional correlations \( \rho_{ij,t} \):

\[
R_t = \begin{bmatrix}
1 & \rho_{12,t} \\
\rho_{12,t} & 1
\end{bmatrix}
\]

\( D_t \) is a diagonal matrix of conditional variances:

\[
D_t = \begin{bmatrix}
\sigma_{11,t}^2 & 0 \\
0 & \sigma_{22,t}^2
\end{bmatrix}
\]
and thus the bivariate conditional variance-covariance matrix $H_t$ is:

$$
\begin{bmatrix}
\sigma_{11,t} & \sigma_{12,t} \\
\sigma_{12,t} & \sigma_{22,t}
\end{bmatrix} = 
\begin{bmatrix}
\sqrt{\sigma_{11,t}} & 0 \\
0 & \sqrt{\sigma_{22,t}}
\end{bmatrix}
\begin{bmatrix}
1 & \rho_{12,t} \\
\rho_{12,t} & 1
\end{bmatrix}
\begin{bmatrix}
\sqrt{\sigma_{11,t}} & 0 \\
0 & \sqrt{\sigma_{22,t}}
\end{bmatrix}
$$

(7)

where $\sigma_{i,t}^2$ is a univariate GARCH model.

The conditional correlation matrix $R_t$ is allowed to change, as in a univariate GARCH model, but with a transformation that guarantees that it is actually a valid correlation matrix. To estimate the dynamic correlations, the DCC model first specifies the dynamic process on the variance-covariance matrix of $\tilde{\varepsilon}_t$, $Q_t$:

$$
Q_t = (1 - \lambda_1 - \lambda_2)\overline{Q} + \lambda_1 \tilde{\varepsilon}_{i-1} \tilde{\varepsilon}_{i-1} + \lambda_2 Q_{t-1}
$$

(8)

$$
\begin{bmatrix}
q_{11,t} & q_{12,t} \\
q_{12,t} & q_{22,t}
\end{bmatrix} = (1 - \lambda_1 - \lambda_2) \begin{bmatrix} 1 & \overline{q}_{12} \\
\overline{q}_{12} & 1 \end{bmatrix} + \lambda_1 \begin{bmatrix} \tilde{\varepsilon}_{1,t-1} & \tilde{\varepsilon}_{2,t-1} \end{bmatrix} + \lambda_2 \begin{bmatrix} q_{11,t-1} q_{12,t-1} \\
q_{12,t-1} q_{22,t-1} \end{bmatrix}
$$

(9)

where $\tilde{\varepsilon}_{i,t} = \varepsilon_{i,t} / \sqrt{\sigma_{ii,t}}$ is the vector of standardised residuals and $\overline{Q}$ is the unconditional correlation matrix of $\tilde{\varepsilon}_t$. $\lambda_1$ and $\lambda_2$ are parameters that govern the dynamics of conditional correlations. $\lambda_1$ and $\lambda_2$ are nonnegative and satisfy $0 \leq \lambda_1 + \lambda_2 < 1$.

Then the dynamic process on the variance-covariance matrix $Q_t$ is used to get the dynamic correlation matrix $R_t$:

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

The dynamic correlation estimator for bivariate DCC model is:
\[
\begin{bmatrix}
1 & \rho_{12,t} \\
\rho_{12,t} & 1
\end{bmatrix} = \begin{bmatrix}
1 & q_{12,t} / \sqrt{q_{11,t} q_{22,t}} \\
q_{12,t} / \sqrt{q_{11,t} q_{22,t}} & 1
\end{bmatrix}
\]

(10)

5.4.1.3 Bivariate BEKK Model

To ensure positive definiteness, a new parameterisation of the conditional variance matrix \( H_t \), Baba et al. (1989), Engle and Kroner (1995) and Kroner and Ng (1998) propose the BEKK model:

\[
H_t = C'C + A'\varepsilon_{t-1}\varepsilon_{t-1}'A + B'\varepsilon_{t-1}B
\]

(11)

where \( C, A \) and \( B \) are \( n \times n \) matrices of parameters and \( C \) is an upper triangular matrix. BEKK are expressed in quadratic forms to ensure that the \( H_t \) matrix is positive definite. The purpose of decomposing the constant term into a product of two triangular matrices is also to guarantee the positivity of \( H_t \); \( C'C > 0 \) is symmetric and positive definite. The bivariate BEKK model is

\[
\begin{bmatrix}
\sigma_{11,t} & \sigma_{12,t} \\
\sigma_{12,t} & \sigma_{22,t}
\end{bmatrix} = \begin{bmatrix}
c_{11,t} & c_{12,t} \\
c_{12,t} & c_{22,t}
\end{bmatrix} + \begin{bmatrix}
a_{11,t} & a_{12,t} \\
a_{12,t} & a_{22,t}
\end{bmatrix} \begin{bmatrix}
\varepsilon_{1,t-1}^2 & \varepsilon_{1,t-1}\varepsilon_{2,t-1} \\
\varepsilon_{1,t-1}\varepsilon_{2,t-1} & \varepsilon_{2,t-1}^2
\end{bmatrix} + \begin{bmatrix}
b_{11,t} & b_{12,t} \\
b_{12,t} & b_{22,t}
\end{bmatrix} \begin{bmatrix}
\sigma_{11,t-1} & \sigma_{12,t-1} \\
\sigma_{12,t-1} & \sigma_{22,t-1}
\end{bmatrix} + \begin{bmatrix}
\sigma_{11,t-1} & \sigma_{12,t-1} \\
\sigma_{12,t-1} & \sigma_{22,t-1}
\end{bmatrix} \begin{bmatrix}
b_{11,t} & b_{12,t} \\
b_{12,t} & b_{22,t}
\end{bmatrix}
\]

(12)

To allow for asymmetric effects following Glosten, Jagannathan & Runkle (1993), I extend the conditional variance matrix \( H_t \) in the symmetric version of the BEKK by adding \( G'\lambda_{t-1}\lambda_{t-1}'G \) term to equation (11):

\[
H_t = C'C + A'\varepsilon_{t-1}\varepsilon_{t-1}'A + B'\varepsilon_{t-1}B + G'\lambda_{t-1}\lambda_{t-1}'G
\]

(13)
5.4.2 Univariate Volatility Spillover Model

Following Bekaert and Harvey (1997), I allow innovations in Saudi Arabia and the United States to affect the stock return of a GCC market through the error term. I use an asymmetric volatility spillover model, which allows the return of each GCC market be driven by a local shock, a regional shock and a global shock. To capture the leverage effect found in the returns of many stock indices, and to avoid imposing non-negativity restrictions on the values of the GARCH parameters to be estimated, I employ the exponential GARCH (EGARCH) representation developed by Nelson (1991) where conditional variance depends on both the sign and the size of lagged residuals. The model is explicitly capable of capturing any asymmetric impact of shocks on volatility. In addition, this model allows volatility to be affected differently by good and bad news.

The univariate volatility spillover model for each GCC market $i$ is specified to allow for past Saudi and US returns in the mean equation of market $i$ and for current return shocks of Saudi Arabia and the United States in the unexpected return:

$$ R_{i,t} = \alpha_{i,0} + \beta_{i} R_{i,t-1} + \gamma_{i} R_{saudi,t-1} + \delta_{i} R_{us,t-1} + \varepsilon_{i,t} $$

(14)

$$ \varepsilon_{i,t} = e_{i,t} + \phi_{i,t} e_{saudi,t} + \psi_{i} e_{us,t} $$

$$ e_{i,t} \mid I_{t-1} \sim N(0, \sigma_{i,t}^2) $$

$e_{i,t}$ is a purely idiosyncratic shock which is assumed to follow a conditional normal distribution with mean zero and variance $\sigma_{i,t}^2$ and is assumed to be uncorrelated with a Saudi return shock $e_{saudi,t}$ or US return shock $e_{us,t}$.  

160
The conditional variance $\sigma^2_{i,t}$ equation follows an asymmetric GARCH(1,1):

$$\log(\sigma^2_{i,t}) = a_{i,0} + \theta \varepsilon_{t-1} + a_{i,1}( | z_{i,t-1} | - \bar{E}(| z_{i,t-1} |)) + b_{i,1} \log(\sigma^2_{i,t-1})$$

(15)

The variance is conditional on its own past values as well as on past values of the standardised innovations $z_{i,t} = \varepsilon_i \sigma_i^{-1}$. The parameter $\theta$ measures the asymmetric effect of shocks on volatility. A negative and statistically significant $\theta$ indicates that a leverage effect exists. The second term $a_{i,1}( | z_{i,t-1} | - \bar{E}(| z_{i,t-1} |))$ represents the magnitude effect.

I differentiate between the relative influence of Saudi Arabia and the United States on the GCC markets because there exists the possibility of common news driving both the Saudi and US markets. I orthogonalise the innovations from the aggregate Saudi market and the United States using their standardised residuals from the bivariate model estimation in the first step. The innovations from Saudi Arabia and the United States are orthogonalised by assuming that the Saudi return shock is driven by a purely idiosyncratic shock and by the US return shock. The orthogonalised Saudi and US innovations, $\hat{e}_{saudi,t}$ and $\hat{e}_{us,t}$ respectively are given by:

$$\begin{bmatrix}
\hat{e}_{saudi,t} \\
\hat{e}_{us,t}
\end{bmatrix} =
\begin{bmatrix}
1 & -\frac{\text{cov}_{t-1}(\varepsilon_{saudi,t}, \varepsilon_{us,t})}{\text{var}_{t-1}(\varepsilon_{us,t})} \\
0 & \frac{1}{1}
\end{bmatrix}
\begin{bmatrix}
\hat{e}_{saudi,t} \\
\hat{e}_{us,t}
\end{bmatrix}$$

(16)

Under this orthogonalisation procedure, the regional shock (Saudi) is unrelated to the global shock (US).
5.4.3 Estimation and Specification Tests

5.4.3.1 Estimation

I examine the magnitude and changing nature of return spillovers from Saudi Arabia and the United States to the other five members of GCC stock markets. First I estimate the three bivariate models, outlined in Section 5.4.1, for the Saudi and US returns. I estimate both the symmetric and asymmetric case for each different bivariate model. In the second step, conditional on the estimates for Saudi Arabia and the United States and assuming that the purely idiosyncratic shocks are normally distributed with mean zero and a time-varying variance, I estimate the univariate EGARCH model outlined in Section 5.4.2 for each GCC stock market by maximising the loglikelihood function.

Given $T$ observations of the return vector, the parameters of the different bivariate GARCH models are estimated by maximising the conditional loglikelihood function:

$$L_T(\theta_f) = \sum_{t=1}^{T} l_t(\theta_f) = \sum_{t=1}^{T} \left( -\log(2\pi) - \frac{1}{2} \log |H_t| - \frac{1}{2} \epsilon_t' H_t^{-1} \epsilon_t \right)$$

(17)

where $\theta_f$ denotes the vector of all the parameters to be estimated. Non-linear optimisation techniques are used to calculate the maximum likelihood estimates based on the Broyden, Fletcher, Goldfarb and Shanno (BFGS) algorithm.\(^{37}\)

---

5.4.3.2 Specification Tests

In order to check whether the bivariate models are correctly specified and to compare their overall performances, I follow Richardson and Smith’s (1993) approach to test for orthogonality conditions implied by a bivariate normal distribution. To conduct the specification tests, I use generalised method of moments (GMM) to estimate standardised residuals, \( \hat{z}_i = C_i^{-1} \hat{e}_i \), where \( C_i \) is obtained through the Cholesky decomposition of \( H_i \). Under the null hypothesis that the model is correctly specified, the following conditions on \( \hat{z}_i \) should hold:

\[
\begin{align*}
(\text{a}) \quad E[\hat{z}_{i,j}, \hat{z}_{i,j-\tau}] & = 0 \quad \text{for } i = \text{Saudi,US} \\
(b) \quad E[(\hat{z}_{i,j}^2 - 1)(\hat{z}_{i,j-\tau}^2 - 1)] & = 0 \quad \text{for } i = \text{Saudi,US} \\
(c) \quad E[(\hat{z}_{\text{saudi},j}^2 \hat{z}_{\text{us},j}^2)(\hat{z}_{\text{saudi},j-\tau}^2 \hat{z}_{\text{us},j-\tau}^2)] & = 0
\end{align*}
\]

for \( j = 1, \ldots, \tau \). The above conditions are tested, respectively, for serial correlation in \( \{ \hat{z}_{i,j} \}, \{ \hat{z}_{i,j}^2 - 1 \}, \) and \( \{ \hat{z}_{\text{saudi},j}^2, \hat{z}_{\text{us},j}^2 \} \). With \( \tau = 4 \), the test statistics for no serial correlation are asymptotically distributed as \( \chi^2(4) \). I also test the null hypothesis that \( \hat{z}_i \) follows a bivariate standard normal distribution by examining the following conditions on the third and fourth moments:

\[
\begin{align*}
(\text{d}) \quad E[\hat{z}_{i,j}^3] & = 0 \quad \text{for } i = \text{Saudi,US} \\
(e) \quad E[(\hat{z}_{\text{saudi},j}^2 \hat{z}_{\text{us},j}^2)] & = 0 \\
(f) \quad E[(\hat{z}_{\text{saudi},j}^2 \hat{z}_{\text{us},j}^2)] & = 0 \\
(g) \quad E[\hat{z}_{i,j}^4 - 3] & = 0 \quad \text{for } i = \text{Saudi,US}
\end{align*}
\]

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where equations (d) and (g) test for skewness and excess kurtosis respectively. Equations (e) and (f) test for cross-skewness and equation (h) tests for cross-kurtosis. All tests are $\chi^2(1)$ distributed with one degree of freedom.

5.5 Empirical Results

5.5.1 Specification Tests of Bivariate Models

The main objective of this study is to investigate how shocks from Saudi and US markets are transmitted to individual GCC stock markets. It is, therefore, important to correctly specify the bivariate model for the Saudi and US return series. Table 5.2 presents the results of the specification tests as outlined in Section 5.4.3.2 for the three different bivariate models, in symmetric and asymmetric cases. The univariate specification tests in Panel A show no evidence against the specifications for both the Saudi and US conditional mean and conditional variances in any of the three models. There is, however, evidence against zero serial correlations in the estimated standardised residuals for Saudi Arabia and the United States.

The likelihood ratio strongly rejects the null hypothesis of no asymmetry in the BEKK and CCC models, suggesting that there are significant asymmetric effects in the variance-covariance matrix. Finally, the likelihood ratio indicates that there is insufficient statistical evidence in support of the asymmetric DCC model.

Panel B of Table 5.2 shows the results of the bivariate normality tests. The test statistics for zero skewness, excess kurtosis, cross skewness and cross kurtosis suggest that the estimated standardised residuals for Saudi Arabia and the United
States both follow a univariate normal distribution. This indicates that the estimation results from all bivariate models are very similar. Since all models seem to give relatively similar results for the bivariate normality tests, I select the asymmetric CCC model for the following reasons: first, the likelihood ratio test suggests that there are significant asymmetric effects in the variance-covariance matrix; and second, the specification tests for the asymmetric CCC model show no evidence against zero serial correlations in all $\{\hat{\epsilon}_{t,i,p}\}$, $\{\hat{\epsilon}_{t,i,p}^2\}$, and $\{\hat{\epsilon}_{t,\text{saudi},i,p}^2, \hat{\epsilon}_{t,\text{us},i,p}^2\}$. The CCC model with asymmetry is thus chosen as the correct specification for the bivariate model for Saudi and the US, and the residuals obtained are used in the univariate volatility spillover models estimation for the each individual GCC stock market.

Table 5.2 Specification and normality tests for the Saudi and US returns

Panel A: Univariate specification tests

<table>
<thead>
<tr>
<th>Model</th>
<th>Meana</th>
<th>Variancea</th>
<th>Covariancea</th>
<th>LR Test for Asymmetrya</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEKK</td>
<td>1.471</td>
<td>2.542</td>
<td>2.873</td>
<td>5.357</td>
</tr>
<tr>
<td></td>
<td>(0.83)</td>
<td>(0.63)</td>
<td>(0.57)</td>
<td>(0.25)</td>
</tr>
<tr>
<td>Asymmetric BEKK</td>
<td>2.602</td>
<td>4.712</td>
<td>0.837</td>
<td>0.754</td>
</tr>
<tr>
<td></td>
<td>(0.62)</td>
<td>(0.31)</td>
<td>(0.93)</td>
<td>(0.94)</td>
</tr>
<tr>
<td>CCC</td>
<td>1.932</td>
<td>3.202</td>
<td>1.606</td>
<td>2.550</td>
</tr>
<tr>
<td></td>
<td>(0.74)</td>
<td>(0.52)</td>
<td>(0.80)</td>
<td>(0.63)</td>
</tr>
<tr>
<td>Asymmetric CCC</td>
<td>2.692</td>
<td>4.123</td>
<td>1.730</td>
<td>1.314</td>
</tr>
<tr>
<td></td>
<td>(0.61)</td>
<td>(0.38)</td>
<td>(0.78)</td>
<td>(0.85)</td>
</tr>
<tr>
<td>DCC</td>
<td>1.967</td>
<td>3.088</td>
<td>1.632</td>
<td>2.596</td>
</tr>
<tr>
<td></td>
<td>(0.74)</td>
<td>(0.54)</td>
<td>(0.86)</td>
<td>(0.66)</td>
</tr>
<tr>
<td>Asymmetric DCC</td>
<td>1.947</td>
<td>3.072</td>
<td>1.611</td>
<td>2.564</td>
</tr>
<tr>
<td></td>
<td>(0.71)</td>
<td>(0.49)</td>
<td>(0.80)</td>
<td>(0.61)</td>
</tr>
</tbody>
</table>

Panel B: Bivariate normality tests

<table>
<thead>
<tr>
<th>Model</th>
<th>Skewnessb</th>
<th>Kurtosisb</th>
<th>Cross Skewnessb</th>
<th>Cross Kurtosisb</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEKK</td>
<td>0.221</td>
<td>1.649</td>
<td>4.683</td>
<td>7.282</td>
</tr>
<tr>
<td></td>
<td>(0.99)</td>
<td>(0.79)</td>
<td>(0.32)</td>
<td>(0.12)</td>
</tr>
<tr>
<td>Asymmetric BEKK</td>
<td>0.172</td>
<td>0.383</td>
<td>2.621</td>
<td>2.969</td>
</tr>
<tr>
<td></td>
<td>(0.99)</td>
<td>(0.98)</td>
<td>(0.62)</td>
<td>(0.68)</td>
</tr>
</tbody>
</table>
### 5.5.2 Univariate Volatility Spillover Model

#### 5.5.2.1 Univariate EGARCH model

In this section I report the empirical results for the univariate volatility spillover model. I first estimate a univariate EGARCH(1,1) model for each individual GCC stock market index by restricting all coefficients measuring regional (Saudi) and global (US) volatility spillovers to the GCC region to zero. The results are presented in Table 5.3 As shown in this table, the degree of volatility persistence \((b_i)\) is very close to unity for all five GCC stock markets. Specifically, it is 0.929 for Bahrain, 0.986 for Kuwait, 0.974 for Oman, 0.919 for Qatar, and 0.953 for UAE; supporting the assumption of covariance stationarity of the GARCH process and the volatility persistence for various finance time series. Persistence in variance refers to the property of momentum in conditional variance: that is, past volatility explains current volatility. The leverage effect parameter \((\theta)\) is negative and statistically significant for all GCC stock market returns, indicating that a leverage effect exists except in the case of Qatar. This implies that volatility is higher after negative shocks than after positive shocks of same magnitude: that change in stock prices tend to be negatively correlated with changes in volatility.

<table>
<thead>
<tr>
<th></th>
<th>(b_i)</th>
<th>(\theta)</th>
<th>(\delta)</th>
<th>(\varphi_1)</th>
<th>(\gamma_1)</th>
<th>(\psi_1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCC</td>
<td>0.078</td>
<td>1.989</td>
<td>9.108</td>
<td>0.464</td>
<td>0.311</td>
<td>10.48</td>
</tr>
<tr>
<td></td>
<td>(0.99)</td>
<td>(0.73)</td>
<td>(0.05)</td>
<td>(0.97)</td>
<td>(0.98)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Asymmetric CCC</td>
<td>0.135</td>
<td>0.958</td>
<td>3.632</td>
<td>8.682</td>
<td>0.671</td>
<td>7.873</td>
</tr>
<tr>
<td></td>
<td>(0.99)</td>
<td>(0.91)</td>
<td>(0.45)</td>
<td>(0.07)</td>
<td>(0.95)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>DCC</td>
<td>0.077</td>
<td>2.052</td>
<td>5.768</td>
<td>1.341</td>
<td>0.410</td>
<td>10.91</td>
</tr>
<tr>
<td></td>
<td>(0.99)</td>
<td>(0.72)</td>
<td>(0.21)</td>
<td>(0.85)</td>
<td>(0.98)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Asymmetric DCC</td>
<td>0.074</td>
<td>2.047</td>
<td>0.410</td>
<td>4.464</td>
<td>0.394</td>
<td>10.75</td>
</tr>
<tr>
<td></td>
<td>(0.96)</td>
<td>(0.70)</td>
<td>(0.98)</td>
<td>(0.34)</td>
<td>(0.93)</td>
<td>(0.02)</td>
</tr>
</tbody>
</table>

Note: Asymptotic p-values in brackets. \(^a\) The test statistics is distributed as \(\chi^2(4)\). \(^b\) The test statistics is distributed as \(\chi^2(1)\).
The Ljung–Box statistics for up to 5 lags, applied on standardised and squared standardised residuals, show that the EGARCH model successfully accounts for all linear and nonlinear dependencies present in the return series. Finally, to assess the shape and overall patterns of the distribution of returns with respect to the normal distribution, the coefficients for skewness show that most GCC stock market returns are negative, implying that the return series has a distribution skewed to the left. For kurtosis, the coefficients are positive and greater than 3 for all returns, implying leptokurtic shape. In sum, the results indicate that univariate EGARCH model employed fits the data generally well.

Table 5.3 Univariate EGARCH model estimation

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha_1 )</td>
<td>-0.0418</td>
<td>-0.0302</td>
<td>0.1572</td>
<td>-0.0394</td>
<td>-0.0408</td>
</tr>
<tr>
<td>( \alpha_2 )</td>
<td>0.1466**</td>
<td>0.0828</td>
<td>0.1211*</td>
<td>0.0679</td>
<td>0.0786</td>
</tr>
<tr>
<td>( a_0 )</td>
<td>0.1214**</td>
<td>0.0262**</td>
<td>0.0576***</td>
<td>0.2283***</td>
<td>0.1544***</td>
</tr>
<tr>
<td>( a_1 )</td>
<td>0.3222***</td>
<td>0.1499***</td>
<td>0.3143***</td>
<td>0.5419***</td>
<td>0.2375***</td>
</tr>
<tr>
<td>( b_1 )</td>
<td>0.9298***</td>
<td>0.9864***</td>
<td>0.9743***</td>
<td>0.9193***</td>
<td>0.9530***</td>
</tr>
<tr>
<td>( \theta )</td>
<td>-0.082*</td>
<td>-0.088***</td>
<td>-0.056**</td>
<td>0.0310</td>
<td>-0.074***</td>
</tr>
</tbody>
</table>

Diagnostics on standardised and squared standardised residuals

<table>
<thead>
<tr>
<th></th>
<th>LB(5)</th>
<th>LB²(5)</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.685</td>
<td>6.029</td>
<td>0.0573</td>
<td>4.345</td>
</tr>
<tr>
<td></td>
<td>10.105</td>
<td>3.242</td>
<td>-0.551</td>
<td>4.075</td>
</tr>
<tr>
<td></td>
<td>8.472</td>
<td>5.057</td>
<td>-0.563</td>
<td>5.861</td>
</tr>
<tr>
<td></td>
<td>10.006</td>
<td>0.757</td>
<td>-0.284</td>
<td>6.409</td>
</tr>
<tr>
<td></td>
<td>7.004</td>
<td>5.637</td>
<td>-0.659</td>
<td>5.433</td>
</tr>
</tbody>
</table>

Note: \( \alpha_1 \) and \( \alpha_2 \) are the coefficients of the constant and first order autoregressive process specified

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for the mean equations. $a_1$ is the measure of the autoregressive conditional heteroscedasticity (ARCH) effect. $b_1$ is the measure of volatility persistence. $\theta$ is the measure of the leverage effect. LB(5) and LB2(5) are the Ljung–Box statistics applied on the standardised and squared standardised residuals respectively. t-statistics in parentheses. *,**,*** indicate significance at 1, 5 and 10 per cent, respectively.

5.5.2.2 Univariate EGARCH and Volatility spillovers

I next estimate the univariate EGARCH(1,1) model as outlined in Section 5.4.2 for each GCC market, to test for volatility spillovers from the regional (Saudi) and global (US) markets. The results are reported in Table 5.4. The degree of volatility persistence in past volatility ($b_1$) is close to 1 for all five GCC stock markets, implying that the movements of the conditional variance away from its long-run mean last a long time. These ($b_1$) values support the assumption of volatility persistence for various finance time series. The leverage effect parameter ($\theta$), or asymmetric impact of past innovations on current volatility (ARCH effect), is negative and statistically significant for all GCC stock market returns, indicating that a leverage effect exists, except in Oman, which is close to significant. This implies changes in stock prices tend to be negatively correlated with changes in volatility, so that volatility is higher after negative shocks than after positive shocks of the same magnitude.

The skewness and kurtosis measures indicate that standardised residuals for all five GCC stock markets exhibit deviations from normality. Finally, all the estimated Ljung–Box statistics for the standardised and squared standardised residuals indicate that the univariate EGARCH models with spillover effect variables are correctly specified, including these variables in the EGARCH function produce a better specification.
Table 5.4 EGARCH models and volatility spillovers from Saudi and US markets

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha_1$</td>
<td>-0.0221</td>
<td>-0.0808</td>
<td>0.0704</td>
<td>-0.0498</td>
<td>-0.0905</td>
</tr>
<tr>
<td></td>
<td>(-0.237)</td>
<td>(-0.765)</td>
<td>(0.751)</td>
<td>(-0.493)</td>
<td>(-0.491)</td>
</tr>
<tr>
<td>$\alpha_2$</td>
<td>0.1571**</td>
<td>0.0766</td>
<td>0.1224**</td>
<td>0.0367</td>
<td>0.0248</td>
</tr>
<tr>
<td></td>
<td>(3.168)</td>
<td>(1.640)</td>
<td>(2.500)</td>
<td>(0.732)</td>
<td>(0.499)</td>
</tr>
<tr>
<td>$\theta_1$</td>
<td>0.1203**</td>
<td>0.0321**</td>
<td>0.0438*</td>
<td>0.0533**</td>
<td>0.1241*</td>
</tr>
<tr>
<td></td>
<td>(3.145)</td>
<td>(2.937)</td>
<td>(2.418)</td>
<td>(3.340)</td>
<td>(2.445)</td>
</tr>
<tr>
<td>$a_1$</td>
<td>0.3347***</td>
<td>0.1595***</td>
<td>0.3204***</td>
<td>0.2807***</td>
<td>0.2379***</td>
</tr>
<tr>
<td></td>
<td>(5.497)</td>
<td>(5.875)</td>
<td>(5.990)</td>
<td>(7.444)</td>
<td>(4.547)</td>
</tr>
<tr>
<td>$b_1$</td>
<td>0.9290***</td>
<td>0.9845***</td>
<td>0.9796***</td>
<td>0.9838***</td>
<td>0.9566***</td>
</tr>
<tr>
<td></td>
<td>(40.263)</td>
<td>(206.691)</td>
<td>(117.764)</td>
<td>(157.903)</td>
<td>(53.871)</td>
</tr>
<tr>
<td>$\theta$</td>
<td>-0.072*</td>
<td>-0.089***</td>
<td>-0.044</td>
<td>-0.055**</td>
<td>-0.101**</td>
</tr>
<tr>
<td></td>
<td>(-2.320)</td>
<td>(-4.764)</td>
<td>(-1.814)</td>
<td>(-2.744)</td>
<td>(-2.618)</td>
</tr>
</tbody>
</table>

Spillover from Saudi
-0.162* | 0.045 | 0.222*** | 0.807*** | 1.826*** |
|            | (-1.989) | (0.368) | (3.728) | (7.883) | (13.541) |

Spillover from US
0.233** | 0.274** | 0.555*** | 0.252** | 0.721*** |
|            | (2.781) | (2.682) | (8.406) | (2.496) | (4.588) |

Diagnostics on standardised and squared standardised residuals

| LB2(5) | 5.557 | 3.189 | 3.487 | 1.831 | 6.649 |
| Skewness | 0.063 | -0.548 | -0.343 | -0.315 | -0.525 |
| Kurtosis | 4.348 | 4.165 | 5.023 | 6.028 | 4.078 |

Note: $\alpha_1$ and $\alpha_2$ are the coefficients of the constant and first order autoregressive process specified for the mean equations. $a_1$ is the measure of the autoregressive conditional heteroscedasticity (ARCH) effect. $b_1$ is the measure of volatility persistence. $\theta$ is the measure of the leverage effect. LB(5) and LB2(5) are the Ljung–Box statistics applied on the standardised and squared standardised residuals respectively. $t$-statistics in parentheses. *,**,*** indicate significance at 1, 5 and 10 per cent, respectively.

As shown in Table 5.4, the local spillover effects of past own shocks for each GCC stock market are significant in Bahrain, Kuwait, Oman, Qatar and UAE stock markets, pointing to a strong ARCH effect. The highest size of the ARCH coefficient is 0.233** for the US stock market.
is 0.334 in Bahrain, and the smallest ARCH coefficient is 0.159 in Kuwait. The average size of the ARCH coefficient is 0.266. Result shows that the current conditional volatility of GCC stock markets depends on past shocks affecting return dynamics, since ARCH coefficients are highly significant for all countries.

The GARCH estimated coefficients are all significant, suggesting persistence in volatility in all five GCC stock markets. The degree of volatility persistence is quite close to 1 for each stock market, implying that shocks to conditional variance take a long time to die out. Specifically, volatility persistence ranges from 0.929 in Bahrain to 0.984 in Kuwait. This finding suggests that past values of conditional volatility in a particular GCC stock market can be employed to forecast future volatility.

Figure 5.1 Return spillovers from Saudi Arabia to Bahrain
Figure 5.2 Return spillovers from Saudi Arabia to Kuwait

Figure 5.3 Return spillovers from Saudi Arabia to Oman
Figure 5.4 Return spillovers from Saudi Arabia to Qatar

Figure 5.5 Return spillovers from Saudi Arabia to UAE
The return spillover coefficients form the regional (Saudi) and global (US) markets are significant to each GCC stock market. The magnitude of spillover coefficients from the regional (Saudi) market to each GCC market varies, with the coefficients of spillovers from the global (US) market being comparatively stable and in a similar range, implying that investors are rewarded for bearing regional market risk more than for bearing global market risk.

In terms of regional effects in the five GCC stock markets, the parameters of spillover effect from the regional market (Saudi) to each GCC market is significant and positive38 almost in all cases except it is not significant in Kuwait and it is negative in Bahrain. The parameter magnitude of regional past shocks is on average 0.347, but shows considerable variation across GCC stock markets: 0.045 for Kuwait and 1.826 for UAE. This is in accordance with Neaime (2012) who finds that Saudi Arabia has causal effects in both the mean and variance for UAE and Kuwait markets. The result suggests that the effect of past shocks from a regional market (Saudi) has important return spillover effects in each local GCC stock market. This finding emphasises the need to strengthen cross border regulatory framework to strengthen domestic asset stability. Furthermore, the persistence of volatilities from the regional (Saudi) market is significant in all GCC stock markets except Kuwait,

38 From a regional perspective, there are sizable positive spillover effects from non-oil activity in Saudi Arabia. Outward spillovers from Saudi Arabia are likely to be felt most strongly in its immediate neighbours (IMF Country Report 12/271). Cashin, Mohaddes & Raissi (2012) use a GVAR model and find that a one percent increase in Saudi non-oil GDP is estimated to increase GDP in GCC countries by between 0.2 and 0.4 percent. Results from a GVAR model show that a positive shock to non-oil GDP in Saudi Arabia has a strong positive impact on the rest of the GCC.
suggesting that adverse events in the Saudi economy have regional spillover effects in other GCC markets.

Figures 5.1 to 5.5 illustrate volatility spillovers from Saudi Arabia to GCC markets. I find a larger impact of volatility spillovers from Saudi Arabia to Qatar and UAE markets. Section 5.5.3 discusses the determinants of volatility spillovers of Saudi Arabia to other GCC markets.

For the global spillover effects, the parameters of past shocks originate that from the global (US) market are highly significant and positive for all five markets, implying that the conditional mean returns of all GCC stock markets are influenced by the US market. The average size of the parameters of global return spillover is 0.4. The parameter magnitude of global past shocks from the US market to Bahrain stock market is the smallest at 0.233, while that with UAE is the largest at 0.721. This may reflect the degree of foreign participation\(^{39}\), which is almost the highest in UAE among all GCC markets.

\(^{39}\) In Bahrain, Kuwait, Oman, Qatar and UAE, listed stocks are relatively freely available to foreign investors. Relatively free entry implies some registration procedures are required to ensure repatriation rights or significant limits on foreign ownership either in general or on a sectoral basis. In the case of Saudi Arabia, listed stocks are closed or severely restricted for non-resident nationals. There is free repatriation of income and capital in Bahrain, Kuwait, Oman, Qatar and UAE; there are some restrictions for repatriation of income and capital in Saudi Arabia. Some restrictions imply registration with or permission of the Central Bank, Ministry of Finance or an Office of Exchange Control that may restrict the timing of exchange release (\textit{Standard & Poor’s global stock markets factbook} 2012)
Figure 5.6 Return spillovers from the United States to Bahrain

Figure 5.7 Return spillovers from the United States to Kuwait
Figure 5.8 Return spillovers from the United States to Oman

Figure 5.9 Return spillovers from the United States to Qatar
Figures 5.6 to 5.10 illustrate return spillovers from the global (US) market on Bahrain, Kuwait, Oman, Qatar and UAE. There are trade links between US and GCC markets: for instance, in 2012 US exports in US$ million were highest in UAE (22570) followed by Qatar (3577), Kuwait (2682.8), Oman (1746.9) and Bahrain (1209.2). In terms of US imports, the highest was Kuwait (13346.1) followed by UAE (2313.7), Oman (1422), Qatar (1055.8) and Bahrain (733.3).

There was a profound impact of volatility spillovers in 2008 and 2009. During this period, GCC stock indices fell (one-fifth in Oman, around one-third in Bahrain, Kuwait and UAE) compared to their levels at the beginning of 2007. Kuwait and UAE were the most affected by the recent financial crisis due to their stronger links with global stock markets, including US banks and equity markets. There have been
a downturn in asset prices, higher cost of capital, a slowdown in capital inflows and a
dercrease in exports due to global financial crisis, and stock market capitalisation
declined significantly between 2007 and 2009 as a result. In UAE, stock market
capitalisation went down from $224.6 billion in 2007 to $109.6 billion in 2009; in
Kuwait from $188 billion in 2007 to $95.9 billion in 2009.

5.5.3 Determinants of Volatility Spillovers from Saudi Arabia to GCC
Economies

This section discusses the impact of trade, turnover, GDP per capita, domestic
credit, inflation and institutional quality variables (control of corruption and
regulatory quality) on volatility spillovers from Saudi Arabia. To deal with basic
problems of endogeneity between variables the regression equation will be based on
the Arellano–Bover/Blundell–Bond linear dynamic panel-data estimation. In these
models, the unobserved panel level effects are correlated with the lagged dependent
variables, making standard estimators inconsistent.

\[
y_{it} = \delta y_{i,t-1} + x_{it}' \beta + u_{it} \quad i = 1, \ldots, N \quad t = 2, \ldots, T
\]

where \( y_{it} \) is volatility spillover, \( \delta \) is a scalar, \( x_{it}' \) is a \( 1 \times K \) vector of explanatory
variables and \( \beta \) is a \( K \times 1 \) vector of parameters to be estimated. The error term \( u_{it} \) is
composed of an unobserved effect and time-invariant effect \( \mu_i \) and a random
disturbance term \( \nu_{it} \).

Table 5.5 illustrates the determinants of volatility spillovers from Saudi Arabia
to GCC economies. The trade variable is positive and significant, implying that trade
enhances information sharing between stock markets. Investors may be inclined to
hold securities of close trading partners for various reasons, including hedging,
familiarity with the host country’s products, or spillovers of information. Investors are better able to attain accounting and regulatory information on foreign markets through trade in goods. Lane & Milesi-Ferretti (2008) and Mishra (2007) state that bilateral equity investment is strongly correlated with the underlying patterns of trade in goods and services. The linkages between the GCC and Saudi Arabia’s economy are via trade and financial markets (IMF Country Report 12/271). In 2012, Saudi Arabia’s exports in US$ million were highest in Bahrain (5294.87) followed by UAE (4260.17), Qatar (2171.25), Kuwait (1954.49) and Oman (1027.45). In terms of Saudi Arabia’s imports in US$ million, the highest was from UAE (3531.2), followed by Bahrain (1292.9), Oman (657.99), Kuwait (504.17) and Qatar (129.16).

The turnover variable appears to be positive and significant, implying that GCC markets share more information as the value of share trading relative to stock market capitalisation increases. GDP per capita is positive and significant, implying the tendency of GCC countries to engage in international asset trade, leading to information sharing among markets. Higher GDP per capita is associated with lower risk aversion, and the international asset trade is perceived as riskier than domestic trade; this may also raise international asset trade. Inflation appears to be negative and significant, indicating that GCC stock markets share more information in low-inflation environment. The governance variables are positive and significant, implying more information sharing among GCC stock markets in a good regulatory environment.
Table 5.5 Determinants of volatility spillovers from Saudi to GCC economies

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
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<tr>
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<td>0.012**</td>
<td>0.017**</td>
<td>0.015***</td>
<td>0.026***</td>
<td>0.013*</td>
<td>0.018*</td>
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<td>(0.002)</td>
<td>(0.009)</td>
<td>(0.053)</td>
<td>(0.098)</td>
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<td>0.010***</td>
<td>0.012</td>
<td>0.009**</td>
<td>0.007*</td>
<td>0.007*</td>
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<tr>
<td></td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.183)</td>
<td>(0.042)</td>
<td>(0.077)</td>
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<tr>
<td>GDP per capita</td>
<td>0.000*</td>
<td>0.000***</td>
<td>0.000*</td>
<td>0.000**</td>
<td>0.000*</td>
<td>0.000***</td>
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<td>(0.225)</td>
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<tr>
<td>Oil production</td>
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<td>(0.430)</td>
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<tr>
<td>Inflation</td>
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<td>-0.101**</td>
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<tr>
<td></td>
<td></td>
<td>(0.039)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Control of corruption</td>
<td></td>
<td></td>
<td></td>
<td>0.814***</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.000)</td>
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<td></td>
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<tr>
<td>Regulatory Quality</td>
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<td></td>
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<td>1.537*</td>
<td></td>
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<td>Wald Chi²</td>
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<td>620.39***</td>
<td>4068.43***</td>
<td>118.36***</td>
<td>157.74***</td>
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<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Arellano Bond Test m1</td>
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<td>-1.833*</td>
<td>-1.644**</td>
<td>-1.325**</td>
<td>-1.521**</td>
<td>-1.535**</td>
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<tr>
<td></td>
<td>(0.011)</td>
<td>(0.066)</td>
<td>(0.010)</td>
<td>(0.018)</td>
<td>(0.012)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Arellano Bond Test m2</td>
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<td>-0.820</td>
<td>-0.034</td>
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<td>-0.224</td>
<td>-0.269</td>
</tr>
<tr>
<td></td>
<td>(0.919)</td>
<td>(0.411)</td>
<td>(0.972)</td>
<td>(0.385)</td>
<td>(0.822)</td>
<td>(0.787)</td>
</tr>
</tbody>
</table>

Note: Volatility spillover from Saudi Arabia is a dependent variable. Lag value of dependent variable is not reported. Constant not reported. Trade is sum of exports and imports as percent of GDP. Turnover is total value of shares traded during the period divided by the average market capitalisation during the period. GDP per capita is gross product divided by mid-year population. Domestic credit is domestic credit provided by banking sector as percent of GDP. Oil production is natural log value of world crude oil production by country in terms of 1000 barrels per day. Inflation is measured by the consumer price index and reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals. Control of corruption index focuses on the measure of corruption within the political system, the rate of severity of corruption within the state, the intrusiveness of the country’s bureaucracy, corruption among public officials etc. Regulatory quality consists of indicators related to the regulations of exports, imports, business ownerships, equities ownerships, banking, foreign investment, price controls, tariffs, unfair competitive practices etc.
5.6 Conclusions

This chapter examines spillover effects from the United States and Saudi Arabia to the five GCC stock markets; namely Bahrain, Kuwait, Qatar, Oman and UAE. I use MSCI weekly stock market indices data from June 2005 to May 2013. I employ the EGARCH model to account for asymmetries in the spillover volatility transmission mechanism. The leverage effect parameter, or asymmetric impact of past innovations on current volatility, is negative and statistically significant for all GCC stock market returns, indicating that a leverage effect exists. I find local spillover effects to be statistically significant in all five stock markets, pointing to a strong ARCH effect. The regional spillover effects from Saudi Arabia to each GCC market are found to be positive and significant in four GCC markets (Kuwait, Oman, Qatar, UAE); and negative and significant in Bahrain. The global spillover effects from the global (US) market is highly significant and positive for all five GCC markets. The regional spillover effects in Qatar and UAE markets are greater in magnitude as compared to global spillover effects in these markets.

I also investigate the determinants of volatility spillovers from Saudi Arabia to GCC markets. I find that trade, GDP per capita and institutional quality variables (control of corruption and regulatory quality) have positive and significant impact; and inflation is found to have a negative and significant impact on volatility spillovers from Saudi Arabia. Research on volatility spillovers in the GCC region is scarce, and my research findings may contribute to macroeconomic policy dimensions.
GCC economies should aim at enhancing trade and financial integration as a macroeconomic policy to reduce the impact of financial crises on the region. GCC markets should increase intraregional and cross-border trade. GCC policy makers should devise trade policies aimed at lifting trade and capital flow barriers. Policies should aim at GCC-, MEAN- and global-level trade agreements through the World Trade Organization, Euro Mediterranean Free Trade Agreement, Jordan–US trade agreement, Greater Arab Free Trade Area (GAFTA) and other GCC/MEAN-level agreements. Further, monetary and fiscal incentives should be provided to trading partners in order to enhance cross-border trade.

GCC economies should aim at development of their financial sectors. GCC economies depend on the banking sector as a major source of financing private sector. For instance, diversifying the sources of financing the real economic activities would increase the resilience of banks’ balance sheets by limiting their exposure to various types of risk. Harmonisation of regulation and supervision within the GCC is also essential to avoid regulatory arbitrage in both offshore and onshore banking activities.

Stock and bond markets are still in the developing stage. Firms find it difficult to raise capital at the local level. A well established stock and bond market would offer lower borrowing costs to assist GCC corporate sectors to raise funds locally. A well developed bond market would protect GCC markets from interest rate shocks. A well established GCC regional financial market would reduce huge costs associated with servicing the accumulated public debt, lower the cost of raising capital, and allow companies to rely increasingly on local markets rather than the world market.
These results may have implications for investor trading strategies. Investors who focus on volatility trading, which is based on market movement of underlying equities, may construct their portfolios using hedge ratios to minimise risk.

Regulatory policies should focus on cross border coordination and supervision among GCC countries to minimise adverse spillover effects. For instance, Saudi Arabia should improve and liberalise its current account, and promote greater integration with world financial markets. Saudi Arabia’s stock market lacks transparency, and there is huge government ownership in listed companies (Neaime 2012). In addition, further strengthening of the capital market regulatory framework would be a key element in support of market stability. Although a few GCC countries already enforce best international practices in the regulation and supervision of their capital markets, others are still in the process of strengthening their frameworks. GCC economies are dependent on oil resources; they should continue their diversification efforts toward services and industrial sectors.

Policy makers need to take into account the transmission channels through which global shocks impact the local economy. The size and impact of future external shocks and their persistence in GCC stock markets will depend on future policies and to prevent transmission of shocks in domestic economies. This may require financial market, monetary and fiscal reform.
Chapter 6  Conclusions and Policy Implications

6.1 Conclusions

The primary objective of this thesis is to investigate financial integration in the GCC region, and provide policy implications. The overall contribution of this thesis is therefore to provide a careful review and understanding of the financial integration in the GCC region. This contribution will offer valuable information for policy makers who adjust current policies or implement new policies in the GCC region with the on-going integration process. Research in this thesis answers the following questions: What are the quantity-based measures of financial integration? What are the drivers of international financial integration across GCC countries? What is the impact of global financial crisis on GCC’s financial integration? What is the magnitude of financial integration in each GCC stock market with the rest of the world and GCC market portfolio? How to develop an international financial integration index for GCC stock markets? What are the determinants of degree of integration index for GCC stock markets? What are the magnitude and changing nature of return spillovers from Saudi Arabia and the United States to GCC stock markets? What are the determinants of volatility spillovers from Saudi Arabia to GCC markets? What are the policy implications deriving from the findings regarding monitoring stock markets integration and stability? To answer these research questions, thesis employs several empirical models and methodologies.

Chapter 3 empirically sheds light on determinants of the degree of GCC’s international financial integration. The chapter investigates the degree of international financial integration of the GCC member countries with the rest of the
world by developing several quantity based measures of financial integration. The chapter uses various indicators based on related literature including indicators of financial depth, trade openness, economic development and banking sector development. The chapter employs linear dynamic GMM panel estimation techniques (Arellano Bond and Arellano–Bover/Blundell–Bond) to study the impact of various indicators on measures of financial integration. Results provide strong evidence that trade openness is an important determinant of international financial integration in GCC countries. The positive and significant trade openness implies that those factors that stimulate trade in goods and services also stimulate trade in assets. Trade in goods and services and trade in assets are complementary activities. The results also provide strong evidence that indicators such as financial openness and domestic credit have positive and significant impact on GCC countries’ international financial integration. During the process of integration, the size of national financial markets should increase (relative to domestic GDP) starting with those countries with less developed financial markets. Financial integration is likely to increase the efficiency of the financial intermediaries and markets of less financially developed countries by stimulating the demand for funds and for financial services. There will be increased competition with more sophisticated and cheaper financial intermediaries, associated with financial integration. The competition from these intermediaries may reduce the cost of financial services to the firms and households of countries with less developed financial systems, and thus expand the quantity of the local financial markets. This chapter also investigates impact of global financial crisis on measures of financial integration. The chapter constructs several interaction variables to capture the change in financial integration measures.
due to financial depth, trade openness, GDP per capita and domestic credit depending on global financial crisis. The chapter finds a negative change in financial integration measures due to trade openness and domestic credit depending on global financial crisis.

Chapter 4 studies all the six stock markets in GCC region over the period from January 2002 to October 2013 and provides some insights into the empirical features of the determinants of the degree of stock market integration. The chapter analyses stock market integration in GCC countries with the world portfolio and country’s diversification portfolio (GCC market portfolio) and estimates integration index for each GCC country with the GCC region and the rest of the world. Results suggest that both local risk and global risk are relevant factor in explaining time-variation of GCC returns. There is significant time variation in GCC returns that can be explained by local risk. The global risk is also conditionally priced for GCC countries. There are wide ranges in the degree of integration for GCC countries, and none of them appear to be under complete segmentation. For example, Bahrain is the most integrated whereas Saudi Arabia is the most segmented among the GCC stock markets. The chapter uses the pre-estimated index of integration to examine the determinants of integration index by employing Arellano Bond and Arellano–Bover/Blundell–Bond linear dynamic panel estimation techniques. Research in this thesis finds that trade openness, market capitalisation and turnover have significant and positive impact while inflation and global financial crisis has significant and negative impact on integration index. These findings have policy implications.

Chapter 5 examines the spillover effects from global (US) and regional (Saudi) to the other five GCC stock markets (Bahrain, Kuwait, Qatar, Oman and UAE). The
chapter uses the EGARCH model to account for asymmetries in the spillover volatility transmission mechanism. The leverage effect parameter, or asymmetric impact of past innovations on current volatility, is negative and statistically significant for all GCC stock market returns indicating that a leverage effect exists. The chapter finds local spillover effects to be statistically significant in all five stock markets pointing to a strong ARCH effect. The regional spillover effects from Saudi Arabia to each GCC market are found to be positive and significant in four GCC markets (Kuwait, Oman, Qatar, UAE); and negative and significant in Bahrain. The global spillover effects from global market (US) is highly significant and positive for all five GCC markets. The regional spillover effects in Qatar and UAE are greater in magnitude as compared to global spillover effects in these markets. The chapter also investigates the determinants of volatility spillovers from Saudi Arabia to GCC markets. The chapter finds that trade, GDP per capita, institutional quality variables (control of corruption and regulatory quality) have positive and significant impact; and inflation is found to have a negative and significant impact on volatility spillovers from Saudi Arabia.

6.2 Policy Implications

The thesis has strong policy implications for GCC countries. In 2002, GCC decided on implementing gradually a unified economic agreement toward establishing a single market, and forming monetary union at a certain stage. Understanding of the drivers of international financial integration will provide important insight into the process of monetary and financial integration. In imperfectly integrated markets, regional factors are important in shaping policy decisions and structures of financial markets which differ across countries. The
future path for international financial integration in GCC depends on the deepening of domestic financial systems, overall economic development, as well as the pace of trade integration. GCC’s financial integration may require improvements in national regulation i.e. accounting standards, securities law, bank supervision and corporate governance to bring it in line with best practice regulation in the integrating area. On public sector front, there is a need for better corporate governance of state- owned/affiliated enterprises, with greater attention given to managing quasi-sovereign balance-sheet risks, transparency, and excessive leverage. A more sophisticated domestic financial sector will give rise to greater private sector capability in the acquisition of foreign assets and sustainable issuance of foreign liabilities. The development of local debt markets could reduce reliance on banks in financing projects and help lower funding costs. Developing the corporate bond market would help banks reduce their asset/liability maturity mismatches. Harmonisation of regulation and supervision within the GCC will also be essential to avoid regulatory arbitrage in both offshore and onshore banking activities. GCC countries may have to attain significant progress in terms of regulation of financial markets and development of robust risk management tools.

Stock market integration has implications beyond traditional issues in investments and corporate finance and deserves further study. The process of stock market integration is usually part of a major reform effort that includes the financial sector and the economy as well as the political process. GCC stock markets have experienced impressive growth in recent decade, and signs point to further growth going forward. The GCC stock markets are among the highest capitalised in the world relative to the size of their economies. Despite their size, GCC stock markets
still fall short of international financial market development standards in terms of product, quality of information, liquidity, and efficiency. Several GCC governments have already initiated efforts to address these shortcomings. GCC officials are aware of the important role stock markets play in the growth and health of their economies, and they want to ensure that these markets are strong and stable and are providing the full benefits to local investors and companies.

GCC economies should aim at development of their financial sectors. GCC markets mainly rely on banking sector as a major source of financing private sector. For instance, diversifying the sources of financing the real economic activities would increase the resilience of banks balance sheets by limiting their exposure to the various types of risks. GCC has taken steps toward harmonisation of investment laws and stock market regulation. Stock and bond markets are still in the developing stage. Firms find it difficult to raise capital at local level. A well established stock and bond market would offer lower borrowing costs to GCC corporate sector to raise funds locally and would lower its exposure to the short term speculative capital inflows, allow companies to increasingly rely on local markets rather than the world market.

While prospects for the GCC are favourable, important challenges remain. The experience of the recent financial crisis has led GCC policy makers to recognise that, in addition to the potential benefits, financial integration may also generate significant costs. In fact, the benefits of capital inflows can be completely offset by large and sudden outflows that may put an already weak local financial system under stress. Therefore, GCC policy makers need to take into account for the possible transmission channels through which global shocks impact the local economy. The size and impact of future external shocks and their persistence in GCC stock markets
will depend on the future policies and to prevent transmission of shocks in local economies. The key issue for GCC policy makers is to design policies that help minimise the short term risks, and maximise the longer run gains of financial integration. This may require financial market, monetary and fiscal reforms. For instance, maintaining a monetary policy consistent with low inflation, limiting fiscal imbalances, and preventing an excessive build-up of local debt, are all preventive measures that are likely to reduce the risk that sudden changes in market sentiment may turn into large capital outflows and trigger a financial crisis.

Research on volatility spillovers in GCC region is scarce and this study findings may contribute to macroeconomic policy dimensions in the ongoing integration process in GCC countries. Understanding the sources of volatility is critical issue for frontier stock market countries because their ability to hedge against fluctuations is particularly limited. GCC countries have shallow financial infrastructures and their compensatory fiscal and monetary policies are often underdeveloped which in turn makes it difficult for those countries to reduce the impact of external shocks. Thus, regional factors are important in shaping GCC policy decisions and developing various regulatory requirements, like capital requirements or capital controls. GCC economies should aim at enhancing trade and financial integration as a macroeconomic policy to reduce the impact of financial crisis from impacting the region. GCC markets should increase intra-regional and cross border trade. GCC policy makers should devise trade policies aimed at lifting trade and capital flow barriers. Policies should aim at GCC level, MENA level and global level trade agreements through World Trade Organization (WTO), Euro Mediterranean Free Trade Agreements, Jordan-US trade agreements, Greater Arab
Free Trade Area (GAFTA) and other GCC/MENA level agreements. Further, monetary and fiscal incentives should be provided to trading partners in order to enhance cross border trade.

Furthermore, results may have implications from investor trading strategies. Investors may focus on volatility trading, which is based on market movement of underlying equities. Investors may construct their portfolios using hedge ratios to minimise risk. Regulatory policies should focus on cross border coordination and supervision among GCC countries to minimise adverse spillover effects. For instance, Saudi Arabia should improve and liberalise its current account, and promote greater integration with the world financial markets. Saudi Arabia’s stock market lacks transparency and there is huge government ownership in listed companies. In addition further strengthening of capital market regulatory framework would be a key element in support of market stability. Although a few GCC countries already enforce best international practices on the regulation and supervision of capital markets, others are in the process of strengthening their frameworks. GCC economies are dependent on oil resources. They should continue their diversification efforts toward services and industrial sectors.

6.3 Further Research

Increased financial integration can increase economic growth rates, but may also potentially increase the speed and the number of channels through which financial crises in general may breed across countries. In fact, cross border capital flows are sensitive to macroeconomic and financial conditions, and the transmission of shocks through these financial channels is much quicker than through real channels. Therefore, financial integration must be carefully prepared and managed to
ensure that benefits outweigh short-run risks. One important issue for future research is to investigate the two main financial channels through which the recent financial crisis in the United States spread to GCC countries: foreign direct investment (FDI) and net private debt flows (short-, medium-, and long-term debt flows). Such findings will offer valuable information for policy makers who adjust current policies or implement new policies in the GCC region.

Another area of research is to examine the impact of financial openness across GCC countries on their consumption, investment and growth. It has been argued that access to world and regional capital markets allows countries to borrow to smooth consumption in the face of adverse shocks, and that the potential growth and welfare gains resulting from such international risk sharing can be large (Obstfeld 1994). At the same time, however, it has been recognised that the risk of volatility and abrupt reversals in capital flows in the context of highly open capital account may represent a significant cost.

An additional significant area of future research from the perspective of the GCC countries is to examine the impact of foreign bank entry on the domestic financial system of GCC countries. From the point of view of international financial integration two important questions arise in this context are: whether the entry of foreign banks has improved the financial system’s ability to respond to large domestic and external shocks, and whether foreign banks can contribute to the stability of the domestic deposit base.
Appendix A: The Estimation of DCC-GARCH Model Parameters

The estimation of equation of the system (7) in Chapter 4 for each GCC country,

\[ r_{it} = \delta_{W,t-1} h_{W,t-1} + \lambda_{1,t-1} h_{GCC,t-1} + \varepsilon_{it} \]
\[ r_{GCC,t} = \delta_{W,t-1} h_{GCC,W,t-1} + \varepsilon_{GCC,t} \]
\[ r_{W,t} = \delta_{W,t-1} h_{W,t-1} + \varepsilon_{W,t} \]

All estimated DCC-GARCH model parameters provide strong evidence that asset returns follow a GARCH process. The GARCH coefficients are highly significant and indicate high persistence for all countries.

Table A.1 The estimation of DCC-GARCH model parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
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<tr>
<td><strong>Mean equation</strong></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>World covariance risk</td>
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<td>0.0499</td>
<td>0.0176</td>
<td>0.0678*</td>
<td>0.0401</td>
<td>0.1103***</td>
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<td>(0.0393)</td>
<td>(0.0291)</td>
<td>(0.0260)</td>
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<td>Risk premium</td>
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<td>0.0173</td>
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<td>(0.0855)</td>
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</tr>
<tr>
<td>Constant</td>
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<td>0.3540*</td>
<td>0.2629*</td>
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<td>0.5218***</td>
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<td>0.9525***</td>
<td>0.9186***</td>
<td>0.9306***</td>
<td>0.9183***</td>
<td>0.9047***</td>
<td>0.9479***</td>
</tr>
<tr>
<td></td>
<td>(0.0159)</td>
<td>(0.0173)</td>
<td>(0.0132)</td>
<td>(0.0239)</td>
<td>(0.0100)</td>
<td>(0.0109)</td>
</tr>
</tbody>
</table>

Notes: The standard error of the coefficients is reported in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.
Appendix B: Pre-estimation Analysis for Returns Data

I performed a pre-estimation qualitative analysis to determine if the stock market returns data in Chapter 5 is heteroskedastic and can be modelled using GARCH. To check for correlation in the return series, the figures of autocorrelation functions indicate the persistence of linear dependency of market returns in Bahrain, Kuwait and Oman. For the squared returns, the figures of autocorrelation functions show strong evidence of non-linear dependency in the returns of all markets. This implies correlation in the variance process, and is an indication that returns is a candidate for conditional heteroskedasticity modelling.

Figure A.6.1 Autocorrelation function of returns and squared returns (Bahrain)
Figure A.6.2 Autocorrelation function of returns and squared returns (Kuwait)

Figure A.6.3 Autocorrelation function of returns and squared returns (Oman)

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Figure A.6.4 Autocorrelation function of returns and squared returns (Qatar)

Figure A.6.5 Autocorrelation function of returns and squared returns (Saudi)
Figure A.6.6 Autocorrelation function of returns and squared returns (UAE)

Figure A.6.7 Autocorrelation function of returns and squared returns (USA)
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