Co-Movement of Stock Markets:Evidence From GCC and Advanced Stock Markets

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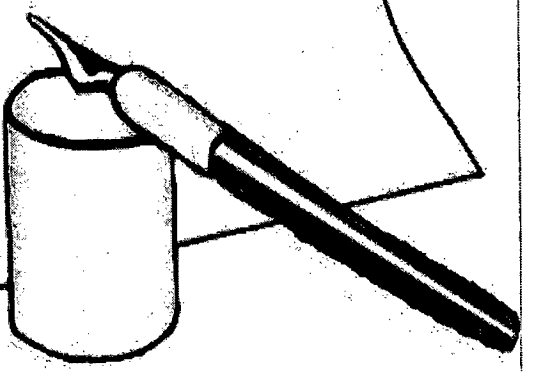

Co-movement of Stock Markets: Evidence from GCC Countries and Advanced Stock Markets

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Abstract:

The paper empirically examines the links among the stock market indices of GCC countries, and between the GCC as an economic block and six selected advanced markets (UK, USA, China, France, Japan and Australia). The methodologies adopted are simple and well accepted approaches to measure the stock markets linkages. We used cointegration methodologies to explore their interdependencies. We also constructed a gravity model to estimate the effect of some geographic variables to capture financial asset behavior. The Gulf Corporation Council (GCC) markets exhibit a stronger co-movement and causal relationship among themselves than with the advanced markets due to economic and political reasons. This study has laid some foundation for critical analysis of the linkages within the GCC stock markets and between the GCC and the advanced stock markets. The paper has some practical implications for practitioners and academics. For both existing and prospective international investors, the GCC stock markets are available to be further exploited not only for maximizing financial gains but also to diversify their investment port folios. The behavioral aspect of market participants and the dynamics of oil pricing deserve more theoretical and empirical research in the future.

Keywords: GCC, stock market, cointegration, co-movement, oil market.

Introduction:

The Gulf Corporation Council which has several economic and political characteristics in common and commonly referred to as the GCC countries is mostly associated with developments in the oil market. It is therefore; of little surprise that most of the research works on the region are centered on oil and oil-price related areas as oil export largely determines their foreign earnings and governments' budget revenues and expenditures.

The six members of the Gulf Corporation Council (GCC) are Saudi Arabia, Kuwait, Oman, Bahrain, United Arab Emirates and Qatar. Bahrain is excluded in this paper only for the research purpose because of its relative economic size and insufficient data. The Saudi Arabia market leads the region in terms of market capitalization. It represents more than forty percent of the GCC market (Arouri and Raul, 2010). These markets are limited by several structural and regulatory weaknesses because of their nature.

The individual country's efforts to diversify its economy, privatize its public sectors, utilize advances in trading technology, and improve legal and financial institutional infrastructures have resulted in real development of their markets and manage to attract some foreign investments to them.

The aim of this study is to empirically examine whether, the Gulf Corporation Council (GCC) countries' stock markets are individually integrated (i.e. pair-wise), and also whether, their markets as a block is integrated with selected advanced stock markets. If they are not integrated with these countries, then we can assume that they have potential for maximizing returns on equity investments and risk diversification for regional and international portfolio managers.

The second question is does natural barriers hinder market correlation when even artificial barriers have been removed. To answer this question we constructed a gravity model to estimate the effects of variables such as, geographic distance, Language, common border and Market size on the level of cross-country stock market correlations.

The rest of the paper is organized as section two discusses related literature. Section three explains the methodology adopted in this paper. Section four presents the empirical settings and the regression results. Conclusion and implications are given in section five.

Literature Review:

International finance has examined extensively the economic determinants of international stock market linkages and its development shows the importance of global businesses. The increased financial integration leads international investors to look for new investment opportunities in order to reduce the portfolio risks of such investments.

Researchers in their studies have also used various methodologies in analyzing the interdependence among stock indices across a number of stock markets based on different time frames. But most of these studies have not revealed consistent results probably as a result of the choice of markets or sample period. It is also on record that most of the studies are on developed economies and some on emerging economies of Asia, but very few on GCC stock markets.

A good number of studies have been carried out on the Asian developed stock markets (Chi et al, 2006, Jakpar et al, 2013) among others. Other authors have focused on the interdependence among developed equity markets and Eastern Europe emerging markets. Dhal (2008) also investigated the degree of integration of the Indian stock market with two

regional (Hong Kong and Singapore) and three leading international markets like the Japan, USA and the UK.

Several relevant studies have also been carried out regarding emerging markets using different models and techniques in order to establish cointegration links (Graham et al, 2012, Akoum et al, 2012) among others. Gklezakou and Mylonakis (2009) examined the correlation and causal relationship among emerging markets in South Eastern Europe and Germany. The influence of Germany on all the other countries in the study was firmly established. Ali et al, (2011) investigated the co-movement between emerging and developed stock markets, but failed to find any link.

Other relevant studies include Beli et al (2012) who investigated the existence of common stochastic trends between European Union member countries and Turkey. They find evidence of trends except for a few cases. Rua and Nunes (2009) used monthly data and find comovements of stock market returns among some advanced markets.

Assaf (2003) examined the dynamic relationships among the GCC markets, though the study is limited in terms of period used (as the study period covered less than four years) and the market dynamics have changed greatly due to economic, structural and political changes. The results show strong evidence of interdependence and feedback effects among the GCC stock markets. Arouri et al (2012) also examined long-run links between oil prices and stock markets in GCC and find evidence for cointegration between oil prices and stock markets except in Saudi Arabia.

In a related study, Akoum et al, (2012) analyzed the short and long-term dependencies between GCC markets and OPEC basket oil returns, using Wavelet Square coherence approach. The study shows that oil and stock returns are not strongly correlated and also examined increasing strength in the market dependencies.

Hammoudeh and Aleisa (2004) studied the daily relationships among stock markets of the GCC members and the New York Mercantile Exchange oil futures prices (NYMEX). The result shows that only the Saudi index can predict and be predicted by NYMEX.

Gravity modeling approach has been used to explain the trade patterns among countries. Studies also suggest that gravity model can be used to explain cross-country stock market correlations adequately. Flavin et al, (2002) test the effect of several geographical variables, such as great circle distance, common land border and common language among others on cross-country stock market correlation. The authors find that sharing a common border and the number of overlapping opening hours exert significant and positive impact on correlation between markets.

Portes and Rey (2005) find that the geographic information is the main determinant of the pattern of cross-border equity flows. Huang et al, 2006, Lucey and Zhang, 2010, and Flavin et al, 2002 also employed the gravity model. They find that geographic variables have significant effect on stock market correlation. Even though the distance variables were found to be insignificant in the study of Flavin (2001) and the authors opined that their study does not in any way invalidate the gravity model.

Methodology:

The research begins our sample in the year 2005 and covers the price development up to 2012. The stock markets are those of Saudi Arabia, Kuwait, Oman, Qatar, and United Arab Emirates for the Gulf Corporation Council (GCC) countries and the United Kingdom, United States of America, China, France, Japan and Australia for the advanced markets. The monthly data was chosen to avoid false correlation problem often found in quarterly and annual data, while the daily is deemed to contain

too much noise and is affected by the day of the week effect (Roca, 1999).

Firstly, we collected monthly closing stock prices of the selected stock markets. All the series were then expressed in logarithmic form. Taking the first logarithm difference of the monthly index, we obtained the continuously compounding rates of return. Table 1 reports the descriptive statistics of these returns.

The empirical analysis of the relationships among the five GCC stock market indices and the GCC as an economic block with the indices of the selected advanced stock markets requires that several time series tests be conducted. The first step requires the conduction of unit root test to determine whether the series are stationary or not. It is important to obtain stationarity to avoid the spurious regression problem (Liu and Shrestha, 2008).The most commonly used test to detect the existence of unit root is the Dickey and Fuller test (Gujarati, 2003). It is considered superior for time series with autoregressive structure and has more reliability, since it ensured white noise residual in the regression (Para and Poshakwale, 2006). The ADF test; with trend was applied on all the indices both at log level and first difference. Table 3 reports these tests.

The next step is to evaluate the cointegrating properties of the data series. Two or more time series that are non-stationary in levels and have individual stochastic trends can share a common stochastic trend(s). In this case these series are cointegrated. This study uses different techniques to analyze the relationships. We first use the Engle and Granger (1987) methodology which is based on analyzing stationarity of error term series obtained from the equation derived with level values of time series that are not stationary on the level but become stationary when their difference is taken. The Johansen cointegration test was also applied to further detect the co-movements in the long-run. A mutual causal relation of the indices was also examined using the Granger causality test.

We finally investigated the source of stock market correlation by constructing a gravity model to capture financial asset market behavior. We also applied a feasible Generalized Least Squares (GLS) specification to estimate the Gravity model. The variables allowed to influencing the degree of stock market correlation are geographic in nature and others are more financially oriented. The model is as follows:

$$\mathbf{Corr}_{ijt} = \beta_0 + \beta_1\{(\mathbf{Size})_{it} * (\mathbf{Size})_{jt}\} + \beta_2(\mathbf{Language})_{ij} + \beta_3(\mathbf{Border})_{ij} + \beta_4(\mathbf{Distance})_{ij} + \beta_5(\mathbf{Growth})_{ij} + \varepsilon_{ilt}$$

where;

$Corr^{ijt}$ are mutual stock market return between country i and j in year t. $\{(Size)^{it} * (Size)^{jt}\}$ represent financial market size between two countries. It is generated by multiplying the market capitalization of two countries. Language represents common language between two countries. It takes the value of one if the same language and zero if otherwise. Border is the common border dummy. It represents the neighborhood effect arising from sharing a common border. Distance represents the geographical distance between two cities where the stock market centers are located. Growth represents the absolute value of the ratio of GDP to Market capitalization expressed in percentage for each country and year. ε_{ij} is a stochastic error term.

Descriptive Statistics and Empirical Results:

This section consists of two parts; the first part presents the descriptive statistics of the data used in this study, while the second part presents the empirical findings of the tests utilized, reviewing their results and provide an interpretation to each of the finding.

Taking the first logarithm difference of the monthly index, we are able to obtain the continuously compounding rates of return. Table 1 reports the descriptive statistics of these stocks returns. Oman has the highest rate of return followed by Japan and the United Kingdom in that order. Qatar, USA and China among others earned negative returns. Japan has the highest standard deviation (0.11432). All the returns are positively skewed except for France and Australia, while all the Kurtosis are high except for Saudi Arabia and Qatar implying that the distribution is peaked relative to normal. A very high Jarque-Bere statistics test which suggests a rejection of the normality hypothesis, even though, Saudi Arabia and Qatar have relatively smaller values. Overall, the descriptive statistics suggest that the returns on the GCC equity markets are less volatile and relatively normally distributed as compared to the selected advanced markets.

Table 1: Descriptive Statistics for monthly returns over 2005 to 2012

Market	Mean	Standard Dev.	Skewness	Kurtosis	Jarque-Bera
Saudi Arabia	0.00054	0.04541	0.66935	0.01612	7.169
Kuwait	0.00157	0.04881	1.84061	10.4611	491.941
Oman	0.00848	0.03551	2.97028	15.7537	1133.88
Qatar	-0.00118	0.04358	0.18352	0.87508	3.602
UAE	0.00405	0.05561	3.77290	28.6870	3519.540
UK	0.00449	0.05074	4.87984	27.2201	3344.740
USA	-0.00084	0.03313	3.39893	19.8010	1753.170
China	-0.00097	0.04495	0.73381	1.33772	15.774
France	-0.00203	0.02848	-1.06978	4.85049	112.420
Japan	0.00838	0.11432	8.86632	81.6567	27929.00
Australia	-0.00224	0.03624	-0.22522	9.36942	351.960
GCC	0.00101	0.04609	2.19200	16.5260	5723.480
Advanced Markets	0.00113	0.05887	2.19200	205.001	10038.870

The monthly returns of all the stock markets for this study are presented in figure 1. We note that there is evidence of volatility clustering, that is small or large returns trend is followed by small or large returns, suggesting that volatility changes over time. The GCC markets tend to exhibit cyclical fluctuation as their movements do not follow any regular pattern, but move in a somewhat unpredictable manner. This may be due to the controlled and early developmental nature of the markets.

Figure 1: Monthly Returns over 2005 to 2012

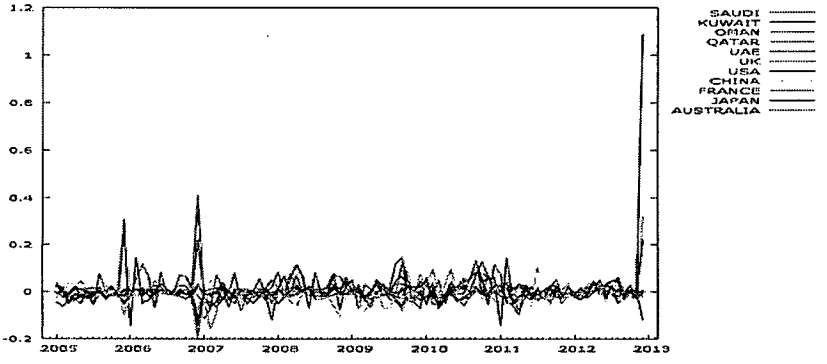

Table 2 presents the descriptive statistics for calculated correlations. The average correlations of all the country-pairs present a time varying path through years and reached the highest value at 0.3042 in 2010. Correlations after 2009 are higher than those before this year, which reflect tighter global relationship for advanced countries in more recent years. By country, France has the highest average correlation (0.2588), while Saudi Arabia presents the lowest average correlation (0.01243) across years. The average correlation of the selected advanced economies is higher than that of the GCC countries.

Table 2: Descriptive Statistics for Correlations

Panel A: by year	Mean	Standard Dev.	Skewness	Kurtosis	Jarque-Bera
2005	0.04701	0.38839	0.11156	-0.31072	0.6707
2006	0.15502	0.32365	0.10252	-0.78874	3.0440
2007	0.10045	0.41261	-0.01112	-0.35551	0.5815
2008	0.14301	0.31172	0.58301	0.50160	7.3848
2009	0.11302	0.43065	0.29510	-1.12133	7,3959
2010	0.30421	0.32744	0.19105	-0.85055	3.9849
2011	0.05247	0.43507	0.10457	-1.00540	4.8334
2012	0.25131	0.36761	0.29677	-1.35235	9.9968
Panel B: by country	**Mean**	**Standard Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**
Saudi Arabia	0.01243	0.27500	-0.34924	-0.41204	2.1922
Kuwait	0.11302	0.32554	0.06887	-0.34072	0.4502
Oman	0.13753	0.38457	0.11164	-0.99064	3.4375
Qatar	0.15991	0.33887	0.05631	-0.48113	0.8139
UAE	0.13115	0.34375	0.20475	-0.02990	0.5619
UK	0.23976	0.42486	-0.11803	-0.86393	2.6736
USA	0.10473	0.38795	-0.11244	-0.54742	1.1675
China	0.03588	0.34894	-0.07141	-0.36071	0.5073
France	0.25882	0.45624	-0.16170	-0.99461	3.6461
Japan	0.22232	0.41888	-0.14964	-0.75763	2.2119
Australia	0.20384	0.42137	0.06063	-1.05993	3.7933

Empirical results :

Four tests have been done namely, Unit root test, Cointegration test, Granger causality test and the Gravity model to investigate the source of stock market correlation.

Augmented Dickey-Fuller Unit Root Test (ADF) :

A necessary condition to perform a cointegration test is that, the order of integration of variables has to be the same. It is therefore, important to obtain stationarity to avoid the spurious regression problem. To test for a unit root, this study employs the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller,

1979). Table 3 shows the empirical approach of ADF unit test. It is tested through level of trend 1(0) and first difference with trend 1(1). The null hypothesis of a unit root is not rejected for the indices at log level however the null hypothesis is rejected when they are taken at the log first difference. We therefore conclude that all the series are stationary and integrated in the same order that is 1(1). The series have satisfied the condition necessary to test for integration. We can now proceed to investigate if there a long-run relationship exists among the GCC equity markets, on one hand and the GCC markets and those of the selected advanced markets on the other hand.

Table 3: ADF Test Results :

STOCK MARKET	ADF (Log)		ADF (Log Diff.)	
	t-Statistics	p-Value	t-Statistics	p-Value
Saudi Arabia	-1.240	(0.659)	-4.586	(0.000)***
Kuwait	-2.140	(0.229)	-2.606	(0.009)***
Oman	-1.620	(0.472)	-2.893	(0.004)***
Qatar	-2.932	(0.052)	-3.119	(0.002)***
UAE	-1.494	(0.537)	-3.656	(0.000)***
UK	-2.089	(0.249)	-4.023	(0.000)***
USA	-1.992	(0.291)	-2.815	(0.005)***
China	-1.401	(0.584)	-3.065	(0.002)***
France	-1.907	(0.329)	-2.431	(0.015)***
Japan	-2.239	(0.193)	-2.488	(0.012)***
Australia	-2.074	(0.256)	-2.192	(0.027)***

Note: Price series in Log form. ADF is with constants. ***, ** and * indicate the level of significance at the 1 percent, 5 percent and 10 percent respectively.

Cointegration Test:

Two variables are said to be cointegrated if they have a long-term or equilibrium relationship. Cointegration as developed by Engle and Granger (1987) is that some linear combination of two or more series is stationary even when each of the series individually is not stationary. Tables 4a & 4b show the result of

the Engle-Granger cointegration test. Saudi Arabian stock market has a long-run relationship with most of the other GCC markets except Oman. Since there are observed links among the GCC markets, there is a danger that shocks in one market may spill over to the other markets. This therefore, requires regional economic policy makers to cooperate and put measures in place to mitigate such spillover effects. (The complete result of the test is not included for lack of space, but is available on request).

Saudi Arabia does not share a common stochastic trend with the selected advanced markets and is said not to be cointegrated. There is also, no cointegration between the GCC markets as a block and the advanced markets.

Table 4 a: ADF test results on Engle-Granger cointegration test residuals

	t-Statistics	Prob.
Saudi Arabia/Kuwait	4.235	0.0050***
Saudi Arabia/Oman	-1.151	0.2527
Saudi Arabia/Qatar	2.272	0.0254**
Saudi Arabia/UAE	2.611	0.0105**
Saudi Arabia/UK	-0.256	0.7983
Saudi Arabia/USA	0.535	0.5937
Saudi Arabia/China	-1.398	0.1654
Saudi Arabia/France	1.520	0.1320
Saudi Arabia/Japan	-2.276	0.0251
Saudi Arabia/Australia	0.078	0.9376
GCC/Industrialized countries	-0.187	0.8520

Note: Prices are in log form. ***, **. And * indicate the level of significance at the 1 percent, 5 percent and ten percent level respectively.

Table4b: ADF test results on Engle-Granger cointecration test residuals for GCC

	Saudi Arabia	Kuwait	Oman	Qatar	UAE
Saudi Arabia	1.00	0.0053*** (4.235)	0.2527 (-1.151)	0.0254** (2.272)	0.0105** (2.611)
Kuwait		1.00	0.0025*** (4.440)	0.0001*** (4.054)	0.0003*** (3.734)
Oman			1.00	0.3993 (0.847)	0.5778 (-0.589)
Qatar				1.00	0.0115** (-2.579)
UAE					1.00

Note: t-statistics are in parenthesis. ***, ** and * indicate the level of significance at the 1percent, 5 percent and 10 percent level respectively.

Granger causality test

Granger (1969) is defined in terms of predictability, and exploits the direction of the flow of time to achieve a causal ordering of associated variables. We test to find whether the stock market indices have significant effect on each other in the bivariate VAR model.

Table 5, indicates the result from pair-wise Granger causality test for the log of monthly price series. We do not find any evidence that would warrant the rejection of the null hypothesis in most of the cases. But in the case of Saudi Arabia and Oman there is bidirectional causality, therefore, any development in either of the markets should be monitored by economic stakeholders of both markets. There is unidirectional causality running from United Arab Emirates to Saudi Arabia. We fail to reject the null hypothesis in almost all the pairs of the GCC countries. (The complete result of the test is not included for lack of space, but is available on request).

There is no short run relationship of any of the GCC markets and the individual advanced markets. There is also no causality running between the GCC markets as a group and those of the advanced markets as a whole. Finally even though, the causal relationship between the GCC group and the advanced markets is not statistically significant, the impact from the advanced markets is more, based on the P-value of 0.4093 and 0.9307 respectively.

Table 5: Granger causality test results

Null Hypothesis	F-Statistics	Prob.	Conclusion
Saudi Arabia does not cause Kuwait Kuwait does not cause Saudi Arabia	2.2035 0.7164	0.1179 0.4918	Saudi does not Granger cause Kuwait. Kuwait does not Granger cause Saudi.
Saudi Arabia does not cause Oman Oman does not cause Saudi Arabia	8.2534 7.9874	0.0006** 0.0007*	Saudi does Granger cause Oman. Oman does Granger cause Saudi.
Saudi Arabia does not cause Qatar Qatar does not cause Saudi Arabia	6.6468 0.0797	0.0023 0.9235	Saudi does not Granger cause Qatar. Qatar does not Granger cause Saudi.
Saudi Arabia does not cause UAE UAE does not cause Saudi Arabia	1.1988 8.4121	0.3076 0.0005**	Saudi does not Granger cause UAE. UAE does Granger cause Saudi.
Saudi Arabia does not cause UK UK does not cause Saudi Arabia	1.2835 0.0651	0.2834 0.9370	Saudi does not Granger cause UK. UK does not Granger cause Saudi.
Saudi Arabia does not cause USA USA does not cause Saudi Arabia	1.0816 1.6642	0.3446 0.1966	Saudi does not Granger cause USA. USA does not Granger cause Saudi.
Saudi Arabia does not cause China China does not cause Saudi Arabia	1.6065 1.0611	0.2078 0.3515	Saudi does not Granger cause China. China does not Granger cause Saudi.
Saudi Arabia does not cause France	1.3150 0.0405	0.2749 0.9603	Saudi does not Granger cause France,

France does not cause Saudi Arabia			France does not Granger cause Saudi
Saudi Arabia does not cause Japan Japan does not cause Saudi Arabia	1.5443 0.0679	0.2204 0.9343	Saudi does not Granger cause Japan, Japan does not Granger cause Saudi
S. Arabia does not cause Australia Australia does not cause S. Arabia	1.7679 0.6188	0.1781 0.5415	Saudi does not Granger cause Australia, Australia does not Granger cause Saudi
GCC does not cause advanced mkts. Adv. mkts. does not cause GCC	0.7184 0.9023	0.9307 0.4093	GCC does not Granger cause Adv. Mkts, Adv. Mkts does not Granger cause GCC

Note: Price series are in log form. ***, ** and * indicate the level of significance at the 1 percent, 5 percent and 10 percent level respectively.

Gravity model:

Table 6, shows the regression results through regress country-pair correlation coefficients on geographic variables. The results are generally consistent with previous research findings. Geographic distance is significant and negatively related to stock market correlation. This implies that country-pairs with smaller geographic distance exhibit higher levels of stock market co-movement.

Market size exhibits a positive and statistically significant relationship with market correlation. The larger the markets the more correlated they are. This could be related to the assumption that larger markets display more price movements and may be more liquid than smaller markets.

The coefficient estimates of growth, common border and language variables have the expected positive signs but are not statistically significant.

Table 6:Panel Regression for Stock Market Correlations 2005-2012

	t-Statistics	P-Value
Constant	-2.1966	0.02860**
Market size	3.5560	0.00042***
Language	0.4894	0.62481
Distance	-2.3487	0.01931**
Growth	1.7840	0.07515*
Border	0.2129	0.33582

Note: The dependent variable is the correlation of monthly returns for each year from 2005 to 2012. ***, ** and * stand for significance at the 1 percent, 5 percent and 10 percent levels respectively.

Conclusion and Implications

The findings of the cointegration test indicate that the GCC markets exhibit a stronger co-movement among themselves than with other markets. This might be as a result of stock market proximity as well as sharing a common border. It somewhere shows that there is no significant investment diversification opportunity within the GCC stock markets. It is also evident from the result that there is no integration of the GCC markets as a block or individually with the selected advanced stock markets, which may be allowed for the benefits of international diversification for portfolio managers of these countries.

Evident that Saudi Arabian market has the most causal linkages with the other GCC markets. There are no statistically significant causal relationships among the GCC and the advanced markets. But despite the political and economic barriers these GCC countries put in place being more affected by the advanced markets.

The analysis of the results of the Gravity model which are in line with recent findings (Hang et al, 2006; Flavin et al, 2002; Lucey and Zhang, 2010) among others reveal that stock market proximity as well as sharing a common border are important explanatory variables for stock market correlation. These geographic variables may be acting as a proxy for information asymmetries across the investment communities. Financial variables such as market size influences cross-country correlation, the larger the market the more they are correlated.

The paper has some practical implications for practitioners and academics. GCC countries economic policy makers should make fundamental regulatory changes in the areas of trading strategies and investment decisions to promote deeper financial integration among the markets. This can be in the form of cross-listing of companies in their stock exchanges and their economic and national leaders should further open up their economies with limited restrictions. A key component of liberalization policy is to allow foreign investors to invest in domestic securities and domestic investors to purchase foreign securities. For both existing and prospective international investors, the GCC stock markets are area to be further exploited not only for maximizing financial gains but also to diversify their investment port folios.

The recent subprime mortgage crisis in the US which triggered a global financial crisis also affected the GCC economies, though to a smaller extent. A broader implication is that no market is completely immune from such type of happenings in any part of the globe. Thus regional and international economic policy coordinators should put in place policies to reduce sensitivity to stochastic shocks.

This study has also laid some foundation for critical analysis of the linkages within the GCC stock markets and between the GCC and the advanced stock markets. The use of different techniques and determinants, especially the behavioral aspect of market participants and the dynamics of oil pricing deserve more theoretical and empirical research in the future.

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