Stock Markets Dynamics In Oil-Dependent Economies: Evidence From The GCC Countries

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This paper investigates the relationship between stock prices and main macroeconomic variables (i.e. oil prices, short-term interest rate and domestic credit) that are believed to affect stock prices in the context of the Gulf Cooperation Council (GCC) markets. For this purpose, this paper employed recent time series techniques of cointegration and Granger causality tests. The multivariate cointegration tests identified that oil prices, interest rates and domestic credit have long-term equilibrium effects on stock market prices in four GCC countries. In addition, the Granger causality test highlighted that the causality is running from oil prices to the stock price index in the case of Kuwait, Saudi Arabia and Oman. Also, the causal flow from the domestic credit to the index has been found in the case of Kuwait and Saudi Arabia; while the interest rate has causal effect on the stock price index in the case of Saudi Arabia, Bahrain and Oman. Further assessment of the relationship between these variables, based on generalised variance decomposition and generalised impulse response functions, reveals the importance of oil prices in explaining a significant part of the forecast error variance of the index in Kuwait, Saudi Arabia and Oman. Most of the variations in the stock prices can be captured by innovations in the three selected variables. Therefore, the causal relationship that macroeconomic variables granger caused stock prices are quantitatively supported by innovation analysis.

JEL Codes: G12, G14, C32, E 44

1. Introduction

During the last few years, the stock markets in the GCC countries have grown enormously in terms of market capitalisation and trading turnover. For example, the GCC stock markets capitalisation increased from $112bn at the end of 2000 to approximately $1,061bn at the end 2005. This represents a growth of 850% in a period of less than five years.[3] In terms of domestic market capitalisation, the combined stock markets of the GCC countries are now larger than the Hong Kong Stock Exchange and nearly one-third the size of the London Stock Exchange.

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The GCC market indices illustrate the extraordinary level of investor interest in the GCC stock markets. During 2005, the General Price Index in Saudi Arabia increased by 82%, the index of the Doha Securities Market by 91%, and the index of the Dubai Financial Market by 171%. The Saudi stock market accounted for more than half of the GCC markets capitalisation at the end of 2005 at $660bn, 116% increase from its end-2004 value of $306bn. The combined capitalisation of the Abu Dhabi and Dubai markets grew to $234.4bn at the end of 2005, up by 63% from $144bn in 2004. Qatar's market value grew from $40.4bn at the end of 2004 to $87.1bn in 2005, a gain of 115.6%. The Kuwait Stock Exchange capitalisation rose 90% to $140bn in 2005, from $73.8bn in 2004; while the relatively smaller stock markets in Bahrain and Oman increased by about 29% and 24% in 2005 respectively. The trading turnover in the seven stock exchanges was also surged by 148% to $1.368 trillion from $552bn in 2004. The Saudi market accounted for $1.1 trillion or 80% of turnover in all the GCC stock markets. It was followed by UAE markets with $138.9bn and Kuwait with $97.3bn. The Dubai Index rose 132.4%, followed by the Saudi Index, which gained 103.7%. The Kuwaiti index rose 78.6%, Qatar by 70.2%, while Abu Dhabi increased by 69.4%. The markets of Oman and Bahrain rose by 44.6% and 23.8%, respectively.[4] Furthermore, real gross domestic product growth for the region grows at an average of around 8.5% in 2003, 5.9% in 2004, and 6.8% in 2005, and 6% in 2006.

Three factors appear to have an impact on the strong and different performance of the GCC stock markets over the last few years, high oil prices, abundant levels of liquidity in the region and the decline in the interest rates. Oil prices hovered from $25 in 2002 to $60 in 2006 to $90 in 2007. For the GCC countries, since they are major suppliers of oil in the world energy market and they collectively possess 47% of the world's proven oil reserves and account for 24% of the global petroleum production and 40% of petroleum exports, oil revenues largely determine their government budget revenues and expenditure. Thus, oil revenues are crucial component of aggregate demand in these countries. The aggregate demand highly influences corporate activities and domestic price levels, which in turn affect corporate earnings and stock prices.

Despite many efforts to diversify their economies, GCC countries remain over dependent on oil and around 80% of their budget revenues are due to oil. In this economic environment, the combination of limited business diversity and excess liquidity favoured the surge of their stock markets, and made it normal for these markets to witness much activity. For example, the domestic liquidity over 2001-2005 increased by 50%, 65%, 50% and 36% in Kuwait, Saudi Arabia, Bahrain and Oman respectively.[5] This increase has directly or

[4]See each exchange's website: each exchange's website:
Saudi Arabia: www.tadawul.com.sa; Kuwait: www.kuwaitse.com; Dubai: www.dfm.co.ae; Bahrain: www.bahrainstock.com; Abu Dhabi: www.portal.adsm.ae/wps/portal; Qatar: www.dsm.com.qa; Oman: www.msm.gov.om.

[5]Source: GCC Economic Statistics Bulletin (2006) issued by the Gulf Investment Company (GIC) in Kuwait.

indirectly fed a rapid rise in demand for credit from the real economy, improving access for finance for corporations, facilitating the strong growth in investment and hence surging stock markets.

The other important factor that may impact the stock market activity in the GCC countries is the low interest rates, which are mainly driven by the sensitivity of the GCC interest rates to changes in the US Treasury bill rate as a result of fixing their national currencies to the US dollar. Most of the GCC countries fix their currencies to the US dollar many years ago, whether one to one or through a basket of currencies dominated by the dollar. Thus, GCC countries by nature are overly sensitive to global factors, such as oil prices and US Treasury bill rates and domestic factors such as excess liquidity.

Nevertheless, a considerable body of literature establishes credible evidence that stock markets are affected by a number of key macroeconomic variables. However, it is quite clear that most of empirical studies related to this issue remained confined to world major stock markets with highly diversified productive sectors. Such studies include Fama (1981, 1990) Chen, Roll and Ross (1986), Hamao (1988), Eun and Shim (1989), Asprem (1989), Kim and Wadhani (1990), Joen and Von Furstenberg (1990), Thornton (1993), Arshanspalli and Doukas (1993), Kasa (1992), Kaneko and Lee (1995) Cheung and Ng (1998), Darrat and Dickens (1999). For example, Fama (1981) asserts that there is a strong relationship between stock prices and macroeconomic variables such as GNP, money supply, capital expenditure, industrial production and interest rate. Similarly, Chen, Roll and Ross (1986) find a relation between stock market prices and macroeconomic factors such as inflation, industrial production, money supply, the exchange rate and the interest rate.

Few studies conducted on developing countries include Mookerjee and Yu (1997), Maysami and Koh (2000) for Singapore, Kwon et al (1997) and Kown and Shin (1999) for South Korea, Habibullah and Baharumshah (1996) and Ibrahim (1999) for Malaysia. For example, Mookerjee and Yu (1997) note a significant relation between money supply and foreign exchange reserves and stock prices for the case of Singapore. However, Maysami and Koh (2000) find a significant relation between Singapore's stock prices and various macroeconomic variables, such as interest rate and exchange rate. Kwon et al (1997) study the Korean equity market and find evidence for the exchange rate, dividend yield, oil price and money supply as being significant macroeconomic variables. Similarly, Kwon and Shin (1999) establish a long-run relation between stock prices and industrial production, exchange rate, trade balance and money supply for Korea.

While most studies conducted on developed countries and few on developing countries, similar work about the fast-growing emerging markets (i.e. GCC stock markets) is almost non-existent. Despite their importance, GCC markets remain under research except for a handful of studies such as Assaf (2003), Hammoudeh and Aleisa (2004) and Hammoudeh and Choi (2006). Assaf (2003) investigates the dynamic relationship among the GCC markets during the period 1997-2000 using VEC models. He finds strong interaction and

feedback among these markets. Specifically, he indicates that Bahrain's market has a dominant role in influencing the other GCC markets, while Saudi Arabia's market is slow in receiving shocks from these markets. Hammoudeh and Aleisa (2004) examine the link between the indices of five GCC stock markets and between the indices and the oil future prices. They use daily data for the period 1994-2001. Their findings suggest that the Saudi index has the most causal linkages with other GCC markets, and it can explain and predict all the GCC indices at five percent level of significance. Bahrain index is the second mostly linked with the other GCC markets. On the other hand, Kuwaiti market has the least causal linkages, followed by Omani market. Furthermore, they find that there is bidirectional relation between the Saudi index and the future oil prices. The oil prices also can predict and explain the other GCC indices, with the exception of the United Arab Emirates index.

Hammoudeh and Choi (2006) investigate the relationships among five GCC stock markets and their link to three global factors: oil spot prices, the US Treasury bill rate and the S&P index over the period 1994-2004. They find that despite the long-run relationships, these markets do not have strong predictability power for each other. Also their results suggest that the US Treasury bill rate has short-term impact on some of the GCC stock markets. However, the oil prices and S&P index have no predictability effect on any market in the short run.

These studies mainly focus on the dynamic relationships among the GCC stock market returns rather than the impact of economic activity on the stock market movements. So far, to our knowledge, no work has been done on the impact of both local and global macroeconomic factors on stock markets in the GCC countries.[6] Furthermore, the data used in the above mentioned studies predate the end of 2001,[7] which make them miss the rapid and important changes that took place in the GCC markets in the last few years. They also neglect to incorporate the influence of local factors such as money supply as a measure of the liquidity in the economy. For example, Beckers et al (1995) find both global and national factors are of roughly equal importance in explaining the co-movement of stock returns, while national factors are dominant in explaining the stock return volatility.[8]

This paper intends to contribute to the literature by: first, overcoming the above mentioned caveats by applying time series data covering the period 1994:10-2007:12 and including two global economic factors (oil prices and US Treasury rate) and one local factor (money supply). Second, clearly, GCC stock markets belong to economies whose general features are not consistent with the standard profile encountered in recent relevant literature. The unique features of these economies render the determination of stock prices in these markets significantly different from those in other countries. Not all variables used in previous studies would be suitable in the case of the GCC markets. For example, many of the standard macroeconomic variables such as

[6]Hammoudeh and Choi (2006) focus only on the global factors.
[7]Except for Hammoudeh and Choi (2006), predate of 2004.
[8]Similar results were found by Grinold et al (1989), Drummen and Zimmermann (1992) and Heston and Rouwenhorst (1994).

industrial production index and inflation rate, which are commonly used as proxies of economic activities, would have little relevance as determinant of stock prices in the context of GCC countries.[9] For example, GCC countries enjoy low level of inflation which undermines the effect of such variable on GCC stock markets.[10] From this perspective, this paper proposes to analyse the stock markets using the variables that reflect those unique features of GCC economies and are believed to impinge on the working of these markets notably, oil prices, US Treasury bill rate and money supply.

Third, we know there is a direct link between the underlying economy and asset prices for most developed and some developing countries. However, we do not know enough about the relationship between the underlying economy and asset prices for economies that rely on the export of a single product; namely, oil. Given that oil prices are determined by demand and supply at the world level, it would be interesting to know whether asset prices in oil exporting countries simply reflect changes in the value of dollar and the developments in the world economy or whether they respond to domestic macroeconomic shocks as well. Although all GCC countries performed very well over the last few years, their individual performance was not alike and their link to oil is not the same; therefore, they are worthy of further investigation. Finally, the investigation of the dynamic relationship between stock prices and macroeconomic variables becomes more and more important for smaller stock markets as their economic role is less understood compared to well-organised and mature markets as they are less liquid and said to be more affected by speculations and government interventions.

Motivated by the lack of literature on the link between the macro-economy and stock prices in oil exporting countries such as the GCC countries, our investigation attempts to widen the scope of this line of research by extending this type of analysis to select GCC economies with different profiles than those already investigated in the literature. Undoubtedly, valuable insights could be gained from such investigations. Thus, allowing for meaningful comparisons of the impact of various economic forces on stock markets across economies with different characteristics. Given that these economies are well-integrated in the world economy; this study can be considered an important contribution to the investigation of small open economies. Such investigation would be very helpful to policy makers and the investing community

The rest of the paper will be organised as follows. Section 2 presents the econometric methodology employed in this paper. Section 3 discusses the variable definitions and data sources. Section 4 reports the empirical results and section 5 concludes.

[9]Most of the studies on the link between economic activities and stock prices, used the industrial production index as a proxy of macroeconomic activities (i.e. Fama (1981, 1990), Schwert (1990, Lee (1992) for the United States, Wasserfallen (1989) for Germany, Switzerland and the UK, Asprem (1989) for a group of European countries, Peiro (1996) for Germany, France, the UK and the US, Binswanger (2001) for G-7 countries).

[10]Only in the last two years the inflation rate increased to about 8% to 10% in both the UAE and Qatar while it remains low in the other GCC countries. Both The UAE and Qatar are not included in our analysis due to lack of consistent monthly data for these countries.

2. Econometric Methodology

This paper employs the multivariate cointegration analysis, the Granger causality test in the context of vector error correction model (VECM), the generalised variance decompositions and the generalised impulse response functions to analyse the dynamics of stock prices in GCC stock markets. As it is common in the literature related to time series techniques, the first step in determining whether common stochastic trends are present among the variables is the detection of a unit root test in each series. For this purpose, this paper employs the well-known Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. These tests are performed on both the level variables and their first differences, with the null hypothesis being that the variable under investigation has a unit root against the alternative that it does not. A time series is stationary when its mean and variance are constant over time (i.e. it has no trend and the value of the covariance between two periods depends only on the distance or lag between the two periods and not on the actual time at which the covariance is computed). The use of no stationary variables in a given model leads to the spurious regression phenomenon discussed by Granger and Newbols (1974) and Phillips (1987). Moreover, Stock and Watson (1998) have also shown that the usual test statistics (t and F) will not possess standard distributions if some of the variables in the model have unit roots and are thus, no stationary.

2.1 Multivariate Cointegration Tests and VEC model

Having established that the variables are integrated in the first difference, and since we are interested in modelling a long-run relationship between macroeconomic variables and stock prices, cointegration analysis is an ideal tool. We proceed to the estimation of the number of co integration vectors using Johansen (1988) and Johansen and Juselius (JJ) (1990) approach. Several advantages of this approach have been identified over its predecessor popular residual based Engle-Granger two-steps approach in testing for cointegration. First, the JJ procedure does not assume the existence at most of a single cointegrating vector; rather it explicitly tests for the number of cointegrating relationships. Second, different from Engle-Granger procedure which is sensitive to the choice of the dependent variable in the cointegration regression, the JJ procedure assumes all variables to be endogenous, and when it comes to extracting the residual from the cointegrating vector, the JJ procedure avoids the arbitrary choice of the dependent variable as in the Engle-Granger approach, and is insensitive to the variable being normalised. Third, the JJ procedure is established on a unified framework for estimating and testing cointegrating relations within the VECM formulation. Fourth, JJ provides the appropriate statistics and the point distributions to test the hypothesis for the number of cointegrating vectors and tests of restrictions upon the coefficients of the vectors. For these reasons, we follow the multivariate test for cointegration advocated by Johansen (1988) and Johansen and Juselious (JJ) (1990).

Consider the following vector autoregressive (VAR):

$$Y_t = \Phi_1 Y_{t-1} + \Phi_2 Y_{t-2} + ...\Phi_k Y_{t-k} + \mu + \eta_t \quad (1)$$

Where Y_t is a k*1 vector containing the variables of our analysis. Suppose that these variables are I (0) after applying the difference filter once. If we exploit the idea that the relevant variables move together over time toward a long-run equilibrium state, then by the granger causality analysis we may posit the following testing relationship that constitutes a VECM model:

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + ...\Gamma_{k-1} \Delta Y_{t-k+1} + \Pi Y_{t-k} + \mu + \eta_t \quad (2)$$

Where ΔY_t is the vector of first differences of the variables, the Γ's are the estimated parameters, Δ stands for the operator difference, η_t is a vector of impulses which represents the anticipated movements in Y_t, with $\eta_t \approx niid(0, \sum)$ and Π is the long-run parameters matrix. With r cointegrating vectors ($1 \le r \le k$), Π has rank r and can be decomposed as $\Pi = \alpha\beta$, with α and β both k*r matrices. β are the parameters in the cointegrating relationship and α is the adjustment coefficients which measure the strength of cointegrating vectors in VECM.

The Johansen (1988) and Johansen and Juselious (JJ) (1990) multivariate cointegration techniques allow us to estimate the long-run relationship between variables, using two likelihood ratio test statistics: the trace statistic and the maximum Eigen value statistic. They can be used for testing cointegrating vectors. The hypothesis that there are at most r distinct cointegrating vectors can be tested by the trace statistic: Trace test: -T $\sum_{i-r+1}^{n}$ ln (1- λ_i), Where T is the number of observations and λ_i's Eigen values between the two residuals R_{0t} and R_{t1}. Alternatively the maximum Eigen values statistic tests the hypothesis of r+1 cointegrating vectors, given r cointegrating vectors and is defined as: Maximum λ test: -T ln (1- λ_{r+1}), Where λ_{r+1} is the (r+1) the largest Eigen value. The trace tests the null hypothesis that the number of distinct cointegrating vectors is less than or equal to r against the general alternative. The max Eigen value tests the null hypothesis of r cointegrating vectors against r+1 cointegrating vectors. The critical values for both tests are available in Oster-Lenum (1992). Johansen (1991, 1992) proved that the intercept terms in the VEC model should be associated with the existence of a deterministic linear trend in the data. However, if the data do not contain a time trend, the VEC model should include a restricted intercept term associated to the cointegrating vectors.

The vector error correction model shows how the system is adjusting in each time period towards its long-run equilibrium state. Since the factors are supposed to be cointegrated, then in the short-run, any deviations from the long-run equilibrium will feed back on the changes in the dependent variables

in order to force their movements towards the long- run equilibrium state. Consequently, the cointegrating vectors from which the error correction terms are derived are each indicating an independent direction where a stable long-run equilibrium state exists. However, the coefficients of the error correction terms represent the proportion by which the long-run disequilibrium in the dependent variables is corrected in each term period.

2.2 Causality Tests

After conducting the cointegration tests, we proceed by applying causality analysis, which enables us to investigate the direction of the relationship between the stock index and the macroeconomic variables. More specifically, we can examine if the macroeconomic variables have an effect on the stock index or they are affected by it. Cointegration analysis allows proving the existence of the relationship but does not allow us to conclude about the direction of the causality. Granger (1989) indicates that if two variables are cointegrated, then Granger causality must exist in at least one direction. This result is a consequence of the relationship described by the VECM. Since the variables move together over time, then any variable or a combination of any of the variables in ΔY_t must be granger caused by the lagged values of the level variables. Given this, the causal relation between the variables can be investigated using the joint F-test applied to the coefficient of each explanatory variable and the coefficient of the cointegrating vector in the VECM.

2.3 Variance Decompositions and Impulse Responses

In order to analyse the dynamic properties of the variables under analysis, we employ the generalised variance decomposition and the generalised impulse response functions. The purpose of this investigation is to find how the index responds to shocks by other variables of the system. The forecast error of generalised variance decompositions analysis reveals information about the proportion of the movements in sequence due to its “own” shocks versus shocks to other variables. If the shocks do not explain any of the forecast error variance of one macroeconomic variable in all forecast horizons, then this variable is exogenous. At the opposite side, if shocks can explain all forecast error variance of the variable at all forecast horizon, this variable is an entirely endogenous variable. The generalised impulse response functions provide an estimate of the response of a variable in the case of innovation in another variable. Plotting the generalised impulse response functions is a practical way to explore the response of a variable to a shock immediately or with various lags.

In calculating variance decompositions and impulse response functions, it is assumed that the variables should be in particular ordering. However, according to Koop et al (1996), unlike orthogonalised variance decomposition and impulse response functions obtained using the Cholesky factorisation, the generalised variance decomposition and impulse response functions are unique and invariant to the ordering of the variables in VAR.

3. Data

In choosing the relevant variables to include in the model we rely on earlier empirical analysis and economic intuition. As discussed earlier, many of the well-known macroeconomic variables that are well-defined in the literature to be related to the stock markets have probably little bearing in the stock market in GCC countries. Based on this point of view, we hypothesise a relationship between GCC stock prices and several variables that we view to be most pertinent to the GCC stock markets setting. In line with the following empirical studies -Chen, Roll and Ross (1986), Mookerjee and Yu (1997), Maysami and Koh (2000), Kwon et al (1997), Kown and Shin (1999), Habibullah and Baharumshah (1996), Ibrahim (1999), Assaf (2003), Hammoudeh and Aleisa (2004) and Hammoudeh and Choi (2006) - have studied three macroeconomic factors that are used in the present study: oil prices, interest rates and money supply.

The first variable, which is believed to impinge on the working of the stock markets in the GCC, is the price of oil. This choice is built on the fact that GCC economies depend mainly on oil revenues. Oil revenues are considered the main source of income and government spending. As known, the profitability of the business sector is largely affected by the level of economic activity. Since the oil prices (oil revenues) is the major component of the gross domestic product in the GCC countries,[11] an increase in oil prices, by affecting economic activity and corporate earnings, has implications for asset prices and stock markets. However, given the recent fast developments in the GCC stock markets, it is unclear to what extent the recent increase in the oil price has been directly responsible for recent turbulence in their stock markets. This strong influence of oil prices on the national economies of GCC countries makes them an interesting case to investigate the impact of oil prices on their stock markets movements. Furthermore, understanding the link between oil prices and stock prices is important for investors to make the right investment decisions and for policy makers to adopt the appropriate policies to develop the stock markets.

The financial economics literature suggests that monetary policy instruments are considered one of the most important mechanisms that affect stock markets. For example, changes in interest rate or domestic liquidity in the economy force the participants in the stock markets and investors in general to reconsider their investment strategies because, as suggested by financial theories, the value of an asset today is the sum of the discounted future cash flows from this asset. As we discussed earlier most of the GCC countries tie their exchanges rates effectively to US dollar. Consequently, GCC monetary policies should follow US monetary policy, resulting in highly correlated relationship between their short-term interest rates and US rates as suggested by the hypothesis of interest rate parity. The correlation coefficients between local short-term interest rate in the GCC and US Treasury bill rate are about 94%, 97%, 99%, and 70% for Kuwait, Saudi Arabia, Bahrain and Oman

[11] The correlation coefficients between oil prices and GDP are .95, .93, .92, and .92 for Kuwait, Saudi Arabia, Bahrain and Oman, respectively. It is worth to mention here that GDP is not available on monthly basis; oil price is the best proxy for it.

respectively.[12] This fixing of exchange rates makes the movements of the local interest rates very tight to the US rates, which have been low over the past years, contributing to lower rates in the GCC countries. Based on this argument, short-term interest rate for the four countries is proxied by the US Treasury bill rate.

Theoretically, an increase in interest rates raises the required rate of return, which in turn inversely affects the value of the asset. Considered as opportunity cost, the nominal interest rate will affect investor's decisions on asset holdings. An increase in this opportunity cost will motivate them to substitute their equity shares for other assets in their portfolio. Thus, an increase in interest rates has negative effect on stock prices from the perspective of asset portfolio allocation. Furthermore, an increase in interest rates may restrain economic activity and cause a decline in future corporate profitability. Therefore, a negative relation between interest rates and stock prices is expected.

In addition, to the oil prices and US Treasury bill rate, we choose another variable which reflects the liquidity in the economy. This variable is the money supply proxied by domestic credit.[13] As known, all GCC countries fix their currency exchange rate to the US dollar. Under these circumstances, where there is no independent monetary policy, money supply will have limited role as an indicator of liquidity in the economy, so given the structure of the GCC countries, domestic credit appears to be an appropriate measure of liquidity and a good proxy for money supply (henceforth, we use domestic credit to describe money supply). The rational of including such variable is that we have to have a factor reflecting the liquidity effect on the stock prices. An increase in liquidity creates an excess supply of money balances and an excess demand for equity, and results in an increase in equity prices. However, in the long run an increase in liquidity will cause inflation and increase interest rate, which in turn will increase the discount rate in the valuation model. Therefore, the stock prices may be negatively related to domestic credit. Note, however, in case of the GCC countries, the inflation rate was low in the period under investigation. Thus, we hypothesise that the domestic credit may have a positive effect on stock prices.

Monthly data in logarithmic form used for the period 1994:10 to 2007:12 for Kuwait, Bahrain and Oman and the period 1996:1 to 2007:12 for Saudi Arabia are used in this investigation. The starting date was dictated by data availability and the need to maintain consistency. Monthly data frequency are chosen in order to avoid potential spurious correlations among the time series often found to exist in aggregated quarterly and annual data. On the other side, data frequency shorter than a month is constrained by the fact that one of our variables (domestic credit) is available only on monthly basis. It is assumed that stock prices are related to some macroeconomic variables, and hence time series, which may be able to capture both current and future directions in the broad economy. Hence the variables are: value weighted

[12] Appendix is available upon request.

[13] The results (not reported) of correlation coefficients between money supply and domestic credit are .90, .70, .98 and .90 for Kuwait, Saudi Arabia, Bahrain and Oman, respectively.

stock price index (INDEX), Crude oil price (OIL), short-term interest rate (INT) and domestic credit (DC). The index variable has been obtained from the Arab monetary funds (AMF); the oil price obtained from US energy information administration; the US Treasury rate and the domestic credit obtained from International Monetary Fund's International Financial Statistics (IFS 2008 CD ROM). Lack of consistent monthly data over the entire sample period makes it difficult to include Qatar and The United Arab Emirates in the present study.

To assess the distributional properties of the data, table (1) assembles some summary statistics for the above mentioned selected variables. As can be noted form the table, the Omani market registered the highest monthly returns of .39%,[14] followed by returns of Saudi Arabia's market .36% and Kuwait's market .29%. The lowest monthly return in the four countries belongs to Bahrain's market at .25%. The Saudi market exhibits the highest degree of risk as measured by the standard deviation (3.5% per month) and Bahraini market is the least risky with standard deviation of only about half (2%) of Saudi's market. Skewness as a measure of asymmetry of the series around its mean shows that the distributions of all variables in the four countries are almost symmetrical. The kurtosis statistics provides a measure of thickness of the tails of a distribution relative to normal distribution. The kurtosis far exceeds 3 across the variables suggesting that the empirical distribution has more weight in the tails and leptokurtic (peaked). These market characteristics are consistent with those found by Bekaert and Harvey (1997) for emerging markets.

[14] In 2006, Oman's stock market was the only GCC market to have registered positive return (up by 14.5%).

Table 1
Descriptive Statistics

The table presents some descriptive statistics for the variables used in our estimation. Variables are INDEX, OIL, INT and DC indicates for stock prices index, oil prices, short-term interest rate and domestic credit respectively. From the stock price index series we calculate the stock returns as 100*(Pt/Pt-1); where Pt is the value of stock price index at time t. Monthly data are used for the period 1994:10 to 2007:12 for Kuwait, Bahrain and Oman and the period 1996:1 to 2007:12 for Saudi Arabia.

	Mean	Median	Std. dev.	Skewness	Kurtosis
KUWAIT					
INDEX	0.296	0.509	2.581	-2.583	21.74
OIL	0.439	0.515	2.673	-0.021	4.135
INT	-0.006	0.015	0.188	-1.209	5.640
DC	18.14	3.870	216.5	0.755	8.026
SAUDI ARABIA					
INDEX	0.362	0.609	3.580	-2.020	12.81
OIL	0.439	0.515	2.673	-0.021	4.135
INT	-0.006	0.015	0.188	-1.209	5.640
DC	0.938	0.645	13.30	0.453	6.976
BAHRAIN					
INDEX	0.259	0.107	2.024	1.804	13.07
OIL	0.439	0.515	2.673	-0.021	4.135
INT	-0.006	0.015	0.188	-1.209	5.640
DC	20.32	20.85	55.10	0.340	5.075
OMAN					
INDEX	0.394	0.240	2.941	0.905	7.420
OIL	0.439	0.515	2.673	-0.021	4.135
INT	-0.006	0.015	0.188	-1.209	5.640
DC	20.04	16.53	89.85	0.643	13.91

Table (2) provides an outline of the relationship between the stock price index and the selected variables for each country. The correlation matrix among the selected variables reveals that the index is positively correlated with oil prices in the four countries. The correlation coefficients between the index and oil prices are .75, .75, .88, and .70 in Kuwait, Saudi Arabia, Bahrain and Oman respectively. Also, the domestic liquidity in the economy is positively correlated to the index in the four countries ranging from about 40% in Oman to .87 in Bahrain. Furthermore, consistent with the theoretical background, the correlation between the interest rate and the index appears negative for Kuwait (-.52), Saudi Arabia (-.22) and Bahrain (-.03) while it appears positive (.20) for Oman. Further discussion about the relationship between stock price index and the above mentioned variables will be presented in the following sections.

Table 2
Correlation among variables

The table presents the correlation coefficients for the variables used in our estimation. Variables are INDEX, OIL, INT and DC indicates for stock prices index, oil prices, short-term interest rate and domestic credit respectively. Monthly data are used for the period 1994:10 to 2007:12 for Kuwait, Bahrain and Oman and the period 1996:1 to 2007:12 for Saudi Arabia.

KUWAIT:				
	INDEX	OIL	TBUS	DC
INDEX	1.00			
OIL	.758	1.00		
INT	-.524	-.155	1.00	
DC	.631	.838	-.199	1.00
SAUDI ARABIA:				
	INDEX	OIL	TBUS	DC
INDEX	1.00			
OIL	.754	1.00		
INT	-.226	-.041	1.00	
DC	.744	.635	-.652	1.00
BAHRAIN:				
	INDEX	OIL	TBUS	DC
INDEX	1.00			
OIL	.881	1.00		
INT	-.030	-.134	1.00	
DC	.870	.919	-.318	1.00
OMAN:				
	INDEX	OIL	TBUS	DC
INDEX	1.00			
OIL	.703	1.00		
INT	.207	-.121	1.00	
DC	.392	.732	-.455	1.00

4. The Empirical Results

This section applies the methodology described above to empirically investigate the dynamic interactions between the stock prices and the macroeconomic variables in four GCC stock markets. The main focus of our analysis is on testing for the existence of long-run equilibrium relationship between the above mentioned variables and stock prices in the context of four GCC countries, investigating the nature of the causal relation among variables considered with particular attention to the causal effects that variables may have on stock prices and to what extent do shocks in macroeconomic variables influence the stock index.

4.1 Test Results for Unit Roots

In testing for unit roots, this chapter employs the well-known Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. These tests are performed on both the level variables and their first differences, with the null hypothesis

being that the variable under investigation has a unit root against the alternative that it does not. If the calculate statistics is higher than McKinnon's critical value then we do not reject H_0 and the considered variable is non-stationary, if not it is stationary. In each case the lag length is chosen by minimising the Akaike Information Criterion (AIC). We also test for the existence of up-to-the-twelfth order serial correlation in the residuals of each regression using the Ljung-Box Q statistics. The results of these tests (not reported) indicate the absence of serial correlation.

Table (3) presents the results of unit root tests for the variables in level and first differences (with trend and without trend). All variables have been transformed to natural log before the analysis. The results indicate that the null hypothesis that the level variables contain unit roots cannot be rejected by both tests for the four countries. However, after differencing the data once, both tests reject the null hypothesis. Since the data appear to be stationary in first differences, no further tests are performed. Up to this stage, we can say that the ADF and PP test statistics suggest that the four variables are candidates for cointegration.

Table 3

Tests Results for Unit Roots

The table presents the results for unit roots test. ADF is the Augmented Dickey-Fuller test and PP is the Phillips-Perron test. Variables are INDEX, OIL, INT and DC indicates for stock prices index, oil prices, short-term interest rate and domestic credit respectively. Monthly data are used for the period 1994:10 to 2007:12 for Kuwait, Bahrain and Oman and the period 1996:1 to 2007:12 for Saudi Arabia. All variables are in natural log. The lag selection is based on the lowest value for Akaike Information Criterion (AIC). The null hypothesis is that the series is I (1). The critical values for rejection are: -3.4422 at 1%, -2.8798 at 5%, -2.5766 at 10% for models without linear trend and -4.0179 at 1%, -3.1288 at 5% and -3.1437 at 10% for models with linear trend. These values are based on Mackinnon (1996) provided by Eviews. (*) indicates significant at 1% for both models.

KUWAIT:				
Variables	**ADF Test**		**PP Test**	
Level	**Constant, no trend**	**Constant, trend**	**Constant, no trend**	**Constant, trend**
INDEX	-.5495	-1.720	-.6551	-1.692
OIL	.1067	-1.823	.0729	-1.924
INT	-1.801	-2.448	-1.311	-1.143
DC	-.6056	-1.912	-.5119	-1.912
1st Diff.				
INDEX	-11.153	-11.129	-11.152*	-11.128*
OIL	-11.402	-11.4534	-11.357*	-11.410*
INT	-3.820	-3.8675	-7.390*	-7.410*
DC	-7.956	-14.004	-13.869*	-13.922*
SAUDIA ARABIA:				
Level				
INDEX	-.9414	-2.009	-.8920	-1.953
OIL	.1067	-1.823	.0729	-1.924
INT	-1.801	-2.448	-1.311	-1.143
DC	-1.809	-.7576	-1.7600	-.8953
1st Diff.				
INDEX	-9.923	-9.888	-9.928*	-9.894*
OIL	-11.402	-11.4534	-11.357*	-11.410*
INT	-3.820	-3.8675	-7.390*	-7.410*
DC	-13.521	-13.703	-13.457*	-13.837*
BAHRAIN:				
Level				
INDEX	.1767	-1.407	.0880	-1.445
OIL	.1067	-1.823	.0729	-1.924
INT	-1.801	-2.448	-1.311	-1.143
DC	-.9174	-2.056	-.9276	-2.047
1st Diff.				
INDEX	-11.719	-11.805	-11.755*	-11.818*
OIL	-11.402	-11.4534	-11.357*	-11.410*
INT	-3.820	-3.8675	-7.390*	-7.410*
DC	-9.544	-9.541	-12.249*	-12.209*
OMAN:				
Level				
INDEX	-.1277	-.7404	-.0767	-.7280
OIL	.1067	-1.823	.0729	-1.924
INT	-1.801	-2.448	-1.311	-1.143
DC	-1.462	-1.7861	-1.5918	-1.986
1st Diff.				
INDEX	-6.521	-6.648	-11.322*	-11.421*
OIL	-11.402	-11.4534	-11.357*	-11.410*
INT	-3.820	-3.8675	-7.390*	-7.410*
DC	-15.759	-15.767	-15.783*	-15.770*

4.2 Test Results for Cointegration

Since all the variables included in the model pertain to stationary time series data, there exists the possibility that they share a long-run equilibrium relationship. To test this, we apply multivariate cointegration test of Johnson's test (1991). The Johansen method provides two different likelihood ratio tests, the trace test statistic and maximal Eigen value test statistic to determine the number of cointegrating vectors. Before applying the Johansen method to estimate the parameters of the cointegrating relationship and the adjustment coefficients β and α, it is necessary to determine the lag length (k) to be included in the VAR equation (1). The lag length should be high enough to ensure that the errors are approximately white noise, but small enough to allow estimation. We select the optimal lag length according to several different criteria. The criteria include the sequentially modified Likelihood Ratio (LR) test, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan Quinn Information Criterion (HQ). We select the optimal lag length based on the most common lags resulting from those criteria. Three out of five criteria, the LR, FPE and AIC show that two lags are appropriate in case of Kuwait, Saudi Arabia and Bahrain and three lags in the case of Oman. The results of testing the number of cointegrating vectors are reported in table (4). As can bee seen in all four countries, both the trace test and the maximum Eigen value statistics yield identical results. They are both sufficiently large to reject the null hypothesis of no cointegration among the variables in the four countries (only the trace test is significant in case of Oman). Specifically both tests suggest the existence of a unique cointegrating vector linking together the four variables in the four markets over the long run.

The result that stock price index cointegrates with the remaining variables in the model means that its movement towards a long-run equilibrium state defined by the cointegrating equation characterises its long-run behaviour. Therefore, in the short run, any deviation of the stock prices from this long-run equilibrium will feed back on their changes in order to force their movement towards their long-run equilibrium state. The coefficient of the cointegrating vector in the stock prices equation is the adjustment coefficient of stock prices and measures their speed of adjustment to the long-run equilibrium state. The adjustment coefficients of stock prices are small and significant for Kuwait, Saudi Arabia and Bahrain, but insignificant for Oman. For example, (α) is .08, .08, .07 for Kuwait, Saudi Arabia and Bahrain and means that in each short-term period, for example, Kuwait stock prices adjust by about 8 percent of the imbalance that exists at time (t-1) between its current value and its long-run equilibrium value given by the long-run equilibrium relationship. However, consistent with Hassan (2003), the coefficient on the cointegrating vector in the index of Oman appears small and insignificant, which may reflect the exogeneity of the Oman's stock price index.

After normalising the coefficients of stock price indices to one, the restricted long-run relationship between stock prices and macroeconomic variables for the four countries can be expressed as:

Kuwait Index = .049 OIL - .290 TBUS +.667 DC
[.0488] [-5.263] [14.515]

Saudi Arabia Index = .350 OIL -.113 TBUS + .746 DC
[2.511] [-1.451] [8.499]

Bahrain Index = -.691 OIL + .356 TBUS + .649 DC
[-3.256] [4.540] [2.641]

Oman Index = -2.079 OIL + .711TBUS -3.168 DC
[-4.053] [5.66] [-4.464]

t-statistics in [ ].

Before interpreting the results, it is important to emphasise here that the above estimated coefficients relate only to the long-run relationship. That is, the estimated coefficients can be viewed as describing some trend linking between the variables concerned. Also, these estimated long-run coefficients may be interpreted as elasticity measures since the variables are expressed in natural logarithms.

As expected, the oil price factor appears positive and significant for Saudi Arabia. Consistent with Hammoudeh and Choi (2006), the results reveal the existence of long-run relationship between the stock price index and oil prices. This is as anticipated and not surprising result for the Saudi Arabia, case which has the highest percentage of oil revenues to total revenues (about 90% in 2005) among GCC countries. Consequently, for the case of Saudi Arabia it is expected that an increase in oil prices (oil revenues) will boost not only the local business activities directly linked to oil, but also other businesses through its impact on government revenues and public expenditure on infrastructure and other mega projects. Furthermore, it seems that the surge in oil revenues in the last few years has fuelled an economic boom that has created many profitable business opportunities for private firms and consequently reflected in their performance and stock prices.

However, in the case of Kuwait, the oil prices do not show statistical significant relationship with the price index, while negative and significant coefficient appears for Bahrain and Oman. The reasons of these results vary across countries. In Kuwait, the market is highly sensitive to fads and herding (Hammoudeh and Choi, 2006), and that makes the monthly connection between oil prices and stock market weak. The result of Kuwait should not mean that Kuwait's stock market is not sensitive to oil prices changes in the long run, but may be that this market is more sensitive to other changes in other variables, such as liquidity in the economy and interest rate (as evident from the above results of Kuwait), and thus corporate profits are related, but indirectly to oil revenues. Thus, it seems that the loop is too long for changes in oil prices to be reflected by the stock price index. For the case of Bahrain and Oman, the negative and significant coefficients of oil prices can be explained by the fact that since the increase in oil prices is expected to raise the production cost in industrial oil importing countries, then an increase in oil

prices is expected to raise the cost of imported capital goods; and therefore, adversely affecting the prospects of higher corporate profits in these markets.

Consistent with Chen et al (1986), Burmenister and Wall (1986), Hamao (1988), Bulmash and Trivoli (1991) and Dhakal et al (1993) for the US stock market, Maysami and Koh (2000) for the Singapore stock market, Achsani and Strohe (2002) for Norway and Indonesia stock markets, the short-term interest rate appears with negative and significant coefficient in the case of Kuwait. The negative effect of interest rate is very evident from the perspective of stock valuation models, where interest rates are considered as discount factors. The result of Kuwait indicates that in this country the short-term interest rate represents alternative investment opportunities. As the interest rate rises, investors prefer to switch out of stocks, causing stock prices to fall and vice versa. However, the positive and insignificant coefficient of Saudi Arabia may refer to application of Islamic Shari'a considerations which play a role in weakening the effect of interest rate on investment. Also, this result can be explained by the fact that despite that Saudi Arabia follows the fixed exchange rate with US dollar, the risk premium for its currency varies over time and weakens the linkage.[15]

In the case of Bahrain and Oman, the coefficients appear positive and significant. It is known that interest rate can be used by the central banks as a growth stimulus instrument. Thus, decreasing interest rate might indicate a central bank response to economic downturn, and rising interest rate might be a response to economic upturn. Therefore, the positive coefficient in the case of Bahrain and Oman can be explained by counter-cycle central bank responses to economic fluctuations.

Consistent with Mukherjee and Naka (1995) for Japanese market, Cheung and Ng (1998) for Canada, Germany, Italy, the US and Japan and Kwon and Shin (1999) for Korea, the results reveal a positive and significant long-run relationship between the index and domestic credit in the case of Kuwait, Saudi Arabia and Bahrain. Conversely, the domestic credit in Oman negatively and significantly influences stock price performance. As we discussed before, the relation between domestic liquidity and stock index can be positive or negative. Higher domestic liquidity can increase future cash flows, corporate profitability, and thereby raises the stock prices, while the opposite outcome is likely to happen in recession.

So far, we can conclude that monthly stock prices, oil price, short-term interest rates and domestic liquidity are cointegrated with one cointegrating vector in all the four countries, which indicates the existence of a stable, long-term equilibrium relationship among these variables. These results are consistent with Chaudhuri and Koo (2001) who investigate the volatility of stock prices in some Asian emerging markets. They find that both domestic and international macroeconomic factors have significant relation with stock prices volatility. Also, the results are consistent with Nasseh and Strauss (2000) who find significant long-run relationship between stock prices and domestic and

[15]See Hammoudeh and Choi (2006).

international economic activity in France, Germany, Italy, Netherlands and the UK. Furthermore, the results show that the stock price indices in Kuwait, Saudi Arabia and Bahrain are adjusting to the long-term equilibrium states whereas prices in Oman are not. Again, we need to emphasise here that the above estimated coefficients related only to the long-run relationship. That is, the estimated coefficients can be viewed as describing some trend linking between the variables concerned. They, however, do not tell us about the short-term relationship and the dynamic interactions among the variables. Accordingly, we proceed with testing the causality relation, variance decomposition and impulse response function based on VAR specification.

Table 4
Johansen cointegration tests

The table presents the cointegration test. Variables are INDEX, OIL, INT and DC indicates for stock prices index, oil prices, short-term interest rate and domestic credit respectively. r represents the number of cointegration vectors. (**) and (*) indicates rejection the null hypothesis at 1% and 5% level of significance respectively.

KUWAIT							
Hypothesis		Max Eigen value	Critical value		Trace test	Critical value	
Null	Alternative		5%	1%		5%	1%
r=0	r=1	37.00**	23.80	8.82	54.07**	39.89	45.58
r≤1	r=2	10.34	17.89	2.99	17.06	24.31	29.75
r≤2	r=3	5.635	11.44	5.69	6.726	12.53	16.31
r≤3	r=4	1.091	3.84	6.51	1.091	3.84	6.51
SAUDI ARABIA							
Hypothesis		Max Eigen value	Critical value		Trace test	Critical value	
Null	Alternative		5%	1%		5%	1%
r=0	r=1	29.99**	23.80	8.82	42.01*	39.89	45.58
r≤1	r=2	8.333	17.89	22.99	12.02	24.31	29.75
r≤2	r=3	3.417	11.44	5.69	3.688	12.53	16.31
r≤3	r=4	0.272	3.84	6.51	0.271	3.84	6.51
BAHRAIN							
Hypothesis		Max Eigen value	Critical value		Trace test	Critical value	
Null	Alternative		5%	1%		5%	1%
r=0	r=1	24.14*	23.80	8.82	47.61**	39.89	45.58
r≤1	r=2	13.45	17.89	2.99	23.47	24.31	29.75
r≤2	r=3	7.452	11.44	5.69	10.01	12.53	16.31
r≤3	r=4	2.560	3.84	6.51	2.560	3.84	6.51
OMAN							
Hypothesis		Max Eigen value	Critical value		Trace test	Critical value	
Null	Alternative		5%	1%		5%	1%
r=0	r=1	23.44	23.80	8.82	46.30**	39.89	45.58
r≤1	r=2	13.34	17.89	22.99	22.86	24.31	29.75
r≤2	r=3	6.175	11.44	5.69	9.516	12.53	16.31
r≤3	r=4	3.340	3.84	6.51	3.340	3.84	6.51

Table 5
The β and α vectors from the restricted model

Variables are INDEX, OIL, INT and DC indicates for stock prices index, oil prices, short-term interest rate and domestic credit respectively. β is the matrix of cointegrating vectors, α is the speed of adjustment coefficients. t-statistics in [ ].

KUWAIT		
	β	α
INDEX	1	-0.0873 [-3.554]
OIL	0.0495 [0.488]	-
INT	-0.2902 [-5.263]	-
DC	0.6671 [14.51]	-
SAUDI ARABIA		
	β	α
INDEX	1	-0.0892 [-3.300]
OIL	0.3504 [2.511]	-
INT	-0.1133 [-1.451]	-
DC	0.7465 [8.499]	-
BAHRAIN		
	β	α
INDEX	1	-0.0770 [-2.933]
OIL	-0.6917 [-3.256]	-
INT	0.3569 [4.540]	-
DC	-0.6497 [-2.641]	-
OMAN		
	β	α
INDEX	1	-0.0280 [-1.295]
OIL	-2.0790 [-4.953]	-
INT	0.7117 [5.660]	-
DC	-3.1689 [-4.464]	-

4.3 Test Results for Granger Causality

Before testing for Granger causality and since the results are sensitive to departures from the standard assumptions, we subject the residuals of the estimated VECM equations to a battery of diagnostic tests. The results suggest that the residuals pass the tests at 95%. In particular, the Lagrange

multiplier test statistics indicate no serial correlation among the residuals for each country. In addition, Ljung-Box Q-statistics (not reported) indicate no autocorrelation.

Given that the analysis of the causal relation focuses on short-term dynamics of stock prices in Kuwait, Saudi Arabia, Bahrain and Oman and how their short-run behaviour is affected by the other variables in the system, we focus our attention on testing for the existence of Granger causality in only one direction, from oil prices, short-term interest rate and domestic credit to stock prices. The existence of such causality means that past information on oil prices, short-term interest rate and domestic credit help predict future values of stock prices in those countries. The Granger causality test results appear in table (4). The results vary from country to country and appear to be mixed. Generally, it is evident that economic activity represented by the three variables granger causes stock prices in the four countries. The results suggest that stock prices in Kuwait are being significantly granger caused by both oil prices and domestic credit, while the stock index in Saudi Arabia granger is caused by the three factors: oil prices, short-term interest rate and domestic credit. In Bahrain, the stock prices index is affected only by the short-term interest rate; while in Oman the index is affected by both oil prices and short-term interest rate.

It is useful to remember here that the Granger causality tests the existence of short-term causal relation from a variable to another, while the cointegration test in the previous section tests the long-term equilibrium relationship among the variables. Specifically, the results of the Granger causality test suggest that stock prices in Kuwait, Saudi Arabia and Oman are being significantly granger caused by oil price. However, no such relation is registered for Bahrain. These results are consistent to what we discussed in chapter three that despite the fact that the GCC economies depend to a large extent on oil revenues, they individually have different degree of oil dependency.

These results mean that, in the short term, stock prices in Kuwait, Saudi Arabia and Oman are sensitive to oil price changes. This is an understandable result since oil exports in these countries determine their foreign earnings and their government budget revenues and spending. Thus, they primarily determine the aggregate demand which influences the corporate activities, earnings and stock prices. However, the result of Bahrain is not surprising according to what we discussed in chapter three; namely, Bahrain is not a major oil exporter and it depends on Saudi Arabia for financial aid. For example, Bahrain has the lowest oil dependency rate measured by the oil sector as ratio of GDP (about 23% in 2005) among the GCC countries.

Similarly, domestic credit appears to have a significant causal effect on the stock prices in Kuwait and Saudi Arabia in the short run; however, no causal effect is observed from domestic liquidity to the index in Bahrain and Oman. The results of Bahrain and Oman are consistent with Bhattacharya and Mukherjee (2002) for India stock market. In addition, consistent with Hammoudeh and Choi (2006), the stock price index of Saudi Arabia, Bahrain and Oman appear to be mainly driven by the short-term interest rate (proxied

by US Treasury bill rate) in the short run. This makes sense since the present value model suggests that prices are determined by the future cash flows and the discount rate for those cash flows. However, there is not such causal impact for Kuwait.

Clearly, the Granger causality results brought out the importance of oil price in affecting the stock price movement. These results are consistent with Achsani and Stroch (2002) for Norway and Indonesia, Jones and Kaul (1996) for the US, Canada and Japan and Papapertou (2001) for Greece. The results indicate that our economic argument is valid for GCC countries included in the sample. In particular, oil prices do profoundly impact the stock market in both short and long run. This indicates the importance of oil prices in determining stock prices in an oil dependent economy like GCC countries. Furthermore, Granger causality test illustrates an important result which is consistent with what we discussed in chapter three that although all GCC countries rely heavily on oil exports for revenues, their macroeconomic environment is mostly different. This result is not surprising, considering the difference in the structure of the economy of these countries, including the degree of economic diversity, the direction of economic policies and the current stage of economic and financial development.

Generally, the results suggest that the historical values of economic activity, more or less, can predict current and future stock price movement in Kuwait, Saudi Arabia, Bahrain and Oman. This evidence suggests that the value of the stock price index in the four countries functions of past and current values of macroeconomic variables since they constitute the information set used to generate a flow of expected future income. Furthermore, the statistical significance of causal relations verifies the fundamental and theoretical linkages between stock prices and macroeconomic variables in the four GCC countries. Although the empirical evidence related to developing economies is limited, our results are found to be consistent with some of the studies done on the developed economies. For example, the predictive power of economic factors over the stock prices is also observed by Dhakal et al (1993), Abdullah and Hayworth (1993) and Pesaran and Timmermann (1995) among others.

4.4 Test Results for Variance Decomposition and Impulse Response Functions

The precise interpretation of the VAR model can be brought out through the generalised variance decomposition analysis and the estimation of the generalised impulse response functions to investigate the dynamic properties of the system. In what follows, we examine the generalised variance decomposition and the generalised impulse response functions among the variables in order to gain insight into the following question: *to what extent do shocks in macroeconomic variables influence the stock index?*

Table 6
Causality Tests

The table presents the Granger causality test. Variables are INDEX, OIL, INT and DC indicates for stock prices index, oil prices, short-term interest rate and domestic credit respectively. (***), (**) and (*) indicates 10%, 5% and 1% level of significance respectively.

Null Hypothesis	F-Statistic	Probability
KUWAIT		
OIL does not Granger Cause INDEX	2.28537	0.10524***
INT does not Granger Cause INDEX	1.58764	0.20782
DC does not Granger Cause INDEX	3.91968	0.02199*
SAUDI ARABIA		
OIL does not Granger Cause INDEX	4.37223	0.01443*
INT does not Granger Cause INDEX	4.50455	0.01277*
DC does not Granger Cause INDEX	4.55833	0.01216*
BAHRAIN		
OIL does not Granger Cause INDEX	1.62538	0.18593
INT does not Granger Cause INDEX	2.70382	0.04765*
DC does not Granger Cause INDEX	0.77216	0.51137
OMAN		
OIL does not Granger Cause INDEX	3.95325	0.02120*
INT does not Granger Cause INDEX	2.31338	0.10245***
DC does not Granger Cause INDEX	0.04132	0.95953

The decomposition of the forecast error variance of stock prices due to shocks in macroeconomic variables is reported in table (7). The reported numbers indicate the percentage of the forecast error in the index that can be attributed to innovations in other variables at five different time horizons: one month, six months, one-year a head (short- run), eighteen months, and two years ahead (medium to long-run).

The results of generalised variance decomposition analysis and the generalised impulse response functions provide more or less the same conclusion regardless the order of decomposition since their estimation is independent of the order. The analysis of the generalised variance decompositions tend to suggest that the index in each country in this empirical analysis can be explained by the disturbances in macroeconomic variables. Not surprisingly, at short horizons, the variances in all four countries stock prices are mainly attributed to the index itself. However the effect drops as the horizon lengthens. At the two-year horizon, the portion of the forecast error variance explained by the index itself remains large in Bahrain (92%), Saudi Arabia (70%) and Oman (63%), but about the half in Kuwait (55%).

Looking through the main diagonal, we may ascertain the extent to which a variable is exogenous since this represents how much of a market variance is being explained by a movement in its own shock over the forecast horizon. Statistically, if the variable explains most of its own shocks, it does not allow variances of other variables to contribute to it being explained and it is

therefore said to be relatively exogenous. The most endogenous one is the Kuwaiti market, in the sense that they allow being explained by the other variables in the model. At the one-year horizon, 5% of the variability in the index is explained by innovations in oil prices, 2% by short-run interest rate and 7% by domestic liquidity. However, these percentages increase as time lengthens. At two-year horizon, 15% of the variability in the price index is explained by innovations in oil prices, 10% by innovations in short-term interest rate and about 21% by innovations in domestic credit. This implies that past information on short-term interest rate and domestic credit together explain about 31% of the future changes in the stock prices in Kuwait; while the largest part of change is due to past (historical) information on the stock prices themselves.

For Saudi Arabia, at two-year horizon, about 11% of the variations in the price index is explained by innovations in oil prices, 10% by short-term interest rate and 9% in domestic liquidity. However, the oil price and short-term interest rate innovations together explain about 7% of the variation in index in Bahrain. As indicated in table (4.7), changes in oil prices are the main contributor to changes in stock prices in Oman, about 28% of the variation in the price index is explained by oil prices shock at two-year horizon. Moreover, for Oman, about 8% of the forecast error variance of index can be equally split between short-term interest rate and domestic credit.

While the oil price innovation explains almost 14% and 11% of the variation in the index in Kuwait and Saudi Arabia, it explains about 30% of the variation in the price index in Oman. Those three markets are relatively more sensitive to shocks coming from oil prices. The short-term interest rate innovation has the largest effect in Kuwait and Saudi Arabia, and it has the smallest in Bahrain and Oman. Generally, while much of the variation in the price index of the four countries can be attributed to their own variations, we note the prominent role of macroeconomic variables in forecasting variances of stock prices; this is consistent with Nasseh and Strauss (2000) who claim that a significant fraction of stock price variance is explained by real economic activity for six OECD countries.

An alternative way to obtain information about the relationship among the four variables included in the variance decomposition analysis is through the generalised response function to one standard error shock. Figure (1) shows the impulse response functions analysis for a horizon of two years illustrating the response of the stock price to a one standard deviation shocks to all macroeconomic variables in each country. The impulse response analysis shows that all the macroeconomics variables are important in explaining stock prices movement. In general, the impulse response functions appear to be consistent with the results obtained from the VECM and the variance decompositions discussed above. The index show positive response to shocks from oil prices which leads to about 5%, 4%, 2%, 11% changes in the index for Kuwait, Saudi Arabia, Bahrain and Oman respectively over 2 years. In addition, the index responds negatively to interest rates shocks. Particularly,

shocks from interest rate forces the market down by 4%, 6%, 5%, and 5% in Kuwait, Saudi Arabia, Bahrain and Oman respectively over 2 years.

The innovation analyses suggest that the GCC stock markets interact with their own key macroeconomics factors. Most of the variations in the index can be captured by innovations in oil prices, short-term interest rate and domestic credit. The causal relationships that macroeconomics variables granger cause stock prices are quantitatively supported by the innovation analyses. Also, the innovation analyses reveals that all four GCC stock markets are driven by their macroeconomic variables providing further evidence concerning the causal relationships between macroeconomic variables and stock prices in these countries. The oil positive shock will benefit all GCC markets. Positive short-term interest rate shock has negative effect on Kuwaiti and Saudi markets, but neutral or positive effect for Bahrain and Oman. This may refer to the fact that some GCC countries have tied their currencies more closely to the US dollar than others.

Interestingly, across the various methodologies, the results reveal the importance of the oil prices in affecting the stock prices indices in the context of GCC countries. Therefore, we conclude that in the GCC, an oil price bust can cause fluctuations in stock prices. This conclusion is consistent with what one expects in countries in which oil revenues are the main source of national income. Thus, oil revenues become the major determinant of the level of economic activity and the mechanism by which the government can affect the circular flow of income within the economy including stock market prices.

Table 7
Generalised Variance Decompositions

The table presents the decomposition of the forecast error variance of stock prices due to shocks in macroeconomic variables. Variables are INDEX, OIL, INT and DC indicate for stock prices index, oil prices, short-term interest rate and domestic credit respectively. The reported numbers indicate the percentage of the forecast error in the index that can be attributed to innovations in the index itself and other variables at five different time horizons: one month, six months, one-year ahead (short run), eighteen months, and two-year ahead (medium to long run).

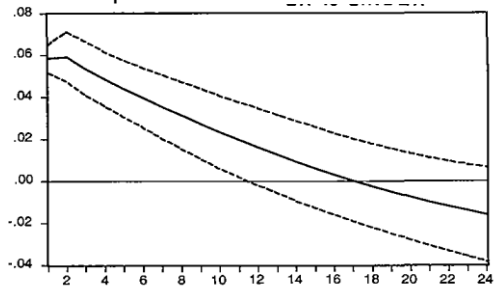
Response of KUWAIT INDEX				
Period	**INDEX shock**	**OIL Shock**	**INT Shock**	**DC Shock**
1	100.0000	0.000000	0.000000	0.000000
6	97.04194	1.730596	0.346530	0.880933
12	87.17201	4.451938	1.621697	6.754355
18	69.86399	9.399832	5.651815	15.08436
24	54.66874	14.79788	9.982315	20.55106
SAUDI ARABIA INDEX				
1	100.0000	0.000000	0.000000	0.000000
6	90.92647	5.387797	3.327844	0.357893
12	87.43212	8.602786	2.654947	1.310146
18	80.31914	10.44993	4.677941	4.552986
24	69.73686	10.87433	10.23009	9.158717
BAHRAIN INDEX				
1	100.0000	0.000000	0.000000	0.000000
6	99.09225	0.193939	0.208824	0.504989
12	98.03231	1.490031	0.190606	0.287052
18	95.71563	3.405079	0.680191	0.199099
24	92.86397	5.257992	1.709331	0.168708
OMAN INDEX				
1	100.0000	0.000000	0.000000	0.000000
6	98.08684	1.137826	0.051010	0.724323
12	88.11850	8.656432	0.303851	2.921215
18	75.20224	18.76781	1.194744	4.835207
24	63.57845	27.94545	2.648240	5.827860

Figure 1: Generalised Impulse response

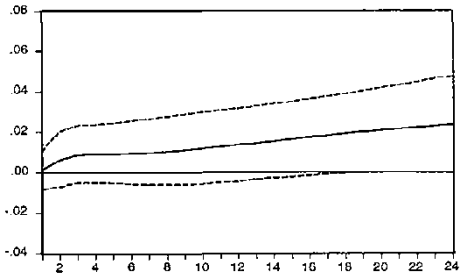
Figure (1) shows the generalised impulse response functions analysis for a horizon of two years illustrating the response of the stock price to a one standard deviation shocks in oil prices (OIL), short-term interest rate (INT) and domestic credit (DC) in each country.

Kuwait

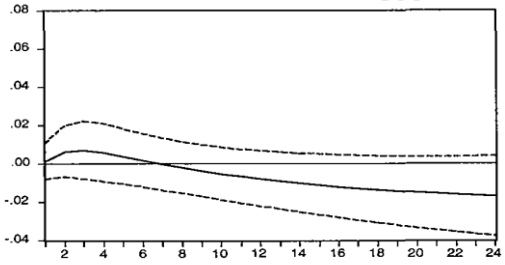
Response of INDEX to INDEX



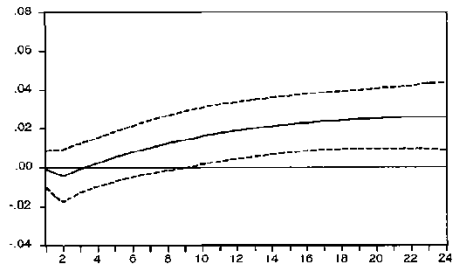
Response of INDEX to OIL



Response of INDEX to INT

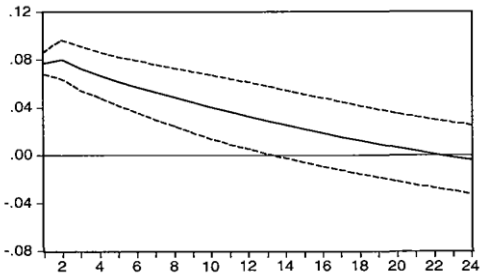


Response of INDEX to DC

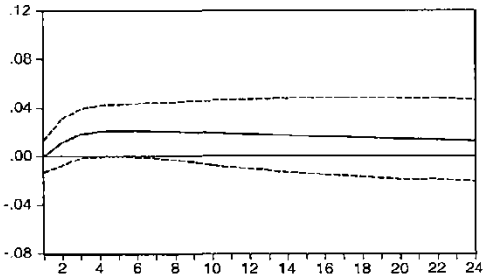


Saudi Arabia

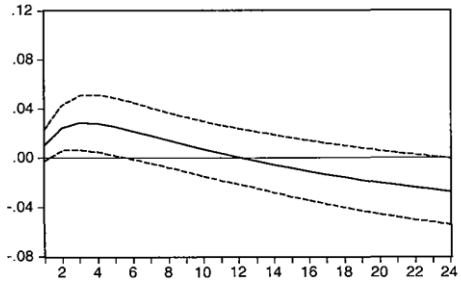
Response of INDEX to INDEX



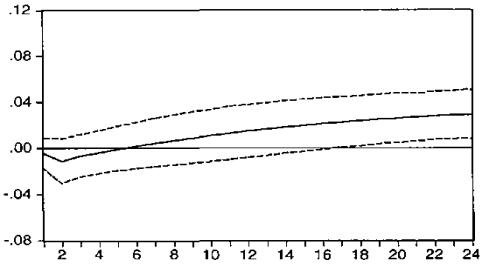
Response of INDEX to OIL



Response of INDEX to INT

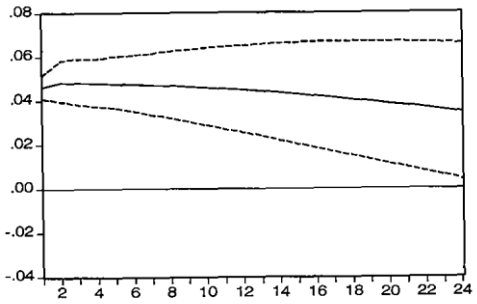


Response of INDEX to DC

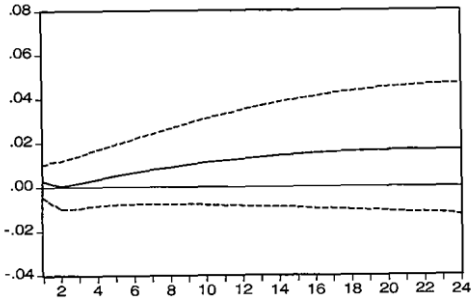


Bahrain

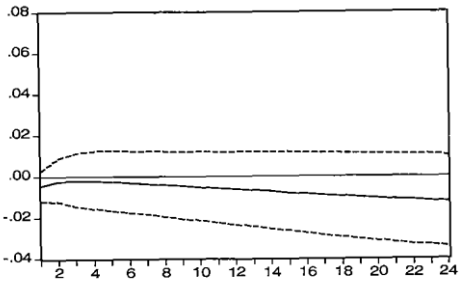
Response of INDEX to INDEX



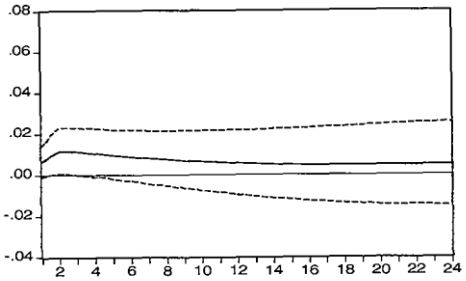
Response of INDEX to OIL



Response of INDEX to INT

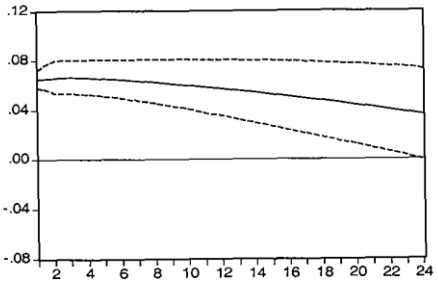


Response of INDEX to DC

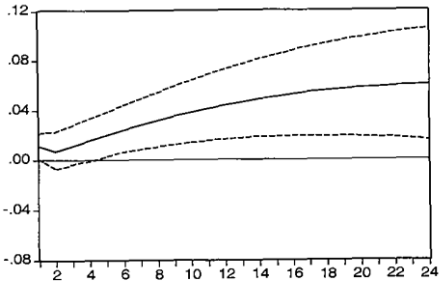


Oman

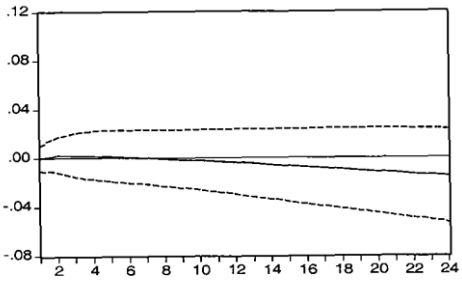
Response of INDEX to INDEX



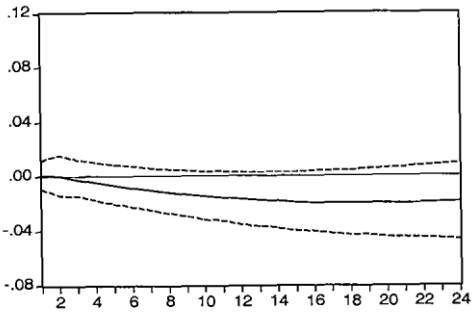
Response of INDEX to OIL



Response of INDEX to INT



Response of INDEX to DC



5. Summary and Conclusion

Using a recent set of monthly data covering the period 1994:10 – 2007:12, this paper investigates the relationship between stock prices and main macroeconomic variables (i.e. oil prices, short-term interest rate and domestic credit) that are believed to affect stock prices in the context of the GCC markets. For this purpose, this paper employed recent time series techniques of cointegration and Granger causality tests. While Granger causality tests the short-run influence of one variable on the other, the multivariate cointegration technique tests the long-run relationship among the variables. In addition, to have an idea about the relative importance of the variables in predicting the future values of stock prices, we decompose the forecast error variance of stock prices into components accounted for by innovations in the different variables in the system. These procedures enable us to evaluate the percentage of stock prices forecast error variance attributable to macroeconomics shocks. While the variance decomposition indicates the percentage of a variable's forecast error variance attributable to innovations in all variables considered, the impulse response functions capture the direction of response of a variable to a one standard deviation shock to another variable. Accordingly, the dynamics that exist among these variables may be fully addressed.

The multivariate cointegration tests identified that oil prices, interest rates (proxied by the US Treasury bill rate) and domestic credit have long-term equilibrium effects on stock market prices in the four GCC countries. We find that these factors form a cointegrating relationship with stock prices in these countries. In addition, the Granger causality test highlighted that the causality is running from oil prices to the stock price index in the case of Kuwait, Saudi Arabia and Oman. Also, the causal flow from the domestic credit to the index has been found in the case of Kuwait and Saudi Arabia; while the interest rate has causal effect on the stock price index in the case of Saudi Arabia, Bahrain and Oman. Generally, Our findings are consistent with those of Mukherjee and Naka (1995), Known, Shin and Bacon (1997), Cheung and Ng (1998), Nasseh and Strauss (2000), who examine the impact of several macroeconomic variables on stock markets in both developed and emerging economies and find that macroeconomic variables have significant impact on the stock market and/or existence of a long-run relationship between these macroeconomic variables and stock prices.

Further assessment of the relationship between these variables, based on generalised variance decomposition and generalised impulse response functions, reveals the importance of oil prices in explaining a significant part of the forecast error variance of the index in Kuwait, Saudi Arabia and Oman. The generalised impulse response functions led us to conclude that oil price shocks do have an important and significant impact on stock price index in the four countries. The results suggest that oil price fluctuations account for a major and significant influence within the system constructed. Furthermore, the innovation analyses tend to suggest that the GCC stock markets dynamically interact with their own key macroeconomic factors. Most of the

variations in the stock prices can be captured by innovations in the three selected variables. Therefore, the causal relationship that macroeconomic variables granger caused stock prices are quantitatively supported by innovation analysis.

The fact that our results show that both global and local macroeconomics factors affect the performance of the stock prices in the GCC markets has important implications. Since these markets are closed and restricted to the locals only, one would expect, *a priori*, that these markets are insulated and not well- integrated with global financial markets. However, our results show that even though they are closed markets, they are influenced by and integrated with world events. On the basis of our findings, domestic markets are influenced through oil prices and US Treasury bill rate, and factors are determined by world related fundamentals. These factors influence the domestic economic environment of the GCCs and through this effect feed their impact on the GCC stock markets. Thus, even if the stock markets are closed to the outside world, the fact that the domestic economic fundamentals are driven by world events means that the stock markets themselves are integrated with and influenced by events and volatility shocks in the global economy. Finally, this line of research could be enhanced by considering more macroeconomic variables as GCC stock markets fundamentals and inclusion of social and political factors used as dummy variables on these grounds. However, this is beyond the aim of this chapter, it is left for future research.

References

Abdullah, D., and Hayworth, S.C. 1993. "Macro-econometrics of Stock Price Fluctuations, *Quarterly Journal of Business and Economics*", *vol*. 32, PP. 50-67.

Achsani, N. and Strohe, H.G. 2002. "Stock Market Returns and Macroeconomic Factors, Evidence from Jakarta Stock Exchange of Indonesia: 1990-2001," University of Potsdam, *Discussion Paper.*

Akaike, H. 1973, *Information Theory and an Extension of the Maximum Likelihood Principle,* In: Petrov, B. and Csake, F. (Eds) 2nd International Symposium on Information Theory. Budapest: Akademiai Kiado.

Arshanapalli, B., and Doukas, J. 1993. "International Stock Market Linkage: Evidence from the Pre and Post-October 1987 Period, *Journal of Banking and Finance*", vol. 17, pp. 193-208.

Asperm, M. 1989. "Stock Prices, Asset Portfolios and Macroeconomic Variables in ten European Countries, *Journal of Banking and Finance*", vol. 4, pp. 589-612.

Assaf, A. 2003. “Transmission of Stock Price Movements: The Case of GCC Stock Markets, *Review of the Middle East Economic and Finance*”, vol. 1, pp. 89-171.

Beckers, S., G. Connor and Curds R. 1995. “National versus Global Factors in Equity Returns, LSE Financial Markets Group”, London, *Unpublished Working Paper.*

Bekaert, G. and Harvey, C.R. 2000. “Foreign Speculators and Emerging Equity Markets, *Journal of Finance*”, vol. 55, pp. 565-613.

Binswanger, M. 2001. “Does the Stock Markets still Lead Real Activity? An Investigation of G-7 Countries,” *Discussion Paper* 2001-2004, Solothurn University of Applied Sciences.

Bhattachraya, B., and Mukherjee, J. 2002. “Causal Relationship between Stock Market and Exchange Rate, Foreign Exchange Reserves and value of Trade Balance: A case study for India,” *www.igidr.ac.in.*

Bulmash, S.B. and Trivoli, G.W. 1991. “Time Lagged Interactions between Stock Prices and Selected Economic Variables, *Journal of Portfolio Management*”, vol. 17, no. 4, pp. 61-67.

Burmeinster, E. and Wall, K. 1986. “The Arbitrage Pricing Theory and Macroeconomic Factors Measures, *Financial Review*”, vol. 21, pp. 1-20.

Burbidge, J. and Harrison, A. 1984. “Testing for The Effects of Oil Price Rises using Vector Autoregressive, *International Economics Review*”, vol. 25, pp. 459-484.

Chen, N.F., Roll, R. and Ross, S.A. 1986. “Economic Forces and the Stock Market, *Journal of Business*”, vol. 59, pp. 383-403.

Cheung, Y. and Ng, L. 1998. “International Evidence on the Stock Market and Aggregate Economic activity, *Journal of Empirical Finance*”, vol. 5, pp. 281-296.

Chaudhuri, K. and Smile, S. 2004. “Stock Market and Aggregate Economic Activity: Evidence from Australia, *Applied Financial Economics*”, vol. 14, pp. 121-129.

Chaudhuri, K. and Koo, L. 2001. “Volatility of Stock Return: Importance of Economic Fundamentals, *Economic and Political Weekly*”, vol. 6, pp. 3852-56.

Dhakal, D., Kandil, M. and Sharma, S.C. 1993. “Causality between the Money Supply and Share Prices: a VAR Investigation, *Quarterly Journal of Business and Economics*”, vol. 32, no. 3, pp. 53-74.

Darrat, A. F. 1990. “Stock Returns, Money and Fiscal Policy, *Journal of Financial and Quantitative Analysis*”, vol. 24, no. 3, pp. 387-398.

Darrat, A. F. 1996. “Financial Deepening and Economic Growth in Some ERF Countries: An Empirical Inquiry,” Paper presented at the *Workshop on Financial Market Development, Arab Monetary Fund and the Economic Research Forum for the Arab Countries,* Iran and Turkey, Abu Dhabi, UAE, 25-27.

Darrat, A., and Dickens, R.N. 1999. “On the Interrelationship among Real, Monetary, and Financial Variables, *Applied Financial Economics*”*,* vol. 9, pp. 289-293.

Darrat, A. and Mukherjee, T.K. 1987. “The Behavior of the Stock Market in a Developing Economy, *Economics Letters*”*, vol.* 22, pp. 273-278.

Darrat, A., and Hakim, S.R. 1997 “Price Linkages, Efficiency and Integration of Emerging Stock Markets in the Middle East,” Paper presented at the *ERF Annual Conference on Regional Trade, Financial Labor Markets in Transition*, Beirut, Lebanon.

Dawson, P. 2003. “Financial Development and Growth in Economics in Transition, *Applied Economic Letters*”*,* vol. 10, pp. 833-836.

Dickey, D.A. and Fuller, W.A. 1981. “Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root, *Econometrica*”*,* vol. 49, pp. 1057-1072.

Dickinson, D. 2000. “Stock Market Integration and Macroeconomic Fundamentals: An Empirical Analysis:1980-95, *Applied Financial Economics*”*,* vol. 10, pp. 261-276.

Dickey, D.A. and Fuller, W.A. 1979. “Distribution of Estimators for Autoregressive Time Series with a Unit Root, *Journal of the American Statistical Association*”*,* vol. 74, pp. 427-431.

Drummen, M. and Zimmermann, H. 1992. “The Structure of European Stock Returns, *Financial Analyst Journal*”*, vol.* 48, pp. 15-26.

El-Erian, M. and Kumar, M. 1995. “Emerging Equity Markets in Middle Eastern Countries, *International Monetary Fund Papers*”*, vol.* 42, no. 2, pp. 313-343.

Engle, R. F. and Granger, W. W. J. 1987. “Cointegration and Error-Correction: Representation, Estimation, and Testing, *Econometrica*”, vol. 55, pp. 251-76.

Eun, C. and Shim, S. 1989 “International Transmission of Stock Market Movements, *Journal of Financial and Quantitative Analysis*”*,* vol. 24, pp. 241-256.

Fama, E. and Schwert, G. 1977. “Asset Returns and Inflation, *Journal of Financial Economics*”, vol. 5, pp. 115-146.

Fama, E. 1981. “Stock Returns, Real Activity, Inflation and Money, *American Economic Review*”, vol. 71, pp. 545-565.

Fama, E., and Gibbons, M. 1982. “Inflation, Real returns and Capital Investments, *Journal of Monetary Economics*”, *vol. 9*, pp. 297-323.

Fama, E. 1990. “Stock returns, Expected returns, and Real Activity, *Journal of Finance*”, vol. 45, pp. 1089-1108.

Fama, E. 1991. “Efficient Capital Markets, *Journal of Finance*”, vol. 46, pp. 1575 1617.

Fama, E. and French, K.R. 1989. “Business Conditions and Expected Returns on Stocks and Bonds, *Journal of Financial Economics*”, vol. 25, pp. 23-49.

Ferderer, J. P. 1996. “Oil Prices Volatility and the Macro-economy: A Solution to the Asymmetry Puzzle, *Journal of Macroeconomics*”, vol. 18, pp. 1-26.
Fischer, S. 1993. “The Role of Macroeconomics Factors in Growth,” *Journal of Monetary Economics,* vol. 32, pp. 485-512.

French, K. R; Schwert, G.W. and Stanbaugh, R. F. 1987. “Expected Stock Returns and Volatility, *Journal of Financial Economics*”, vol. 19, pp. 3-29.

Fung, H. and Lie, C. 1990. “*Stock Market and Economic Activities: A Causal Analysis*,” in S.G.Rhee and R.P. Chang (Eds) Pacific- Basin in Capital Markets, Elsevier Science Publishers, North Holland.

Gjerde, O. and Saettem, F. 1999. “Causal Relations among Stock Returns and Macroeconomic Variables in a Small, Open Economy, *Journal of International Financial Markets, Institutions and Money*”, vol. 9, pp. 61-74.

Gonzalo, J. 1994. “Five Alternative Methods of Estimating Long Run Equilibrium Relationship, *Journal of Econometrics*”, vol. 60, pp. 203-233.

Granger, C.W.J. 1986. “Developments in the Study of Cointegrated Economic Variables, *Oxford Bulletin of Economics and Statistics*”, vol. 48, pp. 213-228.

Granger, C.W.J. 1969. “Investigating Causal Relationship by Econometric Models and Cross Spectral models, *Econometrica*”, vol. 37, pp. 424-438.

Granger, C.W.J. 1981. “Some Properties of Time Series Data and their Use in Econometric Model Specification, *Journal of Econometrics*”, vol. 11, pp. 121-130.

Granger, C.W.J. 1988. “Some Recent Development in the Concept of Causality, *Journal of Econometrics*”, vol. 39, pp. 199-211.

Granger, C. W .J and Weiss, A. 1983. “Time Series Analysis of Error-Correcting Models,” In *Studies in Econometrics, Time Series, and Multivariate statistics,* pp. 255-278 New York: Academic Press.

Granger, C.W.J., and Newbols, P. 1986. “*Forecasting Economic Time series*” (2nd edition), New York: Academic Press.

Green, W. 2000. “*Econometric Analysis”,* 4th edition, New York University, Prentice Hall Int., New Jersey.

Greene, W. H. 2003. *Econometric Analysis,* 5th Ed., Prentice Hall, New Jersey.

Grinold, R., Rudd, A. and Stefek, D. 1989. “Global Factors: Fact or Fiction? *Journal of Portfolio Management*”, vol. 16, pp. 79-88.

Habibullah, M.S. and Baharumshah A Z. 1996. “Money, Output and Stock Prices in Malaysia: An Application of the Cointegration Tests, *International Economic Journal*”, vol. 10, pp.121-130.

Hamao, Y. 1988. “An Empirical Investigation of the Arbitrage Pricing Theory, *Japan and the World Economy*”, vol. 1, pp. 45-61.

Hamilton, J.D. 1983. “Oil and the Macro-Economy since World War 2nd, *Journal of Political Economy”*, vol. 91, pp. 228-248.

Hammoudeh, S., and Aleisa E. 2004. “Dynamic Relationship among GCC Stock Markets and NYMEX Oil Futures, *Contemporary Economic Policy*”, vol. 22, pp. 250-269.

Hammoudeh, S., and Choi, K. 2006. “Behavior of GCC Stock Markets and Impacts of US oil and Financial Markets, *Research in International Business and Finance*”, vol. 20, pp. 22-44.

Harrison, A. 1996 “Openness and Growth: A Time Series, Cross Section Analysis for Developing Countries, *Journal of Development Economics*”, vol. 48, pp. 419-447.

Harris, M. and Raviv, A. 1991. “The Theory of Capital Structure, *Journal of Finance*”, vol. 46, pp. 297-356.

Harris, R. 1997. “Stock Markets and Development: A Re-assessment, *European Economic Review*”, vol. 41, pp. 139-146.

Hassan, A.M. 2003. “Financial Integration of Stock Markets in the Gulf: A Multivariate Cointegration Analysis, *International Journal of Business*”, vol. 8, pp. 336-346.

Heston, S. L. and Rouwenhorst, K. G. 1994. “Does Industrial Structure Explain the Benefits of International Diversification? *Journal of Financial Economics*”, vol. 36, pp. 3-27.

Henry, P. B. 2000. “Do Stock Markets Liberalisations cause Investment Booms? *Journal of Financial Economics*”, vol. 58, pp. 301-334.

Ibrahim, M. H. 1999. “Macroeconomic Variables and Stock Prices in Malaysia: An Empirical Analysis, *Asian Economic Journal*”, vol. 13, pp. 219-31.

Joen, B.N. and Furstenburg, G.M. 1990. “Growing International Co-Movement in Stock Price Indexes, *Quarterly Review of Economics and Business*”, vol. 30, pp. 15-30.

Johansen, S. 1988. “Statistical analysis of Cointegration Vectors, *Journal of Economic Dynamics and Control*”, vol. 12, pp. 231-254.

Johansen, S. and Juselius, K., 1990. “Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money, *Oxford Bulletin of Economics and Statistics*”. *vol.* 52, pp.169-210.

Johansen, S. 1991. “Estimation and Hypothesis Testing of Cointegration Vectors III Gaussian Vector Autoregressive Models, *Econometrica*”, vol. 59, pp. 1551-1580.

Johansen, S. 1992 “Determination of the Cointegration Rank in the Presence of a Linear Trend, *Oxford Bulletin of Economics and Statistics*”, 54, 383-397.

Jones, C. M. and Kaul, G. 1996. “Oil and Stock Markets, *Journal of Finance*”, vol. 51, pp. 463-491.

Kasa, K. 1992 “Common Stochastic Trends in International Stock Markets, *Journal of Monetary Economics*”, vol. 29, pp. 95-129.

Kaneko, T. and Lee, B. 1995. “Relative Importance of Economic Factors in the US and Japanese Stock Markets, *Journal of the Japanese and International Economies*”, vol. 9, *pp.* 290-307.

Kim, S.W. and Wadhwani, S. 1990. “Transmission of Volatility Between Stock Markets, *Review of Financial Studies*”, vol. 3, pp. 5-33.

Koop, G., Pesaran, M. H. and Potter, S. M. 1996. “Impulse Response Analysis in Nonlinear Multivariate Models, *Journal of Econometrics*”, vol. 74, pp. 119-147.

Kwon, C., Shin, T. and Bacon, F. 1997. “The Effect of Macroeconomic Variables on Stock Market Returns in Developing Markets, *Multinational Business Review*”, Fall, pp. 63-70.

Kwon, C. and Shin, T. 1999 “Cointegration and Causality between Macroeconomic Variables and Stock Market Returns, *Global Finance Journal*”, vol. 10, pp. 71-81.

Kyle, A.S. 1985. “Continuous Auctions and Inside Trading, *Econometrica*”, vol. 53, pp. 1315-1336.

Lee, B.S. 1992. “Causal Relations among Stock Returns, Interest Rates, Real Activity and Inflation, *Journal of Finance*”, vol. 47, no. 4, pp. 1591-1603.

Leigh, L. 1997. “Stock Return Equilibrium and Macroeconomic Fundamentals, *International Monetary Fund Working Paper*”, vol. 97/15, PP.1-41.

Maysami, R. C., and Koh, T. S. 2000. “A Vector Error Correction Model of the Singapore Stock Market, *International Review of Economics and Finance*”, *vol.* 9, PP. 79-96.

McMillan, D. G., 2001. “Cointegration Relationships between Stock Market Indices and Economic Activity: Evidence from US Data,” *Discussion Paper*, the Department of Economics, University of St. Andrews.

Mookerjee, R. and Yu, Q. 1997. “Macroeconomic Variables and Stock Prices in a Small Open Economy: the Case of Singapore, *Pacific Basin Finance Journal*”, vol. 5, no. 3, pp. 377-88.

Morck, R., Shleifer, A., and R. Vishny (1988) “Management Ownership and Market Valuation: An Empirical Analysis, *Journal of Financial Economics*” vol. 20, pp. 293-315

Mukherjee, T. K., and Naka, A. 1995. “Dynamic Linkage between Macroeconomic Variables and the Japanese Stock Market: An Application of a Vector Error Correction Model, *Journal of Financial Research*”, vol. 18, pp. 223-237.

Nasseh, A. and Strauss, J. 2000. “Stock Prices and Domestic and International Macroeconomic Activity: A Cointegration Approach, *Quarterly Review of Economics and Finance*”, vol. 40, pp. 229-245.

Papapertou, E. 2001. “Oil Prices Shocks, Stock Market, Economic Activity and Employment in Greece, *Energy Economics*”, vol. 23, pp. 511-532.

Patrick, H., and Park, Y. 1994. “*Financial Development in Japan, Korea and Taiwan”.* New York: Oxford University Press.

Peiro, A. 1996. “Stock Prices, Production and Interest Rates: Comparison of Three Countries with the USA, *Empirical Economics*”, vol. 21, pp. 221-234.

Pesaran, M.H. and Timmermann A. 1995. “The Robustness and Economic Significance of Predictability of Stock Returns, *Journal of Finance*”, vol. 50, pp. 1201-1228.

Pindyck, R., and Rubinfeld, D. 1998. Econometric Models and Economic Forecasts, McGraw-Hill, Singapore.

Phillips, P. and Perron, P. 1988. “Testing for a Unit Root in Time Series Regression, *Biometrika*”, vol. 75, pp. 335-346.

Phillips, P. C. B. 1987. “Time Series Regression with a Unit Root, *Econometrica*”, vol. 55, pp. 277-346.

Poon, S., and Taylor, S. J. 1991. “Macroeconomic Factors and the U.K Stock Market, *Journal of Business Finance and Accounting*”, vol. 18, pp. 619-636.

Robinson, J. 1952. “*The Rate of Interest and other Essays*”, Macmillan, London.

Sadorsky, P. 1999. “Oil Price Shocks and Stock Market Activity, *Energy Economics*” vol. 21, pp. 449-469.

Schwert, W., 1990. “Stock Returns and Real Activity: A Century of Evidence, *Journal of Finance*”, vol. 45, pp. 1237-1257.

Stock, J. H. and Watson, M. W. 1998. “Business Cycle Fluctuations in Macroeconomic Time Series,” *NBER Working Paper*.

Thornton, J., (1993) “Money, Output and Stock Prices in the UK: Evidence on Some Relationships, *Applied Financial Economics*”, *vol.* 3, pp. 335-338.

Van Wijnbergen, S., 1983a. “Interest Rate Management in LDCs, *Journal of Monetary Economics*”, vol. 12, pp. 433-452.

Van Wijnbergen, S., 1983b. “Credit Policy, Inflation and Growth in a Financially Repressed Economy, *Journal of Development Economics*”, vol. 13, pp. 45-65.

Wasserfallen, W. 1989. “Macroeconomic News and the Stock Market, *Journal of Banking and Finance*”, vol. 13, pp. 613-626.