Financial Reforms and Common Stochastic Trends in International Stock Prices -A Case Study of Pakistan

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Abstract

With the growing globalisation the investors' perspective is to diversify risk internationally. The global integration of the markets is one of the prime motives behind institutional and financial reforms in most of emerging and developing countries competing for international capital flows. This paper uses the theory of co-integration and Granger's causality techniques to examine the linkages between Pakistan and other developed markets such as US, Japan, Canada, Australia, France and UK during 1997 to 2004. The study also determines the linkages between Pakistan and other regional markets in South Asia (India, Sri Lanka), East Asia (Indonesia, South Korea, Singapore, Malaysia, Taiwan, Philippines) and EU (Austria, Belgium, Denmark, Germany, Italy and Czech) countries. The results indicated a long run relationship between Pakistan most of markets during overall study period. However, the long run linkages were comparatively stronger with developed and EU markets. The direction of linkages in most cases, are from other regional markets to Pakistan. The linkages of Pakistani market during initial period of reforms (Period I) indicated strong long run relationship between East Asian and European countries only. During later period of reforms (period II) we observed strong long run relationship with all regional markets. However, South Asian markets indicated stronger long run relationship with Pakistan.

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1. Introduction

Financial literature has presented a strong emphasis on the interaction amongst international financial markets. The interest on study of inter-linkages of various markets has increased considerably following the dismantling of regulatory barriers and the introduction of reforms in emerging markets, the progressive removal of impediments to international investment, privatisation, deregulation, as well as growing political, economic and financial integration, affects international market linkages (Login and Solnik, 1995; Furstenberg and Jeon, 1989). Researchers (Login and Solnik, 1995; Solnik, 1974; and Lessard, 1976) have found that lifting the barriers to investment expands the individual's investment opportunity set, and permits the pooling of risks by investing in assets that are less than perfectly correlated with each other. Moreover, the increased flow of international investment has been attributed to different factors. These factors include the relaxation of controls on capital movements, foreign exchange transactions, improvements in information technology, expansion in the multinational operations of major corporations and developments occurring simultaneously in several financial markets (Roll, 1988; King and Wadhwani, 1988; Goodhart, 1988).

Numerous studies on international stock market linkages suggest that most developed stock markets are related (Dwyer and Hafer, 1988; Lessard, 1976; Hilliard, 1979; Jaffe and Westerfield, 1989; Schollhammer and Sand, 1985; and Eun and Shim, 1989) Taylor and Tonks (1989), Kanas (1998), Roca (1999). Kasa's (1992) investigation of five major international stock markets resulted in a single common stochastic trend in the developed markets of the United States, Japan, England, Germany and Canada. Corhay et al. (1993), in their analysis of the price indices of five European markets, found that these markets displayed a common long-run trending behavior over the period of 1975-1991. Divecha et al. (1992) investigated ten emerging Asian stock markets and found that they were homogenous with a dominating strong market force and less correlated with each other and with the developed markets. Cheung and Lee (1993) examined inter-temporal pattern of the correlation coefficients among stock markets in developed markets and those eleven emerging markets in Asia. They concluded that the correlation between the emerging Asian stock markets group and the developed market group was smaller than among the developed markets, though these studies found that the correlation coefficients are not stable overtime. Corhay et al. (1995) also investigated the Asian markets and however found no evidence of a single common stochastic trend in their examination of the stock markets of Australia, Japan, Hong Kong, New Zealand and Singapore for the period February 1972 through February 1992. Choudhry (1997) investigated the long-run relationship between the stock indices of six Latin American countries and the United States, and found evidence with and without the United States index. Christofi and Pericli (1999) explored the short-run dynamics between five major Latin American stock markets, and found evidence of first and second moment interactions among these markets.

For developing and emerging markets the results revealed greater serial dependence than the developed markets (Errunza and Rosenberry, 1982; Errunza, 1983; Solnik, 1973). However, risk reduction among developing countries has persisted through time (Drummen and Zimmermann, 1992), and despite increasing integration of emerging markets into the world economy, by and large the correlation of emerging market indices with global portfolios has remained very low, and at times negative. Maldonado and Saunders (1981) showed that the intertemporal relationships between correlation coefficients of various markets are unstable. On the other hand Philippatos et. al. (1983) support the existence of intertemporal stability of international stock markets. They suggest that national market indices are interrelated over time through a common factor. Meric and Meric (1989) show that the longer the time period, the greater the degree of stability among the international stock markets relationships. Testing for cointegration as a means to measuring the degree of integration (or segmentation) among markets in the same country or across countries and regions has become quite popular in recent applied economics and finance literature. Examples include Kasa (1992), Cheung and Lee (1993), Corhay *et al*. (1995), Kwan *et al*. (1995), Chan *et al*. (1997), Bowe and Mylanidis (1999), Ghosh *et al*. (1999) and Darrat and Zhong (2002), to name just a few. Most of the studies to date on stock market interdependence relate to the European, US, Japan, Asian Pacific and Latin American markets. However, emerging stock markets in the South Asian region, particularly Karachi Stock Exchange is generally neglected in the academic work.

Institutional development and reforms in the financial sector of Pakistan, to attract and channel capital investment through the equity market started in early 80s that includes phasing out interest rate controls, establishment of an Industrial Policy and Procedure Committee and national deregulation commission and issuance of new Companies Ordinance 1984. To strengthen the domestic investment environment and encourage the participation of private investors various policies were announced including divestments of the public sector, loosening the restriction of investment in stock and shares of listed companies or companies owned by government, and incentives and concessions to foreign private investors. In addition, provision of an adequate legal framework and security against expropriation was also provided to foreign investors. Foreigners were allowed to remit profits and capital along with giving relief from double taxation in the case of specific countries. Also, rules regarding listing, approval of prospectus, issues and allotments, letters, bonus shares, holding of Annual General Meetings and dispatch of dividend warrants were revised.

Bulk of reforms followed the regime change in 1990. Listed companies were allowed to issue PTCs and TFCs., permission was given to development financial institutions (DFIs) to float part of their capital in the stock market, permission for new investment banks in the private sector, curtailing of the reserve quota of institutional investors to purchase the initial share at par value. Major privatisation drive was initiated resulting in handing over nationalized banks to private sector. During this period the government also started its borrowing of funds from the open market under an auctioning system; treasury bills (TBs) and Federal Investment Bonds (FIBs) and later Pakistan Investment Bonds (PIBs)

of different maturity period were issued. Amendments in the Prudential Regulations, abolition of Foreign exchange controls, allowing financing against shares, investment of provident and gratuity funds in the equity market followed in the later years.

The regulatory changes in the stock market continued to support and match the required role of the stock market to facilitate capital inflow in Pakistan. The process of restructuring the Corporate Law Authority was initiated in 1997 under the Capital Market Development Plan of the Asian Development Bank (ADB) and Securities and Exchange Commission of Pakistan, having autonomous status, became operational from January 1999. The establishment of the SECP was an important milestone in the evolution of the regulatory framework for the capital market in Pakistan. Since its formation it has taken effective measures to ensure transparency in capital markets and safeguard the interest of the small investors, establishment of CDC, steps to improve corporate governance and efforts toward further deepening of the market has made market more resilient and competitive.

To best of our knowledge, no study that uses the cointegration approach to gauge linkages of Pakistan stock market with other regional markets. The objective of this paper is to determine the impact of institutional development and financial reforms on integration of Pakistan equity market with other international stock markets. The hypothesis is addressed that the due to regulatory policies and financial reforms, the KSE has integrated with international stock markets, particularly in late nineties.

The rest of the paper is organized that second section describes the Econometric Technique and methodology. Data description is provided in section three. Results are discussed in section four followed by summary and concluding remarks

2. Econometric Technique Methodological Issues

In this section we discuss the Granger Causality and Johnson Cointegration and Error-correction techniques used in this study.

2.1. Granger Causality Test:

The dynamic linkage between two series may simply be examined using the concept of Granger's (1969, 1988) causality. Formally, a time series X_t Granger-causes another time series Y_t if series Y_t can be predicted with better accuracy by using past values of X_t rather than by not doing so, other information being identical. In other words, variable X_t fails to Granger-cause Y_t if

$$\Pr(Y_{t+m)} \left| \Psi_t \right.) = \Pr(Y_{t-m} \left| \Omega_t \right.) \qquad (1)$$

where Pr(•) denotes conditional probability, ψ_t is the set of all information available at time t and Ω_t is the information set obtained by excluding all information on X_t from

ψ_t .Testing causal relations between two stationary series X_t and Y_t (in bivariate case) can be based on the following two equations:

$$Y_t = \alpha_0 + \sum_{k=1}^{p} \alpha_k Y_{t-k} + \sum_{k=1}^{p} \beta_k X_{t-k} + u_t \qquad (2)$$

$$X_t = \varphi_0 + \sum_{k=1}^{p} \varphi_k Y_{t-k} + \sum_{k=1}^{p} \phi_k X_{t-k} + v_t \qquad (3)$$

where p is a suitably chosen positive integer; ak's and ßk's, k = 0,1, … ..,p are constants; and u_t and v_t usual disturbance terms with zero means and finite variances. The null hypothesis that X_t does not Granger-cause Y_t is not accepted if the ßk's, k > 0 in equation (2) are jointly significantly different from zero using a standard joint test (e.g., an F test). Similarly, Y_t Granger-causes X_t if the f k's, k > 0 coefficients in equation (3) are jointly different from zero.

It may be mentioned that the above test is applicable to stationary series. In reality, however, underlying series may be non-stationary. In such cases, one has to transform the original series into stationary series and causality tests would be performed based on transformed stationary series. A special class of non-stationary process is the I(1) process (i.e. the process possessing a unit root). An I(1) process may be transformed to a stationary one by taking first order differencing. Thus, while dealing with two I(1) process for causality, equations (2) and (3) must be expressed in terms of differenced-series. However, if underlying I(1) processes are cointegrated, the specifications so obtained must be modified by inserting the lagged-value of the cointegration relation (i.e. error-correction term) as an additional explanatory variable (Engle and Granger, 1987). In other words, equations (2) and (3) should be modified as:

$$\Delta Y_t = \alpha_0 + \sum_{k=1}^{p} \alpha_k \Delta Y_{t-k} + \sum_{k=1}^{p} \beta_k \Delta X_{t-k} + \delta ECT_{t-1} + u_t \qquad (4)$$

$$\Delta X_t = \phi_0 + \sum_{k=1}^{p} \phi_k \Delta Y_{t-k} + \sum_{k=1}^{p} \Phi_k \Delta X_{t-k} + \eta ECT_{t-1} + v_t \qquad (5)$$

where Δ is the difference operator and ECT_{t-1} represents an error correction term derived from the long-run cointegrating relationship between the I(1) processes X_t and Y_t. This term can be estimated by using the residual from a cointegrating regression. Clearly, if X_t and Y_t are I(1) but not cointegrated, the term ECT_{t-1} would be absent from equations (4) and (5). However, the deficiencies as brought forward by a number of researchers (Johansen, 1988 and Phillips 1986) are: Finite sample problems of lack of power in unit roots and cointegration tests, Asymmetrical treatment of variables as endogenous and exogenous as there is simultaneous equation bias of bi-directional causality, and Lack of possibilities for running hypothesis tests on cointegrating relationship.

These are taken care of by the use of large sample size and all of them are overcome by Johansen's methodology, (1988). In particular, the Johansen methodology provides

estimates of all the cointegrating vectors that exist within a vector of variables, fully captures the underlying time series properties of the data, and offers a test statistic for the number of cointegrating vectors with an exact limiting distribution. This test may therefore be viewed as more discerning in its ability to reject a false null hypothesis.

2.2. Johansen's Methodology

Johansen's method can be illustrated by considering the following general autoregressive representation for the vector Y, which contains n variables, all of which are I(1),

$$Y_t = \alpha_t Y_{t-2} + ... + \alpha_k Y_{t-k} + \varepsilon_t \qquad (6)$$

where k is the maximum lag, ε_t is assumed to be a (*n x1*) vector of Gaussian error terms, and *a* is a (*n x n*) matrix of coefficients. In order to use Johansen's test, the above vector autoregressive process can be reparametarized and turned into a vector error correction model of the form as:

$$\Delta Y_t = \Pi_1 Y_{k-k} + \Gamma_1 \Delta Y_{t-1} + ... + \Gamma_{k-1} \Delta Y_{t-(t-k)} + \varepsilon_t \qquad (7)$$

$$\Pi = (\sum_{j=1}^{k} \beta_t) - I_g \; and \;\; \Gamma_i = (\sum_{j=1}^{i} \beta_j) - I_g \qquad (8)$$

The issue of potential cointegration is investigated when we compare both sides of equation (7). As $Y_t \sim I(1)$, $\Delta Y_t \sim I(0)$, so are ΔY_{t-i}. This gives the left-hand side of equation (7) stationarity. Since ΔY_{t-i} are all stationary, the right-hand side of equation {7} will also be stationary if ΠY_{t-k} is also stationary. The Johansen test centers around an examination of the Π matrix. The Π can be interpreted as a long run coefficient matrix, since in equilibrium, all the ΔY_{t-i} will be zero, and setting the error terms, ε_t to their expected value of zero will leave $\Pi Y_{t-k} = 0$. The test for cointegration between the Y_s is calculated by looking at the rank of the Π matrix via eigenvalues. The rank of a matrix is equal to the number of its characteristic roots (eigenvalues) that are different from zero. If the eigenvalues (λ_i) are roots, they must be less than 1 in absolute values and positive. If the variables are not cointegrated, the rank of Π will not be significantly different from zero, so $(\lambda_i) = 0$, $\ln(1-\lambda_i) = 0$. The test statistics actually incorporates $\ln(1-\lambda_i) = 0$, rather than the (λ_i) themselves, but still when $(\lambda_i) = 0$, $\ln(1-\lambda_i) = 0$

Suppose now that the rank $(\Pi) = 1$, then $\ln(1-\lambda_i) = 0$ will be negative and $\ln(1-\lambda_i) = 0 \forall_i > 1$. If the eigenvalue is non-zero, then $\ln(1-\lambda_i) < 0 \; \forall_i > 1$. That is Π to have a rank of 1, the largest eigenvalue must be significantly non-zero, while others will not be significantly different from zero.

Testing for the existence of potential cointegrating relationships among the variables involves testing for statistically significant eigenvalues (λ_i). The eigenvector (v_i) corresponding to the statistically significant eigenvalues (λ_i) are the

coefficient of the variables in the co-integrating relationship. Johansen (1988) suggests the following two likelihood ratio tests, depending on the null and alternative hypotheses considered.

2.3. Theory of Stationarity

Following are different ways of thinking about whether a time series variable X_t is stationary or has a unit root. In the AR(1) model, if $\Phi = 1$, then X has a unit root. If $|\Phi| < 1$ then, X is stationary. If X_t has a unit root, then its autocorrelations will be near one and will not drop much as a lag length increases. If X_t has a unit root, then it will have a long memory. Stationary time series do not have long memory. If X_t has a unit root then the series will exhibit trend behaviour. If X_t has a unit root, then ΔX_t will be stationary. For this reason, series with unit root are often referred to as difference stationary series.

The stationarity condition of the data series used in the study has been tested using Augmented Dickey Fuller Test. Consider a simple general AR(p) process given by

$$Y_t = \mu + \phi_1 * Y_{t-1} + \phi_2 * Y_{t-2} + ... + \phi_p * Y_{t-p} + \varepsilon \quad (9)$$

If this is the process generating the data but an AR(1) model is fitted, say

$$Y_t = \mu + \phi_1 * Y_{t-1} + v_t \quad (10)$$

then

$$v_t = \phi_2 * Y_{t-2} + ... + \phi_p * Y_{t-p} + \varepsilon_t \quad (11)$$

and the auto correlations of v_t and v_{t-k} for k> 1 will be nonzero, because of the presence of the lagged Y terms. Thus an indication of whether it is appropriate to fit an AR(1) model can be aided by considering the autocorrelations of the residual from the fitted models. To illustrate how the DF test can be extended to autoregressive process of order greater than 1, consider the simple AR(2) process below.

$$Y_t = \mu + \phi_1 * Y_{t-1} + \phi_2 * Y_{t-2} + \varepsilon_t \quad (12)$$

and the above is same as

$$Y_t = \mu + (\phi_1 + \phi_2) * Y_{t-1} - -\phi_2 * (Y_{t-2} - Y_{t-1}) + \varepsilon_t \quad (13)$$

and subtracting Y_{t-1} from both the sides give

$$\Delta Y_t = \mu + \beta * Y_{t-1} - \alpha_1 \Delta Y_{t-1} + \varepsilon_t \quad (14)$$

where the following have been defined

$$\beta = \phi_1 + \phi_2 - 1$$

and $$\alpha_1 = -\Phi_2$$

This means that if the appropriate order of the AR process is 2 rather than 1, the term ΔY_{t-1} should be added to the regression model. A test of whether there is a unit root can be carried out in the same way as for the DF test, with the test statistics provided by the 't' statistics of the β coefficient. If $\beta_0 = 0$ then there is a unit root. The same reasoning can be extended for a generic AR (p) process. Therefore to perform a Unit Root test on AR (p) model the following regression should be estimated.

$$\Delta Y_t = \mu + \beta Y_{t-1} - \sum_{j=1}^{p} \alpha_j \Delta Y_{t-j} + \varepsilon_j \qquad (15)$$

Here the standard Dickey-Fuller model has been augmented by ΔY_{t-j}. In this case the regression model and the t test are referred as ADF test.

3. Data

The data used in this study are the stock indices of major developed and emerging markets, chosen to represent the largest stock exchanges, emerging markets and those stock markets, which contributed large inflows of capital into Pakistan in recent years. The weekly stock price indices for Pakistan, Indonesia, Malaysia, Philippines, South Korea, Thailand, Singapore, Taiwan, Australia, Canada, United Kingdom, Japan, USA, France, Austria, Belgium, Denmark, Germany, Italy, Czech Republic, Sri Lanka and India are taken and the sample consists of 377 observations starting from July 1997 to September 2004.

The data is obtained from the Web site of Yahoo Finance. Since we have weekly data, the timing of trading and the overlapping problems are not considered here. The data collected was the closing index values for the respective countries. The data is from July 1, 1997 to September 20. 2004. The Cointegration analysis was done for the entire data from July 1, 1997 to September 20, 2004 as well as for the period July 1, 1997 to December 31. 2000 when stock market reforms took shape in Pakistani market and during this period major institutional reforms took place in Pakistan when reforms like effective formation of SECP, electronic settlements, shortening of settlement time and similar stock market reforms were undertaken. (Financial Sector Analysis, SBP 2002).

The simple correlations of these markets as well as the descriptive statistics of stock markets in south Asia, East Asia, Developed markets and EU markets are presented in table 1 through table 6 for the overall period (July 1997 to September 2004), period I (July 1997 to December 2000) and Period II (January 2001 to September 2004)

4. Empirical Results and Discussion

The time series properties of the model need to be studied first such as presence of unit roots. Unit root tests were run for each series. The order of ADF was ascertained on minimum AIC criteria. The results are given in tables 7 to 9. Test results indicate that stock indices from all regional markets are unable to reject the one unit root hypothesis.

Thus ADF test results show that all regional stock series are non-stationary in levels, but stationary after the first difference.

The Granger Causality test results are reported in table 10. Only selected causal relationship between Pakistan and other regional markets are presented. The results indicate that during overall period. In South Asian region Pakistan is causing the variation in Sri Lanka market but not vice versa. Between Pakistan and India, India causes the variation in Pakistani market but not otherwise. In East Asian markets only Indonesia and Pakistan has significant Granger causality in both ways. As expected, developed markets has a Granger one way causal relationship on Pakistan. In case of EU countries Granger causal relationship is from Pakistan to Austria where as the causal relationship between Pakistan and Czech is both ways.

The results during period I, among south Asian countries, results are not change for India where as all other markets in East Asia and developed countries have causal influence on Pakistan. During period II, we observe more causal relationship from Pakistan to other regional markets namely Sri Lanka, Indonesia, Malaysia and Philippines. Among the developed markets we observe that these markets have Granger causal relationship on Pakistan except Canada where the causal relationship is bi directional. Among EU countries, we observed more causal relational relationship between Pakistan and EU markets both unidirectional and bi-directional. For example, in period II Pakistan is indicating a bi-directional causal relationship between Demark and Czech markets.

Having satisfied with the results of ADF test we now employ Johansen Cointegration test for the variables. The lags are chosen on minimum AIC criteria. The results are presented in table 11 to 13. As presented in table 11 for overall period we observe one co-integrating factor for South Asian and East Asian markets whereas for developed markets we observe two co-integrating factors. However, for EU markets we observe three co-integrating factors. These results employ that Pakistan has more long run linkages with EU and developed markets due to particularly trade relations with these countries.

The results for period I, presented in table 12 indicate that Pakistani market have stronger relationship with South Asian and East Asian regional markets then developed and EU markets. The reason could be international events have influenced these Asian markets as they indicated more common stochastic trends.
During period II (table 13), all regional markets have indicated one co-integrating factor except South Asian markets which indicted comparatively stronger long run relationship (two co-integrating factors) as compared to other markets.

The error correction models which is undertaken as further test of Cointegration hypothesis which shows the size of error or deviation in an equilibrium relationship and the speed of adjustment as well as the direction of causality from the regional markets to Pakistan. Error correction results are presented in Table 11 to 13. For overall period, only India has indicated significant error correction term and the coefficients very small which implies that equilibrium error from cross exchange relationship is not that important to change in next period in Pakistani market. The results indicate even though

Pakistani and India market indices are tied to each other in long run, the small value of coefficient indicate that it can not be used to made significant price change in Pakistan. It further suggests that in India or Pakistan market innovations may be exogenous even though the two markets are co integrated.

For East Asian countries only South Korea indicated a significant error correction term which indicates that this disequilibria error term could be used to predict the corrections in Pakistani market in future (Granger, 1986). Among developed markets the error correction term for Japan is significant at lag 3. However the coefficient is very small which implies that the disequilibria error terms from Japan to Pakistani term is not that important and cannot be used to predict the price changes in Pakistan

Among European markets, only Czech market indicated a very high and significant error term, which could be used to predict the future prices in Pakistani market. The results for period I indicated similar pattern for India, Korea in Asian region (table12). Among developed markets only UK indicated a significant error correction term. However, again the coefficient is not very high, implying the cross relation is not that important factor to predict next period's change in Pakistani stock market index. In period II, we observe a little different pattern. In Asian region Pakistan observe significant and high error term from the Asian tigers like Malaysia and Singapore. Large values of error term imply that disequilibria error from East Asian tigers is important factor to predict the corrections in future stock price levels in Pakistan.

Interestingly among developed markets the error correction term indicated significant error term for Japan and US, which indicates that during this period Pakistan is not only co integrated in long but also these error terms could be used to predict the correction in Pakistani market. It is important to mention that lately Pakistan has observed a significant foreign capital inflow from these countries and they are the key trade partners of Pakistan

5. Summary and Concluding Remarks

The objective of this paper is to determine the impact of institutional development and financial reforms on integration of Pakistan equity market with other international stock markets. The hypothesis is addressed that the due to regulatory policies and financial reforms, the KSE has integrated with international stock markets, particularly in late nineties. This paper uses the theory of co-integration to test the hypothesis that regulatory policies and institutional development in Pakistan observed during 1990s has linked the Pakistan stock market with international markets particularly during late 1990s and early 2000. We examine the linkages between Pakistan stock exchange and leading developed markets such as United States, Australia and Japan. Other set of emerging markets and developing countries markets considered are India, Korea, Philippines, Sri Lanka, Indonesia and Malaysia. This paper uses the theory of co-integration and Granger's causality techniques to examine the linkages between Pakistan and other developed markets such as US, Japan, Canada, Australia, France and UK during 1997 to 2004. The study also determines the linkages between Pakistan and other regional markets in South Asia (India, Sri Lanka), East Asia (Indonesia, South Korea, Singapore, Malaysia, Taiwan,

Philippines) and EU (Austria, Belgium, Denmark, Germany, Italy and Czech) countries. The results indicated a long run relationship between Pakistan most of markets during overall study period. However, the long run linkages were comparatively stronger with developed and EU markets. The direction of linkages in most cases, are from other regional markets to Pakistan. The linkages of Pakistani market during initial period of reforms (Period I) indicated strong long run relationship between East Asian and European countries only. During later period of reforms (period II) we observed strong long run relationship with all regional markets. However, South Asian markets indicated stronger long run relationship with Pakistan.

Reference

Akaike, H. (1973), "Information Theory and The Extension of The Maximum Likelihood Principle," in: Petrov, B. N. and F. Caski, eds., Second International Symposium On Information Theory, Budapest.

Bowe, M., and N. Mylonidis (1999). Is the European Capital Market Ready for The Single Currency?
Journal of Business Finance and Accounting, 26: 1-32

Chan, C., B. E. Gup, and M. S. Pan (1997). International Stock Market Efficiency and Integration: A Study
of Eighteen Nations." Journal of Business Finance and Accounting, 24: 03-813

Cheung, C. S. and J. Lee (1993), "Integration Vs Segmentation In Korean Stock Market," Journal of Business Finance and Accounting, 20(2), January, pp. 267-73.

Choudhry, I., (1997) "Stochastic Trends in Stock Prices: Evidence from Latin American Markets", Journal of Macroeconomics, 19.: 285-304.

Corhay, A., Rad, A. T. and Urbain, J.P. (1993), "Common Stochastic Trends in European Stock Markets", Economics Letters, Vol. 42,: 385-390.

Corhay, A., Torani Rad, A. and J. P. Urbain (1995), "Long Run Behaviour of Pacific-Basin Stock Prices," Applied Financial Journal, No. 5, pp. 11-18.

Darrat, A. F., and M. Zhong (2002), Permanent and Transitory Driving Forces in the Asian-Pacific
Stock Markets." The Financial Review, 37: 35-52.

Divecha A.B. Drach, I and Stefec, D., (1992), "Emerging Markets: A Quantitative Perspective", Journal of Portfolio Management, 19.:41-45.

Drummen, M. and H. Zimmermann (1992), "The Structure of European Stock Returns," Financial Analyst Journal, Vol. 48(4), pp. 15-26.

Dwyer, G. P. and R. W. Hafer (1988), "Are National Stock Markets Liked?," Federal Reserve Bank of St. Louis Review, 39, pp. 314.

Engle, R. F. and C. Granger (1987), "Cointegration and Error Correction: Representation, Estimation and Testing," Econometrica, 55, pp. 251-76.

Errunza, V. R. (1983), "Emerging: A New Opportunity For Improving Global Portfolio Performance," Financial Analyst Journal, Vol. 39(5), pp. 51-58.

Errunza, V. R. and B. Rossenberry (1982), "Investment In Developed and Less Developed Countries," Journal of Financial and Quantitative Analysis, Vol. 17(5), pp. 741-62.

Eun, C. S. and S. Shim (1989), "International Transmission of Stock Market Movements," Journal of Financial and Quantitative Analysis, 24, pp. 241-56.

Financial Sector Analysis, State Bank of Pakistan, 2002.

Goodhart, C. A. E. (1988), "The International Transmission of Asset Price Volatility, in: Financial Market Volatility, Federal Reserve Bank of Kansas City, Kansas, pp. 79-121.

Ghosh, A., R. Saidi, and K. H. Johnson (1999), "Who Moves the Asian-Pacific Stock Markets—
U.S. or Japan?" The Financial Review, 34: 159-170.

Granger, C. W. J. (1969), "Investing Casual Relations by Econometric Models and Cross Spectral Methods," Econometrica, 37, pp. 424-38.

Hilliard, J. E. (1979), "The Relationship Between Equity Indices on World Exchanges," Journal of Finance, 34, pp. 103-114.

Jaffe, F. and R. Westerfield (1989), "Is there a Monthly Effect in Stock Market Returns?: Evidence from Foreign Countries," Journal of Banking and Finance, Vol. 13(2), pp. 232-244.

Johansen, S. (1988), Statistical analysis of cointegrating vectors. Journal of Economic Dynamic and Control 12:231-254.

Johansen, S. (1991). Estimation and hypothesis testing of cointegrating vectors in Gaussian vector autoregressive models. Econometrica 59 (November):1551-1580.

Johansen, S. (1992). Determination of cointegration rank in the presence of a linear trend. Oxford Bulletin of Economics and Statistics, 54 (3):383-397.

Johansen, S., and K. Juselius. (1990). Maximum likelihood estimation and inference on cointegration with application to the demand for money. Oxford Bulletin of Economics and Statistics, 52:169-209.

Johansen, S., and K. Juselius. (1994). Indentification of the long-run and the short-run structure: An application to the ISLM model. Journal of Econometrics 63:7-36.

Kasa K, (1992) Common Stochastic trends in International Stock Markets, Journal of Monetary Economics, 29, 95-124

Kanas, A. 1998. Linkages between the US and European equity markets: further evidence from cointegration tests. Applied Financial Economics, 8: 607 - 614.

King, M. and S. Wadhwani (1988), "Transmission of Volatility Between Stock Markets," London School of Economics, Financial Markets Working Paper.

Lessard, D. A. (1976), "International Diversification," Financial Analyst Journal, 32, pp. 32-38.

Login, F. and B. Solnik (1995), "Is Correlation in International Equity Returns Constant: 1960-1990," Journal of International Money and Finance, Vol. 14(1), pp. 3-26.

Maldonado, R. and A. Saunders (1981), "International Portfolio Diversification and The Intertemporal Stability of International Stock Market Relationships, 1957-78," Financial Management , pp. 54-63.

Meric, I. and G. Meric (1989), "Potential Gains from International Portfolio Diversification and Inter-temporal Stability and Seasonality in International Stock Market Relationships," Journal of Banking and Finance, 13, pp. 627-40.

Phylaktis K., "Capital Market Integration in the Pacific-Basin Region: An Impulse Response Analysis", Journal ofInternational Money and Finance 18, (1999): 267-287.

Phillips, P. C. B. (1986). Understanding Spurious Regressions in Econometrics. Journal of Econometrics,
33: 311-380.

Rocca E.D. 1999. Short-term and long-term price linkages between the equity markets of Australia and its major trading partners. Applied Financial Economics. 9: 501-511

Roll, R. W. (1988), "The International Crash of October 1987," in: Kamphius, R. R. Kormendi and J. W. H. Watson, eds., Black Monday and The Future of Financial Markets, Mid-American Institute, pp. 35-70.

Schollhammer, H. and O. Sand (1985), "Interdependence Among The Stock Markets of Major European Countries and The United States: An Empirical Investigation of Interrelationships Among National Stock Price Movements," Management International Review, 25, pp. 17-26.

Solnik, B. H. (1974), "Why Not Diversify Internationally Rather Than Domestically?," Financial Analyst Journal, No. 30, pp. 48-54.

Taylor, M.P. and Tonks, I. 1989. The internationalization of stock markets and abolition of UK exchange control, The Review of Economics and Statistics, 71: 332 - 336.

Table 1. **Summary Statistics**
Overall Period

1 a. Summary Statistics of Stock Indices of South Asian Markets

	PAKISTAN	SRI_LANKA	INDIA
Mean	2134.4	713.4	3957.4
Median	1637.5	608.3	3712.5
Maximum	5582.3	1456.4	6119.6
Minimum	777.3	383.4	2600.1
Std. Dev.	1305.4	276.6	835.6
Skewness	1.43	1.20	0.70
Kurtosis	3.76	3.44	2.49

1 b. Summary Statistics of Stock Indices of East Asian Markets

	Indonesia	Malaysia	Philippines	S.Korea	Thailand	Singapore	Taiwan
Mean	507.0	708.2	1590.5	672.8	418.8	1694.0	6529.3
Median	479.6	718.3	1486.5	693.1	378.6	1709.2	6135.0
Maximum	819.8	1073.3	2759.0	1027.9	783.4	2479.6	10128.7
Minimum	263.2	302.9	993.4	298.5	207.3	805.0	3585.5
Std. Dev.	123.9	134.7	412.3	169.3	127.8	320.6	1600.6
Skewness	0.736	-0.297	0.637	-0.252	0.936	-0.204	0.352
Kurtosis	2.638	3.406	2.626	2.452	2.986	2.670	2.141

1 c. Summary Statistics of Stock Indices of developed Markets

	AUSTRALIA	CANADA	UK	JAPAN	US	FRANCE
Mean	3062.1	7616.9	5288.0	13537.8	1144.6	4227.0
Median	3095.2	7429.5	5256.8	13428.7	1122.7	4007.1
Maximum	3643.9	11388.8	6930.2	20434.7	1527.5	6813.7
Minimum	2464.8	5481.8	3491.6	7699.5	800.6	2574.9
Std. Dev.	271.5	1131.1	889.9	3410.9	180.0	1112.0
Skewness	-0.324	0.979	-0.128	0.164	0.245	0.676
Kurtosis	2.306	3.769	1.745	1.833	2.104	2.393

1 d. Summary Statistics of Stock Indices of EU Markets

	AUSTRIA	BELGIUM	DENMARK	FRANCE	GERMANY	ITALY	CZECK
Mean	1293.5	2694.7	245.8	4227.0	4891.3	22757.5	510.0
Median	1205.7	2763.0	244.8	4007.1	4877.5	22339.5	482.9
Maximum	2031.7	3600.3	353.8	6813.7	7976.0	34661.0	860.7
Minimum	987.5	1530.2	173.8	2574.9	2403.2	13608.0	322.9
Std. Dev.	240.5	458.2	42.8	1112.0	1305.2	4948.2	117.7
Skewness	1.647	-0.276	0.417	0.676	0.332	0.502	1.182
Kurtosis	5.037	2.208	2.280	2.393	2.351	2.508	3.944

Table 2. Summary Statistics
Period I

2 a. Summary Statistics of Stock Indices of South Asian Markets

	PAKISTAN	SRI_LANKA	INDIA
Mean	1396.5	587.8	4009.9
Median	1444.2	557.5	4011.3
Maximum	2014.9	865.8	5933.6
Minimum	777.3	437.6	2783.1
Std. Dev.	349.7	104.6	703.7
Skewness	0.06	0.94	0.28
Kurtosis	1.76	2.90	2.45

2 b. Summary Statistics of Stock Indices of East Asian Markets

	Indonesia	Malaysia	Philippines	S. Korea	Thailand	Singapore	Taiwan
Mean	497	699.8	1888.6	641.7	393.7	1761.1	7823.3
Median	490.4	727.8	1938.3	626.3	385.3	1903.3	7809.1
Maximum	736.6	1073.3	2759	1027.9	657.1	2479.6	10129
Minimum	263.2	302.9	1082.2	298.5	207.3	805	4743.9
Std. Dev.	104.01	172.17	367.22	208.14	97.48	399.8	1185.4
Skewness	0.23	-0.21	0.06	0.03	0.48	-0.6	-0.28
Kurtosis	2.42	2.44	2.42	1.87	2.9	2.29	2.78

2 c. Summary Statistics of Stock Indices of developed Markets

	AUSTRALIA	CANADA	UK	JAPAN	US	FRANCE
Mean	2898.1	7698.6	5937.8	16587.2	1231.2	4571.5
Median	2907.2	7099.3	6130.1	16667.2	1288.2	4276.0
Maximum	3326.3	11388.8	6930.2	20434.7	1527.5	6813.7
Minimum	2464.8	5481.8	4741.8	12880.0	899.5	2698.9
Std. Dev.	242.49	1417.22	566.73	1814.61	188.03	1258.5
Skewness	-0.05	0.91	-0.67	0.16	-0.30	0.29
Kurtosis	1.78	2.74	2.30	2.33	1.73	1.76

2 d. Summary Statistics of Stock Indices of EU Markets

	AUSTRIA	BELGIUM	DENMARK	FRANCE	GERMANY	ITALY	CZECK
Mean	1232.3	3000.5	238.6	4571.5	5581.6	24400.9	487.1
Median	1177.6	3059.8	219.2	4276.0	5302.5	24112.5	489.2
Maximum	1607.1	3600.3	353.8	6813.7	7976.0	34661.0	691.0
Minimum	987.5	2267.1	176.0	2698.9	3676.7	13608.0	323.4
Std. Dev.	144.04	324.71	46.55	1258.5	1151.3	5702.3	70.92
Skewness	0.91	-0.56	0.83	0.29	0.36	-0.08	0.15
Kurtosis	2.78	2.52	2.52	1.76	1.99	2.12	3.19

Table 3. Summary Statistics
Period II

3a. Summary Statistics of Stock Indices of South Asian Markets

	PAKISTAN	SRI_LANKA	INDIA
Mean	2827.6	830.6	3909.2
Median	2285.9	781.3	3469.4
Maximum	5582.3	1456.4	6119.6
Minimum	1133.4	383.4	2600.1
Std. Dev.	1482.6	331.6	940.8
Skewness	0.580	0.373	0.902
Kurtosis	1.806	1.859	2.431

3 b. Summary Statistics of Stock Indices of East Asian Markets

	Indonesia	Malaysia	Philipines	S_korea	Thailand	Singapore	Taiwan
Mean	516.0	715.9	1308.6	701.6	441.8	1632.1	5301.9
Median	452.5	711.4	1328.2	705.1	374.0	1657.3	5416.5
Maximum	819.8	904.5	1763.3	936.1	783.4	2003.6	6943.7
Minimum	342.9	557.7	993.4	472.3	268.1	1226.2	3585.5
Std. Dev.	139.6	84.66	197.6	114.5	147.5	203.1	747.2
Skewness	0.828	0.256	0.080	0.036	0.793	-0.231	-0.151
Kurtosis	2.257	2.116	1.955	1.942	2.137	1.980	2.310

3 c. Summary Statistics of Stock Indices of developed Markets

	AUSTRALIA	CANADA	UK	JAPAN	US	FRANCE
Mean	3217.6	7545.2	4679.4	10662.1	1063.6	3909.7
Median	3246.4	7629.6	4466.3	10697.4	1091.7	3665.9
Maximum	3643.9	9224.1	6294.3	14421.6	1355	5925.6
Minimum	2715	5935.3	3491.6	7699.5	800.6	2574.9
Std. Dev.	195.3	765.3	683.8	1540.0	126.5	840.9
Skewness	-0.277	-0.045	0.538	0.233	-0.103	0.663
Kurtosis	2.489	2.077	2.309	2.616	2.366	2.403

3 d. Summary Statistics of Stock Indices of EU Markets

	AUSTRIA	BELGIUM	DENMARK	FRANCE	GERMANY	ITALY	CZECK
Mean	1350.2	2407.7	253.0	3909.7	4247.5	21242.5	531.4
Median	1231.6	2453.5	260.3	3665.9	3988.1	20561	465.2
Maximum	2031.7	3013.6	344.2	5925.6	6695.2	30975	860.7
Minimum	1014.1	1530.2	173.8	2574.9	2403.2	15982	322.9
Std. Dev.	293.7	370.9	38.011	840.9	1096.8	3505.8	145.7
Skewness	1.218	-0.183	0.0009	0.663	0.4711	0.888	0.860
Kurtosis	3.115	1.852	2.446	2.403	2.212	3.116	2.441

Table 4

Summary Statistics of Stock Returns (Overall period)

4 a. Summary Statistics of Stock Returns of South Asian Markets

	PAKISTAN	SRI_LANKA	INDIA
Mean	0.003	0.002	0.001
Median	0.005	(0.001)	0.002
Maximum	0.128	0.180	0.121
Minimum	(0.168)	(0.104)	(0.134)
Std. Dev.	0.041	0.031	0.037
Skewness	(0.620)	0.827	(0.213)
Kurtosis	5.166	8.266	4.436

4 b. Summary Statistics of Stock Returns of East Asian Markets

	Indonesia	Malaysia	Philipines	S_Korea	Thailand	Singapore	Taiwan
Mean	0.000	-0.001	-0.001	0.000	0.000	0.000	-0.001
Median	0.000	-0.001	-0.002	0.001	0.003	-0.001	0.000
Maximum	0.188	0.265	0.162	0.174	0.158	0.199	0.183
Minimum	-0.178	-0.190	-0.220	-0.213	-0.172	-0.255	-0.143
Std. Dev.	0.048	0.041	0.040	0.054	0.045	0.038	0.041
Skewness	0.052	0.430	-0.229	-0.289	-0.014	-0.339	0.063
Kurtosis	5.758	9.846	7.688	4.679	4.143	10.265	4.619

4 c. Summary Statistics of Stock Returns of developed Markets

	Australia	Canada	UK	Japan	US	France
Mean	0.001	0.001	0.000	-0.002	0.001	0.001
Median	0.002	0.003	0.002	0.000	0.002	0.001
Maximum	0.050	0.093	0.101	0.103	0.075	0.110
Minimum	-0.053	-0.118	-0.089	-0.113	-0.117	-0.121
Std. Dev.	0.016	0.025	0.025	0.031	0.026	0.032
Skewness	-0.203	-0.576	-0.104	-0.019	-0.428	-0.064
Kurtosis	3.486	5.727	4.066	3.361	4.834	3.699

4 d. Summary Statistics of Stock Returns of EU Markets

	AUSTRIA	BELGIUM	DENMARK	FRANCE	GERMANY	ITALY	CZECK
Mean	0.001	0.000	0.001	0.001	0.000	0.001	0.001
Median	0.003	0.003	0.002	0.001	0.003	0.002	0.003
Maximum	0.060	0.129	0.081	0.110	0.129	0.178	0.116
Minimum	-0.104	-0.103	-0.133	-0.121	-0.141	-0.268	-0.140
Std. Dev.	0.024	0.029	0.026	0.032	0.038	0.032	0.030
Skewness	-0.565	-0.139	-0.528	-0.064	-0.151	-1.013	-0.243
Kurtosis	4.149	5.194	4.780	3.699	3.877	17.487	4.656

Table 5

Summary Statistics of Stock Returns (period I)

5a. Summary Statistics of Stock Returns of South Asian Markets

	PAKISTAN	SRI_LANKA	INDIA
Mean	0.000	-0.003	0.000
Median	0.001	-0.003	0.002
Maximum	0.128	0.072	0.121
Minimum	-0.168	-0.089	-0.134
Std. Dev.	0.050	0.025	0.042
Skewness	-0.487	-0.056	-0.013
Kurtosis	4.190	3.910	3.713

5 b. Summary Statistics of Stock Returns of South Asian Markets

	Indonesia	Malaysia	Philipines	S_Korea	Thailand	Singapore	Taiwan
Mean	-0.003	-0.003	-0.003	-0.002	-0.005	0.000	-0.003
Median	-0.005	-0.005	-0.003	0.000	-0.010	-0.004	-0.001
Maximum	0.188	0.265	0.145	0.174	0.158	0.199	0.111
Minimum	-0.178	-0.190	-0.220	-0.213	-0.137	-0.255	-0.143
Std. Dev.	0.060	0.055	0.048	0.065	0.055	0.047	0.042
Skewness	0.182	0.516	-0.401	-0.229	0.334	-0.277	-0.103
Kurtosis	4.480	6.447	6.407	3.925	3.132	8.754	3.507

5 c. Summary Statistics of Stock Returns of South Asian Markets

	AUSTRALIA	CANADA	UK	JAPAN	US	FRANCE
Mean	0.001	0.002	0.001	-0.002	0.002	0.004
Median	0.001	0.003	0.003	-0.004	0.002	0.002
Maximum	0.050	0.093	0.064	0.103	0.071	0.092
Minimum	-0.046	-0.118	-0.063	-0.113	-0.111	-0.086
Std. Dev.	0.018	0.030	0.025	0.031	0.027	0.031
Skewness	-0.099	-0.610	-0.142	-0.099	-0.331	0.161
Kurtosis	3.054	5.205	2.978	4.048	4.059	3.133

5 d. Summary Statistics of Stock Returns of South Asian Markets

	AUSTRIA	BELGIUM	DENMARK	FRANCE	GERMANY	ITALY	CZECK
Mean	-0.001	0.001	0.003	0.004	0.003	0.004	0.000
Median	0.000	0.003	0.004	0.002	0.004	0.004	0.000
Maximum	0.060	0.098	0.055	0.092	0.119	0.141	0.116
Minimum	-0.104	-0.090	-0.066	-0.086	-0.141	-0.081	-0.140
Std. Dev.	0.028	0.027	0.026	0.031	0.035	0.032	0.034
Skewness	-0.455	-0.042	-0.171	0.161	-0.246	0.184	-0.104
Kurtosis	3.632	3.990	2.685	3.133	3.982	4.092	4.510

Table 6

Summary Statistics of Stock Returns (period II)

6 a. Summary Statistics of Stock Returns of South Asian Markets

	PAKISTAN	SRI_LANKA	INDIA
Mean	0.006	0.006	0.002
Median	0.007	0.002	0.002
Maximum	0.102	0.179	0.118
Minimum	-0.124	-0.109	-0.122
Std. Dev.	0.031	0.034	0.032
Skewness	-0.500	0.933	-0.577
Kurtosis	4.971	8.177	5.296

6 a. Summary Statistics of Stock Returns of South Asian Markets

	INDONESIA	MALAYSIA	PHILIPINES	S_KOREA	THAILAND	SINGAPORE	TAIWAN
Mean	0.003	0.0012	0.001	0.002	0.004	0.0001	0.001
Median	0.002	-0.0007	-0.002	0.003	0.008	-0.0005	0.002
Maximum	0.094	0.065	0.161	0.135	0.081	0.0968	0.183
Minimum	-0.092	-0.114	-0.067	-0.141	-0.172	-0.1205	-0.130
Std. Dev.	0.032	0.021	0.030	0.040	0.033	0.0282	0.040
Skewness	-0.046	-0.642	0.799	-0.225	-0.842	-0.472	0.326
Kurtosis	3.366	7.386	6.379	3.532	6.351	5.8133	5.763

6 a. Summary Statistics of Stock Returns of South Asian Markets

	AUSTRALIA	CANADA	UK	JAPAN	US	FRANCE
Mean	0.0007	-0.0002	-0.0015	-0.0012	-0.0008	-0.002
Median	0.002	0.0023	-0.0006	0.0005	0.0007	0.0001
Maximum	0.0414	0.0564	0.1006	0.0946	0.0748	0.110
Minimum	-0.0527	-0.0670	-0.0886	-0.0772	-0.1171	-0.1212
Std. Dev.	0.0148	0.0200	0.024	0.0302	0.0251	0.0324
Skewness	-0.3725	-0.4754	-0.0778	0.0619	-0.5583	-0.2268
Kurtosis	3.9469	4.1401	5.3011	2.6412	5.734	4.0303

6 a. Summary Statistics of Stock Returns of South Asian Markets

	AUSTRIA	BELGIUM	DENMARK	FRANCE	GERMANY	ITALY	CZECK
Mean	0.003	-0.000664	-0.0006	-0.0024	-0.0025	-0.0018	0.0029
Median	0.0051	0.001	0.0006	0.0001	0.0008	0.0012	0.0063
Maximum	0.0503	0.1290	0.0810	0.1101	0.1288	0.1779	0.0647
Minimum	-0.0582	-0.1032	-0.1325	-0.1212	-0.1391	-0.2678	-0.080
Std. Dev.	0.0194	0.0301	0.0266	0.0324	0.0397	0.0327	0.0248
Skewness	-0.4388	-0.1904	-0.8240	-0.2268	-0.0463	-2.0172	-0.4047
Kurtosis	3.5744	5.9027	6.2764	4.0303	3.7954	28.010	3.3721

Table 7
Cross Correlation of stock returns (Overall Period)

7 a. Cross correlation of stock Returns of South Asian Markets with Pakistani Market

	Overall	Period I	Period II
SRI_LANKA	0.15	0.289	0.012
INDIA	0.12	0.077	0.208

7 b. Cross correlation of stock Returns of East Asian Markets with Pakistani Market

	Overall	Period I	Period II
INDONESIA	-0.013	-0.058	0.091
MALAYSIA	0.120	0.131	0.075
PHILIPINES	0.013	0.007	0.014
S_KOREA	0.020	-0.044	0.166
THAILAND	0.073	0.069	0.055
SINGAPORE	0.118	0.099	0.164
TAIWAN	0.094	0.048	0.159

7 c. Cross correlation of stock Returns of Developed Markets with Pakistani Market

	Overall	Period I	Period II
AUSTRALIA	0.077	0.037	0.149
CANADA	0.107	0.093	0.147
UK	0.002	-0.068	0.121
JAPAN	0.047	0.068	0.014
US	0.092	0.050	0.177
FRANCE	0.013	-0.066	0.146

7 d. Cross correlation of stock Returns of EU Markets with Pakistani Market

	Overall	Period I	Period II
AUSTRIA	0.012	-0.025	0.069
BELGIUM	-0.029	-0.119	0.096
DENMARK	0.043	0.005	0.114
FRANCE	0.013	-0.066	0.146
GERMANY	0.054	-0.008	0.156
ITALY	0.050	-0.029	0.186
CZECK	0.153	0.137	0.176

Table 8.

Granger Causality of Pakistan Stock market with other markets

8 a. Overall Period

Granger Causality of Pakistan with Other Countries	F- stat	Prob.
South Asia		
PAKISTAN Granger Cause Sri Lanka	5.147	0
India Granger Cause PAKISTAN	3.72	0.006
Sri Lanka Granger Cause India	2.393	0.05
East Asia		
INDONESIA Granger Cause PAKISTAN	2.333	0.074
PAKISTAN Granger Cause INDONESIA	3.887	0.009
S_KOREA Granger Cause PAKISTAN	3.876	0.009
PAKISTAN Granger Cause THAILAND	3.677	0.012
Developed		
UK Granger Cause PAKISTAN	3.112	0.046
JAPAN Granger Cause PAKISTAN	2.622	0.074
EU		
PAKISTAN Granger Cause AUSTRIA	3.9163	0.0018
CZECK Granger Cause PAKISTAN	1.9178	0.0903
PAKISTAN Granger Cause CZECK	3.6341	0.0032

8 b. Period I

Granger Causality of Pakistan with Other Countries	F- stat	Prob.
South Asia		
INDIA Granger Cause PAKISTAN	6.58	0.00
INDIA Granger Cause SRI_LANKA	2.32	0.06
East Asia		
INDONESIA Granger Cause PAKISTAN	2.10	0.07
S_KOREA Granger Cause PAKISTAN	2.98	0.01
SINGAPORE Granger Cause PAKISTAN	2.50	0.03
Developed		
CANADA Granger Cause PAKISTAN	2.42	0.07
JAPAN Granger Cause PAKISTAN	3.13	0.03
EU		
PAKISTAN does not Granger Cause BELGIUM	7.85	0.00
CZECK does not Granger Cause PAKISTAN	2.37	0.10

8 c. Period II

Granger Causality of Pakistan with Other Countries	F- stat	Prob.
South Asia		
PAKISTAN Granger Cause SRI_LANKA	3.05	0.02
SRI_LANKA Granger Cause INDIA	3.59	0.01
East Asia		
PAKISTAN Granger Cause INDONESIA	3.11	0.01
PAKISTAN Granger Cause MALAYSIA	1.82	0.11
PAKISTAN Granger Cause PHILIPINES	1.92	0.09
Developed		
AUSTRALIA Granger Cause PAKISTAN	2.61	0.05
CANADA Granger Cause PAKISTAN	2.64	0.05
PAKISTAN Granger Cause CANADA	2.56	0.06
FTSE Granger Cause PAKISTAN	2.74	0.04
JAPAN Granger Cause PAKISTAN	2.42	0.07
FRANCE Granger Cause PAKISTAN	3.28	0.02
EU		
PAKISTAN Granger Cause AUSTRIA	4.06	0.02
BELGIUM Granger Cause PAKISTAN	3.99	0.02
DENMARK Granger Cause PAKISTAN	3.67	0.03
PAKISTAN Granger Cause DENMARK	2.79	0.06
FRANCE Granger Cause PAKISTAN	3.70	0.03
GERMANY Granger Cause PAKISTAN	3.57	0.03
ITALY Granger Cause PAKISTAN	2.96	0.05
CZECK Granger Cause PAKISTAN	2.27	0.11
PAKISTAN Granger Cause CZECK	8.26	0.00

Table 9

Unit root test Results (ADF) (Overall Period)

9 a. ADF tests results for South Asian Countries

Country	Optimal Lag Length	Level/ first difference	Constant	Trend and Constant
Pakistan	3	Level	0.626	-1.642
	2	First Difference	-8.742	-8.922
Sri Lanka	3	Level	0.518	-1.290
	2	First Difference	-9.768	-10.180
India	1	Level	-1.434	-1.743
	1	First Difference	-13.309	-13.342

Critical values at 1%, and 5% are -3.45 and -2.57 respectively

9 b. ADF tests results for East Asian Countries

Country	Optimal Lag Length	Level/ first difference	Constant	Trend and Constant
Indonesia	2	Level	-1.307	-2.356
	1	First Difference	-12.150	-12.339
Malaysia	5	Level	-2.720	-3.205
	4	First Difference	-7.389	-7.444
Philipines	2	Level	-2.857	-2.635
	1	First Difference	-11.253	-11.348
South Korea	4	Level	-2.093	-2.516
	3	First Difference	-8.204	-8.211
Thailand	4	Level	-1.755	-2.678
	3	First Difference	-9.218	-9.452
Taiwan	1	Level	-2.064	-2.111
	1	First Difference	-13.598	-13.620
Singapore	3	Level	-2.141	-2.150
	3	First Difference	-9.347	-9.372

9 c. ADF tests results for Developed Countries

Country	Optimal Lag Length	Level/ first difference	Constant	Trend &Constant
Canada	2	Level	-1.787	-1.826
	1	First Difference	-12.519	-12.502
France	1	Level	-1.391	-1.605
	1	First Difference	-14.343	-14.423
Australia	1	Level	-1.355	-2.412
	1	First Difference	-13.685	1.000
United Kingdom	1	Level	-1.282	-2.414
	1	First Difference	-13.557	-13.573
Japan	1	Level	-1.780	-1.832
	1	First Difference	-13.665	-13.691
United States	1	Level	-1.751	-2.024
	1	First Difference	-13.692	-13.711

9 d. ADF tests results for European Union

Country	Optimal Lag Length	Level/ first difference	Constant	Trend &Constant
Austria	1	Level	0.355	-0.456
	1	First Difference	-12.523	-12.798
Belgium	1	Level	-1.638	-2.329
	1	First Difference	-14.353	-14.339
Czeck	4	Level	-0.206	-1.107
	3	First Difference	-8.846	-9.018
Denmark	3	Level	-1.905	-1.892
	6	First Difference	-7.544	-7.550
France	1	Level	-1.391	-1.605
	1	First Difference	-14.343	-14.423
Germany	1	Level	-1.343	-1.895
	1	First Difference	-13.495	-13.517
Italy	1	Level	-2.122	-2.324
	1	First Difference	-12.999	-13.049

Table 10

Unit root test Results (ADF) (Period I)

10 a. ADF tests results for South Asian Markets

Country	Optimal Lag Length	Level/ first difference	Constant	Trend and Constant
Pakistan	1	Level	-1.982	-1.947
	1	First Difference	-7.610	-7.712
Sri Lanka	3	Level	-2.679	-3.201
	2	First Difference	-7.309	-7.358
India	1	Level	-1.757	-2.267
	1	First Difference	-9.951	-9.927

10 b. ADF tests results for East Asian Markets

Country	Optimal Lag Length	Level/ first difference	Constant	Trend and Constant
Indonesia	2	Level	-2.709	-2.826
	1	First Difference	-8.774	-8.786
Malaysia	5	Level	-2.330	-2.923
	4	First Difference	-5.075	-5.107
Philipines	2	Level	-2.492	-2.538
	1	First Difference	-7.816	-7.811
South Korea	4	Level	-1.236	-1.530
	3	First Difference	-9.406	-9.382
Thailand	4	Level	-3.084	-3.066
	3	First Difference	-7.725	-7.753
Taiwan	1	Level	-1.398	-1.559
	1	First Difference	-9.345	-9.316
Singapore	3	Level	-1.187	-1.937
	3	First Difference	-6.144	-6.164

10c. ADF tests results for Developed Markets

Country	Optimal Lag Length	Level/ first difference	Constant	Trend and Constant
Canada	2	Level	-1.127	-1.767
	1	First Difference	-8.730	-8.705
France	2	Level	-1.003	-1.471
	1	First Difference	-11.009	-11.000
Australia	1	Level	-1.123	-3.369
	1	First Difference	-9.191	-9.172
United Kingdom	1	Level	-2.204	-2.547
	1	First Difference	-9.420	-9.441
Japan	1	Level	-1.968	-1.977
	1	First Difference	-9.521	-9.498
United States	1	Level	-1.673	-1.559
	1	First Difference	-10.513	-10.595

10 d. ADF tests results for EU Markets

Country	Optimal Lag Length	Level/ first difference	Constant	Trend and Constant
Austria	1	Level	-1.751	-2.413
	1	First Difference	-9.041	-9.016
Belgium	6	Level	-2.297	-2.073
	5	First Difference	-5.239	-5.326
Czeck	3	Level	-2.286	-2.45
	3	First Difference	-6.077	-6.06
Denmark	1	Level	-0.411	-1.575
	1	First Difference	-9.233	-9.24
France	2	Level	-1.003	-1.471
	1	First Difference	-11.009	-11
Germany	1	Level	-1.415	-1.946
	1	First Difference	-9.825	-9.815
Italy	1	Level	-1.669	-2.405
	1	First Difference	-8.223	-8.237

Table 11

Unit root test Results (ADF) (Period II)

11 a. ADF tests results for South Asian Markets

Country	Optimal Lag Length	Level/ first difference	Constant	Trend and Constant
Pakistan	4	Level	0.192	-2.536
	3	First Difference	-6.192	-6.289
Sri Lanka	3	Level	-0.027	-3.251
	2	First Difference	-7.279	-7.322
India	1	Level	-0.351	-1.741
	1	First Difference	-8.453	-8.581

11 b. ADF tests results for East Asian Markets

Country	Optimal Lag Length	Level/ first difference	Constant	Trend and Constant
Indonesia	2	Level	0.039	-1.657
	1	First Difference	-8.105	-8.215
Malaysia	2	Level	-1.237	-2.303
	1	First Difference	-8.402	-8.402
Philipines	2	Level	-1.038	-1.247
	1	First Difference	-8.339	-8.562
South Korea	1	Level	-1.505	-1.919
	1	First Difference	-10.771	-10.741
Thailand	1	Level	-0.619	-1.789
	1	First Difference	-9.177	-9.159
Taiwan	1	Level	-1.858	-2.004
	1	First Difference	-10.262	-10.234
Singapore	1	Level	-1.600432	-1.815
	1	First Difference	-10.089	-10.304

11 c. ADF tests results for Developed Markets

Country	Optimal Lag Length	Level/ first difference	Constant	Trend and Constant
Canada	1	Level	-1.821	-2.075
	1	First Difference	-9.234	-9.465
France	1	Level	-2.383	-1.606
	1	First Difference	-9.467	-9.666
Australia	1	Level	-1.111	-1.272
	1	First Difference	-10.173	-10.217
United Kingdom	1	Level	-2.253	-1.659
	1	First Difference	-9.984	-10.150
Japan	1	Level	-2.117	-1.720
	1	First Difference	-9.799	-9.898
United States	1	Level	-2.238	-1.890
	1	First Difference	-8.944	-9.044

11 d. ADF tests results for EU Markets

Country	Optimal Lag Length	Level/ first difference	Constant	Trend and Constant
Austria	1	Level	0.951	-0.637
	1	First Difference	-5.695	-5.923
Belgium	2	Level	-1.643	-0.755
	1	First Difference	-11.465	-11.658
Czeck	1	Level	0.805	-2.084
	1	First Difference	-8.675	-9.012
Denmark	1	Level	-1.659	-1.056
	1	First Difference	-9.008	-9.151
France	1	Level	-2.383	-1.606
	1	First Difference	-9.467	-9.666
Germany	1	Level	-1.980	-1.475
	1	First Difference	-9.255	-9.361
Italy	2	Level	-2.575	-1.939
	1	First Difference	-10.565	-10.745

Table 12

Johansen Co integration Test (Overall Period)

12 a. Johansen Co integration Test for South Asian Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.0855	41.307	29.68	35.65	None **
0.0202	7.874	15.41	20.04	At most 1
0.0006	0.237	3.76	6.65	At most 2

Intercept and Trend in Cointegrated Equation - no trend in VAR,
*(**) Denotes rejection of the hypothesis at 5%(1%) significance level

12 b. Johansen Co integration Test for East Asian Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.143	199.565	182.820	196.080	None **
0.113	141.681	146.760	158.490	At most 1
0.082	96.957	114.900	124.750	At most 2
0.056	65.141	87.310	96.580	At most 3
0.044	43.687	62.990	70.050	At most 4
0.034	26.790	42.440	48.450	At most 5
0.028	13.836	25.320	30.450	At most 6
0.009	3.381	12.250	16.260	At most 7

Intercept and Trend in Cointegrated Equation - no trend in VAR
*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 1 cointegrating equation(s) at 5% significance level
Lags interval: 1 to 5

12 c. Johansen Co integration Test for Developed Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.096	138.243	146.760	158.490	None *
0.081	95.506	114.900	124.750	At most 1 *
0.068	63.928	87.310	96.580	At most 2
0.052	37.793	62.990	70.050	At most 3
0.026	17.749	42.440	48.450	At most 4
0.021	7.967	25.320	30.450	At most 5
0.001	0.188	12.250	16.260	At most 6

Intercept and Trend in Cointegrated Equation - no trend in VAR
*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 2 cointegrating equation(s) at 5% significance level
Lags interval: 1 to 5

12 d. Johansen Co integration Test for European Union Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.1192	197.7923	182.82	196.08	None **
0.0911	150.5566	146.76	158.49	At most 1 *
0.0795	115.0223	114.9	124.75	At most 2 *
0.0758	84.2236	87.31	96.58	At most 3
0.0481	54.9085	62.99	70.05	At most 4
0.0471	36.5538	42.44	48.45	At most 5
0.0329	18.6125	25.32	30.45	At most 6
0.0164	6.1536	12.25	16.26	At most 7

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 3 cointegrating equation(s) at 5% significance level
Intercept and Trend in Cointegrated Equation - no trend in VAR
Lags interval: 1 to 5

Table 13

Johansen Co integration Test (Period I)

13 a. Johansen Co integration Test for South Asian Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.062582	25.83859	42.44	48.45	None
0.046478	14.20594	25.32	30.45	At most 1
0.030843	5.639195	12.25	16.26	At most 2

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates no cointegrating equation(s) at 5% significance level
Lags interval: 1 to 3

13 b. Johansen Co integration Test for East Asian Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.330	227.242	182.820	196.080	None **
0.256	154.273	146.760	158.490	At most 1 *
0.145	100.375	114.900	124.750	At most 2
0.138	71.918	87.310	96.580	At most 3
0.091	44.798	62.990	70.050	At most 4
0.072	27.423	42.440	48.450	At most 5
0.046	13.861	25.320	30.450	At most 6
0.028	5.242	12.250	16.260	At most 7

Intercept and Trend in Cointegrated Equation - no trend in VAR
*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 2 cointegrating equation(s) at 5% significance level
Lags interval: 1 to 2

13 c. Johansen Co integration Test for Developed Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.171336	119.5348	146.76	158.49	None
0.128613	85.32951	114.9	124.75	At most 1
0.104413	60.27369	87.31	96.58	At most 2
0.076498	40.20346	62.99	70.05	At most 3
0.060618	25.71951	42.44	48.45	At most 4
0.044498	14.33842	25.32	30.45	At most 5
0.032717	6.054093	12.25	16.26	At most 6

L.R. test indicates 2 cointegrating equation(s) at 5% significance level
Lags interval: 1 to 5

13 d. Johansen Co integration Test for European Union Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.344856	225.9572	182.82	196.08	None **
0.234886	150.258	146.76	158.49	At most 1 *
0.168222	102.3343	114.9	124.75	At most 2
0.128369	69.36431	87.31	96.58	At most 3
0.114216	44.7717	62.99	70.05	At most 4
0.061777	23.0622	42.44	48.45	At most 5
0.044858	11.64777	25.32	30.45	At most 6
0.018993	3.432506	12.25	16.26	At most 7

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 2 cointegrating equation(s) at 5% significance level
Lags interval: 1 to 4

Tables 14

Johansen Co integration Test (Period II)

14 a. Johansen Co integration Test for South Asian Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.1496	57.2616	42.44	48.45	None **
0.0858	25.6680	25.32	30.45	At most 1 *
0.0411	8.1784	12.25	16.26	At most 2

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 2 cointegrating equation(s) at 5% significance level
Lags interval: 1 to 3

14 b. Johansen Co integration Test for East Asian Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.3075	191.6942	182.82	196.08	None *
0.1696	120.0377	146.76	158.49	At most 1
0.1365	83.7916	114.9	124.75	At most 2
0.1135	55.1844	87.31	96.58	At most 3
0.0682	31.6969	62.99	70.05	At most 4
0.0518	17.9233	42.44	48.45	At most 5
0.0255	7.5459	25.32	30.45	At most 6
0.0128	2.5132	12.25	16.26	At most 7

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 1 cointegrating equation(s) at 5% significance level
Lags interval: 1 to 2

14 c. Johansen Co integration Test for Developed Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.213365	148.9913	146.76	158.49	None *
0.130338	102.193	114.9	124.75	At most 1
0.121926	74.96111	87.31	96.58	At most 2
0.08686	49.60634	62.99	70.05	At most 3
0.077272	31.88754	42.44	48.45	At most 4
0.050574	16.20544	25.32	30.45	At most 5
0.030726	6.085458	12.25	16.26	At most 6

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 1 cointegrating equation(s) at 5% significance level
Lags interval: 1 to 3

14 d. Johansen Co integration Test for European Union Markets

Eigenvalue	Likelihood Ratio	5 % Critical Value	1 % Critical Value	Hypothesized No. of CE(s)
0.249	201.918	182.82	196.08	None **
0.182	146.115	146.76	158.49	At most 1
0.177	106.926	114.9	124.75	At most 2
0.127	69.001	87.31	96.58	At most 3
0.076	42.533	62.99	70.05	At most 4
0.062	27.056	42.44	48.45	At most 5
0.051	14.672	25.32	30.45	At most 6
0.023	4.500	12.25	16.26	At most 7

Table 15

Error Correction (Overall)

South Asian Markets		
	D (PAKISTAN)	
	Coefficient	t stat
D (SRI LANKA (-1))	-0.199	-1.27
D (SRI LANKA (-3))	-0.231	-1.474
D (INDIA (-1))	0.081	**-3.071**
D (INDIA (-2))	0.057	**-2.121**
East Asian Markets		
D (INDONESIA (-1))	0.247	-1.139
D (MALAYSIA (-3))	0.174	-1.002
D (PHILIPINES (-3))	-0.09	-1.158
D (S_KOREA (-2))	0.345	**-2.442**
D (SINGAPORE (-2))	-0.102	-1.136
D (SINGAPORE (-3))	0.091	-1.013
Developed Markets		
D(CANADA(-2))	0.046	-1.401
D(CANADA(-4))	0.047	-1.454
D(FTSE(-1))	0.062	-1.071
D(FTSE(-5))	0.07	-1.251
D(JAPAN(-2))	0.017	-1.538
D(JAPAN(-3))	0.026	**-2.34**
D(US(-3))	-0.414	-1.514
D(US(-4))	-0.326	-1.193
EU Markets		
D(AUSTRIA(-1))	0.184	-1.171
D(AUSTRIA(-2))	0.195	-1.257
D(AUSTRIA(-3))	0.235	-1.507
D(BELGIUM(-2))	-0.118	-1.515
D(BELGIUM(-4))	-0.092	-1.176
D(DENMARK(-3))	-0.847	-1.029
D(FRANCE(-2))	0.087	-1.224
D(GERMANY(-4))	0.061	-1.136
D(ITALY(-4))	0.013	-1.263
D(CZECK(-1))	0.616	-1.843
D(CZECH(-2))	-0.666	**-2.037**
D(CZECK(-4))	-0.395	-1.194
D(CZECK(-5))	0.357	-1.089

Table 16

Error Correction (Period I)

South Asian Markets	**D (PAKISTAN)**	
	Coefficient	t stat
D(SRI_LANKA(-3))	-0.65678	-1.91289
D(INDIA(-1))	0.115667	**-4.31805**
D(INDIA(-2))	0.047675	-1.7207
East Asian Markets		
D(MALAYSIA(-1))	0.198	-1.207
D(S_KOREA(-2))	0.469	**-3.230**
D(THAILAND(-2))	-0.334	-1.035
Developed Markets		
D(AUSTRALIA(-2))	-0.134	-1.099
D(CANADA(-2))	0.038	-1.338
D(FTSE(-1))	0.095	-1.839
D(FTSE(-2))	-0.116	**-2.295**
D(JAPAN(-2))	0.015	-1.482
D(FRANCE(-2))	0.088	-1.633
EU Markets		
D(BELGIUM(-1))	-0.129	-1.541
D(BELGIUM(-2))	-0.102	-1.233
D(BELGIUM(-4))	-0.085	-1.046
D(FRANCE(-1))	-0.092	-1.244
D(FRANCE(-3))	0.076	-1.034
D(GERMANY(-1))	0.075	-1.139
D(ITALY(-4))	0.019	-1.645
D(CZECH(-1))	0.619	-1.626
D(CZECK(-2))	-0.545	-1.460

Table 17

Error Correction (Period II)

South Asian Markets	**D (PAKISTAN)**	
	Coefficient	t stat
D(SRI_LANKA(-1))	-0.2809	-1.42332
D(SRI_LANKA(-3))	-0.20078	-1.00802
D(INDIA(-2))	0.067777	-1.35527
East Asian Markets		
D(INDONESIA(-1))	0.546	-1.236
D(MALAYSIA(-1))	-1.298	**-2.601**
D(SINGAPORE(-1))	0.573	**-2.825**
D(TAIWAN(-1))	0.051	-1.197
Developed Markets		
D(AUSTRALIA(-2))	0.308083	-1.61687
D(CANADA(-1))	0.074346	-1.06531
D(CANADA(-2))	0.112595	-1.6545
D(CANADA(-3))	-0.07485	-1.12485
D(FTSE(-2))	0.205417	-1.53731
D(JAPAN(-3))	0.039904	**-1.90991**
D(US(-1))	-1.47312	**-2.81453**
D(US(-2))	-1.16072	**-2.03245**
D(US(-3))	-0.92498	-1.71449
D(FRANCE(-1))	0.198812	-1.4891
EU Markets		
D(CZECH(-1))	0.791234	-1.46563