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ARTICLE

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

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## ABSTRACT

*This study uses the co-integration and error-correction techniques to examine the linkages between Pakistan and other capital markets of developed economies (US, UK, Japan, Australia and Canada); 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 indicate a long-run relationship between Pakistani stock market and most of the international markets during the sample period (1997 to 2004). 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 data depicted a long-run relationship both in the initial period of reforms (1997-2000) and in the later period of reforms (2001-2004). However, a market group based analysis indicated that the South Asian markets indicated comparatively stronger long run relationship with Pakistan.*

**JEL classification:** G18, G15

**Keywords:** Reforms, International Financial Markets Integration

## 1. INTRODUCTION

Institutional development and reforms in the financial sector of Pakistan during 1980's mainly focused to attract and channel capital investment through the equity market. These reforms include phasing out of 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 investment environment and encourage the participation of private investors various policies were announced including divestments of the public sector, loosening the restriction on 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. Among major reforms undertaken during the period includes the permission to issue Participation Term Certificates (PTCs) and Term Finance Certificates (TFCs) and Development Financial Institutions (DFIs) were allowed to float part of their capital in the stock market and reserve quota of institutional investors to purchase the share at par value was curtailed. Investment banks were allowed to operate in the private sector, and major privatisation drive was initiated resulting in handing over nationalized banks to private sector. During this period the government started borrowing funds from the open market under an auctioning system of Treasury Bills (TBs) and Federal Investment Bonds (FIBs) and later through Pakistan Investment Bonds (PIBs) of different maturity periods. 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 (SECP), with autonomous status, became operational in 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. The establishment of Central Depository Company (CDC), steps to improve corporate governance and efforts toward further deepening of the market has made market more resilient and competitive. The institutional development and financial reforms undertaken during the last decade suggest that a common single stochastic trend between Pakistan and other international markets may exist as observed among Asian and North American markets (Siklos and Ng, 2001).

The objective of this paper is to see the level of integration between Pakistani and other equity markets of the world using two sub periods of institutional development and financial reforms in Pakistan. The hypothesis addressed is that due to regulatory policies and financial reforms, the KSE has integrated with international stock markets. The study also distinguishes the pattern of common stochastic trend between Pakistani market and other international markets during earlier (1997 to 2000) and later (2001 to 2004) period of financial reforms. In rest of the paper, section two describes the literature review followed by Econometric Technique and Data description in section three. Results are discussed in section four followed by summary and concluding remarks in section five.

## 2. LITERATURE REVIEW

International financial market integration is the most dazzling feature of the financial globalisation that has increased the opportunity set of investors and their ability to diversify the risk. Login and Solnik, (1995), Solnik, (1974); and Lessard, (1976) have found that lifting the barriers to investment in most developed markets expand 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.

Lifting the barriers, however, require a number of short-term and long-term measures and policy changes. The increased flow of international investment has been attributed to different factors. The important measures include the relaxation of controls on capital movements and 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 Wadhvani, 1988; Goodhart, 1988).

Several studies<sup>1</sup> on international stock market linkages suggest that most developed stock markets are related. 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 eleven emerging markets in Asia. They concluded that the correlation between the emerging Asian stock markets group and the developed markets 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 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. 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

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<sup>1</sup> Dwyer and Hafer, 1988; Lessard, 1976; Hilliard, 1979; Jaffe and Westerfield, 1989; Schollhammer and Sand, 1985; Eun and Shim, 1989; Taylor and Tonks, 1989; Kanas, 1998; Roca, 1999.

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 in relationship among the international stock markets. Testing for cointegration as a mean 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, Asia Pacific and Latin American markets. However, emerging stock markets in the South Asian region, particularly Karachi Stock Exchange is a good case for understanding the integration of financial markets.

### **3. ECONOMETRIC TECHNIQUE AND DATA**

The standard Johnson Cointegration and Error-correction techniques are used to determine the linkages between Pakistani and various international and regional markets. 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 countries' 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. 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 period 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. During this period, major institutional reforms like effective formation of SECP, electronic settlements, shortening of settlement time and similar stock market reforms were undertaken (Financial Sector Analysis, State Bank of Pakistan, 2002).

The descriptive statistics of stock returns of south Asian, East Asian, Developed markets and EU markets are presented in table 1 through table 3 for the overall period (July 1997 to September 2004), period I (July 1997 to December 2000) and Period II (January 2001 to September 2004). The cross correlation of KSE stock returns and other international and regional market returns are presented in table 4.

#### 4. EMPIRICAL RESULTS AND DISCUSSION

For determining the common stochastic trend through Cointegration techniques the time series properties of the data 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 5 to 7. Test results indicate that stock indices from all regional markets are unable to reject the unit root hypothesis. Thus ADF test results show that all regional stock series are non-stationary in levels, but stationary at first difference ( $I_1$ ).

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 8 to 10. As presented in table 8 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 particularly due to trade relations with these countries.

As presented in table 9 the Pakistani market showed stronger relationship with South Asian and East Asian regional markets then developed and EU markets during early period of reforms. This infers that during this period all these markets were volatile due to several global events and hence resulted in presence of common stochastic trends. During period II (table 10), all regional markets have indicated one co-integrating factor except South Asian markets which indicated comparatively stronger long run relationship (two co-integrating factors) as compared to other markets. Error correction results are presented in table 11 to 13. For overall sample period, the error correction term is statistically significant for India only. Moreover the coefficients are 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 that even though the Pakistani and the Indian 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 suggests 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 the Japanese to the Pakistani market 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 (table 12).

Among developed markets only UK indicated a significant error correction term. However, the coefficient is again not very high, implying that 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 countries is important factor to predict the corrections in future stock price levels in Pakistan.

Interestingly among developed markets the error correction term are statistically significant for Japan and US, which infers that during this period Pakistan is not only co-integrated in long run and these error terms could be used to predict the correction in Pakistani market. It is important to mention that during later period of reforms Pakistan has attracted substantial amount of foreign capital inflow from these countries and they are also the key trade partners of Pakistan.

## 5. SUMMARY AND CONCLUDING REMARKS

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 determine the number of common stochastic trends and examine the linkages between Pakistan stock exchange and leading developed markets such as United States, Australia and Japan. Other set of emerging and developing markets considered are India, Korea, Philippines, Sri Lanka, Indonesia and Malaysia. The results indicated a long run relationship between Pakistan and 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. The results indicated that Pakistani market follow an error-correction from developed markets like US, Japan and leading Asian markets like Malaysia and Singapore.

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**Table 1**

**Summary Statistics of Stock Returns (Overall period)**

**1 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

**1 b. Summary Statistics of Stock Returns of East Asian Markets**

	INDONESIA	MALAYSIA	PHILIPPINES	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

**1 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

**1 d. Summary Statistics of Stock Returns of EU Markets**

	AUSTRIA	BELGIUM	DENMARK	FRANCE	GERMANY	ITALY	CZECH
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 2**

**Summary Statistics of Stock Returns (period I)**

**2 a. 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

**2 b. Summary Statistics of Stock Returns of South Asian Markets**

	INDONESIA	MALAYSIA	PHILIPPINES	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

**2 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

**2 d. Summary Statistics of Stock Returns of South Asian Markets**

	AUSTRIA	BELGIUM	DENMARK	FRANCE	GERMANY	ITALY	CZECH
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 3**

**Summary Statistics of Stock Returns (period II)**

**3 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

**3 b. Summary Statistics of Stock Returns of South Asian Markets**

	INDONESIA	MALAYSIA	PHILIPPINES	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

**3 c. 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

**3 d. Summary Statistics of Stock Returns of South Asian Markets**

	AUSTRIA	BELGIUM	DENMARK	FRANCE	GERMANY	ITALY	CZECH
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 4**

**Cross Correlation of Stock Returns (Overall Period)**

**4 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

**4 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
PHILIPPINES	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

**4 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

**4 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
CZECH	0.153	0.137	0.176

**Table 5**

**Unit Root Test Results (ADF) (Overall Period)**

**5 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

**5 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
Philippines	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

**5 c. ADF tests results for Developed Countries**

Country	Optimal Lag Length	Level/ First Difference	Constant	Trend and 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

**5 d. ADF tests results for European Union**

Country	Optimal Lag Length	Level/ First Difference	Constant	Trend and 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
Czech	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 6**  
**Unit Root Test Results (ADF) (Period I)**

**6 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

**6 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
Philippines	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

**6 c. 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

**6 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
Czech	3	Level	-2.286	-2.450
	3	First Difference	-6.077	-6.060
Denmark	1	Level	-0.411	-1.575
	1	First Difference	-9.233	-9.240
France	2	Level	-1.003	-1.471
	1	First Difference	-11.009	-11.000
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 7**

**Unit Root Test Results (ADF) (Period II)**

**7 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

**7 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
Philippines	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

**7 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

**7 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
Czech	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 8**

**Johansen Cointegration Test (Overall Period)**

**8 a. Johansen Cointegration 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

**8 b. Johansen Cointegration 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

**8 c. Johansen Cointegration 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

**8 d. Johansen Cointegration 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 9**

**Johansen Cointegration Test (Period I)**

**9 a. Johansen Cointegration 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

**9 b. Johansen Cointegration 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

**9 c. Johansen Cointegration 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

**9 d. Johansen Cointegration 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 10**

**Johansen Cointegration Test (Period II)**

**10 a. Johansen Cointegration 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

**10 b. Johansen Cointegration 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

**10 c. Johansen Cointegration 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

**10 d. Johansen Cointegration 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 11**  
**Error Correction (Overall)**

<b>South Asian Markets</b>		
	<b>D (PAKISTAN)</b>	
	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
<b>East Asian Markets</b>		
D (INDONESIA (-1))	0.247	-1.139
D (MALAYSIA (-3))	0.174	-1.002
D (PHILIPPINES (-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
<b>Developed Markets</b>		
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
<b>EU Markets</b>		
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 (CZECH (-1))	0.616	-1.843
D (CZECH (-2))	-0.666	-2.037
D (CZECH (-4))	-0.395	-1.194
D (CZECH (-5))	0.357	-1.089

**Table 12**  
**Error Correction (Period I)**

	<b>D (PAKISTAN)</b>	
	Coefficient	t stat
<b>South Asian Markets</b>		
D (SRI LANKA (-3))	-0.65678	-1.91289
D (INDIA (-1))	0.115667	-4.31805
D (INDIA (-2))	0.047675	-1.7207
<b>East Asian Markets</b>		
D (MALAYSIA (-1))	0.198	-1.207
D (S. KOREA (-2))	0.469	-3.230
D (THAILAND (-2))	-0.334	-1.035
<b>Developed Markets</b>		
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
<b>EU Markets</b>		
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 (CZECH (-2))	-0.545	-1.460

**Table 13**  
**Error Correction (Period II)**

	<b>D (PAKISTAN)</b>	
	Coefficient	t stat
<b>South Asian Markets</b>		
D (SRI LANKA (-1))	-0.2809	-1.42332
D (SRI LANKA (-3))	-0.20078	-1.00802
D (INDIA (-2))	0.067777	-1.35527
<b>East Asian Markets</b>		
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
<b>Developed Markets</b>		
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
<b>EU Markets</b>		
D (CZECH (-1))	0.791234	-1.46563