

Research Article

Interdependence of South Asian Equity Markets

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Abstract: This Study aimed at exploring the relationship between South Asian Equity Markets. Four major South Asian Equity Markets (Karachi Stock Exchange, Bombay Stock Exchange, Colombo Stock Exchange and Dhaka Stock Exchange) were taken to explore this relationship. Data was taken from the year 1999 to 2009 on monthly basis. Data Analysis was conducted using co-integration Analysis for the long run relationship and VECM (Vector Error Correction Model) for the short run relationship. For the purpose of stationarity of data, Unit root test was used and all series were found integrated of at first difference. Co-integration Analysis indicated that there exists no long run relationship among the equity markets of South Asia. VECM shows the similar results and no relationship was found among these markets in short run. Granger Causality, Variance Decomposition and Impulse Response Function were used and unidirectional granger causality is found from CSE to DSE, KSE to BSE and BSE to CSE. It was found that most of the changes in Colombo Stock Exchange and Dhaka Stock Market were explained due to changes or innovations in their own market. Variance Decomposition Analysis shows that Variance is Karachi Stock Market is explained by changes in its market and changes in Bombay Stock Market. Similarly Variance is Bombay Stock Market is explained by its own markets innovations or changes in Karachi Stock Market. Impulse Response Function reveals most of the market shocks in KSE are explained by its own innovations and other markets do not have much influence on Karachi Stock Market. However, result of impulse response function shows that BSE is exerting some pressure on Karachi Stock Exchange in the end periods.

Keywords: Bombay stock exchange, Colombo stock exchange, Dhaka stock exchange, Karachi stock exchange, South Asian equity markets

INTRODUCTION

In many previous studies relationship is found among equity markets of the countries which either belongs to same region or countries having trade relationship ships like Chaudhry (1997) found integration among six Latin American Countries. Many other studies also focused this issue and found relationship among the markets (Masih and Masih, 1999; Roca, 1999). Pakistan, India, Bangladesh and Sri Lanka belong to the same region and economic conditions in these countries are not very much different. Political and Economic situations in these countries are similar in many aspects. So this study is conducted to examine that whether any relationship exists between these equity markets or not.

The Capital flow in different countries stock markets started after relaxation of capital controls after liberalization of stock market in 1975. After this liberalization many other countries took stock market liberalization policies like Stock Market liberalization in UK in 1975, deregulation in Japanese Market in 1978-79 and stock market liberalization in Karachi Stock Market in 1991. Pakistani Stock market was

formally liberalized in 1991 which includes lifting restrictions on holding foreign currency, dividends transfer, capital gain, trade liberalization for foreign companies and transfer of shares to foreigner will require approval SBP only in the case if more than 5% shares in financial institutions or banks are traded.

Due to liberalization of stock markets, now investor has opportunity to take the securities from different markets within the country and from other countries stock markets. Investors have the opportunity to select the securities from those sectors or markets which has no positive correlation to get the diversification benefits. Because selecting the portfolio securities from integrated markets will increase the portfolio risk.

Portfolio diversification theory was given by Markowitz in his study in 1952, 59. Markowitz discussed that an investor can diversify his risk by investing in different securities. South Asian Stock Markets are considered emerging or developing markets and most of the literature favors that emerging stock markets show low or no correlation with the other equity markets or developed markets. Literature considers that including the securities from emerging

equity markets in a portfolio will benefit the investors in portfolio diversification context (Chaudhary, 1991; Hartmann and Khambata, 1993).

The purpose of this study is to investigate the long term relationship among South Asian Stock Market and their impact on Karachi Stock Exchange. In this research it is examined that how interdependence of South Asian stock markets causes stock prices in regional stock exchanges. This research explores that the liberalization in south Asian emerging stock markets and whether these markets attract the investors to invest their funds in international stock and securities to diversify their portfolios to get higher returns because in an international portfolio an individual's country risks can be diversified away. Major South Asian Stock Markets like BSE (Bombay Stock Exchange), DSE (Dhaka Stock Exchange), CSE (Colombo Stock Exchange) and KSE (Karachi Stock Exchange) are taken in this study.

Overview of South Asian stock market: India is among the top emerging markets in South Asia with almost more than 20 regional stock exchanges. Mumbai Stock Exchange, Delhi Stock Exchange and Calcutta Stock Exchanges account for more than 50% listing. Mumbai Stock Exchange is among top emerging stock exchanges in the world (Ariff and Khalid, 2000).

Pakistan has three stock exchanges: the Islamabad Stock Exchange, Lahore Stock Exchange and Karachi Stock Exchange with biggest market share among these three markets. Pakistan government at different times have taken many steps to make Pakistani Stock Markets more investor friendly and different steps has been taken to strengthen the structure of securities and exchange commission but political instability and uncertainty in investment environment has created difficulties. Karachi stock exchange represents 35 sectors (Ariff and Khalid, 2000).

Sri Lanka has one of oldest Stock Exchange in the world. The Colombo Stock Exchange (CSE) has 235 listed companies representing 20 business sectors. In 1989 Sri Lanka liberalized foreign investment and, at the same time, the government's focus turned to developing a modern capital market to raise funds for economic development. The Securities and Exchange Commission and the regulatory framework were strengthened through passage of important legislation such as insider trading laws and a takeover and mergers code, which contributed to improving market integrity (Ariff and Khalid, 2000).

The decision for establishing a stock exchange at Bangladesh was taken when Early in 1952 Calcutta Stock Exchange had prohibited the trading in Pakistani Shares and securities. East Pakistan Stock Exchange was established in 1954 but formal trading was started in 1956 after obtaining the certificate of commencement of business, shifted to Dhaka in 1958 and its name was changed to "Dhaka Stock Exchange

Ltd." in 1964. The trading activities were continued in 1976 after a break from 1971 to 1976 due to civil war and economic policies, at that time Dhaka Stock Exchange had nine listed companies and the number of listed companies at September 2008 has increased to 272. As compared to other south Asian stock markets, the Bangladesh stock market is still small and number of shares listed company's shares is not actively traded (Chowdhury, 1994).

LITERATURE REVIEW

Eun and Shim (1989) investigated that there exists a significant interdependence among the national stock markets. In this study nine major national stock markets were included which Australia, Canada, France, Germany, Hong Kong, Japan, Switzerland, the United Kingdom and the United States. The data was taken from December 1979 to December 1985. Vector auto-regression model was used for the analysis and results of the study indicated that US market was the major market which brings changes or variances in other markets, so it was the most influential among all the markets. Kasa (1992) investigated the integration among the equity markets of USA, Japan, England, Germany and Canada using the stock market indices from 1974 till 1990 and found that there exist long run relationship among these equity markets using co integration technique. Results of this study indicated that there is a single common trend driving the stock markets of these countries.

Chaudhry (1997) examines the interdependence among six Latin American Countries. In his study he used stock market data from the period 1985 to 1993. Long run relationship was explored by using co-integration technique and found the existence of such relationship, furthermore, causal relationship was also found by using Granger Causality Approach.

Masih and Masih (1999) investigated the short and long term dynamic linkages among eight national daily stock price indices, which includes four major established markets (US, UK, Germany, Japan) and four Asian emerging markets (Malaysia, Thailand, Singapore, Hong Kong) using end of day national stock price indexes from 14-February-1992 to 19-June-1997 (inclusive) by using time-series econometric techniques vector error-correction model and level VAR model containing integrated and co-integrated processes of arbitrary orders, Variance Decomposition, Augmented Dicky Fuller Unit root test and Multivariate Co-integration Analysis. Results from this study found the evidence for co-integration among these eight markets. In this research study this increased interdependence is discussed in various perspectives and some of the reasons are assumed for increased interrelationship like globalization and flow of information from one market to another market.

Cha and Oh (2000) examined the interdependence among the equity markets of US, Japan with some of the emerging markets of Asia (Hong Kong, Korea, Singapore and Taiwan). This study found the contagion effect between these countries and indicated that after the stock market crash of 1987 co-movements among these markets increased.

Narayan *et al.* (2004) examined four south Asian markets All Share (Bangladesh), Bombay SE National 200 (India), Karachi SE 100 (Pakistan) and Colombo SE All Share (Sri Lanka) use daily data (excluding weekends and holidays) for the period 2 January 1995 to 23 November 2001, which gives a total of 1,800 observations. For Analysis different techniques like Descriptive Statistics, Granger Causality, Unit Root Test (For Data Stationary), Variance Decomposition Analysis were used and It was found that in long run, stock prices in Bangladesh, Sri Lanka and India granger cause the sock prices in Pakistan. In short run Pakistan Stock prices in Pakistan granger cause stock prices in Sri Lanka and India, Stock prices from Sri Lanka to Stock Prices in India. Bangladesh was exogenous having less correlation due to its small size and market capitalization.

Lamba (2005) concluded that there exists a long run relationship among South Asian emerging stock markets and the developed equity markets for the period of July 1997 to December 2003 by applying multivariate co-integration test. Empirical results indicate that developed equity markets of US, UK and Japan has impact on Indian stock market. Further he founded that the stock markets of Pakistan and Sri Lanka are relatively independent and are not influenced by the stock markets of developed countries during the whole period. Moreover he noted that the three South Asian equity markets are integrating with each other but relatively in a slow manner.

Kazi (2008) investigated the long run relationship among equity markets of UK, USA, the Canadian, German, French and Japan. Annual data was taken from the period 1945 to 2002. Unit root test was used and both ADF and PP were used for this purpose. To find the long run relationship among these markets, co-integration technique was used. It was found that there exist integration among these equity markets and long run relationship was indicated by the results in this study. However, results for UK, Canadian and German markets were significant and investor should have more interest in the other markets for diversification purpose.

Hasan *et al.* (2008) investigated the dynamic linkage of Pakistan equity market with the 9 developed equity markets of USA, UK, France, Germany, Japan, Canada, Italy and Australia by using weekly prices for the period of 2000-2006. In this study they used (Johansen and Juselius, 1990) multivariate co integration analysis. It was found that Pakistan Equity market is not integrated with the equity markets of the USA, UK, Germany, Canada, Italy and Australia. But the UK and USA stock markets have little impact on Pakistan equity market. However, there exists

integration of Pakistani equity market with France and Japan.

Bastos and Caiado (2010), this study found the integration among the global equity market using stock market indices from 46 countries. This study was conducted to examine the interdependence in terms of equity markets returns. The data was taken from the period 1995:01 and 2009:05. The study investigated the interdependence between the stock returns of developed and emerging countries. The data was taken for three different periods to examine whether interdependence increased over time or not and results indicated that interdependence among emerging and developed countries markets is increasing over time.

METHODOLOGY

This study includes monthly stock prices indexes for the period of January 1999 to 2009 December for All Share Bangladesh, KSE 100 Index, Bombay National 200 and Colombo All Share. The continuous compounded rate of return is calculated by using the following model:

$$\text{Return} = R_t = \ln (P_t/P_{t-1})$$

where,

R_t = Return for given Period 't'

P_t = Price at closing time

P_{t-1} = Price at the opening time

ln = Natural log

Hypothesis of the study: Following hypothesis of the study are confirmed by applying the above explained methodologies:

- H_1 : South Asian equity markets have long term relationship with KSE.
- H_{10} : South Asian equity markets have no long term relationship with KSE.
- H_2 : South Asian equity markets have short term relationship with KSE.
- H_{20} : South Asian equity markets have no short term relationship with KSE.
- H_3 : South Asian equity markets have long term interrelationship.
- H_{30} : South Asian equity markets have no long term interrelationship.
- H_4 : South Asian equity markets have short term interrelationship.
- H_{40} : South Asian equity markets have no short term interrelationship.

RESULTS AND DISCUSSION

Descriptive statistics are applied on the returns of four south Asian markets (Table 1). Results indicated that Dhaka stock exchange has average returns of

Table 1: Descriptive statistics

	DSE	KSE	BSE	CSE
Mean	0.011927	0.010166	0.008865	0.010304
Median	0.006009	0.012865	0.014628	0.010577
Maximum	0.264057	0.241114	0.248851	0.225223
Minimum	-0.221321	-0.448796	-0.272992	-0.184168
Std. dev.	0.071584	0.101854	0.079924	0.075906
Skewness	0.279588	-1.075146	-0.404912	0.067535
Kurtosis	4.213829	6.659657	3.539045	3.412991
Jarque-bera	11.460550	115.608100	6.072645	1.211501
Probability	0.003246	0.000000	0.048011	0.545665
Observations	154	154	154	154

Table 2: Correlation matrix

	DSE	KSE	BSE	CSE
DSE	1.000000	-0.064363	0.133462	0.014367
KSE	-0.064363	1.000000	0.286309	0.195500
BSE	0.133462	0.286309	1.000000	0.289088
CSE	0.014367	0.195500	0.289088	1.000000

5% level of significance

Table 3: Vector Auto Regression (VAR technique)

Lag	1	2	3	4	5	6	7	8	9	10	11	12
AIC	-8.8849	-8.8786	-8.8811	-8.8146	-8.7030	-8.5557	-8.4798	-8.4728	-8.3306	-8.2532	-8.2986	-8.2800
SC	-8.4905	-8.1655	-7.8466	-7.4559	-7.0170	-6.5396	-6.1307	-5.7875	-5.3060	-4.8860	-4.5863	-4.2191

Akaike Information Criterion (AIC); Schwarz Criterion (SC)

1.1927% with standard deviation of 7.1584%. Karachi Stock Exchange has average returns of 1.1016% with volatility of 10.18% during 1999 to 2009. Bombay Stock Exchange has average returns of 0.88% with standard deviation of 7.99% and Colombo stock Exchange has average returns of 1.030% with volatility of 7.590%.

Karachi Stock Exchange and Dhaka Stock Exchange are found the markets with comparatively high returns and high risk. Karachi Stock Exchange returns are more volatile among these four markets with standard deviation of 10.18%. All other markets have low standard deviation as compared to Karachi Stock Market. So, it could be deduced that Karachi Stock Market is most volatile markets in South Asian Equity Markets. Descriptive Statistics showed that Dhaka Stock Exchange is giving comparatively high returns among all these markets with the lower level of risk. So, Dhaka Stock Market is the high return market with lower levels of risk.

Bombay Stock Exchange is giving lower returns among these four markets with high risk level after Karachi Stock Exchange. Skewness and Kurtosis measures provide insight about the underlying statistical distribution of stock returns. Karachi Stock Exchange and Bombay Stock Exchange are negatively skewed. The Jarque-Bera Statistic is high for Karachi Stock Market, implying that stock returns of Karachi Stock Market follow pattern So, it differ significantly from normal distribution.

Result of descriptive statistic shows very low returns. This study covers the time period that witnessed market crash of 2005 and 2008. This may be the reason of very low average returns.

Table 2 presents the correlation results for the four south Asian Markets. It was found that there exists no significant correlation among these markets. Karachi Stock Exchange has very weak negative correlation with the Dhaka Stock Exchange. All other correlation results depicts that there exist very weak positive correlation among these markets. Correlation among Karachi Stock Exchange and Bombay Stock Exchange is more as compared to other results but still it is not significant and. Twenty eight is very weak to assume any positive relationship between these two markets.

From the results of Correlation it is clear that there exist no positive correlation among the returns of stock markets of these four countries. These results are attractive for the investors who want to get diversification benefits through investing their funds in these four south Asian markets. Correlation Analysis is considered a weak technique to explore the integration among the markets. So, Co-integration and Granger Causality are used to further investigate this issue (Table 3 and 4).

The estimation of Johansen (1991) Co-integration approach requires that there should be appropriate lag selected for all estimations. For this purpose unrestricted VAR is estimated. Akaike information criterion and Schwarz criterion are used for this purpose. VAR is estimated from 12 to 1 months and SC and AIC are found minimum at 1 month lag. So, 1 month lag is used for the estimation.

Augmented Dickey Fuller Tests is based on the assumption that data is independently identically distributed. Dickey Fuller Test assumes that error terms have constant variance. Results of this test show that data was non-stationary at level and when unit root was taken at first difference, it becomes stationary. Further

Table 4: Unit root test

Stock markets	Augmented dicky-fulller test at level	Augmented dicky-fulller test at 1 st difference	Phillip-perron test at level	Phillip-perron test at 1 st difference
DSE	1.426192	-8.04550	1.544272	-11.8358
KSE	-0.614840	-8.14567	-0.518020	-11.8004
BSE	-0.320280	-7.56533	-0.186420	-11.4821
CSE	0.321444	-7.95293	0.464261	-11.0480
1%	-3.474100	-3.47430	-3.473800	-3.4741
5%	-2.880400	-2.88050	-2.880200	-2.8804
10%	-2.576700	-2.57680	-2.576600	-2.5767

Table 5: Multivariate co-integration test-trace statistics

Equity markets	Hypothesis	Eigenvalue	Trace statistics	Critical value at 5%	Remarks
DSE	None*	0.129701	34.568570	47.856130	Trace test indicates
KSE	At most 1*	0.055164	13.313970	29.797070	no co-integrating
BSE	At most 2*	0.026952	4.632176	15.494710	eqn (s)
CSE	At most 3*	0.002949	0.451888	3.841466	

*: Indicates 5% level of significance

Table 6: Multivariate co-integration maximum eigenvalue statistics

Equity markets	Hypothesis	Eigenvalue	Maximum eigenvalue statistics	Critical value at 5%	Remarks
DSE	None*	0.129701	21.254600	27.584340	Maximum eigenvalue
KSE	At most 1*	0.055164	8.681799	21.131620	statistics provides
BSE	At most 2*	0.026952	4.180287	14.264600	results that there
CSE	At most 3*	0.002949	0.451888	3.841466	exists no co-integrating equations

*: Indicates 5% level of significance

Table 7: Bivariate co-integration test-trace statistics

	Hypothesis	Eigenvalue	Trace statistics	Critical values at 0.05 level	Remarks
DSE-KSE	None	0.026699	4.144971	15.494710	No
	At most 1	2.95E-05	0.004521	3.841466	Co-integration
DSE-BSE	None	0.034432	6.091096	15.494710	No
	At most 1	0.004761	0.730243	3.841466	Co-integration
DSE-CSE	None	0.029515	6.457145	15.494710	No
	At most 1	0.012170	1.873356	3.841466	Co-integration
KSE-BSE	None	0.027876	4.880167	15.494710	No
	At most 1	0.003618	0.554577	3.841466	Co-integration
KSE-CSE	None	0.056241	8.904648	15.494710	No
	At most 1	0.000316	0.048338	3.841466	Co-integration
BSE-CSE	None*	0.051665	8.121660	15.494710	No
	At most 1*	3.53E-05	0.005404	3.841466	Co-integration

*: Indicates 5% level of significance

it was found that all the data stationary at level 1. So, Co-integration assumption that all the variables should be integrated of same order is fulfilled.

Augmented Dickey Fuller Test is assumed a strict test so, Phillip Peron Test is also used to verify the results. Phillip Peron Test also considers the weak form of dependence. Results of the Phillip Peron Test showed that data was non-stationary at level and becomes stationary at first difference.

If all the series are integrated of same order than co-integration can be used to investigate the long run relationship between the series. Co-integration can be applied by two different methods. One is Jhonson and Julius Approach and other is ARDL (Auto Regressive Distribution Lag approach). Jhonson and Julius Approach is used if data is integrated of same order and ARDL approach is used if it is not integrated of same order. Unit Root test indicated that all the series

becomes stationary at first difference. So, Johnson and Julius Approach of Co-integration are used.

Table 5 and 6 represents the results of Multivariate Co-integration Approach using Johnson and Julius Approach. Results of Johnson and Julius Approach are verified through two different tests, one is Trace statistics and other is Maximum Eigen Value Test. Trace Statistics indicates that there exist no co-integration vectors and Maximum Eigen Value Test also confirms the results that no co-integration vectors exist. If different series are co-integrated in a group, it might be a case that they are not integrated in bivariate analysis. Similarly if different series are showing co-integration in Multivariate Analysis then it must also be studied that which of these markets are showing integration by using Bivariate Analysis. In the above analysis it was found that there exists no integration among these markets in Multivariate Analysis. So, Bi-

Table 8: Bivariate co-integration maximum eigenvalue statistics

	Hypothesis	Eigenvalue	Max-eigen statistics	Critical values at 0.05 level	Remarks
DSE-KSE	None	0.026699	4.140450	14.264600	No
	At most 1	2.95E-05	0.004521	3.841466	Co-integration
DSE-BSE	None	0.034432	5.360853	14.264600	No
	At most 1	0.004761	0.730243	3.841466	Co-integration
DSE-CSE	None	0.029515	4.583790	14.264600	No
	At most 1	0.012170	1.873356	3.841466	Co-integration
KSE-BSE	None	0.027876	4.325590	14.264600	No
	At most 1	0.003618	0.554577	3.841466	Co-integration
KSE-CSE	None	0.056241	8.856309	14.264600	No
	At most 1	0.000316	0.048338	3.841466	Co-integration
BSE-CSE	None*	0.051665	8.116256	14.264600	No
	At most 1*	3.53E-05	0.005404	3.841466	Co-integration

*: Indicates 5% level of significance

Table 9: Vector error correction model

Regressor	Coefficient	S.E.	t-ratio (prob.)
DSE	-0.14844	0.11118	-1.3351 (0.184)
BSE	0.33593	0.10373	3.2384 (0.001)
CSE	0.16773	0.10762	1.5586 (0.121)
ecm (-1)	-1.00000	0.00000	*none*

List of additional temporary variables created:

(KSE) dX1 = X1 - X1 (-1)

(DSE) dX2 = X2 - X2 (-1)

(BSE) dX3 = X3 - X3 (-1)

(CSE) dX4 = X4 - X4 (-1)

ecm = X1 + 0.14844*X2 - 0.33593*X3 - 0.16773*X4

R-squared 0.52945

S.E. of regression 0.097203

Mean of dependent variable 0.1979E-3

Residual sum of squares 1.4173

Akaike info. criterion 138.0538

DW-statistic 1.9370

R-bar-squared 0.52317

F-stat. F (3, 149) 56.2582 (0.000)

S.D. of dependent variable 0.14077

Equation log-likelihood 141.0538

Schwarz Bayesian criterion 133.5081

Dependent variable is KSE; 153 observations used for estimation from 2 to 154; S.E.: Standard error

Table 10: Pair wise granger causality test of KSE-100

Null hypothesis	Obs.	F-statistic	Probability
ΔKSE does not granger cause DSE	153	0.56018	0.45536
ΔDSE does not granger cause KSE		0.91119	0.34134
ΔBSE does not granger cause DSE	153	1.10237	0.29544
ΔDSE does not granger cause BSE		0.09515	0.75815
ΔCSE does not granger cause DSE	153	5.37900	0.02173
ΔDSE does not granger cause CSE		3.24223	0.07377
ΔBSE does not granger cause KSE	153	0.00110	0.97359
ΔKSE does not granger cause BSE		3.92137	0.04951
ΔCSE does not granger cause KSE	153	0.05099	0.82166
ΔKSE does not granger cause CSE		0.04562	0.83115
ΔCSE does not granger cause BSE	153	1.01675	0.31492
ΔBSE does not granger cause CSE		5.29434	0.02277

variate Analysis is used to further investigate the integration among these markets (Table 7 and 8).

The results of bi-variate Co-integration analysis shows that there exist no co-integration among the stocks markets of South Asia. Trace Statistics and Max-Eigen Value Statistics both represents the same results that there exist no long run integration among these two markets.

R-Squared and R-Bar-Squared measures refer to the dependent variable dX1 and in cases where the error correction model is highly restricted, these measures could become negative (Table 9).

Result of the VECM suggests that there exists no short term relationship between the Karachi Stock market and other South Asian Stock Markets.

Granger representation Theorem says that if co-integration is found between two time series then granger causality must exist from at least one direction. Test results (Table 10) indicated that Colombo Stock Market Granger Causes stock prices in Dhaka Stock Market and Karachi Stock Market granger causes stock prices in BSE and unidirectional causality is found from Bombay Stock Exchange to Colombo Stock Exchange. It means that information flows from Karachi Stock market to Bombay Stock market.

Impulse response function: Results of the impulse response function shows (Fig. 1) that most of the market shocks in KSE are explained by its own innovations and other markets do not have much

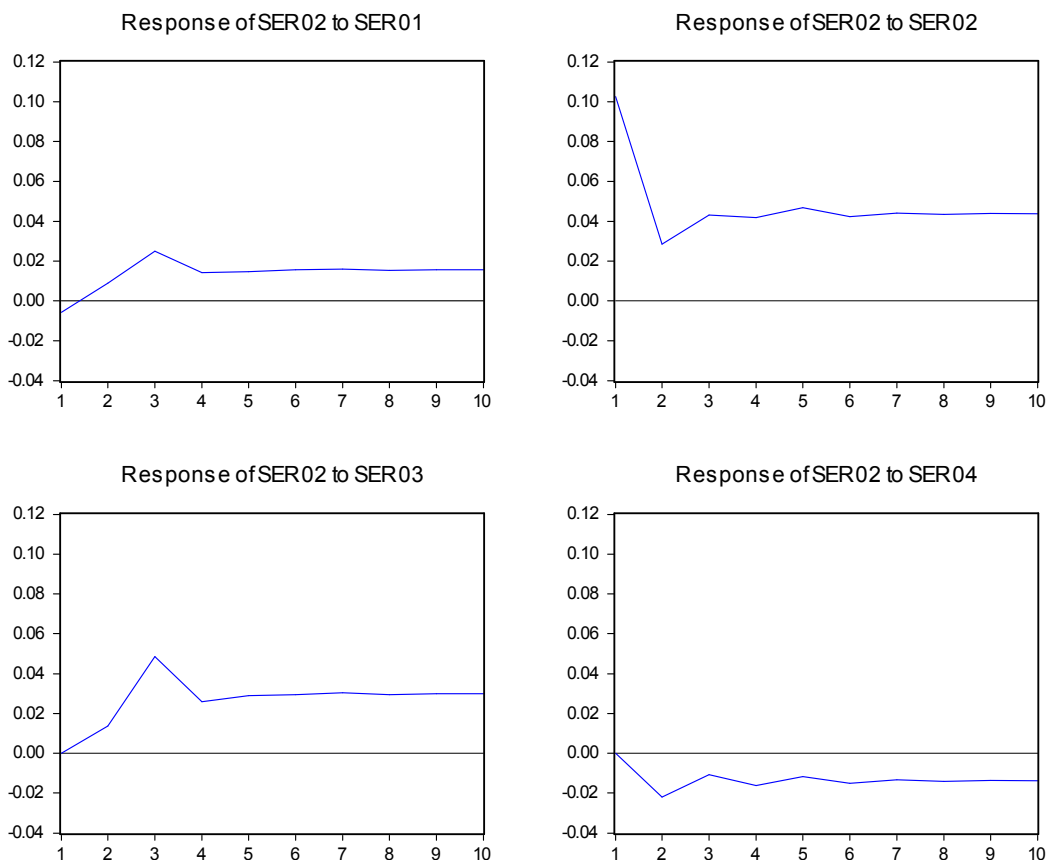


Fig. 1: Response to one S.D. innovations

Table 11: Impulse response

Period	DSE	KSE	BSE	CSE
1	-0.005650	0.102569	0	0
2	0.008946	0.028585	0.013769	-0.02202
3	0.024832	0.043170	0.048442	-0.01081
4	0.014182	0.041783	0.025779	-0.01617
5	0.014613	0.046746	0.028887	-0.01178
6	0.015623	0.042375	0.029499	-0.01499
7	0.015914	0.044079	0.030472	-0.01325
8	0.015436	0.043567	0.029465	-0.01410
9	0.015568	0.043922	0.029759	-0.01363
10	0.015568	0.043647	0.029742	-0.01391

Ordering: DSE KSE BSE CSE

influence on Karachi Stock Market (Table 11). However, result of impulse response function shows that BSE is exerting some pressure on Karachi Stock Exchange in the end periods.

Table 12 represents that Dhaka Stock Exchange is the most exogenous market and all of its shocks are explained by its own market innovations and other markets have very low effects on it. Most of the variable in DSE is explained by its own market changes. However, Karachi Stock market is exerting some pressure in its total variance.

Table 13 represents the variance decomposition of Karachi Stock Market with the changes in its own market and with Bombay Stock Exchange, Dhaka Stock

Exchange and Colombo Stock Exchange. In the initial periods it is clear that most of the changes in the Karachi Stock Market are due to its own market innovations. So, Karachi Stock market is exogenous market initially but Table 13 shows that at the end of the table Bombay stock exchange is becoming a reason for changes in the Karachi Stock Market. Results showed that Colombo Stock Exchange is also influencing Karachi Stock Market. So, it could be deduced that Colombo Stock Exchange and Bombay Stock Exchange are exerting significant pressure on the changes in Karachi Stock Market but still it most of the changes in the Karachi Stock Market index are due to innovations in its own market.

Table 14 represents the results of variance decomposition of Bombay Stock Exchange. It was found that Karachi Stock Exchange is exerting some impact on the Bombay Stock Exchange. Most of the changes in Bombay stock market are due to its own market changes or impact is found from Karachi Stock Market to Bombay Stock Market.

Table 15 represents that Colombo stock market is not influenced from changes in other markets. Dhaka Stock Market and Bombay Stock Market are exerting some impact on Colombo Stock Market. However,

Table 12: Variance decomposition analysis of DSE

Variance decomposition of DSE					
Period	S.E.	DSE	KSE	BSE	CSE
1	0.080171	100	0	0	0
2	0.089840	97.56953	1.523381	0.268916	0.638171
3	0.105026	95.01521	2.100852	2.340443	0.543493
4	0.115527	94.62018	2.388995	2.335151	0.655669
5	0.126461	94.45486	2.437932	2.487899	0.619308
6	0.135903	94.13839	2.614913	2.587723	0.658978
7	0.144946	93.95166	2.690263	2.704220	0.653855
8	0.153383	93.80277	2.769548	2.761774	0.665911
9	0.161412	93.69128	2.821322	2.820256	0.667140
10	0.169045	93.59008	2.872039	2.865192	0.672686

Table 13: Variance decomposition analysis of KSE

Variance decomposition of KSE					
Period	S.E.	DSE	KSE	BSE	CSE
1	0.102724	0.302275	99.69773	0	0
2	0.110109	0.923255	93.51360	1.56365	3.999496
3	0.130643	4.268589	77.34651	14.85970	3.525201
4	0.141210	4.662216	74.95831	16.05166	4.327817
5	0.152684	4.903906	73.48969	17.30949	4.296915
6	0.162625	5.245517	71.56890	18.54826	4.637329
7	0.172474	5.514843	70.15998	19.61178	4.713398
8	0.181523	5.701836	69.09966	20.34005	4.858457
9	0.190246	5.860626	68.23845	20.96446	4.936468
10	0.198542	5.995887	67.48773	21.49310	5.023286

Table 14: Variance decomposition analysis of BSE

Variance decomposition of BSE					
Period	S.E.	DSE	KSE	BSE	CSE
1	0.084677	0.087684	14.43356	85.47876	0
2	0.093204	1.242511	25.18178	73.54421	0.031500
3	0.107426	2.461768	33.09960	64.30472	0.133915
4	0.116499	2.519590	35.60161	61.73207	0.146730
5	0.126754	2.658660	38.06898	59.13365	0.138712
6	0.135264	2.809696	39.96618	57.10144	0.122681
7	0.143704	2.916327	41.46092	55.51156	0.111194
8	0.151466	2.993717	42.57417	54.33202	0.100092
9	0.158959	3.058028	43.52449	53.32589	0.091590
10	0.166057	3.114419	44.30526	52.49623	0.084093

Table 15: Variance decomposition analysis of CSE

Variance decomposition of CSE					
Period	S.E.	DSE	KSE	BSE	CSE
1	0.088301	2.069338	1.097231	3.307147	93.52628
2	0.101495	1.876777	0.839743	5.401590	91.88189
3	0.122697	2.304539	1.458529	4.089666	92.14727
4	0.136154	2.532584	1.319923	3.918922	92.22857
5	0.150159	2.522284	1.308412	3.807306	92.36200
6	0.162209	2.595652	1.264220	3.721208	92.41892
7	0.173774	2.626112	1.258009	3.630800	92.48508
8	0.184449	2.661628	1.238736	3.574197	92.52544
9	0.194613	2.681152	1.228449	3.528066	92.56233
10	0.204240	2.701799	1.218129	3.489951	92.59012

most of the Variance in Colombo Stock Market is explained by Bombay Stock Market or changes in its own market.

CONCLUSION

South Asian countries belong to same economic region and have similar economic environment for the investors in many aspects. So, in order to focus on this particular region which were expected to have

similarities due to same economic, geographic and social conditions. Political conditions are also not very much different in these countries.

Due to these expected geographic, economic, social and political similarities, this research was conducted to explore that whether equity markets of these countries do have close integration or not.

This study was aimed at exploring the relationship among the equity markets of south Asia. Four major markets from South Asian countries were selected

Pakistan (Karachi Stock Market), India (Bombay Stock Market), Sri-Lanka (Colombo Stock Market) and Bangladesh (Dhaka Stock Market). Monthly stock market index was used to explore this relationship. The study was conducted to examine the co movement of the stock markets of South Asian Countries. Governments and investors do have the interest in this issue. Integration or co movement among these markets removes the diversification benefits which are achieved in case of low level of integration.

It was found that among these four markets KSE is the high risk and high return market. Dhaka stock market was also found with high returns but low level of risk as compared to others. (This shows that stock returns in KSE are more volatile) However, these high returns are an attraction for the investors who want to get benefit from emerging markets through directly investing or through indirectly investing like investing in emerging markets mutual funds.

Results of correlation analysis show that there exists no significant correlation among these four markets. Correlation results were showing positive correlation but it was very weak to establish any significant relationship. Dhaka and Karachi stock markets were only showing negative correlation but it was also very weak to establish any significant inverse relationship.

This research study was conducted to explore the relationship of different international markets to focus on this particular issue which could benefit these international investors who are interested to reduce their systematic risk through diversifying their portfolio in international equity markets.

Augmented Dickey Fuller and Phillip Peron Tests were used for stationarity of data and all the data was found integrated of same order.

Multivariate and Bi-variate co integration were used for long run relationship and VECM was used to analyze the short run relationship among these equity markets. In co-integration analysis Trace Statistics and Maximum Eigen Value Tests were used and results showed that there exists no long run relationship among South Asian Equity Markets. Both Multivariate and Bi-variate analysis found no relationship. VECM results also found that there exists no short run relationship among these countries.

From all these analysis it could be deduced that South Asian Equity Markets are not Co-integrated. Investors can diversify their country systematic risks through investing their funds in South Asian Equity Markets. Results of this study were not consistent with Narayan *et al.* (2004) and were consistent with Hassan *et al.* (2009). Reason could be difference of time period taken in these studies because economic conditions at different times might not be similar in these countries.

The reason for non-integration might be absence of trade among these countries because trade between

countries increases the flow of capital across the borders.

The results are also consistent with Lamba (2005) this study found that Pakistan and Indian markets are independent of each other. Indian and Dhaka markets are co-integrated but in a slower manner.

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