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Long run Relationship among East Asian equity markets and KSE

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ABSTRACT

The dependence of various stock markets plays a vital role in diversification while selecting securities in an investor's portfolio. This study examines interdependence among the East Asian stock markets in relation to the Karachi Stock Exchange. Monthly data ranging from 2000 to 2010 is included and tested in this paper. This relationship is tested by using descriptive statistics and correlation matrix. Data stationarity is ensured by Unit Root Test. Evidence from Granger Causality and Impulse Response Test prove no relationship between KSE and stock markets of the East Asian countries while there exists certain level of unidirectional relationship from Japan to China and from Japan to Pakistan.

1. Introduction

Liberalization of trade policies around the globe is making cross border investments very attractive for the investors. Researchers all around the world are very conscious to study the behavior of stock markets. Relaxed cross border policies can contribute to the portfolio diversification and movement of value across nations. This type of research has become an area of immense interest for academic uses and contributing widely to existing body of knowledge. Investors in developed nations find less opportunities in native markets and are targeting foreign markets to avail maximum portfolio benefits by considerably reducing portfolio risks.

This paper focuses on the long run linkages among the stock markets of South Korea, Pakistan, Japan and China. This study can be helpful for the prediction of stock market behavior in future. Reduction in brokerage costs, investor friendly policies and new technological innovations are pushing investors to jump over the boundaries to get their share of international financial benefits. Developing countries

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are constantly engaged in devising such policies which may lead to fund inflows and increase the interest of investors. Relationship among stock markets of South Korea, Pakistan, Japan and China is studied and data is taken from monthly indices from yahoo finance. This study is distributed in four parts. First segment deals with review of previous studies, second phase emphasizes on data and methodology, third part reports results and finally paper is concluded.

2. Literature review

Hussain and Saidi (2000) investigated the relationship of the Pakistani stock market with international markets. Results obtained from weekly data ranging from 1983 to 1993 showed poor evidence of integration. Their study proved the Pakistani equity market attractive for reduction in portfolio risk. Narayan et al. (2004) studied the relationship between the south Asian stock markets through multivariate co-integration. Their results showed unidirectional movement of shocks which were examined through granger causality and impulse response function. They took the daily data from January 1995 to November 2001. They suggested that stock prices in Bangladesh, Sri Lanka and India affect stock prices in Pakistan in longer periods and short run results showed movement from stock prices in Pakistan to India, stock prices from Sri Lanka to India and finally from Pakistan to Sri Lanka. Bangladesh being a very small market in size and limited market capitalization did not operate endogenously among the South Asian markets.

Islam et al. (2005) studied both long and short run relationship between the equity markets of India Malaysia and Singapore using daily indices ranging from July 1, 1997 to February 24,2005. They said that these markets granger cause each other in both directions except Singapore to Kualalumpur which is unidirectional. Marashdeh (2005) investigates the long run relationship among MENA countries and developed nations like USA, UK and Germany. He used the autoregressive distributed lag approach to study the relationship and suggested that MENA countries are interdependent while they have no relationship with developed countries in the long run. Lamba (2005) analyzed the relationship between the South Asian stock markets i.e, India, Pakistan and Sri Lanka and the developed markets of US, UK and Japan. He used pair wise granger causality test on the basis vector error correction model to capture any structural break ups. The argument that south Asian stock markets are independent of the stock markets of developed nations in the long run was strengthened by this study. It was found that Indian market is receptive of changes in developed markets but Pakistan and Sri Lanka showed no such trends.

Glezakos et al. (2007) explained the interdependence of world's major stock markets i.e, USA, England, France, Germany, Italy, Spain, Holland, Belgium and Japan in comparison to Athens stock market. These markets were found integrated at first level of difference and muilti-directional spillover effects were detected. Al Asad & Hoque (2007) analyzed the long-term relationship between stock markets of Bangladesh, USA, Japan and India. The results from Johannes Juselius test showed long term relationship between these markets. Short term dynamics were tested through vector error correction model and impulse response function. They proved that these markets share common stochastic trend and Bangladesh is affected by the shocks in US and Indian markets.

Hassan and Abdullah (2008) examined the co-integration between KSE and equity markets of USA, UK, Germany, Canada, Italy and Australia. Relationship was tested by employing descriptive statistics, correlation matrix, co-integration and granger causality on data ranging from 2000 to 2008. Results showed that KSE has no relationship with equity markets of developed countries and it can be an option to equity diversification.

Arouri and Nguyen (2010) examined the association among the stock markets of gulf countries and the world stock market. They used the data ranging from June 2, 2005 to April 2, 2008. They focused on quantifying the break ups and tried to detect rapport of these points with major events at similar times. For this purpose Muiltivariate Dynamic Conditional Correlational GARCH model was used. It was found that gulf countries are integrated but have no relationship with outer world. Agye-

Ampomah (2011), suggested that African markets are independent of the major stock markets of the world but the South African market is dependent on foreign economies. All the stock markets of these countries show no relationship and provide favorable information for the foreign investors and interested researchers. However, local investors have not much facility for portfolio investment.

3. Data description and methodology

This study includes monthly stock prices indexes for the period of January 2000 to 2010 December for KSE 100 Index, Nikkei 225, SSE Composite and KOSPI Composite index. The continuous compounded rate of return is calculated by using the following model

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

3.1. Hypothesis

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

HYPOTHESIS: 1

H_1 East Asian equity markets have long term relationship with KSE

H_0 East Asian equity markets have no long term relationship with KSE

HYPOTHESIS: 2

H_1 East Asian equity markets have long term interrelationship

H_0 East Asian equity markets have no long term interrelationship

4. Results

Table 1
Descriptive Statistics

	KOSPI	KSE	NIKKIE	SSE
Mean	0.008802	0.016687	-0.004031	0.004225
Median	0.016117	0.019256	-2.05E-05	0.016381
Maximum	0.202537	0.241114	0.120888	0.242526
Minimum	-0.263112	-0.448796	-0.272162	-0.282779
Std. Dev.	0.074239	0.089898	0.059689	0.087775
Skewness	-0.452659	-1.132808	-0.827162	-0.628542
Kurtosis	3.795762	8.021293	5.119582	4.149421
Jarque-Bera	7.506325	156.7897	37.35199	14.99072
Probability	0.023443	0.000000	0.000000	0.000556
Sum	1.091393	2.069205	-0.499800	0.523957
Sum Sq. Dev.	0.677899	0.994041	0.438225	0.947653
Observations	124	124	124	124

Descriptive Statistics is used to analyze the behavior of the stock returns. Descriptive statistics employed on the returns showed that South Korea has an average return of .88 percent and with standard deviation of 7.4 percent. KSE has highest returns among these four markets with standard deviation of 8.98 percent. Japan and china markets are offering returns of .4 and .42 percent with standard deviation of 5.9 and 8.7 percent. KSE is found high risk high returns market among these four markets

Table 2
Correlation

	KOSPI	KSE	NIKKIE	SSE
KOSPI	1	0.03398	-0.02683	-0.02542
KSE	0.03398	1	0.250992	0.626767
NIKKIE	-0.02683	0.250992	1	0.16819
SSE	-0.02542	0.626767	0.16819	1

From results obtained through correlation it is evident that there is no significant correlation among these markets except Karachi Stock Exchange and Shanghai Stock Exchange. There is low positive correlation between KSE and South Korea and between KSE and Japan. South Korea is partially negatively correlated with Japan and China. We can conclude on the basis of these results that there are many opportunities for selection of securities in portfolios intended by the investors of these markets except China and Pakistan who showed strong correlation.

Table 3
VAR statistics

Lag	1	2	3	4	5	6	7	8	9	10	11	12
AIC	-9.89	-9.79	-9.78	-9.75	-9.71	-9.94	-9.83	-9.74	-9.71	-9.58	-9.56	-9.60
SC	-9.44	-8.97	-8.58	-8.17	-7.76	-7.60	-7.11	-6.63	-6.20	-5.67	-5.24	-4.87

Lag selection is a pre-requisite in order to employ co-integration test. To estimate Johansen and Julius (1991) unrestricted VAR is estimated. Both Akaike information criterion and Schwarz criterion are found minimum at one lag. So one month lag is appropriate lag length.

Table 4
Unit root test statistics

	ADF Level	ADF First Diff.	PP Level	PP First Diff.
KOSPI	-0.87495	-7.73672	-0.66388	-10.2635
KSE	-1.27027	-7.86035	-1.29111	-10.1199
NIKKEI	-1.93227	-6.81061	-1.90822	-9.02939
SSE	-1.23272	-5.81967	-1.23581	-10.1313
Critical Values				
1%	-3.4843	-3.4847	-3.4839	-3.4843
5%	-2.8849	-2.8851	-2.8847	-2.8849
10%	-2.5791	-2.5792	-2.579	-2.5791

To run co-integration test it is necessary for the data to be stationary of same order. Above tests ensure that this data is non-stationary at level but becomes stationary at first difference. Data stationarity is tested through Augmented Dicky Fuller and Phillip Perron Tests as the later is not that much strict in nature as is ADF test and both tests confirmed similar results (Dickey & Fuller ,1981). Data is stationery of same order so we can test co-integration among these markets.

Table 5
Muiltivariate Co-integration

	Eigen value	Likelihood Ratio	5% critical value	
KOSPI	-10.1313	45.25507	47.21	No Co-integration
KSE	0.131751	25.21739	29.68	
NIKKEI	0.056472	7.840325	15.41	
SSE	0.005597	0.690413	3.76	

Co-integration is used to analyze the long run relationship between different series. Table 5 represents the results for multivariate co-integration analysis and no co-integration was found between these series in the multivariate analysis. It is possible that different series are not found integrated in multivariate analysis but shows different results with a bi-variate analysis.

Table 6
Bi-variate Co-integration

	Eigen Value	Likelihood Ratio	5% critical value	
KOSPI-KSE	0.037641	6.108076	15.41	No Co-integration
	0.011228	1.388879	3.76	
KOSPI-NIKKEI	0.032221	4.925226	15.41	No Co-integration
	0.007265	0.896811	3.76	
KOSPIE-SSE	0.056848	8.844849	15.41	No Co-integration
	0.013292	1.645883	3.76	
KSE-NIKKIE	0.041089	7.960879	15.41	No Co-integration
	0.022509	2.800182	3.76	
KSE-SSE	0.054457	10.03182	15.41	No Co-integration
	0.02524	3.14432	3.76	
NIKKEI-SSE	0.117946	22.85735	15.41	Co-integration
	0.058546	7.420551	3.76	

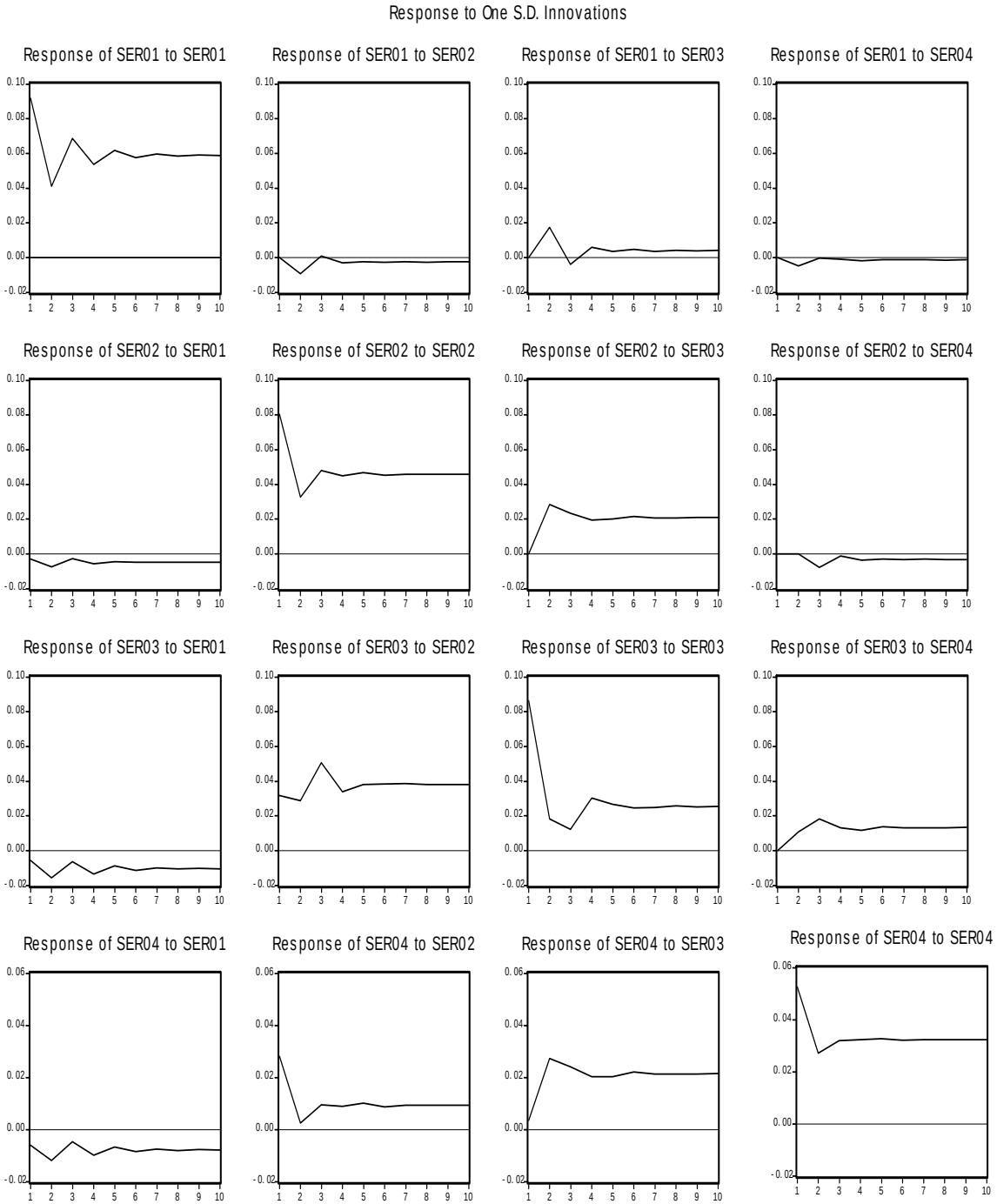
This table reports that there exists no bivariate co-integration among theses markets except the stock markets of Japan and China. These results only prove the existence of co-integration but do not identify the direction of flow of information. To check the direction we need to employ granger representation theorem.

Table 7
Granger causality

Null Hypothesis:	Obs	F-Statistic	Probability
KSE does not Granger Cause KOSPI	123	1.007	0.31764
KOSPI does not Granger Cause KSE		0.20206	0.65387
NIKKEI does not Granger Cause KOSPI	123	2.48681	0.11744
KOSPI does not Granger Cause NIKKEI		3.68221	0.05737
SSE does not Granger Cause KOSPI	123	1.55798	0.21439
KOSPI does not Granger Cause SSE		1.48652	0.22515
NIKKEI does not Granger Cause KSE	123	5.58288	0.01975
KSE does not Granger Cause NIKKEI		1.02412	0.31358
SSE does not Granger Cause KSE	123	1.63811	0.20305
KSE does not Granger Cause SSE		0.04719	0.8284
SSE does not Granger Cause NIKKEI	123	0.54528	0.46169
NIKKEI does not Granger Cause SSE		10.6457	0.00144

Granger causality test reports that the Japan stock market granger cause the stock market in China. Similarly Japanese stock market granger causes KSE. A unidirectional flow of information exists from Japan to China and from Japan to Pakistan.

Impulse Response Function



Impulse response function shows that one standard deviation change in on market brings what standard deviation change in other market. Results from impulse response function show that Japanese stock market exert pressure on Karachi Stock Exchange as well as on Shanghai Stock Exchange.

SER01 (KOSPI), SER02(KSE), SER03(NIKKEI),SER04(SSE)

Table 8
Variance decomposition of KOSPI

Period	S.E.	KOSPI	KSE	NIKKIE	SSE
1	0.091651	100	0	0	0
2	0.102413	96.08471	0.842439	2.838899	0.233951
3	0.12337	97.19543	0.586679	2.055929	0.161963
4	0.134687	97.386	0.546387	1.927767	0.139845
5	0.148191	97.74126	0.481063	1.647223	0.13045
6	0.159042	97.91202	0.448753	1.518812	0.120419
7	0.169901	98.10207	0.412981	1.372859	0.112093
8	0.179765	98.22139	0.390368	1.282373	0.105869
9	0.189284	98.32758	0.370681	1.200582	0.101158
10	0.198263	98.41172	0.354822	1.136408	0.097053

Table 9
Variance Decomposition of KSE

Period	S.E.	KOSPI	KSE	NIKKIE	SSE
1	0.080464	0.130289	99.86971	0	0
2	0.091782	0.801535	89.50416	9.693981	0.000322
3	0.106505	0.667749	86.76637	12.03174	0.534141
4	0.117373	0.79232	86.12457	12.63268	0.45043
5	0.128085	0.784003	85.69688	13.0566	0.462516
6	0.137653	0.810553	84.99371	13.7456	0.450136
7	0.146693	0.81868	84.61789	14.11031	0.453121
8	0.155181	0.828753	84.33307	14.39247	0.445713
9	0.163238	0.836344	84.08401	14.63582	0.443825
10	0.170911	0.84227	83.87701	14.83941	0.441305

Table 10
Variance Decomposition of NIKKEI

Period	S.E.	KOSPI	KSE	NIKKIE	SSE
1	0.092315	0.400909	11.83811	87.76098	0
2	0.100204	2.819675	18.21708	77.78656	1.176681
3	0.114505	2.461287	33.42145	60.68784	3.429421
4	0.124606	3.235179	35.5832	57.18599	3.995628
5	0.133796	3.228909	39.00265	53.52917	4.239266
6	0.142445	3.486109	41.6027	50.22222	4.688971
7	0.150569	3.561932	43.79345	47.67221	4.972412
8	0.158311	3.678467	45.34911	45.77542	5.197005
9	0.165654	3.749241	46.73192	44.13886	5.379978
10	0.172706	3.820284	47.88112	42.75596	5.54264

Table 11
Variance Decomposition of SSE

Period	S.E.	KOSPI	KSE	NIKKIE	SSE
1	0.059981	1.045464	21.81317	0.34564	76.79573
2	0.072289	3.399294	15.14693	14.48872	66.96506
3	0.083264	2.877106	12.69953	19.23461	65.18876
4	0.092589	3.480236	11.20375	20.38316	64.93285
5	0.101006	3.364955	10.42941	21.17077	65.03486
6	0.108981	3.512814	9.599515	22.32521	64.56246
7	0.116224	3.506223	9.087816	22.9583	64.44766
8	0.123134	3.557471	8.661695	23.45894	64.32189
9	0.129633	3.57132	8.32728	23.86897	64.23243
10	0.135846	3.59516	8.044722	24.21978	64.14034

Variance Decomposition shows the decomposition of variance. It was found that most the changes in South Korea market are explained by its own market innovations and other markets have no or very little effect on it. So, South Korea market is found exogenous among these four markets. Variance Decomposition of Karachi Stock Market shows that variance in Karachi Stock Market returns are caused by its own market innovations and due to changes in Japan Market. Similar results were seen in Granger Causality. Variance Decomposition of Japan and China markets shows that changes in these markets are due to changes in their own market innovations but it was found that changes in Japan Market are explained by China and Karachi Stock Market. Similarly changes in China market are explained by Karachi Stock Market and Japan Stock Market. South Korean Market is found exogenous in these results.

4. Conclusion

This paper focuses on integration among East Asian markets with reference to Pakistan. East Asian markets show poor integration except Japan and Pakistan and Japan and China. Impulse response function also proved the similar results and variance decomposition explained that only South Korean market is affected by its own performance. These results can be due to the geographical and trade associations. Pakistan and China have strong relations but there most of the trade is not subject to strong trade regulations. Japan has a strong impact on these markets due to strong build up of trade and trade regulations.

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