
Research

STOCK MARKET COINTEGRATION: EVIDENCE FROM DEVELOPED AND DEVELOPING EQUITY MARKETS

Waqas Siddique¹, Muhammad Usman Arshad², Muhammad Sufian³
Sohail Aslam⁴ & Fahad Najeeb Khan⁵

Abstract

This study examined the relationship between KSE and stock markets of developed and developing countries for the period of 2000-2012. Cointegration approach showed that one cointegration equation exists in KSE and developed countries equity markets and two cointegration equations exist in KSE and developing countries equity markets case. Granger causality test showed a uni-directional relationship between KSE and developed and developing markets, and a bi-directional relationship with Taiwan's equity market. Variance decomposition analysis showed that most of the changes in KSE are due to its own dynamics in both the developed and developing markets. Correlation matrix shows that there is a weak or no correlation between the KSE and developed and developing countries so the benefit of diversification can be achieved by investing in KSE.

Keywords: Diversification, cointegration, developed markets, developing markets.

JEL Classification: G 100

1 Dept of Commerce, University of Sargodha Sub-Campus, Bhakkar, Pakistan

2 Dept of Commerce, University of Gujrat, Pakistan

3&4-Muhammad Ali Jinnah University, Islamabad, Pakistan

5 Dept of Business Administration, University of Sargodha Sub-Campus, Bhakkar, Pakistan

Introduction

The concept of portfolio diversification was presented by Markowitz (1952). He named it “the modern portfolio theory”. Later it gained a lot of popularity among investment field. He said that risk of portfolio could be minimized by selecting different assets that have low negative correlation. William Sharp (1960) further preceded this work by adding borrowing and lending opportunities. His work was called Capital Asset Pricing Model. Sharp said that only systematic risk is relevant and unsystematic risk could be diversified.

After 1975, when international market liberalization started, many countries government welcomed foreign investment in home-country. When there was less trade barriers for going into international market, markets of different countries began to link with foreign markets. Means one market changes started affecting other markets and one market began to lead or follow the other one. Risk can diversify by selecting those assets which have negative correlation, so first the investor makes portfolio diversification at the company level. If there is no benefit of diversification, he will go for industry level diversification and finally on economy level. So in order to make a well diversified portfolio, the investor must know the relationship among different stock market returns.

Today many countries are integrated into one economic body in order to promote and develop the financial markets of these countries in that specific region. European Economic Community (EEC), the European Free Trade Association (EFTA) and North America Free Trade Association are examples of these bodies. Apart from these associations there was another emerging body in Asia-pacific area. After very long negotiations when China became a member of WTO, it liberalized its economy, in order to compete and sustain in world economy. The financial crisis of 1997, had badly affected many Asian economies, but the situation got better with the passage of time, and when china liberalized its economy, foreign capital investments

increased due to becoming the member of WTO. Here it is evident that whenever a country relaxes its trade policies and investment strategy, that country and region surely gains the benefits of these policies. Similarly, Hong Kong also benefited from Chinese liberalized economy, as it's a part of China's Territory, and investors and manufacturers of Hong Kong have started to sell their goods in massive Chinese markets. The same is the case with Taiwan, when it became a member of WTO in 2002, after seeing China getting benefits of liberalization, gained many benefits by opening its markets to the world. There is a concept of "Asian economic integration" which is called "Chinese Economic Area" includes Hong Kong, China and Taiwan. In this economic area researchers have practically observed that many MNC's of Chinese economies have benefited from this CEA. But despite this CEA, every country knows that China is playing a leading role in the world financial markets, and Hong Kong, Taiwan also know it is difficult to dominate China, but still no one can reject the fact that these countries relationships are getting closer and this integration would benefit these three countries for sure.

While investing in other countries or getting inflow of investments in home country, there exist some barriers to foreign institutional investors. Like political barriers, international restrictions on trade, quotas, economic barriers, demographic barriers, cultural barriers, import/export duties barriers. But some countries, in order to attract foreign investment, relax in tax matters. For example, say tax department may make a condition that every institutional investor will be exempted from tax, during the first 5 years of investment. And similarly to make investments unattractive government may impose a condition on foreign institutional investor that after 5 years of working the project will have to be sold/ handed over to local business community. So minimizing these barriers will definitely bring fruitful results, but there are some drawbacks also, of relaxing too much in these policies.

The historical perspective of Regulation and Deregulation

A brief historical perspective of regulation and deregulation is described here so that liberalization process may become clear. In the early 20th century, US financial markets were mostly unregulated and due to this a high volume of hypothetical activity triumphed. And this deregulation caused the stock market crash that terminated in 1929. This stock market crash diverted the attention towards regulation of the financial markets. Regulation of the financial markets has an underlying objective, which is to stabilize the markets and to help in the accumulation of inflow of capital. This stable financial sector means that credit is available to non-financial firms readily and at low costs. Then international financial system was also regulated, and an exchange rate system was introduced, called 'Fixed exchange rate system' due to this the value of the US dollar was fixed in order to provide stability in foreign trade and investment activities. The rate was fixed with the gold. These regulations and policies brought very fruitful results to economies and high figures of economic growth were achieved. However in 1970 a severe situation arose and inflation rates increased greatly, which led the economies to the period of depression and finally fixed exchange rate system was abolished. All these conditions led towards neoliberalism, which aimed to provide capital to non-financial sector and to increase the profitability of this sector. After this a steady deregulation of industries started and in 1978 the Airline Deregulation Act came into existence and process of deregulation started, in this process many monopolies which were developed by large firms were broken. In 1979 interest rates were increased by the new appointee at Federal Reserve which had a very bad impact on investments and ultimately unemployment increased drastically. Although financial sector did make an effort to deregulate the policies in the 1930s and 1940s but the process of deregulation started in the 1970s. The finance side of the economy was liberalized and so many financial novelties were introduced. By ending up the fixed exchange rate system, an uncertainty regarding the value of currency raised, which in turn became the source of introducing the financial derivatives in the market. Interest rates policies were

established and international diversification was allowed to institutional investors, by the “Modernization Act of 1999”. After these regulations and deregulations many Acts regarding investment, interest rates and financial derivatives were presented.

After liberalization of markets, investor must know that where the best opportunity for diversification exists, because now one country crisis affect other countries markets, too. It is noteworthy that, relationship will be stronger among those countries markets which have trade relationships. So if countries maintain trade relationships with other countries, there will be more integrated markets.

The purpose of this study is to find out those markets which have no cointegration, because of liberalization cash flows of one market affects the cash flow of the other markets. If these markets are interdependent, there would be no benefits of diversification. It would be better to find out those markets which have no cointegration, so that if one market performs bad, other markets may not perform that badly and hence diversification will be useful in such situations.

The above discussion, suggest firmly to start diversification, by applying the Top-down approach. The investor should first make diversification at the economy level, then at industry level and finally at the company level.

Research questions

1. Is there any Cointegration of KSE with the major markets of developed and developing countries?
2. Is there any diversification opportunity among these markets?

Research objectives

1. To investigate the Cointegration among KSE with the major stock indices of developed and developing countries.
2. To identify the strength and direction of relationships between stock indices.
3. To identify the possibilities of any diversification opportunity among these markets.

Literature Review

Several empirical studies have focused on this issue but the authors have presented a review of some prominent studies in the following section.

Kamaralzaman and Samad (2011) examined the relationship between Malaysian and developed markets by applying the cointegration and granger causality test, and taking the monthly stock indices for 1996-2007. It was found that the Malaysian market is cointegrated with Japan, China, the U.S.A, the U.K, Australia, and Canada. Developed countries are in higher granger causality than developing countries.

Sharma (2010) examined the relationship between global stock markets by using cointegration test. It was found that market integration has increased significantly over the years with an international context.

Hassan (2008) checked the relationship among KSE and developed countries. Researcher took the data from 2000 to 2006 and applied the multivariate cointegration test. Result showed that there is a long run relationship among the markets. Pair-wise cointegration tests showed KSE is not integrated with the U.S, the U.K, Germany, Canada, Australia, and Italy but integrated with France and Japan.

Celyan and Dogan (2004) studied whether the stock markets of OIC countries are cointegrated or not, by using the Engle granger (1987) and dynamic OLS model. They used the period 1999 to 2004 and the sub period 1999 to 2001. Two pairs of countries Turkey and Egypt, Lebanon and Kuwait were found to be cointegrated. Results revealed that strength of relationship increase after September, 2011.

Tahir and Rehman (2009) examined the relationship between the U.S and selected Asian stock markets for the period 1996-2008. They used two approaches vector-auto regressive model and nonlinear Markowitz switching vector-auto regressive model. Results showed some lead-lag relationship between Hong Kong and Indian markets, and Hong Kong and Korean markets significantly affected the Malaysian market returns.

Halim and Nawawi (2010) investigated the relationship of Asian and the U.S market for the period (1988-2007) and applied the cointegration, unit-root test. They found that Malaysians and Singapore are interdependent markets to each other.

Sharma (2011) studied relationship between Asian emerging markets and the USA for the period (2002-2007). Researcher intended to find out if these markets offer diversification benefit. Researcher concluded that there exist significant relationship between emerging market and Asian stock market, highest positive correlation were found between the U.S.A, Singapore, and Philippines. There were also positive correlation among Malaysia and Philippines.

Subramanian (2008) checked the relationship of stock markets in Asia by using cointegration technique. Data was collected as daily stock indices of SSE, TSE, KRX, HKEX, and OSE from the period (2002-2008). Results reveal that the five markets are cointegrated. There exists the linear combination of these markets so they have long term equilibrium relationship. It means they are perfectly positively correlated.

Taimur (2011) investigated the U.S and 22 other developed and developing countries markets for the period (1999-2010) and run the techniques of Johnson and Gregory and Hensen. Results reveal that China, Malaysia and Australia were not cointegrated with the U.S market so they offered the diversification benefits.

Damber and Turan (2012) examined the integration in south Asian markets. They collected study data from 2006 to 2011. They used the cointegration approach pair-wise and then multivariate approach. They found no integration for South Asian markets. There was no evidence of co-movements among Pakistani and Indian markets and Pakistani and Nepalese markets

Significance of the study

This study will help individual investors, brokers and institutional investors to identify those markets where portfolio diversification is beneficial. Investors are so much conscious about their resource allocation. Diversification is the only way to minimize the risk and earn profit at a lower risk. So the objective is to identify negatively correlated markets. Further it will contribute to the literature in terms of developed and developing markets. So there would be more comprehensive results, and these will assist investors in deciding about which market they should enter for diversification.

Methodology

This study used monthly data of stock markets from developed and developing countries from January 2000 to December 2012. From developed countries the stock markets of the UK, the USA, Australia, China, and France and from developing countries Indonesia, Sri Lanka, Hong Kong Malaysia and Taiwan have been selected. From Pakistan

KSE has been selected as it is a major equity market. Returns of stock markets are calculated as:

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

R_t = Return for current period

P_t = Closing price at time t

P_{t-1} = Price at last time t-1

L_n = Natural log

Hypothesis

H_0 : There is no long-run relationship among KSE 100 index and developed countries' equity markets.

H_1 : There is long-run relationship among KSE 100 index and developed countries' equity markets.

H_0 : There is no long-run relationship among KSE 100 index and developing countries' equity markets.

H_2 : There is long-run relationship among KSE 100 index and developing countries' equity markets

Unit Root Test

It is necessary for cointegration test that all series should be stationary at the same order. On its basis, researchers decide about Johnson & Julious approach or ARDL approach. To check stationary of the data, researchers first used the Augmented Dickey Fuller (ADF) test at level of difference. We found that these were non-stationary. Researchers then tested these at 1st difference and series were stationary at the 1st difference. But the ADF test is very rigid, as it assumes that all series are independent to each other. So we also applied Phillip-Perron unit root test because it assume that to some extent series are dependent on each other. Once data become stationary at the same order then Johnson & Julious cointegration test can be

applied. Several researchers (Simpson & Evans, 2004; Al-Zalabani & Menon, 2012; Khan & Aslam, 2014) have used this technique empirically.

Johnson & Julious Cointegration test

This test is used to check the long-run relationship among the series and it can be applied only, if all series are stationary at the same order. It tells us about the existence of cointegration among the series. It does not explain the lead-lag relationship. We apply Granger causality test to check the lead-lag relationship if there exists cointegration among any two series. If all series are not stationary at the same order, then auto regressive distributed lag will be applied.

Granger Causality test

Granger causality test is used to identify the long-run relationship among two series. It tells us about the lead-lag relationship means which series leads the other series and which series follow the other. If one series leads and other follows, it will be called unidirectional relationship and if both series have lead-lag directions, it will be called the bidirectional relationship. It means both the markets are causing each other to move.

Impulse Response

This test finds out that if one market situation is changed, then how much is the impact on other market. Ono (2011) have used this technique empirically for oil prices shocks and stock markets in BRICs.

Variance Decomposition Test

Variance decomposition test tells us, that what percentage of change in market is due to its own characteristics, and what percentage of change is due to other markets. It is the division of variance among

different markets. By this the researchers come to know the actual variance that is due to other cointegrated markets. Ono (2011) also used this test for his empirical research.

Table 1:

Indices of the developed and developing countries markets

Country Name	Stock Market Name	Symbol
Pakistan	Karachi Stock Exchange	KSE
US	Standard & Poor's 500 Index	SP
UK	Financial Times Stock Exchange 100 Index	FTSE
France	Cotation Assistée en Continu 40 Index	CAC
China	Shanghai Stock Exchange Composite Index	SSE
Australia	All Ordinaries index	AORD
Canada	Toronto Stock Exchange	TSE
Developing countries		
Hong Kong	Hang Seng Index	HIS
Taiwan	Taiwan weighted Index	TW
India	Bombay Stock Exchange	BSE
Indonesia	Jakarta Stock Exchange	JKSE
Siri Lanka	Colombo Stock Exchange	CSE
Malaysia	Kuala Lumpur Stock Exchange	KLSE

Empirical Findings

Figure 1:

Trends in log of indices KSE and developed countries' equity markets

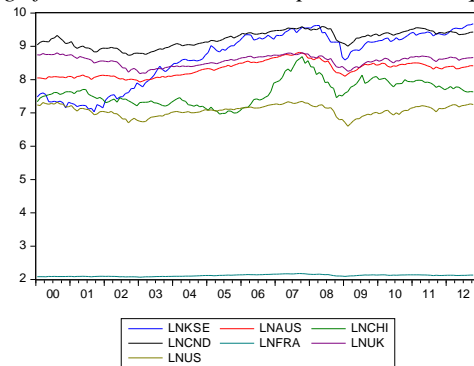
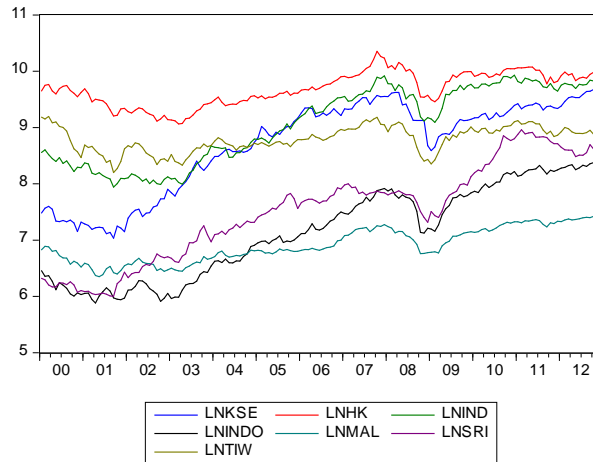


Figure 2:

Trends in log of indices KSE and developing countries' equity markets



In figure 1 and 2, trends and movements of logs of indices of developed and developing countries' equity markets have been shown. On x-axis, years are plotted. As study used monthly data from 2000-2012, so each point on x-axis has 12 points of index logs of each country equity market. On Y-axis, index logs of each country equity market have been plotted. Below the table colors have been defined with respect to country. There are various tests to examine the cointegration /co-movement between these indices. One of these techniques is a simple line graph in Eviews. By graphical representation it can be observed that KSE has co-movement with which country's equity market. These lines show over the time period movement. If at any point any line moves like KSE index line, and close to it, it means there exists cointegration between KSE and that specific equity market. But, to establish more concrete and solid arguments about this relationship, further tests of cointegration have been applied.

Table 2:
Descriptive Statistics (developed markets)

	L NRAUS	L NRCH	L NRCND	L NRFRA	L NRKSE	L NRUK	L NRUS
Mean	0.002644	0.002522	0.002468	-0.00285	0.014549	-0.00039	0.000145
Median	0.010622	0.00676	0.009691	0.010036	0.019439	0.005343	0.007103
Maximum	0.073643	0.242526	0.106249	0.125882	0.241114	0.083	0.102307
Minimum	-0.15088	-0.28278	-0.18552	-0.19225	-0.4488	-0.13954	-0.18564
Std. Dev.	0.038779	0.081473	0.045326	0.055345	0.084624	0.04232	0.046613
Skewness	-1.00883	-0.50986	-1.05954	-0.62203	-1.16273	-0.70051	-0.67431
Kurtosis	4.517108	4.419205	5.207001	3.618927	8.42674	3.665376	4.114007

Table 2 shows the descriptive statistics of the developed countries equity markets. The Study applied test on returns log. The Study finds that KSE is offering highest return with 0.0145 and with highest risk of 0.084624. We can say that it is the highly volatile market and the main reason behind this is the country unpredictable political conditions and law and order situation of Karachi. The Study found that Australian market is offering lowest risk and its return is highest after KSE return.

Table 3:
Descriptive Statistics (developing markets)

	L NRHK	L NRIND	L N RINDO	L NRKSE	L NRMAL	L NRSRI	L NR TIW
Mean	0.002436	0.008497	0.012351	0.014549	0.003905	0.014957	-0.00152
Median	0.010441	0.010187	0.022069	0.019439	0.009794	0.009815	-0.00072
Maximum	0.157634	0.248851	0.183417	0.241114	0.127032	0.225223	0.224201
Minimum	-0.25446	-0.27299	-0.3772	-0.4488	-0.16514	-0.17615	-0.21503
Std. Dev.	0.065971	0.074982	0.072698	0.084624	0.046439	0.07486	0.073316
Skewness	-0.62617	-0.46728	-1.13128	-1.16273	-0.5196	0.240481	-0.06599
Kurtosis	4.085357	4.085459	7.258468	8.42674	4.004455	3.360278	3.677116

Table 3 shows that with developing countries' equity markets, KSE is the highly risky with standard deviation (volatility) of 0.0846 and its return is 0.014549. Sri Lankan market is offering a return of 0.014957 with the standard deviation of 0.0786. It is offering less risk and higher return, than that of KSE.

Table 4:
Correlation Matrix (developed markets)

	LNKSE	LNRAUS	LNRCND	LNRFRA	LNRUK	LNRUS
LNKSE	1	0.275816	0.05906	0.228236	0.262541	0.213329
LNRAUS	0.275816	1	0.365157	0.745775	0.759809	0.771339
LNRCND	0.05906	0.365157	1	0.334381	0.273924	0.249525
LNRFRA	0.228236	0.745775	0.334381	1	0.718819	0.738146
LNRUK	0.262541	0.759809	0.273924	0.718819	1	0.885437
LNRUS	0.213329	0.771339	0.249525	0.738146	0.885437	1

Correlation matrix shows that KSE is weak positively correlated with the developed markets. This shows that there is almost no correlation of KSE and equity markets of developed countries. It is attractive for the investors. Australian market is highly correlated with Canadian, France, the UK and the US equity markets. In short, all developed markets are highly correlated with each other and all have weak positive relationship with KSE.

Table 5:
Correlation Matrix (developing markets)

	LNKSE	LNRI	LNRI	LNRI	LNRI	LNRI	LNRI
LNKSE	1	0.191466	0.230994	0.155115	0.123132	0.069628	0.226196
LNRI	0.191466	1	0.687314	0.564302	0.542641	0.264106	0.625895
LNRI	0.230994	0.687314	1	0.648882	0.505747	0.236533	0.550115
LNRI	0.155115	0.564302	0.648882	1	0.541041	0.235779	0.432617
LNRI	0.123132	0.542641	0.505747	0.541041	1	0.190516	0.578278
LNRI	0.069628	0.264106	0.236533	0.235779	0.190516	1	0.203334
LNRI	0.226196	0.625895	0.550115	0.432617	0.578278	0.203334	1

Table 5 shows that KSE has weak positive relation with the developing countries' equity markets or it has no correlation and Indian, Indonesian and Malaysian markets are significantly correlated but weak positively correlated with the Sri Lankan equity market.

Table 6:
Unit Root Analysis (Developed countries)

	ADF LEVEL	ADF 1ST DIFF	PP LEVEL	PP 1ST DIFF
AUS	-1.507067	-10.17947	-1.59463	-10.42591
CHINA	-1.442474	-6.770029	-1.95389	-12.06377
CANADA	-1.38093	-9.860879	-1.49162	-10.47606
FRNCE	-1.502936	-10.23295	-1.59032	-10.47606
UK	-1.817583	-11.77145	-2.04565	-11.83086
US	-2.034728	-10.68146	-2.1552	-10.76046
Critical value	-3.473672	-3.473672	-3.47367	-3.473672
	-2.880463	-2.880463	-2.88046	-2.880463
	-2.576939	-2.576939	-2.57694	-2.576939

To run the cointegration test it is essential to check whether our all variables are stationary at the same level or not. In this case our all variables are stationary at the level. The study checks it by applying two methods, one is ADF and one is PP.

Table 7:
Unit Root Analysis (Developing countries)

	ADF(level)	ADF(1st diif)	PP(level)	PP(1st diiff)
Hong Kong	-1.145037	-10.68758	-1.360465	-10.6863
India	-0.374343	-11.25998	-0.535899	-11.363
Indonasia	-0.251955	-9.928132	-0.119505	-9.91312
Pakistan	-0.861245	-9.928132	-0.881425	-11.2469
Malaysia	-0.190182	-10.82603	-0.521465	-10.9145
Srilanka	-0.63197	-10.83025	-0.728297	-10.9551
Taiwan	-2.356299	-10.93243	-2.710731	-10.9985
Critical values	-3.472813			
	-2.880088			
	-2.576739			

Table 8:
Lag-length criteria (developed markets)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1506.592	NA	3.73E-18	-20.26475	-20.123	-20.2072
1	2750.759	2353.831	3.61E-25	-36.41567	-35.2816	-35.9549
2	2879.408	231.2195	1.24e-25*	-37.49200*	-	-
3	2924.602	76.95260*	1.32E-25	-37.44057	-34.3219	-36.1734
4	2957.908	53.55916	1.66E-25	-37.22849	-33.1175	-35.5582
5	2999.91	63.57031	1.89E-25	-37.13392	-32.0306	-35.0604
6	3025.554	36.38713	2.72E-25	-36.8183	-30.7226	-34.3416

Here AIC is found minimum on 2.

Before applying the Johnson & Julious test, proper lag-length must be selected. For this unrestricted VAR is estimated from 1 to 12 months. Proper lag-length is considered where AIC is found minimum. Results of this table are as above.

Table 9:
Lag-length criteria (developing markets)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	452.5228	NA	6.21E-12	-5.9403	-5.79981	-5.88323
1	1593.677	2160.586	2.94E-18	-20.5024	19.37839*	20.04573*
2	1643.318	89.35381	2.93E-18	-20.5109	-18.4035	-19.6547
3	1709.61	113.1388	2.35e-18*	-	20.74147*	-17.6506
4	1755.351	73.79439	2.50E-18	-20.698	-16.6236	-19.0427
5	1799.192	66.63817*	2.77E-18	-20.6292	-15.5714	-18.5744
6	1835.572	51.90268	3.44E-18	-20.461	-14.4196	-18.0066

Here AIC is found minimum on 3.

As the study consists of monthly data, so lag length 6 was put in selection criteria. Then AIC was found minimum on 2. So 1 2 was used in lag length specification.

Table 10:*Johnson & Julious Cointegration (developed market)*

Hypothesized		Trace	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None *	0.283675	138.9906	125.6154	0.0059
At most 1	0.200772	88.61383	95.75366	0.1401
At most 2	0.105779	54.7733	69.81889	0.4285
At most 3	0.092394	37.89109	47.85613	0.3068
At most 4	0.079576	23.25234	29.79707	0.2339
At most 5	0.053806	10.73133	15.49471	0.2285
At most 6	0.015637	2.379889	3.841466	0.1229

**MacKinnon-Haug-Michelis (1999) p-values

Cointegration analysis has been checked by the two methods, critical trace statistics, and second is maximum Eigen value test. Table 10 shows that there is only one series which is cointegrated at 5% significance level. Therefore, result provides the evidence of a long term relationship between KSE index and that of developed countries equity markets, so null hypothesis of no cointegration is rejected and alternate hypothesis (1) is accepted.

Table 11:*Maximum Eigen value test*

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.283675	50.37674	46.23142	0.017
At most 1	0.200772	33.84053	40.07757	0.2128
At most 2	0.105779	16.88221	33.87687	0.9262
At most 3	0.092394	14.63875	27.58434	0.7762
At most 4	0.079576	12.52101	21.13162	0.4971
At most 5	0.053806	8.35144	14.2646	0.3441
At most 6	0.015637	2.379889	3.841466	0.1229

**MacKinnon-Haug-Michelis (1999) p-values

It is confirmed through maximum Eigen value statistics that there is only one cointegrating series.

Table 12:

Johnson & Juselius Cointegration (developing markets)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.374455	178.7621	125.6154	0
At most 1 *	0.247682	107.4541	95.75366	0.0062
At most 2	0.156802	64.19547	69.81889	0.1294
At most 3	0.096707	38.2714	47.85613	0.2903
At most 4	0.06509	22.81174	29.79707	0.2554
At most 5	0.055405	12.58141	15.49471	0.1311
At most 6 *	0.025445	3.917626	3.841466	0.0478

**MacKinnon-Haug-Michelis (1999) p-values

As the study consists of monthly data, so lag length 6 was put in selection criteria. Then AIC was found minimum on 3. So 1 3 was used in lag length specification in case of developing equity markets. By applying trace statistics, the study found that there are two series which are cointegrated at the 5% significance level. Therefore, result provides the evidence of a long term relationship between KSE and that of developing countries' equity markets, so null hypothesis of no cointegration is rejected and alternative hypothesis(2) is accepted.

This table confirms our result by applying maximum Eigen value test that there are two cointegrating series at 5% significance level.

Table 13:
Maximum Eigen value test (developing markets)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.374455	71.30802	46.23142	0
At most 1 *	0.247682	43.2586	40.07757	0.0212
At most 2	0.156802	25.92407	33.87687	0.3254
At most 3	0.096707	15.45966	27.58434	0.7111
At most 4	0.06509	10.23033	21.13162	0.7227
At most 5	0.055405	8.663786	14.2646	0.3152
At most 6 *	0.025445	3.917626	3.841466	0.0478

Table 14:
Pair-wise Granger Causality test for KSE (with developed markets)

Null Hypothesis:	F-Statistic	P-value	Inferences
AUS does not Granger Cause Pak	3.85495	0.0109	Unidirectional
Pak does not Granger Cause AUS	1.68315	0.1732	
CH does not Granger Cause Pak	7.11989	0.0002	Unidirectional
KSE does not Granger Cause CH	0.28811	0.8339	
CND does not Granger Cause Pak	2.07904	0.1056	Unidirectional
Pak does not Granger Cause CND	2.53069	0.0595	
FRA does not Granger Cause Pak	0.85782	0.4646	Unidirectional
Pak does not Granger Cause FRA	2.61335	0.0535	
UK does not Granger Cause Pak	1.38695	0.2492	Unidirectional
Pak does not Granger Cause UK	2.99362	0.0329	
US does not Granger Cause Pak	2.64788	0.0512	Unidirectional
KSE does not Granger Cause US	3.44377	0.0184	

Results indicated that Australian equity market granger causes KSE, but KSE does not granger causes AORD index. Flow of information is from Australian equity market to KSE. Thus it is unidirectional relationship means AORD moves first, and KSE follows. Chinese market granger causes KSE, but KSE does not granger causes Chinese equity market. It has unidirectional relationship with all other developed markets.

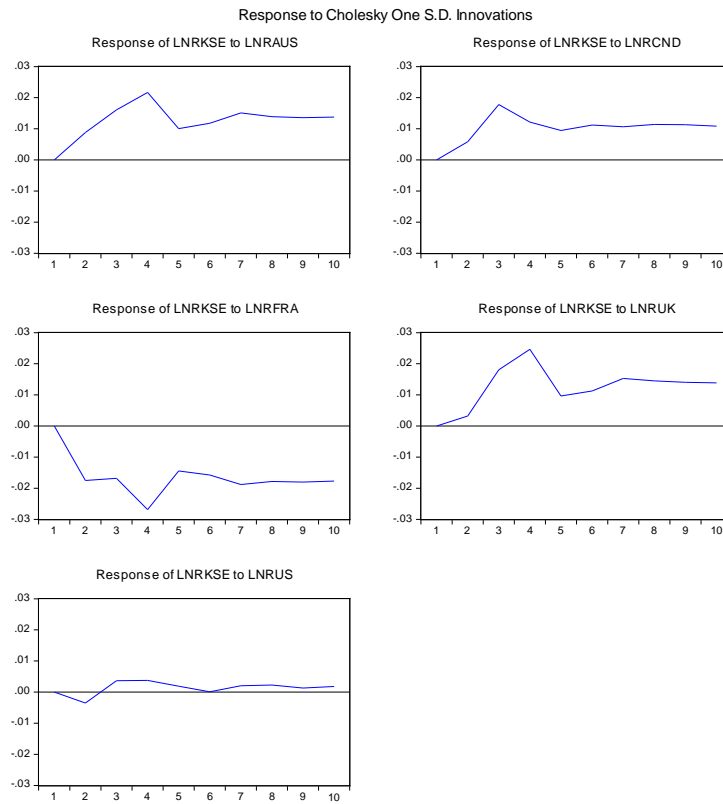
Table 15:

Pair-wise Granger Causality test for KSE (with developing markets)

Null Hypothesis:	F-Statistic	P-value	
HK does not Granger Cause Pak	3.77627	0.012	Unidirectional
Pak does not Granger Cause HK	2.50552	0.0615	
IND does not Granger Cause Pak	5.47339	0.0014	Unidirectional
Pak does not Granger Cause IND	1.22824	0.3017	
INDO does not Granger Cause Pak	7.40028	0.0001	Unidirectional
Pak does not Granger Cause INDO	1.72893	0.1637	
MAL does not Granger Cause Pak	9.01023	2.00E-05	Unidirectional
Pak does not Granger Cause MAL	3.31442	0.0218	
SRI does not Granger Cause Pak	4.54527	0.0045	Bidirectional
Pak does not Granger Cause SRI	4.04003	0.0086	
TIW does not Granger Cause Pak	4.14616	0.0075	Bidirectional
Pak does not Granger Cause TIW	4.59223	0.0042	

Results of this test shows that KSE has unidirectional relationship with Honk Kong, India, Indonesia and Malaysian equity markets. But it has bidirectional relationship with Taiwan and Siri Lankan equity markets.

Impulse Response Function (developed markets)



Impulse Response Function (developing markets)

Through this test we came to know that if there is one standard deviation (S.D) change in one variable than how much S.D change will occur in other variable. The following figures show the response of KSE with the major markets of the developed countries. To apply impulse response function, we applied VAR, and put lag intervals 1 3, as already selected by AIC then applied impulse response function for 10 periods.

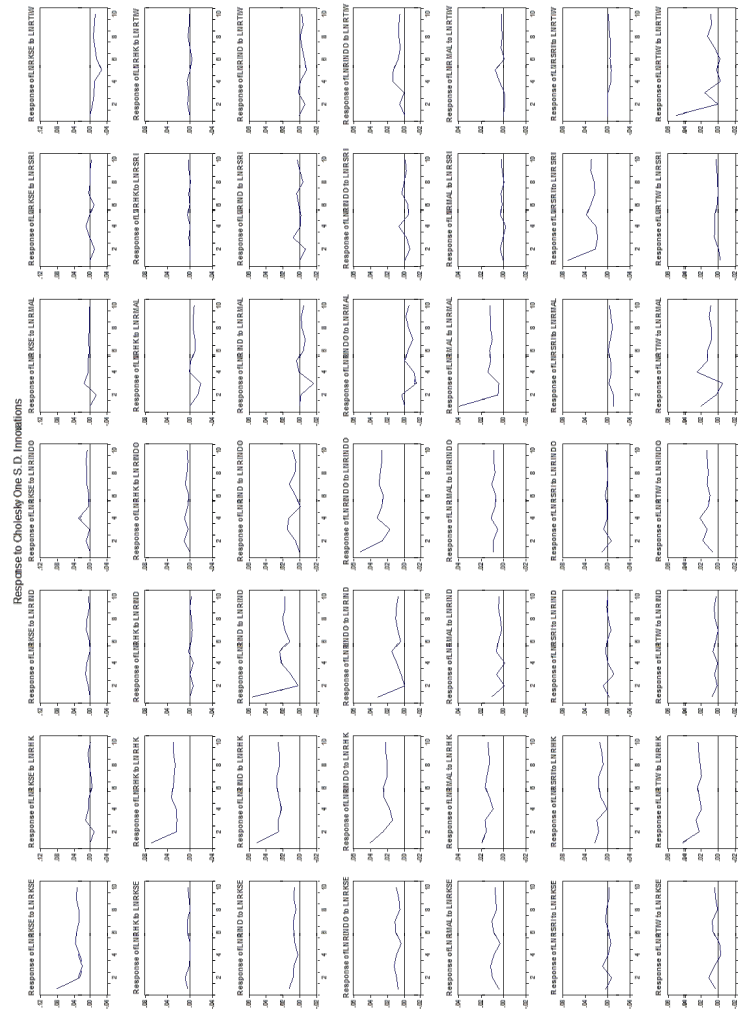


Table 16:
Variance Decomposition (developed markets)

Period	S.E.	LNRKSE	LNRAUS	LNRCH	LNRCND	LNRFRA	LNRUK	LNRUS
1	0.081283	100	0	0	0	0	0	0
2	0.08658	93.96591	0.669714	0.058176	1.096864	3.877483	0.026742	0.305112
3	0.097882	74.37841	3.073606	10.38846	3.549283	5.970479	2.222912	0.416849
4	0.107816	65.3003	5.688028	8.56293	4.367939	11.59783	3.889068	0.593912
5	0.114149	63.80778	5.509702	9.584832	5.062429	11.68092	3.768079	0.586264
6	0.119775	63.09752	5.874784	9.692393	5.240852	11.90473	3.613657	0.576066
7	0.125068	61.03303	6.348251	9.414273	5.529329	13.2974	3.849381	0.528342
8	0.130683	59.04313	6.621199	9.790082	6.112684	13.86421	4.070386	0.498314
9	0.135695	57.89476	7.018872	9.693363	6.311913	14.46394	4.136534	0.480619
10	0.140624	56.86871	7.188811	9.782023	6.534315	14.96447	4.213918	0.447754

Cholesky Ordering: LNRAUS LNRCH LNRCND LNRFRA LNRKSE LNRUK LNRUS

Above results show that mostly the variation in KSE is due to its own changing behavior and the other small change is due to changes in other developed countries. The study also found that this effect from other markets increasing as the time period passes on.

Table 17:
Variance Decomposition (developing markets)

Period	S.E.	LNRKSE	LNRHK	LNRIND	LNRINDO	LNRMAL	LNRSRI	LNRTIW
1	0.082099	100	0	0	0	0	0	0
2	0.090012	92.75492	1.193875	0.192291	1.017665	2.853452	1.50311	0.484683
3	0.094684	87.55039	2.320688	1.48526	0.922588	4.781708	1.361603	1.577759
4	0.103598	80.24114	2.058093	1.733602	7.491507	4.154242	1.982229	2.339192
5	0.113783	77.46464	1.749766	1.438362	6.287662	3.598899	1.648943	7.811727
6	0.120595	77.41981	1.706944	1.283472	5.634569	3.218154	2.088113	8.648934
7	0.125165	77.1549	1.620851	1.661042	5.58681	3.072881	1.993662	8.909855
8	0.129272	77.61846	1.537809	1.844072	5.529143	2.884849	1.872733	8.712936
9	0.134976	78.25899	1.527529	1.700749	5.532416	2.676753	1.717824	8.585736
10	0.1398	78.62482	1.43039	1.650808	5.368876	2.495458	1.652131	8.777511

Just like the developed countries it has been found that most of the change in KSE is from its own dynamic behavior and the contribution from the other developing countries' equity markets is small, but it is increasing as the time period increase.

Conclusion

This paper aims at finding the long-run relationship between KSE and developed countries' equity markets and developing countries equity markets. In developing economies the study took India, Malaysia, Taiwan, Sri Lanka and Indonesia. From developed economies the study took Australia, China, France, the UK, the US and Canada. Study took monthly data from 2000 to 2012.

In case of developed countries equity markets and KSE, descriptive statistics show that KSE offers the highest return of 14.5% with the highest risk of 8% whereas France and the UK equity markets offered negative returns. Among the developing countries equity markets and KSE, Sri Lankan market offers 14.9% return at a 7% risk and KSE provides 14.5% return with 8% risk. The Market of Taiwan provided negative return. Correlation of KSE with developed countries equity markets shows that KSE has weak or no correlation with developed countries equity markets. It tells that there exists diversification opportunities for the investors. In the correlation matrix of KSE and developing countries' equity markets, results reveal that KSE is weakly correlated with developing countries equity markets. But these markets have a moderate level of correlation among them. Because correlation has some limitations so to check long-run relationship, the study used Johnson and Juselius approach. Proper lag length was selected by AIC. To apply this test it is necessary that all series should be stationary at the same level, so the study applied unit root test. First the study used Augmented Dicky Fuller test (1979) and Phillips-Perron test. It confirmed that both the developed and developing countries equity markets are stationary at the 1st difference. Then the study applied Johnson & Juselius approach. The study found one cointegration equation in developed economies and two cointegration equations in developing economies.

Cointegration test was authenticated by further two tests. Trace statistics and max Eigen value. In both cases, trace statistics

confirmed the Johnson and Juselious approach and trace statistics results were confirmed by the maximum Eigen value test. All results of Johnson and Juselious approach were found to be correct. Granger causality tests with KSE and developed economies showed that KSE has unidirectional relationship with all developed countries' equity markets. Australian and Chinese equity markets granger cause KSE means information flows from these markets to KSE and KSE granger causes France, the UK and the US equity markets.

As with KSE and developing economies equity markets, Granger causality test results show that KSE has unidirectional relationship with the Hong Kong, Indonesia, India, Malaysia and Siri Lankan equity markets. It has bidirectional relationship with Taiwan equity market. Hong Kong, India and Indonesia granger causes KSE and KSE granger causes Malaysian equity market. And KSE granger causes Taiwan equity market, Taiwan equity market granger causes KSE, means information flows from both markets to each other.

Impulse response function indicates that how one equity market responds to the change in other equity market. On KSE with the developed equity markets study observed that shocks due to developed equity markets affected in short term and after that their effect removed from KSE. The Developing countries equity markets showed that the shocks of developing equity markets did not remain for a long time in the KSE.

When the study applied variance decomposition test on developed equity markets with KSE, the results showed that almost 94% change in KSE is due to its own innovation and shocks and the remaining change was due to other developed equity markets. With the developing equity markets study found that about 90% variance in KSE is due to its own dynamics and remaining change is due to other developing equity markets.

References

- Kamaralzaman, S & Samad, M. (2011). A Cointegration analysis between Malaysian and developed markets. *International conference on economics and business information*, 9.
- Sharma, G. D. (2010). Are the global stock markets interlinked? *Global journal of Management and Business Research*, 10(1), 29-40.
- Tahir, M., & Abdul-Rehman, R. (2009). Modeling the relationship between the US and selected Asian stock markets. *World applied science journal*, 7(11), 1412-1418.
- Imtiaz, M., & Hassan, A. (2011). Are the major south Asian equity markets cointegrated? *International journal of humanities and social sciences*, 1(12), 117-121
- Hussain, S., & Sabir, H. (2013). Inter dependence of South Asian and developed stock markets and their impact on KSE Pakistan. *Asian Economic and Financial Review*, 3(1), 16-27.
- Zhao, Y., & Zhang, Y. (2010). Study on openness of Chinese stock market comparing with mature markets. *International Journal of Trade Economics and Finance*, 1(1), 114-120.
- Keung, W., & Penm, J. (2004). The relationship between stock markets of major developed countries and Asian emerging markets. *Journal of Applied Mathematics and Decision Sciences*, 8(4), 201-218.
- Sharma, P. (2011). Asian emerging economies and United States of America Do they offer a diversification benefit. *Australian Journal of Business and Management Research*, 1(4), 85-92.
- Subramanian, U. (2008). Cointegration of stock markets in East Asia. *European Journal of Economics, Finance and Administrative Sciences*, 14, 84-92.
- Hassan, A., & Sallem, H. (2008). Long run relationship between an emerging equity markets and equity markets of developed words an empirical analysis of Karachi stock exchange. *International Research Journal of Finance and Economics*, 16(1), 52-62.
- Yang, J., & Hsiao, C. (2006). Emerging crisis and stock market linkages. *Journal of applied econometrics*, 21(6), 727-744.

- Phuong, T., & Daly, K. (2012). Long-run relationship among the south Asian equity markets. *International Conference on Economics Trade and Development*, 36.
- Ali, S., & Z.butt, B. (2011). Co-movement between emerging and developed stock markets. *World Applied Science Journal*, 12(4)395-403.
- Bhunia, A. (2012). Financial market integration: Empirical evidence from India and selected southasian countries. *International Journal of Scientific and Engineering Research*, 3(3), 1-6.
- Hussain, H. (2012). Long-run relationship among East Asian equity markets and KSE100 Index. *Management Science Letters*, 2.
- Simpson, J. and Evans, J. (2004). Interdependence in Gulf Cooperating Stock Markets. *Working Paper Series of the University of Wollongong in Dubai, U.A.E.*
- Al-Zabani, A, M., & Menon, S, S. (2012). Cointegration of the Saudi Arabian stock market with other markets from emerging and developed economies. *Pakistan Business Review*. 615-630.
- Khan, S, N., & and Aslam, M, S. (2014). Cointegration of Karachi Stock Exchange with Major South Asian Stock Exchanges. *International Journal of Accounting and Financial Reporting*, 4(1), 2162-3082.
- Ono, S. (2011). Oil price shocks and stock markets in BRICs. *The European Journal of Comparative Economics*, 8(1), 29-45.