

Co Movements and Inter-Linkages among Emerging and Developed Stock Markets in Asia with Reference to Singapore Stock Exchange

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Abstract

The study of Inter-Linkages, Co Movement and Causal Relationship among emerging stock market indices returns and developed stock market index in Asia. Asian stock markets attract huge inflows of portfolio investments which promote the economic development in the continent. The favorable regulatory changes and technological advancement have brought about significant changes in the Asian emerging markets. The purpose of the study is to make a better-quality point with respect to Inter Linkages, Co Movements and Causal relationship among the Emerging Stock Market returns and Developed Stock Market (Singapore - Straits Times Index) in Asia. This study was based on secondary daily time series data for a period of 12 years from 1st January 2002 to 31st December 2013. Statistical tools like Descriptive Statistics, Unit Root, Correlation Matrix, Linear Regression Model and Granger Causality Test were employed. The findings of this study would help the investors in making efficient investment decisions in the indices of emerging stock markets in Asia.

Keywords: Asian Emerging Stock Markets, Causal Relationship, Co Movements, Correlation Matrix, Descriptive Statistics, Granger Causality, Inter – Linkages, Unit Root Test, Singapore Stock Market Index.

JEL Classification: G15; G17; N25; P34

1. Introduction

Inter – Linkages, Co Movements and Causal Relationship among the emerging and developed stock markets have naturally constituted a fertile field for international financial research. A large number of Asian markets have launched a series of reforms in the last few years, including the modernization and liberalization of their markets⁴. The impact of these reforms is bound to be felt in the later stages of liberalization. At the same time, the international investors do take some time to formulate their investment decisions, taking into account the impact of such reforms on the country's fundamentals. Major aggressive reforms have been introduced in the emerging markets from 20th century (**Eiji Fujii, 2005**). The research study on the implications of reforms may improve the level of pricing efficiency and would help the present as well as the potential foreign investors to reap the gains from international portfolio diversification. The present research examines the Inter – Linkages, Co Movements and Causal Relationship of emerging stock market indices over a long period of time. The study of this nature would facilitate a comparison of the results of emerging markets with developed markets in Asia.

1.1. Emerging Stock Markets

In 1988, the Morgan Stanley Capital International (MSCI) launched the first comprehensive emerging markets index. Since then, emerging markets Index has become an important and integrated part of a global equity portfolio allocation. It is to be noted that there were just 10 countries in the MSCI Emerging Markets Index, representing less than 1% of world market cap. Today, the MSCI Emerging Markets Index covers over 800 securities across 21 markets and represents approximately 11% of world market cap.⁵ Any research study using MSCI emerging markets index is the need of the hour and would help all the stakeholders in general and investors in particular. The list of emerging markets is given in **Figure - 1**.

Figure 1: List of Emerging Markets (Regional wise) in the World

Americas ⇓	Europe, Middle East & Africa ⇓	Asia ⇓
1) Brazil	1) Czech Republic	1) China
2) Chile	2) Egypt	2) India
3) Colombia	3) Greece	3) Indonesia
4) Mexico	4) Hungary	4) Korea
5) Peru	5) Poland	5) Malaysia
	6) Russia	6) Philippines
	7) South Africa	7) Taiwan
	8) Turkey	8) Thailand

Source: <http://www.msci.com>

Figure 1 shows the list of emerging stock markets in the world, as identified by MSCI. According to the criteria adopted by the Morgan Stanley Capital International (MSCI), the world emerging stock markets are grouped into three categories -Americas, Europe, Middle East & Africa and Asia. It is clear that there are five markets in America, eight markets in Europe and Middle East & Africa continents and eight markets in Asian continents. The present study used only eight emerging markets of Asian region, namely, Shanghai Stock Exchange Composite Index (**China**), NSE Nifty (**India**), Jakarta Composite Index (**Indonesia**), Kospi Index (**Korea**), KLSE (**Malaysia**), Philippine stock Index (**Philippines**), TSEC weighted Index (**Taiwan**), and SET Index (**Thailand**). In addition, one developed market, namely, Straits Times Index (**Singapore**) was also selected.

⁴ Emerging markets: A 20 –year’s perspectives – 2008 MSCI Barra.

⁵ http://www.msci.com/products/indices/country_and_regional/em/ retrieved on 02.02.2014

2. Review of Literature

An attempt has been made to review the earlier research works undertaken in the area of emerging Asian stock markets to understand research gaps, tools used and findings of earlier studies.

S. No	Authors and year	Period of the Study	Tools used for Analysis	Samples and Inputs	Findings of the study
1	Orawan Ratanapakorn and Subhash C. Sharma (2002).	Daily data from January 1, 1990 to March 30, 2000.	Unit Root Test (ADF and PP), Co integration, Granger Causality and Vector Error Correction Model (VECM).	USA – S&P 500 Index, European Index, Asian–Pacific index, Latin American index and Eastern European–Middle East index.	The short-term and long-term relationships were investigated in five regional stock indices during the pre-Asian crisis (January 1, 1990 to December 31, 1996) and Asian crisis (July 2, 1997 to March 10, 2000) periods. It is found that the US stock market was the most influential one among regional markets during the study period.
2	Gong-meng Chen, Michael Firth and Oliver Meng Rui (2002)	From 1st February, 1995 to 30 th June, 2000.	Descriptive Statistics, Autocorrelation, Correlation, Unit Root Test, Co Integration Test and (VECM).	Brazil, Mexico, Chile, Argentina, Colombia and Venezuela.	This research investigated the behavior of stock prices in six major Latin American stock exchanges using univariate and multivariate approaches. It is found that investing in various Latin American stock markets offered limited risk diversification until 1999.
3	Bang Nam Jeon and Beom-Sik Jang (2004).	From July 1, 1996 and ending February 9, 2001	Unit Root Test, Vector Auto Regression Model (VAR), Vector Error Correction Model (VECM), Correlation Matrix and Co Integration.	US – S&P 500 Index and Korea – Korea Composite Stock Price Index.	This paper investigated the interrelationships between stock prices in the United States and Korea. It is found that the US stock market played a leading role over the Korean market at every level of aggregation. The reverse direction of influence from Korea to the US, was found to be minimal.
4	Eiji Fujii (2005)	From January 1, 1990 to November 14, 2001	Descriptive statistics, Correlation Matrix, Residual Cross-Correlation Function Tests, AR-GARCH Models, Intra-Regional Causality Test,	Hong Kong, Malaysia, Philippines, Thailand, Argentina, Brazil and Chile.	This study examined the causal linkages among several emerging stock markets in Asia and Latin America using the daily observations of their stock indices. It is found that there are indeed considerable causal interactions across the emerging stock markets. Within each region as well as across the two regions, the markets appeared to become more interdependent on each other.
5	Ming-Shiun Pan, Robert Chi-Wing Fok and Y. Angela Liu (2007)	From January 1988 to October 1998.	Granger Causality Test, VAR, Unit Root Test, Multivariate Cointegration Test and Pairwise Granger Causality Tests.	Hong Kong, Japan, Korea, Malaysia, Singapore, Taiwan, and Thailand.	This study examined the dynamic linkages between the foreign exchange and stock markets of seven East Asian countries, including Hong Kong, Japan, Korea, Malaysia, Singapore, Taiwan, and Thailand. The findings indicated that the linkages could vary across economies with respect to exchange rate regimes, the trade size, the degree of capital control, and the size of equity market.
6	Claudio Morana and Andrea Beltratti (2008)	Period 1973–2004	Conditional Correlations and Linkages between correlation and volatility.	Closing price index returns for Germany, Japan, the US and the UK.	This paper examined the linkages across stock markets from several perspectives. Evidence of strong linkages across markets, as measured by comovements in prices and returns and in volatility processes, has been found.

7	Jarl Kallberg and Paolo Pasquariello (2008)	From January 5, 1976 and December 31, 2001	Descriptive Statistics and Regressions Analysis.	82 industry indexes in the U.S. stock market.	This research study empirically investigated the excess co movement among 82 industry indices in the U.S. stock market between January 5, 1976 and December 31, 2001. It is found that excess square correlation was positively related to the dispersion and copiousness of analysts' earnings forecasts and negatively related to market volatility.
8	Leo Chan (2008)	From January 1991 to July 1997, and January 1999 to May 30, 2006	Summary Statistics and Causality Test.	Hong Kong and US financial markets.	This research examined the change in the dynamic causal relationships between Hong Kong and US financial markets after the Hong Kong handover (and Asian Crisis) across spectral frequency band. It is found that there was relationship between country's openness and capital market interactions. It is suggested that portfolio managers must distinguish short run factors and long run factors while making capital allocation decisions.
9	Lee K. Lim (2009)	From 1990 to 2008.	Summary statistics, Correlation matrix, Granger causality test, Converging trend, Co integration method and VAR.	Association of Southeast Asian Nations' (ASEAN) five countries, namely Indonesia, Malaysia, the Philippines, Singapore and Thailand.	This paper examined the dynamic interdependence and long-run relationships between the ASEAN-5 stock markets. The convergence of all ASEAN-5 market indices was not supported, except for convergence in two pairs of ASEAN-5 markets over the sample period.
11	Zeynel Abidin Ozdemira, Hasan Olgun and Bedriye Saracoglu (2009)	From 1 st January, 1985 to 24 th March 2006.	Unit Root Test, Multivariate Co Integration Test and Pair wise Granger-Causality Test.	Argentina, Brazil, Chile, China, Indonesia, Malaysia, Mexico, Peru, Philippines, Singapore, South Korea, Taiwan, Thailand, Turkey, Venezuela and USA.	This study examined the dynamic linkages between the equity markets of a center (the US) and its periphery (emerging markets). This study showed a significant causal relation between S&P500 and all emerging stock markets. This indicates that a kind of center - periphery relation existed in international stock markets.
12	Shamila A. Jayasuriya (2011)	From November 1993 to July 2008.	Summary Statistics and Vector Autoregression (VAR) model,	Four emerging markets of China, Thailand, Indonesia and Philippines	This research was to identify inter linkages of stock return behavior between China and three of its emerging market neighbors in the East Asia and Pacific region. It is to be noted that a common group of investors actively trading in international equity markets may be a likely determinant to financial integration across markets.
13	Cristiana Tudor and Carmen Popescu – Dutaa (2012)	From January 1997 to March 2012.	Descriptive Statistics and Granger Causality Tests.	Australia, Canada, France, Hong Kong, Japan, United Kingdom, and United States (developed) and Brazil, China, India, Korea, Russia and South Africa (emerging markets).	This study investigated the issue of Granger causality between stock prices and exchange rates movement for developed and emerging financial markets. It is found that the equity market and the evolution of the exchange rate were two interactive time series in the case of Korea.

14	Murugesan Selvam et al. (2013)	from 01/07/2005 to 30/06/2013	Descriptive Statistics, Pearson Correlation, Granger Causality and Graphical Exposition.	USA (Developed Country) and India (Developing Country) the SMALL CAP, MIDCAP and major index of both India and USA were taken.	This study covered the stock market integration of sample SMEs Indices of India and USA. The results of Granger Causality indicate unidirectional GC running from the US stock markets (DJ Small Cap Index, DJ Midcap Index and DJIA) to Indian stock market (CNX Midcap, CNX Small Cap and NSE Nifty index). It is to be noted that small and mid cap stocks had produced superior returns over long periods of time during the study period.
15	Chaker Aloui and Besma Hkiri (2014)	Periods from 2005 to 2010.	Descriptive statistics, Wavelet , wavelet squared coherence Test, Unconditional cross correlation and VAR.	Gulf Cooperation Council (GCC) (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE)	This study examined the short term and long term dependencies between stock market returns for the Gulf Cooperation Council (GCC) Countries. It is found that co-movement depends on both frequency and time and it is strongly affected by the occurrence of financial crisis.
16	Tomoe Moore and Ping Wang (2014)	From January 1973 to December 2006.	DCC–GARCH model and time-varying correlation	Indonesia, Malaysia, South Korea, Philippines, Singapore and Thailand, (Asian emerging markets), Australia, Canada, Japan and the UK (Developed Markets)	This study examined the determinants of the time-varying correlation between stock return differentials and real exchange rates for the six Asian emerging markets and the four developed markets. It is found that there was significant time-varying correlation between the two times series.

The review of earlier studies clearly reveals the fact that there was no comprehensive study exclusively covering the Inter Linkages, Co Movements and Causal Relationship between the emerging stock markets and developed market in Asia. A continued research on the subject could help the policy makers and Foreign Institutional Investors to easily identify the riskless Asian Market and their diversification strategy for investments. The present study takes a step ahead in the same direction. It is also an attempt to fill the time gap of researches on Inter – Linkage and Co Movements of emerging and developed Asian Stock Markets.

3. Statement of Problem

The emerging stock markets like Latin America and Europe have been extensively researched in the past. The stock markets of Gulf Region and emerging Asia and Africa have not attracted much attention of researchers. Among these three regions, the Asian Region has been considered as significant from the viewpoint of international portfolio diversification. A major question to be resolved while dealing with asset allocation is that among competing markets, to what extent these markets get influenced by other markets within the region. Countries like China and India, which till recently had limited trade and investment interests in most of the Asian countries, are expanding their economic ties with several countries in the region. Recent years have also seen greater cross-border acquisitions within Asian region. Against this background, an attempt has been made in this study to examine co-movements, inter-linkages and causal relationship among emerging and developed stock markets in Asia with reference to the Singapore Stock Exchange.

4. Need and Importance of the Study

This research is important on the grounds that Asia attracts huge volume of portfolio investments compared to other emerging markets in the region and it is home for some of the fastest growing economies, including India and China. Additionally, the continued reform efforts in emerging Asian economies, developments in information technology and market micro-structures have resulted in bringing the efficiency in the information transmission across the markets. Therefore, the assessment of linkage dynamics, co movements and causality of emerging and developed markets within the Asian region, with empirically proven data, is useful for international portfolio managers in making asset allocation decision. The capital market reforms increased the participation of foreign investors in Asia on the basis of economic fundamentals of emerging markets in Asia. There is a growing evidence of Inter Linkages and Co Movement of emerging Asian stock markets with developed Asian Stock Market. Hence it becomes imperative to assess the influence of local risk factors vis-à-vis global risk factors in the Asian Stock Market.

5. Objectives of the Study

The main objective of this study is to examine the Inter – Linkages, Co Movement and Causal Relationship among the emerging stock markets (China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand) and developed stock **market** in Asia, with special reference to Singapore.

6. Hypothesis of the Study

For the purpose of this study, following hypotheses were put to test.

- NH1:** There is no normal distribution among the Indices of Emerging and Developed Asian Stock Markets.
- NH2:** There is no stationarity among the Indices of Emerging and Developed Asian Stock Markets.
- NH3:** There is no co - relation between the Indices of Emerging with developed Asian Stock Markets.
- NH4:** There is no influence of the Indices of Emerging Asian Stock Markets on developed Singapore market, and
- NH5:** There is no causal relationship among the Indices of Emerging Asian Markets with developed Singapore Stock Market in Asia.

7. Methodology of the Study

7.1. Period of Study

For the purpose of examining the dynamic linkages and co movement among sample stock indices of selected emerging and developed markets in Asia, the study covered a period of 12 years from January 1, 2002 through December 31, 2013.

7.2. Sample Design

In order to examine the inter linkages and co movement between stock indices of emerging markets and developed market in Asia, the study focused on eight Asian Emerging Equity Markets as identified by the Morgan Stanley Capital International (MSCI) and one developed market (Singapore).

7.3. Data Variables and Data Sources

The study used daily returns data of the composite stock market indices of the respective emerging and developed stock markets of Asian countries. As pointed out earlier, the emerging equity market indices used in the study were – Shanghai Stock Exchange Composite Index (China), NSE Nifty (India), Jakarta Composite Index (Indonesia), Kospi Index (Korea), KLSE (Malaysia), Philippine stock Index (Philippines), TSEC weighted Index (Taiwan) and SET Index (Thailand). The index of one developed market i.e. Straits Times Index (Singapore) was used for comparison. The daily adjusted closing prices of each of the sample indices were collected from MSCI Emerging Market Database, Yahoo Finance database available online at www.finance.yahoo.com and website of National Stock Exchange (NSE). Finally, the daily stock market index return data were transformed by taking natural logarithm of the raw index return data.

Table 1: The Details of Sample Asian Countries and Sample Stock Market Indices

S. No	Sample Asian Countries	Name of the Sample Stock Market	Asian Sample Indices Name	Period of the Study	No of ob's	
Emerging Asian Markets	1	China	Shanghai Stock Exchange	SSE Composite Index (SSE)	1 st Jan 2002 -31 st Dec 2013	3046
	2	India	National Stock Exchange	S&P CNX Nifty	1 st Jan 2002 -31 st Dec 2013	2997
	3	Indonesia	Indonesia Stock Exchange	Jakarta Composite Index (^JKSE)	1 st Jan 2002 -31 st Dec 2013	2928
	4	Korea	Korea Stock Exchange	Korea Stock Exchange Index (KOSPI)	1 st Jan 2002 -31 st Dec 2013	2969
	5	Malaysia	Malaysia Stock Exchange	FTSE Bursa Malaysia (KLSE)	1 st Jan 2002 -31 st Dec 2013	2965
	6	Philippines	The Philippine Stock Exchange, Inc	Philippine Stock Index	1 st Jan 2002 -31 st Dec 2013	2937
	7	Taiwan	Taiwan Stock Exchange	TSEC Weighted Index (TWII)	1 st Jan 2002 -31 st Dec 2013	2966
	8	Thailand	Stock Exchange of Thailand	Thailand SET Index	1 st Jan 2002 -31 st Dec 2013	2934
Developed Markets	1	Singapore	Singapore Exchange	Straits Times Index	1 st Jan 2002 -31 st Dec 2013	3030

Source: Morgan Stanley Capital International (MSCI) <http://www.msci.com> retrieved on 03.01.2014

8. Tools Used for Analysis

The following tools were used for the analysis

- Descriptive Statistics (to find out the normal distribution of returns of Emerging Asian Markets)
- Unit Root Test (to test stationarity among the Sample Asian Markets)
- Correlation Matrix (to find correlation between the Sample Asian Stock Markets)
- Linear Regression Model (to test the impact of Emerging Markets on Developed Asian Markets)
- Granger Causality Test (to examine the Inter – Linkage among the Emerging and Developed Asian Markets)

The computation of data for this study was made by using E-Views (Version 6.0) and SPSS (Version 16.0).

9. Limitations of the Study

The study suffers from the following limitations.

- This study considered only nine indices (as identified by MSCI) of Asian countries (indices of eight emerging and one developed market).
- The study period was limited to 12 years i.e. from 1st January 2002 to 31st December 2013.
- All the limitations associated with statistical tools used, were also applicable to this study.

10. Analysis of Co Movements and Inter - Linkages among Indices of Emerging and Developed Stock Markets

The analysis of Co Movements, Inter Linkages and Causal relationship among the sample indices of Emerging and Developed Stock Markets in Asia is presented as follows.

- a) Movements of Emerging Market indices with developed market indices (Singapore) in Asia.
- b) Results of Descriptive Statistics among the indices of Asian emerging and developed markets
- c) Results of Unit Root Test among the indices of emerging and developed markets in Asia
- d) Results of Correlation among the indices of emerging and developed markets in Asia
- e) Results of Regression Test among the indices of emerging markets and Singapore Stock Market Index in Asia.
- f) Results of pair wise Granger Causality Test among the indices of emerging markets and developed Stock Market Index (Singapore) in Asia.

a. Movements of Emerging Markets with Index of developed Market (Singapore) in Asia

In order to study the movements of indices, the line chart was used. The movements of index of Singapore stock exchange was compared with all the eight indices of emerging markets separately.

Figure 2 shows the Inter- Linkages and Co Movements of indices of China and Singapore during the study period from 01st January 2002 to 31st December 2013. It is clear from the Figure that Shanghai Stock Exchange composite index (China) was fluctuating more highly than that of Singapore during the above period. However, the index of Straits Times Index (Singapore) earned better return than that of China from 2011 to end of the study period.

The Co Movements of Indices of India and Singapore during the study period from 2002 to 2013 are shown in **Figure 3**. The above two indices (S&P CNX Nifty and Straits Times Index) performed equally well from 2002 to 2008. But the Index of S&P CNX Nifty (India) highly moved upward from 2009 onwards. The Index of Straits Times Index (Singapore) also gradually moved up from 2009 to 2013. In other words, the performance of S&P CNX Nifty (India) earned higher return to the retail investors during the study period.

Figure 4 shows the co-movements of indices of Indonesia and Singapore during the study period from 2002 to 2013. It is to be noted that the index curve of Jakarta Composite Index (Indonesia) was below Singapore till 2008. Besides, it is clearly understood that there was no interrelationship between the indices of Singapore and Indonesia from 2009 onwards.

The co-movements of indices of Korea and Singapore during the study period from 2002 to 2013 are given in **Figure 5**. The performance of Korea Stock Exchange Index (KOPSI) was not highly volatile when compared to Singapore. It is clearly evident that the line of both indices registered similar patterns of movements throughout the study period.

Figure 6 illustrates the co-movements of indices of Malaysia and Singapore during the study period from 2002 to 2013. The growth level of FTSE Bursa Malaysia (KLSE) was not volatile when compared with the index of Straits Times Index (Singapore). But the both indices registered the same pattern of risk and return to the retail investors during the study period.

The co-movements of indices of Philippines and Singapore from 2002 to 2013 are given in **Figure 7**. It is clearly observed from the figure that there was interrelationship between both the indices of Philippine Stock exchange and Singapore Stock exchange up to 2011. From 2011 onwards, the indices of both markets moved in the opposite direction.

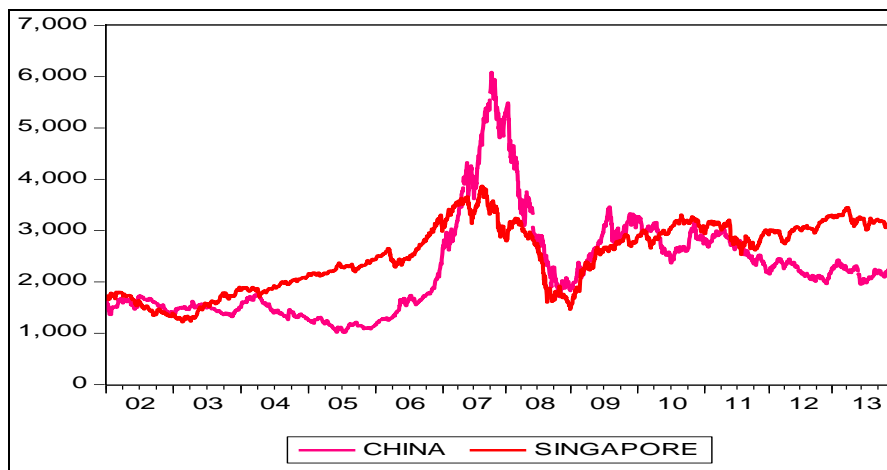
Figure 8 reveals the co-movements of indices of Taiwan with Singapore from 1st January 2002 to 31st December 2013. It is clearly evident from the Figure that both the indices (TSEC Weighted Index (TWII) and Straits Times Index (Singapore)) did not have interrelationship with each other during the study period. But TSEC weighted index (Taiwan) appeared to be highly volatile than the index of Singapore during whole study period.

The co-movements of indices of Thailand and Singapore during the study period from 2002 to 2013 are shown in **Figure 9**. It is understood that there was no interrelationship between Thailand SET Index and Singapore Straits Times Index (STI) during the study period. The index of Thailand SET was highly volatile when compared with Singapore (STI) index till 2008.

Figure 10 gives the movements for all the emerging eight indices of Asian stock markets during the study period from 2002 to 2013. All the eight sample indices performed equally well from 2006 to 2010. From 2007-2008, all the sample indices moved down together due to the Global Financial Crisis 2008.

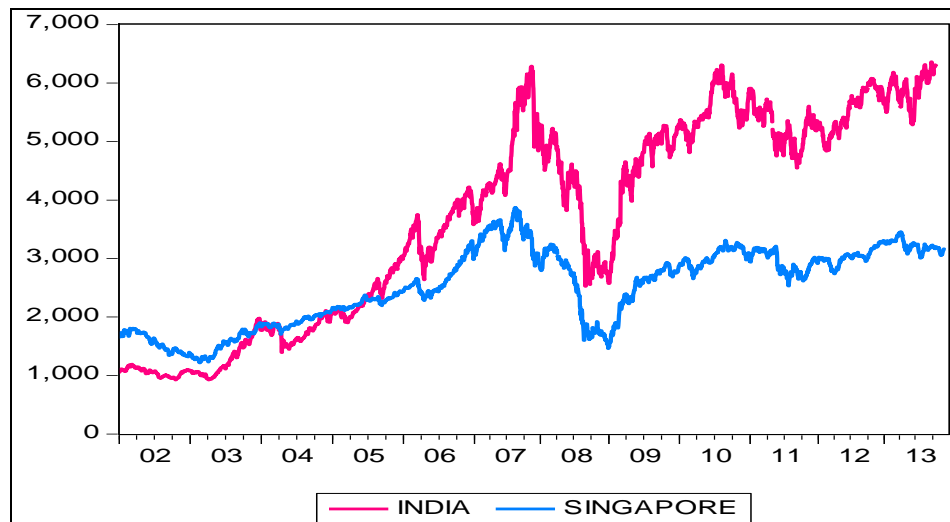
The movement of Straits Times Index (Singapore) from 2002 to 2013 is shown in **Figure 11**. It is clearly observed that the index of STI Singapore was highly volatile during the study period from 2006 to 2009. Therefore, the performance of Straits Times Index of Singapore assumed a low level of risk and return to the retail investors during the periods from 2002 to 2006 and from 2009 to 2013.

Figure 2: Co Movement of Indies of China and Singapore (From 2002 to 2013)



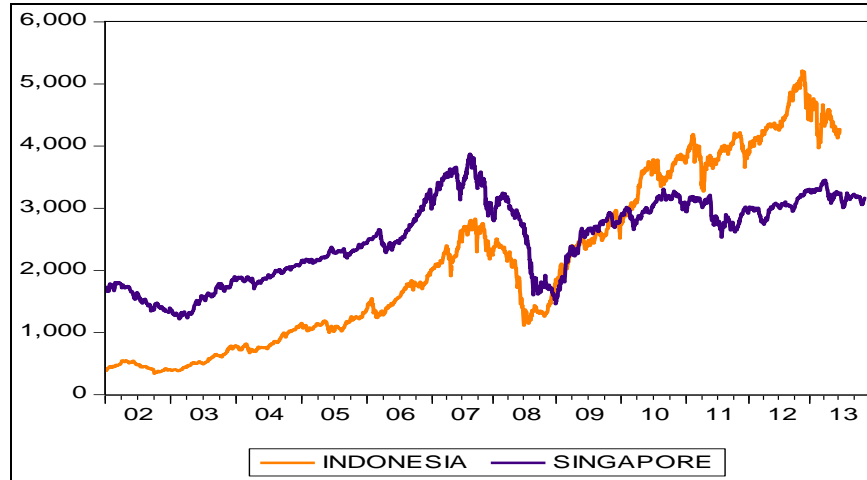
Source: Yahoo finance and computed using E-Views (Version 6)

Figure 3: Co Movement of Indies of India and Singapore (From 2002 to 2013)



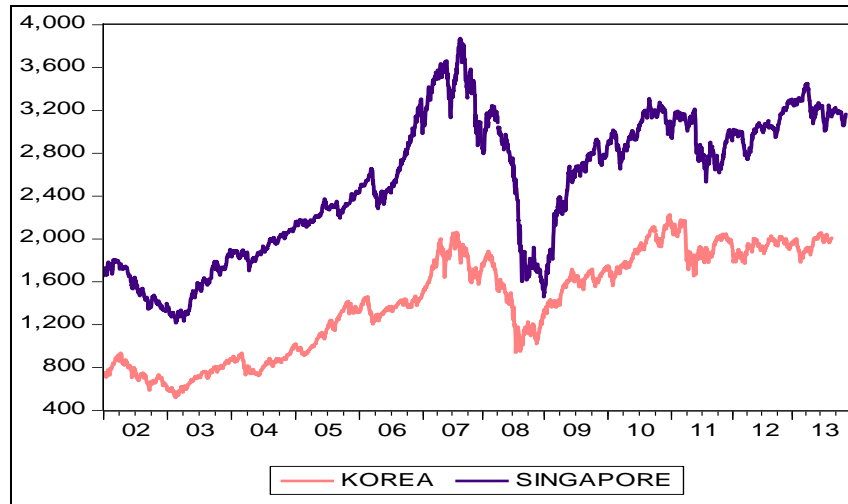
Source: Yahoo finance and computed using E-Views (Version 6)

Figure 4: Co Movement of Indices of Indonesia and Singapore (From 2002 to 2013)



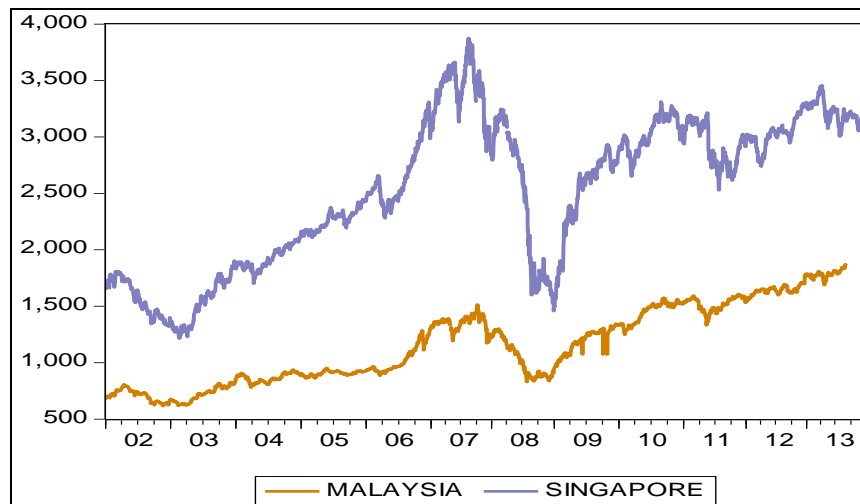
Source: Yahoo finance and computed using E-Views (Version 6)

Figure 5: Co Movement of Indices of Korea and Singapore (From 2002 to 2013)



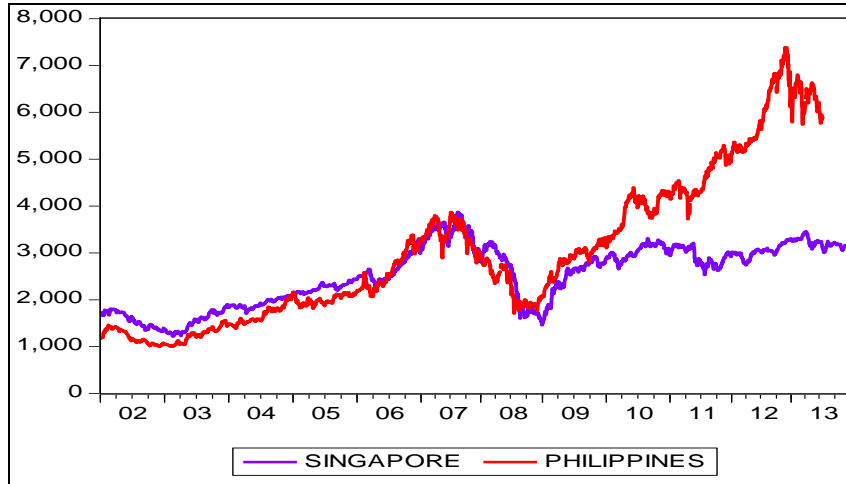
Source: Yahoo finance and computed using E-Views (Version 6)

Figure 6: Co Movement of Indices of Malaysia and Singapore (From 2002 to 2013)



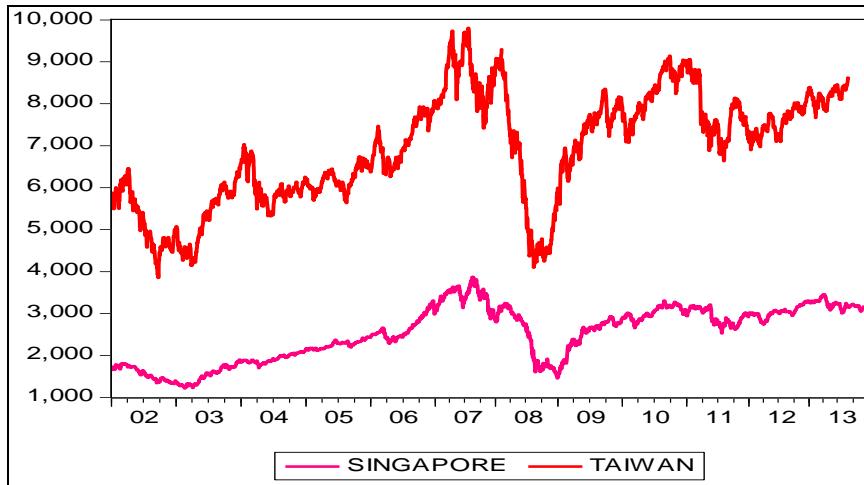
Source: Yahoo finance and computed using E-Views (Version 6)

Figure 7: Co Movement of Indices of Philippines and Singapore (From 2002 to 2013)



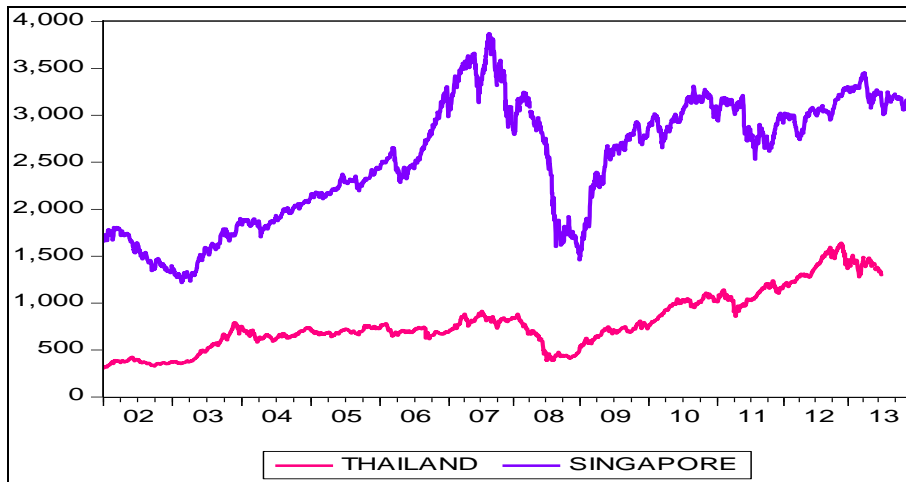
Source: Yahoo finance and computed using E-Views (Version 6)

Figure 8: Co Movement of Indices of Taiwan and Singapore (From 2002 to 2013)



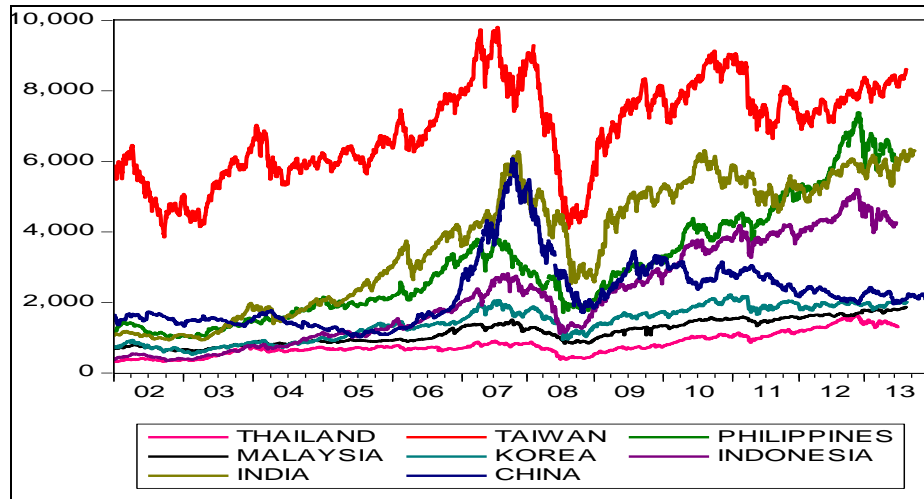
Source: Yahoo finance and computed using E-Views (Version 6)

Figure 9: Co Movement of Indices of Thailand with Singapore (From 2002 to 2013)



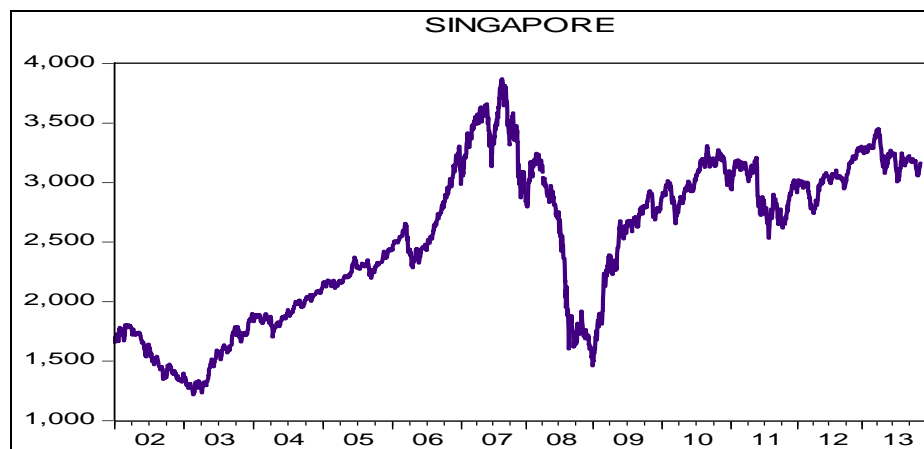
Source: Yahoo finance and computed using E-Views (Version 6)

Figure 10: Movements of Indices of Emerging Asian Stock Market (From 2002 to 2013)



Source: Yahoo finance and computed using E-Views (Version 6)

Figure 11: Co Movement of Index of Developed Singapore Stock Market (From 2002 to 2013)



Source: Yahoo finance and computed using E-Views (Version 6)

b. Descriptive Statistics for the Indices of Asian Emerging and Developed Markets

Table - 2 shows the results of descriptive statistics for sample stock market indices in Asia (emerging and developed) during the study period from 01-01-2002 to 31-12-2013. It is to be noted that the summary statistics, namely, mean, minimum, maximum, median, standard deviation (SD), skewness, kurtosis and the Jarque- Bera were used to analyse the sample indices return during the study period.

It is clear from the **Table** that during the study period, the Indonesia Stock Market (JKSE) earned high mean value of 0.000932, followed by Indian stock market (Nifty) with a value of 0.00072. These values were greater than that of other Asian sample indices. It is to be noted that the mean value for all the sample indices showed positive sign and it indicates the fact that all the indices earned high return during the study period. It is to be noted that two indices, namely, China (SSE) and Taiwan (TWII) recorded the lowest average daily mean returns, with values of 0.00021 and 0.00237, respectively. The mean returns of sample indices i.e. Philippines (0.00064) and Thailand (0.00059), Korea (0.00045) and Malaysia (0.00039) improved and came closer to Indonesia and India. In terms of market unpredictability, as measured by the standard deviation of daily returns, China earned the highest risk value (0.015994), followed by India (0.015731), Korea (0.015032), Indonesia (0.01467), Thailand (0.013858), Taiwan (0.013582), Philippines (0.013314), Singapore (0.011724) and Malaysia (0.010726). This indicates the fact that there was high risk (in respect of these indices, namely, SSE

Composite Index, S&P CNX Nifty, Jakarta Composite Index, Kospi Index, KLSE, Philippine stock Index, TSEC weighted Index, SET Index and Straits Times Index) which was useful for speculators but the investors may carefully study the market risk and take studied investment decision of portfolio diversification. The analysis of skewness shows that the values for all sample indices, except India (0.025075) and Malaysia (0.010726), were negative. It is significant to note from the Table that all sample indices of emerging Asian markets earned values of kurtosis larger than three or high level fat-tails, which make it Leptokurtic. Besides, the Jarque-Bera (JB) values of the sample indices implied that all the sample indices were normally distributed. In other words, all the sample indices were less volatile during the study period. In short, the distribution of return data for all the sample indices was normal. Hence the Null Hypothesis (NH1), **There is no normal distribution among the Indices of Emerging and Developed Asian Stock Markets**, was rejected.

Table 2: The Results of Descriptive Statistics for Emerging Asian Stock Market Indices Returns during the study period from 01-01-2002 to 30-12-2013

Emerging Asian Countries	China	India	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand	Singapore
Mean	0.000210	0.00072	0.000932	0.000457	0.000396	0.00064	0.000237	0.00059	0.000289
Median	0.000000	0.001202	0.001386	0.000946	0.000522	0.000587	0.00061	0.000841	0.000431
Maximum	0.094549	0.177441	0.079215	0.119457	0.2197	0.098178	0.067422	0.111567	0.078213
Minimum	-0.08840	-0.122377	-0.103753	-0.105705	-0.175076	-0.122683	-0.066789	-0.148395	-0.08804
Std. Dev.	0.015994	0.015731	0.01467	0.015032	0.010726	0.013314	0.013582	0.013858	0.011724
Skewness	-0.01085	0.025075	-0.532686	-0.298497	1.905172	-0.414521	-0.184178	-0.545991	-0.13373
Kurtosis	7.153316	12.91989	9.041185	7.930896	135.4433	9.240686	5.682545	12.51171	9.207489
Jarque-Bera	2189.376	12288.55	4590.974	3051.901	2168866	4850.147	906.08	11206.05	4872.204
Probability	0	0	0	0	0	0	0	0	0
Observations	3046	2997	2928	2969	2965	2937	2966	2934	3029
Mean return (mean = X total no. of observations) (%)	63.97%	215.78%	272.89%	135.68%	117.41%	187.97%	70.29%	173.11%	87.53%

Source: (<http://finance.yahoo.com/>) and Computed using E-Views 6 Version.

c. Unit Root Test for the Indices of Asian Emerging and Developed Markets

The univariate linear (the Augmented Dickey-Fuller test (ADF), the Phillips-Perron test (PP) and Dickey-Fuller test transformed by a GLS regression (DF-GLS)) were used to test the stationarity among the sample indices in Asia.

The results of the Augmented Dickey Fuller Test (ADF), Phillips Perron test (PP) and Dickey-Fuller test, transformed by a GLS regression (DF-GLS), for daily closing price returns for sample stock market indices during the period from 01st January 2002 to 31st December 2013, are illustrated in **Table-3**. It is to be noted that the sample indices of emerging and developed stock markets in Asia taken for this study included SSE Composite Index (SSE), S&P CNX Nifty, Jakarta Composite Index (JKSE), Korea Stock Exchange Index (KOPSI), FTSE Bursa Malaysia (KLSE), Philippine Stock Index, TSEC Weighted Index (TWII), Thailand SET Index and Singapore Straits Times Index (STI). It is to be noted that the values of test critical for all sample indices of emerging and developed stock market in Asia were analysed at three significant levels of 1%, 5% and 10%. The probability value for all the nine sample indices was zero, on the basis of all the three tools used for analysis. The other identification of the statistical values using ADF test for all the sample indices were - (-54.9615) China, (-51.4379) India, (-48.2857) Indonesia, (-53.4835) Korea, (-65.0105) Malaysia, (-47.4837) Philippines, (-51.7158) Taiwan, (-52.6556) Thailand, and (-54.873) Singapore and the statistical values of DF-GLS Test for sample indices were - (-54.963) China, (-9.13365) India, (-6.77012) Indonesia, (-51.2189) Korea, (-65.0105) Malaysia, (-45.055) Philippines, (-2.50534) Taiwan, (-2.16327) Thailand, and (-1.83759) Singapore

while the statistical values of Phillips Perron test for sample indices were (-54.9852) China, (-51.4424) India, (-48.1258) Indonesia, (-53.5979) Korea, (-64.9749) Malaysia, (-47.1327) Philippines, (-51.6565) Taiwan, (-52.7282) Thailand, and (-54.8858) Singapore. These values were less than that of test critical values at 1%, 5% and 10% level of significance. The results of Unit Root test indicate the fact that the returns data of all sample emerging and developed market indices in Asia attained stationarity during the study period. Hence the Null Hypothesis (NH₃), namely, **There is no stationarity among the Indices of Emerging and Developed Asian Stock Markets**, is rejected and the Alternate Hypothesis, namely, **There is stationarity among the Indices of Emerging and Developed Asian Stock Markets**, is accepted.

Table 3: The Results of Unit Root Test for Asian Stock Market Index Returns during the Study period from 01-01-2002 to 30-12-2013

Unit Root Test Tools Sample Asian Countries		ADF TEST			DF-GLS TEST			PP TEST		
		Statistical Value	Critical Value	P Value	Statistical Value	Critical Value	P Value	Statistical Value	Critical Value	P Value
China	1%	-54.9615	-3.43234	0.0001	-54.963	-2.56574	0.0001	-54.9852	-3.43231	0.0001
	5%	-54.9615	-2.8623	0.0001	-54.963	-1.94093	0.0001	-54.9852	-2.86231	0.0001
	10%	-54.9615	-2.56722	0.0001	-54.963	-1.61663	0.0001	-54.9852	-2.56721	0.0001
India	1%	-51.4379	-3.43234	0.0001	-9.13365	-2.56574	0.0001	-51.4424	-3.43234	0.0001
	5%	-51.4379	-2.86231	0.0001	-9.13365	-1.94093	0.0001	-51.4424	-2.86231	0.0001
	10%	-51.4379	-2.56722	0.0001	-9.13365	-1.61663	0.0001	-51.4424	-2.56722	0.0001
Indonesia	1%	-48.2857	-3.43239	0.0001	-6.77012	-2.56576	0.0001	-48.1258	-3.43239	0.0001
	5%	-48.2857	-2.86233	0.0001	-6.77012	-1.94093	0.0001	-48.1258	-2.86233	0.0001
	10%	-48.2857	-2.56723	0.0001	-6.77012	-1.61663	0.0001	-48.1258	-2.56723	0.0001
Korea	1%	-53.4835	-3.43236	0.0001	-51.2189	-2.56574	0.0001	-53.5979	-3.43236	0.0001
	5%	-53.4835	-2.86232	0.0001	-51.2189	-1.94093	0.0001	-53.5979	-2.86232	0.0001
	10%	-53.4835	-2.56723	0.0001	-51.2189	-1.61663	0.0001	-53.5979	-2.56723	0.0001
Malaysia	1%	-65.0105	-3.43237	0.0001	-65.0105	-2.56574	0.0001	-64.9749	-3.43237	0.0001
	5%	-65.0105	-2.86232	0.0001	-65.0105	-1.94093	0.0001	-64.9749	-2.86232	0.0001
	10%	-65.0105	-2.56723	0.0001	-65.0105	-1.61663	0.0001	-64.9749	-2.56723	0.0001
Philippines	1%	-47.4837	-3.43239	0.0001	-45.055	-2.56575	0.0001	-47.1327	-3.43239	0.0001
	5%	-47.4837	-2.86233	0.0001	-45.055	-1.94093	0.0001	-47.1327	-2.86233	0.0001
	10%	-47.4837	-2.56723	0.0001	-45.055	-1.61663	0.0001	-47.1327	-2.56723	0.0001
Taiwan	1%	-51.7158	-3.43237	0.0001	-2.50534	-2.56575	0.0001	-51.6565	-3.43237	0.0001
	5%	-51.7158	-2.86232	0.0001	-2.50534	-1.94093	0.0001	-51.6565	-2.86232	0.0001
	10%	-51.7158	-2.56723	0.0001	-2.50534	-1.61663	0.0001	-51.6565	-2.56723	0.0001
Thailand	1%	-52.6556	-3.43239	0.0001	-2.16327	-2.56575	0.0001	-52.7282	-3.43239	0.0001
	5%	-52.6556	-2.86233	0.0001	-2.16327	-1.94093	0.0001	-52.7282	-2.86233	0.0001
	10%	-52.6556	-2.56723	0.0001	-2.16327	-1.61663	0.0001	-52.7282	-2.56723	0.0001
Singapore	1%	-54.873	-3.43232	0.0001	-1.83759	-2.56573	0.0001	-54.8858	-3.43232	0.0001
	5%	-54.873	-2.86229	0.0001	-1.83759	-1.94092	0.0001	-54.8858	-2.86229	0.0001
	10%	-54.873	-2.56721	0.0001	-1.83759	-1.61663	0.0001	-54.8858	-2.56721	0.0001

Source: (<http://finance.yahoo.com/>) and Computed using E-Views 6 Version

Note: Critical Value at 1%, 5% and 10% level of significance.

d. Correlation for the Indices of Asian Emerging Markets and Singapore

As a general indicator of market, a correlation matrix was used. **Table 4** shows the results of correlation among the sample indices of emerging and developed markets in Asia. According to the results of the Table, the values of correlation ranged from -0.023 (India–Korea) to 0.116 (Korea–Philippines). Similarly, all the sample stock indices in Asia were positively correlated but few indices (i.e. S&P CNX Nifty - Korea Stock Exchange Index (KOPSI) with the value of -0.023), (China – Taiwan with the value of -0.015), and (China - Malaysia with the value of -0.014) were negatively correlated. At the same time, it is significant to note from the correlation values earned by emerging indices that all the indices China (-0.007), India (0.010), Indonesia (0.006), Korea (0.014), Malaysia (0.030), Philippines (-0.019), Taiwan (-0.031) and Thailand (0.001) did not correlate with Singapore.

Hence the Null Hypothesis (NH3), **There is no co - relation between the Indices of Emerging with developed Asian Stock Markets**, was accepted.

Table 4: The Results of Correlation Matrix for Asian Stock Market Index Returns during the study period from 01-01-2002 to 31-12-2013

Pearson Correlations									
Samples	China	India	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand	Singapore
China	1								
India	0.010	1							
Indonesia	0.009	-0.007	1						
Korea	-0.014	-0.023	.051**	1					
Malaysia	-0.011	-0.004	0.016	.067**	1				
Philippines	0.030	0.029	.050**	.116**	0.028	1			
Taiwan	-0.015	.051**	0.007	.037*	0.022	.092**	1		
Thailand	-0.004	0.023	.040*	0.015	0.015	0.03	.055**	1	
Singapore	-0.007	0.010	0.006	0.014	0.030	-0.019	-0.031	0.001	1

** . Correlation is significant at the 0.01 level (2-tailed).
* . Correlation is significant at the 0.05 level (2-tailed).

Source: (<http://finance.yahoo.com/>) and Computed using SPSS 16 Version

e. Regression Test for the Indices of Emerging Asian Countries and Developed Singapore.

Table 5 presents the results of Regression Test for the indices of eight emerging markets and the developed market, Singapore, during the study period. The extent of relationship of each independent variable (indices of Eight Emerging Asian Markets) with the dependent variable (Index of Developed Markets - Singapore) was ascertained from the calculations.

It is to be noted from the analysis of 'T' Test and Probability that the values of the independent variables were compared with dependent variables. The analysis shows that out of eight emerging markets, only three emerging markets recorded significant influence with Singapore. Malaysia, Korea and India earned 't' values of 1.61600, 0.85600 and 0.71500 respectively during the study period. This reveals that the above three emerging markets (Malaysia, Korea and India) recorded statistically significant relationship with Singapore. The positive and statistical probability value of Malaysia (0.106) indicates that Malaysia experienced statistically significant relationship with Singapore at 90% confidence level. It is to be noted that emerging markets (like Taiwan, Philippines and China) registered highly negative influence with Singapore, with t values of -1.63700, -1.07400 and -0.37800 respectively. The probability value of the three indices (TSEC Weighted Index (TWII), Philippine Stock Index, and SSE Composite Index (SSE)) recorded values of 0.10200, 0.28300 and 0.47500, respectively.

The analysis of ANOVA and Regression Model summary shows the Inter linkages and Co Movements of eight emerging sample markets with Singapore. However, three Asian emerging markets, namely, Philippines, Taiwan and China indicated high negative influence with Singapore. The overall results of Regression Model, the Regression (R -Value (0.05200), Adjusted R - Square value (0.0000), the Durbin Watson test statistical value of nearly two (1.99600) and significant while F test value of nearly 0.50 (0.44800), indicate that the regression model was perfectly fit. Hence the Null hypothesis (NH4), namely, **"There is no influence of the Indices of Emerging Asian Stock Markets on developed Singapore market"**, was rejected.

Table 5: The Results of Regression Analysis for testing the influence of **Singapore** with eight emerging Asian Markets during From 01-01-2002 to 31-12-2013

MODEL	Coefficients						
	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	0.00000	0.00000		1.32300	0.18600	0.00000	0.00100
China	-0.00500	0.01400	-0.00700	-0.37800	0.70600	-0.03200	0.02100

Table 5: The Results of Regression Analysis for testing the influence of **Singapore** with eight emerging Asian Markets during From 01-01-2002 to 31-12-2013 - continued

India	0.01000	0.01400	0.01300	0.71500	0.47500	-0.01700	0.03700
Indonesia	0.00500	0.01500	0.00700	0.35200	0.72500	-0.02400	0.03500
Korea	0.01300	0.01500	0.01600	0.85600	0.39200	-0.01600	0.04100
Malaysia	0.03300	0.02000	0.03000	1.61600	0.10600	-0.00700	0.07300
Philippines	-0.01800	0.01700	-0.02000	-1.07400	0.28300	-0.05100	0.01500
Taiwan	-0.02700	0.01600	-0.03000	-1.63700	0.10200	-0.05800	0.00500
Thailand	0.00100	0.01600	0.00100	0.07300	0.94200	-0.03000	0.03200
a. Dependent Variable: SINGAPORE							
ANOVA							
MODEL	Sum of Squares	DF	Mean Square	F		Sig.	
Regression	0.00100	8	0.00000	0.98200		0.44800	
Residual	0.41100	2919	0.00000				
Total	0.41200	2927	0.00000	0.98200		0.44800	
a. Predictors: (Constant), Taiwan, China, Korea, India, Malaysia, Philippines, Indonesia, Thailand							
b. Dependent Variable: SINGAPORE							
Model Summary							
R	R Square	Adjusted R Square	Std. Error of the Estimate	F Change	df1	df2	Sig. F Change
0.05200	0.00300	0.00000	0.01187	0.98200	8	2919	0.44800
a. Predictors: (Constant), Taiwan, China, Korea, India, Malaysia, Philippines, Indonesia, Thailand							
b. Dependent Variable: SINGAPORE							

Source: Compiled from yahoo finance and Computed by using SPSS

f. Pair wise Granger Causality Test for the Indices of Emerging and Developed Asian Markets

An attempt has been made to study the Co Movements and Bidirectional Causality relation among all emerging Asian stock market indices with developed market in Asia, using Pair Wise Granger Causality Test. **Table – 6** shows the results of Granger Causality for testing the inter linkages of Singapore market, with eight sample emerging stock market indices in Asia during the study period. It is clear that among the sample indices, only one Asian emerging market index, India, was perfectly fit and recorded Co Movement with developed Singapore market on the basis of two way bidirectional causality relation (as per F – Statistics, India→ Singapore (10.0662) and Singapore→ India (9.96729)). It is to be noted that out of remaining seven emerging markets, only two markets (Taiwan and Philippines) were significant and recorded causality relationship on the basis of one way bidirectional causality (F – Statistics and Probability values). Further, the remaining five indices (China, Thailand, Indonesia, Malaysia and Korea) had no causality relation with Singapore. Hence the Null Hypothesis (NH5), **There is no causal relationship among the Indices of Emerging Asian Markets with developed Singapore Stock Market in Asia**, was partially accepted.

The co-movements of stock market indices of Singapore and eight indices of emerging Asian countries during the study period from 01st January 2002 to 31st December 2013 are shown in **Figure 12**. This figure was created from the results of Granger Causality test shown in Table 6. It is to be noted that out of eight emerging markets, India registered a high degree of Co Movements (two way) with Singapore market while two other emerging markets (Taiwan and Philippines) recorded lesser degree of correlation (single side causal relationship) with Singapore. The remaining five indices (China, Thailand, Indonesia, Malaysia and Korea) had no causal relationship with Singapore.

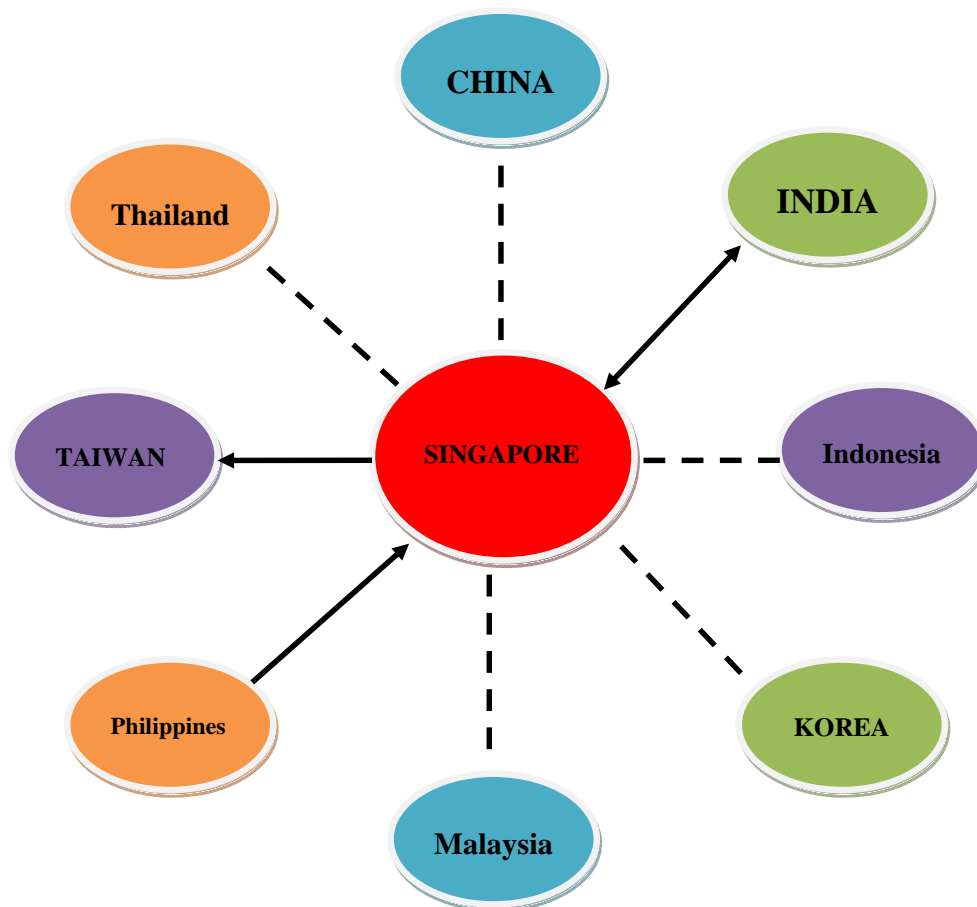
Table 6: The Results of Granger Causality for testing the Inter – Linkage of Developed Singapore Markets with Eight Emerging Asian Markets during from 01-01-2002 to 31-12-2013

Null Hypothesis	Obs	F-Statistic	Prob.	Results
Singapore Does Not Granger Cause China	3027	1.19082	0.30410	Accepted
China Does Not Granger Cause Singapore	3027	0.48628	0.61500	Accepted
Singapore Does Not Granger Cause India	2995	9.96729	0.00005	Rejected
India Does Not Granger Cause Singapore	2995	10.0662	0.00004	Rejected

Table 6: The Results of Granger Causality for testing the Inter – Linkage of Developed Singapore Markets with Eight Emerging Asian Markets during from 01-01-2002 to 31-12-2013 - continued

Singapore Does Not Granger Cause Indonesia	2926	0.26669	0.76590	Accepted
Indonesia Does Not Granger Cause Singapore	2926	1.12191	0.32580	Accepted
Singapore Does Not Granger Cause Korea	2967	0.00137	0.99860	Accepted
Korea Does Not Granger Cause Singapore	2967	1.00148	0.36750	Accepted
Singapore Does Not Granger Cause Malaysia	2963	1.82535	0.16130	Accepted
Malaysia Does Not Granger Cause Singapore	2963	0.40584	0.66650	Accepted
Singapore Does Not Granger Cause Philippines	2935	0.28282	0.75370	Accepted
Philippines Does Not Granger Cause Singapore	2935	3.3280	0.03600	Rejected
Singapore Does Not Granger Cause Taiwan	2964	3.14022	0.04340	Rejected
Taiwan Does Not Granger Cause Singapore	2964	1.54386	0.21370	Accepted
Singapore Does Not Granger Cause Thailand	2932	0.57123	0.56490	Accepted
Thailand Does Not Granger Cause Singapore	2932	0.52244	0.59310	Accepted

Sources: <http://finance.yahoo.com/> using E- views Rejection of Null Hypothesis when the Probability value is less than or equal to 0.05.

Figure 12: The Co-Movement of Stock Market between Singapore and Eight Emerging Asian countries during from 01st January 2002 to 31st December 2013.

Note: 2ways – Bidirectional causality \longleftrightarrow
 1way – Bidirectional causality \longrightarrow
 No causality relation $---$

Source: As per the results of Table – 6

11. Discussion and Conclusion

An attempt was made to study co movement of the returns of the emerging Asian exchanges indices (SSE Composite Index (SSE), S&P CNX Nifty, Jakarta Composite Index (JKSE), Korea Stock

Exchange Index (KOPSI), FTSE Bursa Malaysia (KLSE), Philippine Stock Index, TSEC Weighted Index (TWII), Thailand SET Index) and Singapore Straits Times Index (STI) Singapore). The daily closing returns varied from 63.97 to 272.89 percent. The average daily returns of Indonesia were higher than that of eight other emerging Asian stock markets, with 272.89 percent, followed by NSE with 215.78 percent. China recorded the least return value of 63.97 percent while developed Asian market (Singapore) earned a value of 87.53 percent. It is clear that among the sample indices of Asia, India (215.78%) provided better return than that of Singapore (87.53%) during the study period. According to the analysis, better opportunities existed for diversification among the Asian stock markets in general and among India, China and Singapore in particular.

The analysis of this study clearly shows that in the long run, three countries namely India, Taiwan and Philippines exerted the greatest influence on Singapore. The developed Asian market (Singapore) also exercised influence on **India** during whole study period. It is to be noted that **India** enjoyed highly inter linked co movements with Singapore i.e. **(two way Bidirectional causality relationship)**. Out of remaining seven markets, only two markets (Philippines and Taiwan) recorded one way Bidirectional Causality relationship with Singapore. The other five emerging Asian markets (China, Indonesia, Malaysia, Korea and Thailand) did not Inter Linkages and Co Movements with Singapore during the study period. The five emerging markets (China, Indonesia, Korea, Malaysia and Thailand) recorded higher risk than **India, Taiwan and Philippines**.

References

- [1] **Bang Nam Jeon and Beom-Sik Jang (2004)**. The linkage between the US and Korean stock markets: the case of NASDAQ, KOSDAQ, and the semiconductor stocks. *Research in International Business and Finance*, 18, 319–340.
- [2] **Chaker Aloui and Besma Hkiri (2014)**. Co-movements of GCC emerging stock markets: New evidence from wavelet coherence analysis, *Economic Modelling*, 36, 421–431.
- [3] **Claudio Morana and Andrea Beltratti (2008)**. Comovements in international stock markets. *Journal of International Financial Markets, Institutions and Money*, 18, 31-45
- [4] **Cristiana Tudor and Carmen Popescu – Dutaa (2012)**. On the causal relationship between stock returns and exchange rates changes for 13 developed and emerging markets. *Procedia - Social and Behavioral Sciences*, 57, 275 – 282.
- [5] **Eiji Fujii (2005)**. Intra and inter-regional causal linkages of emerging stock markets: evidence from Asia and Latin America in and out of crises. *International Financial Markets, Institutions and Money*, 15, 315–342.
- [6] **Gong-meng Chen, Michael Firth and Oliver Meng Rui (2002)**. Stock market linkages: Evidence from Latin America. *Journal of Banking & Finance*, 26, 1113–1141.
- [7] **Guglielmo Maria Caporale, Andrea Cipollini and Nicola Spagnolo (2005)**. Testing for contagion: a conditional correlation analysis. *Journal of Empirical Finance*, 12, 476–489.
- [8] **Jan G. De Gooijer and Selliah Sivarajasingham (2008)**. Parametric and nonparametric Granger causality testing: Linkages between international stock markets. *Physica A*, 387, 2547–2560.
- [9] **Jarl Kallberg and Paolo Pasquariello (2008)**. Time-series and cross-sectional excess comovement in stock indexes. *Journal of Empirical Finance*, 15, 481–502.
- [10] **Kate Phylaktis and Fabiola Ravazzolo (2005)**. Stock market linkages in emerging markets: implications for international portfolio diversification. *International Financial Markets, Institutions and Money*, 15, 91-106.
- [11] **Lee K. Lim (2009)**. Convergence and interdependence between ASEAN-5 stock markets, *Mathematics and Computers in Simulation*, 79, 2957–2966.
- [12] **Leo Chan, Donald Lien and Wenlong Weng (2008)**. Financial interdependence between Hong Kong and the US: A band spectrum approach, *International Review of Economics and Finance*, 17, 507–516.

- [13] **Ming-Shiun Pan, Robert Chi-Wing Fok and Y. Angela Liu (2007)**. Dynamic linkages between exchange rates and stock prices: Evidence from East Asian markets. *International Review of Economics and Finance*, 16, 503–520.
- [14] **Murugesan Selvam, Kasilingam Lingaraja and Gayathri Mahalingam (2013)**. Stock Market Integration of India and USA: A Study on Small and Medium Enterprises. Electronic copy available at: <http://ssrn.com/abstract=2368110>
- [15] **Orawan Ratanapakorn and Subhash C. Sharma (2002)**. Interrelationships among regional stock indices. *Review of Financial Economics*, 11, 91-108.
- [16] **Shamila A. Jayasuriya (2011)**. Stock market correlations between China and its emerging market neighbors. *Emerging Markets Review*, 12, 418–431.
- [17] **Theodore Syriopoulos (2007)**. Dynamic Linkages between Emerging European and Developed Stock Markets: Has the EMU any impact?. *International Review of Financial Analysis*, 16, 41– 60.
- [18] **Titus O. Awokuse, Aviral Chopra and David A. Bessler (2009)**. Structural change and international stock market interdependence: Evidence from Asian emerging markets. *Economic Modelling*, 26, 549–559.
- [19] **Toda H.Y, Phillips P.C.B. (1991)**. Vector Autoregression and Causality: A Theoretical Overview and Simulation Study, Cowles Foundation Discussion Paper No: 1001, 1-42.
- [20] **Tomoe Moore and Ping Wang (2014)**. Dynamic linkage between real exchange rates and stock prices: Evidence from developed and emerging Asian markets. *International Review of Economics and Finance*, 29, 1–11.
- [21] **Zeynel Abidin Ozdemira, Hasan Olgun and Bedriye Saracoglu (2009)**. Dynamic linkages between the center and periphery in International stock markets. *Research in International Business and Finance*, 23, 46–53.