

CO MOVEMENTS AND INTER-LINKAGES OF INDIAN STOCK MARKET WITH EMERGING STOCK MARKET INDICES IN ASIA

Kasilingam Lingaraja , Murugesan Selvan** , Vinayagamoorthi Vasanth* & Mahalingam Gayathri**

Abstract: *The study of Inter-Linkages, Co Movement and Causal Relationship of Indian Stock Market with emerging stock market indices returns in Asia, has gained momentum. With the establishment of SEBI and technological advancement, the Indian Stock Market has now reached the global standard. This study used the secondary daily time series data for a period of 12 years from 2002 to 2013. Descriptive Statistics, Unit Root, Correlation Matrix, Linear Regression Model and Granger Causality Test were used. This paper endeavors to empirically investigate the co movement relationship and inter linkages of S&P CNX Nifty with other emerging markets in Asia.*

Keywords: *Asian Emerging Stock Markets, Causal Relationship, Co Movements, Indian Stock Market, Inter – Linkages, International Diversification.*

JEL Classification: *G11; G17; N25; P34*

1. INTRODUCTION

This research paper to examine the Inter linkages and Co Movements among Asian emerging stock market indices in general and stock exchange of Indian CNX Nifty index in particular. Dynamic linkages among eight Asian emerging stock markets are investigated in the current research paper and these may have implications for the level of Linkages and Movements among the indices of S&P CNX Nifty (India) and Other emerging markets in Asian, which may be present as well as for the potential for foreign institutional investors to attained the expected gains from international portfolio investments and diversification benefits in China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand. In particular, the research paper examines these linkages and movements over a long period to analyse whether these international price movements and dynamic linkages have changed since previous studies were undertaken. Inter – Linkages, Co Movements and Causal Relationship of Indian Stock Market index with other emerging stock

* PhD Research Scholar in Management, Department of Commerce and Financial Studies, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India, E-Mail: klingarajaphd@gmail.com

** Professor and Head, Department of Commerce and Financial Studies, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India

market indices in Asia 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 markets¹. The study of this nature would facilitate a comparison of the results of Asian emerging markets in general and Indian stock market (S&P CNX Nifty) in particular.

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.² 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.

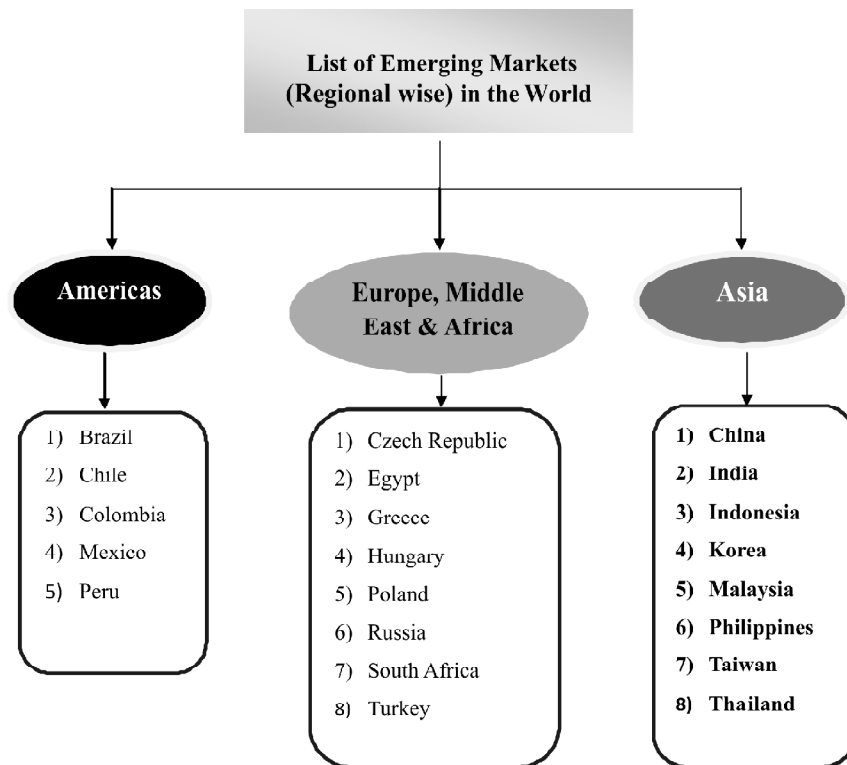


Figure - I

Source: <http://www.msci.com> retrieved on 04.03.2014.

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**).

The present study is mainly focused on the comparative analysis of the Indian Stock Market index and various Asian emerging market indices. The study considered key issues that may be of interest to investors, portfolio managers, corporate executives and policy makers. Hence it becomes essential to examine the interdependence and co-movement phenomenon between different Asian emerging markets indices, including Indian S&P CNX Nifty. The main part of the current study captures the trends, similarities and patterns in the activities and price movements of the Indian Stock Market (S&P CNX Nifty) in comparison to Asian emerging markets, namely, Shanghai Stock Exchange Composite Index (**China**), Jakarta Composite Index (**Indonesia**), Kospi Index (**Korea**), KLSE (**Malaysia**), Philippine stock Index (**Philippines**), TSEC weighted Index (**Taiwan**), and SET Index (**Thailand**). The main aim is to help the investors to understand the impact of important happenings on the Indian Stock Exchange and other stock markets considered for this study.

1.2. National Stock Exchange of India (S&P CNX Nifty Index)

The National Stock Exchange (NSE) is India's leading stock exchange covering various cities and towns across the country. NSE was set up by leading institutions to provide a modern, fully automated screen-based trading system with national reach. In October 1995, it became the largest stock exchange in the country. Now, NSE network stretches to more than 1,500 locations in the country and supports more than 2, 30,000 terminals.

The CNX Nifty is a well diversified 50 stock index, accounting for 22 sectors of the economy. It is used for a variety of purposes such as benchmarking fund portfolios, index based derivatives and index funds. The CNX Nifty Index represents about 68.99% of the free float market capitalization of the stocks listed on NSE as on December 31, 2013³.

2. REVIEW OF LITERATURE

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

Orawan Ratanapakorn and Subhash C. Sharma (2002) investigated the short-term and long-term relationships in five regional stock indices (USA - S&P 500 Index, European Index, Asian-Pacific index, Latin American index and Eastern European-Middle East index) during the pre-Asian crisis (January 1, 1990 to December 31, 1996) and Asian crisis (July 2, 1997 to March 10, 2000) periods. Statistical tools like Unit Root Test (ADF and PP), Co integration, Granger Causality and Vector Error Correction Model (VECM) were used. It was found that the US stock market was the most influential one among regional markets during the study period. Gong-meng Chen, *et al.* (2002) studied the behavior of stock prices in six major Latin American stock exchanges using univariate and multivariate approaches. The sample stock exchanges of this research were Brazil, Mexico, Chile, Argentina, Colombia and Venezuela markets. Descriptive Statistics, Autocorrelation, Correlation, Unit Root Test and Co Integration Test and (VECM) were used. It was found that investing in various Latin American stock markets offered limited risk diversification until 1999. Bang Nam Jeon and Beom-Sik Jang (2004) examined the interrelationships between stock prices in the United States and Korea during the period from July 1, 1996 to February 9, 2001. Statistical tools like Unit Root Test, Vector Auto Regression Model (VAR), Vector Error Correction Model (VECM), Correlation Matrix and Co Integration were used. It was 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. **Eiji Fujii (2005)** analyzed the causal linkages among several emerging stock markets (Hong Kong, Malaysia, Philippines and Thailand) in Asia and Latin America (Argentina, Brazil and Chile) using the daily observations from January 1, 1990 to November 14, 2001 of their stock indices. It was found that there were indeed considerable causal interactions across the emerging stock markets. Within each region as well as across the two regions, the stock markets appeared to be more interdependent on each other. **Ming-Shiun Pan, et al. (2007)** demonstrated the dynamic linkages between the foreign exchange and stock markets of seven East Asian countries, (Hong Kong, Japan, Korea, Malaysia, Singapore, Taiwan, and Thailand) during the period from January 1988 to October 1998. It is to be noted that the statistical tools like Granger Causality Test, VAR, Unit Root Test, Multivariate Cointegration Test and Pairwise Granger Causality Tests were applied. 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. **Selvam Murugesan et al. (2007)** discussed the dynamic behavior of stock index returns of sample markets of Asia Pacific countries like Japan, Hong Kong, India, Korea, China, Taiwan, Singapore, Malaysia, Thailand and Indonesia during the period from January 2006 to December 2006. It is to be noted that the stock price for Asian markets were forecasted for 30, 60, 90, 120 and 150 days and Nikkei 225 index (Japan) that showed a high rate of volatility. It was found that there was evidence of time varying volatility, which

exhibited clustering, high persistence and predictability for almost all the Asian market indices. **Claudio Moranaa and Andrea Beltratti (2008)** examined the linkages across stock markets from several perspectives (Germany, Japan, USA and UK) during the period from 1973 to 2004. Statistical tools like Conditional Correlations and Linkages between correlation and volatility were used. Evidence of strong linkages across markets, as measured by co movements in prices and returns and in volatility processes, was found. **Leo Chan (2008)** studied the changes in the dynamic causal relationships between Hong Kong and US financial markets after the Hong Kong handover (and Asian Crisis) across spectral frequency band during the periods January 1991 to July 1997 and January 1999 to May 30, 2006. It was found that there was relationship between country's openness and capital market interactions. It is suggested that portfolio managers must distinguish short run factors from long run factors while making capital allocation decisions. **Lee K. Lim (2009)** distinguished the dynamic interdependence and long-run relationships between the ASEAN-5 (Indonesia, Malaysia, the Philippines, Singapore and Thailand) stock markets during the period from 1990 to 2008. Statistical tools like summary statistics, correlation matrix, granger causality test, converging trend, co integration method and VAR. were used. The convergence of all Association of Southeast Asian Nations' (ASEAN-5) market indices was not supported, except for convergence in two pairs of ASEAN-5 markets over the sample period. **Zeynel Abidin Ozdemira, Hasan Olgun and Bedriye Saracoglu (2009)** analyzed the dynamic linkages between the equity markets of a center (the US) and its periphery emerging markets (Argentina, Brazil, Chile, China, Indonesia, Malaysia, Mexico, Peru, Philippines, Singapore, South Korea, Taiwan, Thailand, Turkey and Venezuela) during the period from 1st January, 1985 to 24th March 2006. This study found a significant causal relation between S&P500 and all emerging stock markets. Unit Root Test, Multivariate Co Integration Test and Pair wise Granger-Causality Test were used. **Shamila A. Jayasuriya (2011)** investigated the inter linkages of stock return behavior between China and three of its emerging markets (Thailand, Indonesia and Philippines) neighbors in the East Asia and Pacific region during the study period from November 1993 to July 2008. 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. **Cristiana Tudor and Carmen Popescu - Dutaa (2012)** examined the issue of Granger causality between stock prices and exchange rates movement for developed (Australia, Canada, France, Hong Kong, Japan, United Kingdom, and United States) and emerging financial markets (Brazil, China, India, Korea, Russia and South Africa) during the period from January 1997 to March 2012. This study employed tools like Descriptive Statistics and Granger Causality Tests for the analysis. It was found that the equity market and the evolution of the exchange rate were two interactive time series in the case of Korea. **Chaker Aloui and Besma Hkiri (2014)** estimated short term and long term dependencies between stock market returns for the Gulf Cooperation

Council (GCC) Countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE) during the period from 2005 to 2010. Statistical tools like descriptive statistics, wavelet, wavelet squared coherence test, Unconditional cross correlation and VAR were used to determine the co-movement in terms of both frequency and time and it was found to be strongly affected by the occurrence of financial crisis. **Tomoe Moore and Ping Wang (2014)** examined the determinants of the time-varying correlation between stock return differentials and real exchange rates for the six Asian emerging markets (Indonesia, Malaysia, South Korea, Philippines, Singapore and Thailand) and the four developed markets (Australia, Canada, Japan and the UK) during the period from January 1973 to December 2006. Significant time-varying correlation was found between the two times series, by using DCC-GARCH model and time-varying correlation. **Kasilingam Lingaraja et al. (2014)a** in their study were focused on eight Asian emerging markets and one developed market like Singapore was used. It is to be noted that inter linkages and co-movements were tested by using 12 years time series data (01/01/2002 to 31/12/2013). This study was suggested and help to the investors making efficient decisions for investment in the indices of emerging stock markets in Asia. **Kasilingam Lingaraja et al. (2014)b** examined the market efficiency of Emerging Stock Market indices in Asia. This study was mainly focused performance and market efficiency of emerging market indices in Asia about longer period i.e., ten years from 1st January 2004 to 31st December 2013.

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 of Indian Stock Market with the emerging stock markets 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 identified in the earlier researches on Inter - Linkage and Co Movements of seven emerging Asian Stock Markets in relation to Indian stock market.

3. STATEMENT OF PROBLEM

Emerging stock market countries like Latin America and Europe countries 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 in the area of finance. 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 of Indian Stock Exchange in relation to emerging stock markets in Asia.

4. NEED AND IMPORTANCE OF THE STUDY

This research study is important because 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 markets and Indian market 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 Indian Stock Market. Hence it becomes imperative to assess the influence of local risk factors vis-à-vis global risk factors in the Asian Emerging Stock Markets.

5. OBJECTIVES OF THE STUDY

The main objective of this study is to examine the Inter - Linkages, Co Movement and Causal Relationship of Indian Stock Market index (S&P CNX Nifty) with the emerging stock markets indices (China - SSE Composite Index, Indonesia - Jakarta Composite Index, Korea - Korea Stock Exchange Index, Malaysia - FTSE Bursa (KLSE), Philippines - Philippines Stock Index and Taiwan - TSEC Weighted Index and Thailand - SET Index) in Asia.

6. HYPOTHESES 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 Asian Stock Markets.

NH2 There is no stationarity among the Indices of Emerging Asian Stock Markets.

NH3 There is no co - relation between the Indices of Emerging Asian Stock Markets and Indian Market.

NH4 There is no influence of the Indices of Emerging Asian Stock Markets on Indian market.

NH5 There is no causal relationship between the Indices of Emerging Asian Markets and Indian market in Asia.

7. METHODOLOGY OF THE STUDY

7.1. Period of Study

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

7.2. Sample Design

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

7.3. Data Variables and Data Sources

The study used daily returns data of the composite stock market indices of the respective emerging 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) and details are given in Table 1. 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.

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 emerging Asian markets and Indian market).

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

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

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

- Linear Regression Model (to test the impact of Emerging Markets on Indian Market).
- Granger Causality Test (to examine the co movements among the Emerging Asian Markets with Indian Market).

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 eight indices of Asia (as identified by MSCI).
- The study period was limited to 12 years i.e. from 1st January 2002 to 31st December 2013, and
- All the limitations associated with statistical tools used, were applicable to this study also.

10. ANALYSIS OF CO MOVEMENTS, INTER - LINKAGES AND CAUSAL RELATIONSHIP AMONG INDICES OF EMERGING ASIAN MARKETS AND INDIAN STOCK MARKET

The analysis of Co Movements, Inter Linkages and Causal Relationship among the sample indices of Emerging and Indian Stock Market (S&P CNX Nifty) in Asia is presented as follows.

- (a) Descriptive Statistics for the sample indices of Asian emerging markets.
- (b) Unit Root Test for the sample indices of emerging markets in Asia.
- (c) Correlation for the sample indices of emerging markets in Asia.
- (d) Regression Test for the sample indices of emerging stock markets and Indian stock market in Asia.
- (e) Pair wise Granger Causality Test for the sample indices of emerging markets and Indian stock market in Asia.

(a) Descriptive Statistics for the Sample Indices of Asian Emerging Markets

Table 2 shows the results of descriptive statistics for sample stock market (emerging) indices in Asia during the study period from 01-01-2002 to 31-12-2013. 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 index of 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 considered for this study. It is significant to note that the mean value for all the sample indices was positive and it indicates the fact that all the indices earned return during the study period. It is to be noted that two sample indices, namely, China (SSE) and Taiwan (TWII) recorded the lowest average daily mean returns, with values of 0.000210 and 0.000237 respectively. The mean returns of four sample indices i.e. Philippines (0.00064) and Thailand (0.00059), Korea (0.000457) and Malaysia (0.000396) improved and came closer to the return of Indonesia and India during the study period. In terms of market unpredictability, as measured by the standard deviation of daily returns, China assumed 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) and Malaysia (0.010726). This indicates the fact that there was high risk (in the order of indices, namely, SSE Composite Index, S&P CNX Nifty, Jakarta Composite Index, Kospi Index, KLSE, Philippine stock Index, TSEC weighted Index and SET Index). High degree of risk was useful for speculators but the investors may carefully study the market risk and carefully take investment decision of portfolio diversification. The analysis of skewness shows that values for all sample

indices, except India (0.025075) and Malaysia (1.905172), 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 Asian Stock Markets, was rejected.

(b) Unit Root Test for the Sample Indices of emerging markets in Asia

As pointed out earlier, 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, for daily closing price returns for sample indices during the period from 01st January 2002 to 31st December 2013, are illustrated in Table 3. As stated earlier, the sample indices of emerging 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) and Thailand (SET Index). It is to be noted that the values of test critical for all sample indices of emerging markets in Asia were analyzed at three significant levels of 1%, 5% and 10%. The probability value for all the eight sample indices was zero, calculated on the basis of all the three tools used for the analysis. 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) and -52.6556 (Thailand) 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) and -2.16327 (Thailand) 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) and -52.7282 (Thailand). These values were less than that of test critical values at 1%, 5% and 10% levels of significance. The results of Unit Root Test indicate the fact that the returns data of all sample emerging 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 Asian Stock Markets, was rejected and the Alternate Hypothesis, namely, there is stationarity among the Indices of Emerging Asian Stock Markets, was accepted.

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

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

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

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

Sample Asian Countries	Unit Root Test Tools			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	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	-54.9852	0.0001
	5%	-54.9615	-2.8623	0.0001	-54.963	-1.94093	0.0001	-54.9852	-2.86231	0.0001	-54.9852	0.0001
	10%	-54.9615	-2.56722	0.0001	-54.963	-1.61663	0.0001	-54.9852	-2.56721	0.0001	-54.9852	0.0001
Indonesia	1%	-48.2857	-3.43239	0.0001	-6.77012	-2.56576	0.0001	-48.1258	-3.43239	0.0001	-48.1258	0.0001
	5%	-48.2857	-2.86233	0.0001	-6.77012	-1.94093	0.0001	-48.1258	-2.86233	0.0001	-48.1258	0.0001
	10%	-48.2857	-2.56723	0.0001	-6.77012	-1.61663	0.0001	-48.1258	-2.56723	0.0001	-48.1258	0.0001
Korea	1%	-53.4835	-3.43236	0.0001	-51.2189	-2.56574	0.0001	-53.5979	-3.43236	0.0001	-53.5979	0.0001
	5%	-53.4835	-2.86232	0.0001	-51.2189	-1.94093	0.0001	-53.5979	-2.86232	0.0001	-53.5979	0.0001
	10%	-53.4835	-2.56723	0.0001	-51.2189	-1.61663	0.0001	-53.5979	-2.56723	0.0001	-53.5979	0.0001
Malaysia	1%	-65.0105	-3.43237	0.0001	-65.0105	-2.56574	0.0001	-64.9749	-3.43237	0.0001	-64.9749	0.0001
	5%	-65.0105	-2.86232	0.0001	-65.0105	-1.94093	0.0001	-64.9749	-2.86232	0.0001	-64.9749	0.0001
	10%	-65.0105	-2.56723	0.0001	-65.0105	-1.61663	0.0001	-64.9749	-2.56723	0.0001	-64.9749	0.0001
Philippines	1%	-47.4837	-3.43239	0.0001	-45.055	-2.56575	0.0001	-47.1327	-3.43239	0.0001	-47.1327	0.0001
	5%	-47.4837	-2.86233	0.0001	-45.055	-1.94093	0.0001	-47.1327	-2.86233	0.0001	-47.1327	0.0001
	10%	-47.4837	-2.56723	0.0001	-45.055	-1.61663	0.0001	-47.1327	-2.56723	0.0001	-47.1327	0.0001
Taiwan	1%	-51.7158	-3.43237	0.0001	-2.50534	-2.56575	0.0001	-51.6565	-3.43237	0.0001	-51.6565	0.0001
	5%	-51.7158	-2.86232	0.0001	-2.50534	-1.94093	0.0001	-51.6565	-2.86232	0.0001	-51.6565	0.0001
	10%	-51.7158	-2.56723	0.0001	-2.50534	-1.61663	0.0001	-51.6565	-2.56723	0.0001	-51.6565	0.0001
Thailand	1%	-52.6556	-3.43239	0.0001	-2.16327	-2.56575	0.0001	-52.7282	-3.43239	0.0001	-52.7282	0.0001
	5%	-52.6556	-2.86233	0.0001	-2.16327	-1.94093	0.0001	-52.7282	-2.86233	0.0001	-52.7282	0.0001
	10%	-52.6556	-2.56723	0.0001	-2.16327	-1.61663	0.0001	-52.7282	-2.56723	0.0001	-52.7282	0.0001
India	1%	-51.4379	-3.43234	0.0001	-9.13365	-2.56574	0.0001	-51.4424	-3.43234	0.0001	-51.4424	0.0001
	5%	-51.4379	-2.86231	0.0001	-9.13365	-1.94093	0.0001	-51.4424	-2.86231	0.0001	-51.4424	0.0001
	10%	-51.4379	-2.56722	0.0001	-9.13365	-1.61663	0.0001	-51.4424	-2.56722	0.0001	-51.4424	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.

(c) Correlation for the Sample Indices of emerging markets in Asia

Table 4 shows the results of correlation among the sample indices of emerging stock markets and Indian market 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 like 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 -0.011 were negatively correlated. It is significant to note from the correlation values earned by emerging indices like Taiwan (0.51), Philippines (0.029), Thailand (0.023) and China (0.010) that they were positively correlated with India. At the same time, only three indices, namely, Korea Stock Exchange Index - KOPSI (-0.023), Jakarta Composite Index (JKSE) Indonesia (-0.007) and FTSE Bursa Malaysia - KLSE (-0.004) were negatively correlated with India. Hence the Null Hypothesis (NH₃), there is no co - relation between the Indices of Emerging stock markets and Indian market, was partially rejected.

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

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

(d) Regression Test for the Sample Indices of Emerging Asian Markets and Indian Market

Table 5 presents the results of Regression Test for the sample indices of seven emerging markets and Indian market during the study period. The extent of relationship of each independent variable (indices of Seven Emerging Asian Markets) with the dependent variable (stock exchange of India CNX Nifty index) was ascertained from the calculations.

It is to be noted that for the purpose of analysis, 'T' Test statistics and Probability values of the independent variables were compared with the dependent variable. The analysis shows that out of seven emerging markets, only one emerging market, namely, Taiwan (Probability value of 0.009) exerted significant influence over India. At the same time, Taiwan earned 't' statistic values of 2.62200 and it indicated high positive influence with India during the study period. This reveals that one emerging market (Taiwan) recorded statistically significant relationship with India. The positive and statistical probability value of Taiwan at 0.009 indicates that Taiwan experienced statistically significant relationship with India at 99.1% confidence level. It is to be noted that emerging markets like Korea (-1.4880) registered highly negative influence with India. The probability values of the four sample indices (TSEC Weighted Index (TWII) - Taiwan, Philippine Stock Index, Thailand SET Index and SSE Composite Index (SSE) - China) were 0.009, 0.13700, 0.27400 and 0.58300, respectively. This indicates that the above four indices recorded significant influence with India S&P CNX Nifty.

The analysis of ANOVA and Regression Model Summary indicates Inter linkages and co movements of seven sample indices of emerging markets with India. However, three Asian emerging markets, namely, Korea, Indonesia and Malaysia, recorded negative influence with India. The overall results of Regression Model, the Regression (R -Value (0.06800), Adjusted R - Square value (0.0050), and the Durbin Watson test (statistical) value of nearly two (1.88000) were significant while F test sig probability value of 0.0610 indicates that the regression model was fit. Hence the Null hypothesis (NH₄), namely, there is no influence among the indices of Emerging Asian stock markets on Indian market, was rejected.

(e) Pair wise Granger Causality Test for the Sample Indices of Emerging Asian Markets and Indian Market

An attempt has been made to study the Co Movements and Bidirectional Causality relationship among all emerging Asian stock market indices with Indian market in Asia, using Pair Wise Granger Causality Test. Table 6 shows the results of Granger Causality for testing the inter linkages of Indian market, with seven sample emerging stock market indices in Asia during the study period. It is to be noted that out of the remaining seven emerging markets, only three markets TSEC Weighted Index - Taiwan (TWII), Korea Stock Exchange Index (KOPSI) - Korea and Jakarta Composite Index (JKSE) - Indonesia were significant and recorded causality relationship on the basis of one way bidirectional causality as per F - Statistics values (Taiwanà India (4.49249), Indiaà Indonesia (3.1343) and Korea à India (3.25561)) and (F - Statistics and Probability values. Further, the remaining four markets (SSE Composite Index - China, FTSE Bursa Malaysia (KLSE) - Malaysia, Philippines Stock Index - Philippines and SET Index - Thailand) did not show any causality relation with India index (S&P CNX Nifty). Hence the Null

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

MODEL	Unstandardized Coefficients		Coefficients Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	0.00100	0.00000		2.38400	0.01700	0.00000	0.00100
China	0.01000	0.01800	0.01000	0.54900	0.58300	-0.02600	0.04500
Indonesia	-0.00900	0.02000	-0.00800	-0.45200	0.65100	-0.04800	0.03000
Korea	-0.02900	0.02000	-0.02800	-1.48800	0.13700	-0.06700	0.00900
Malaysia	-0.00600	0.02700	-0.00400	-0.22100	0.82500	-0.05900	0.04700
Philippines	0.03300	0.02200	0.02800	1.48800	0.13700	-0.01100	0.07700
Taiwan	0.05700	0.02200	0.04900	2.62200	0.00900	0.01400	0.09900
Thailand	0.02300	0.02100	0.02000	1.09300	0.27400	-0.01800	0.06500

a. Dependent Variable: INDIA

MODEL	Sum of Squares	DF	ANOVA		Sig.
			Mean Square	F	
Regression	0.00300	7	0.00000	1.93000	0.06100
Residual	0.73100	2920	0.00000		
Total	0.73400	2927	0.00000	1.93000	0.06100

a. Predictors: (Constant), Thailand, China, Malaysia, Indonesia, Philippines, Taiwan, Korea

b. Dependent Variable: INDIA

Model Summary								
R	R Square	Adjusted R Square	Std. Error of the Estimate	F Change	df1	df2	Sig. F	Durbin-Watson
0.06800	0.00500	0.00200	0.01582	1.93000	7	2920	0.06100	1.88000

a. Predictors: (Constant), Thailand, China, Malaysia, Indonesia, Philippines, Taiwan, Korea

b. Dependent Variable: INDIA

Source: Compiled from yahoo finance and Computed by using SPSS

Hypothesis (NH5), there is no causal relationship among the Indices of Emerging Asian Markets and Indian stock market in Asia, was partially accepted.

The co-movements of S&P CNX Nifty - India and seven sample indices of emerging Asian countries during the study period from 01st January 2002 to 31st December 2013, are shown in Figure 2. This figure was constructed from the results of Granger Causality Test, as given in Table - 6. It is to be noted that out of eight emerging market indices, three emerging market indices (TSEC Weighted Index (TWII) - Taiwan, Korea Stock Exchange Index (KOPSI) - Korea and Jakarta Composite Index (JKSE) - Indonesia) recorded lesser degree of co movements (single side causal relationship) with S&P CNX Nifty (India). The remaining four

Table 6
The Results of Granger Causality for testing the Co Movements of India Market with Seven Emerging Asian Markets during from 01-01-2002 to 31-12-2013

Null Hypothesis:	Obs	F-Statistic	Prob.	Results
INDIA does not Granger Cause CHINA	2995	1.79203	0.1668	Accepts
CHINA does not Granger Cause INDIA	2995	0.89975	0.4068	Accepts
INDIA does not Granger Cause INDONESIA	2926	3.1343	0.0437	Rejects
INDONESIA does not Granger Cause INDIA	2926	0.27996	0.7558	Accepts
INDIA does not Granger Cause KOREA	2967	0.79276	0.4527	Accepts
KOREA does not Granger Cause INDIA	2967	3.25561	0.0387	Rejects
INDIA does not Granger Cause MALAYSIA	2963	1.73722	0.1762	Accepts
MALAYSIA does not Granger Cause INDIA	2963	0.09753	0.9071	Accepts
INDIA does not Granger Cause PHILIPPINES	2935	2.16477	0.1150	Accepts
PHILIPPINES does not Granger Cause INDIA	2935	0.09045	0.9135	Accepts
INDIA does not Granger Cause TAIWAN	2964	0.50611	0.6029	Accepts
TAIWAN does not Granger Cause INDIA	2964	4.49249	0.0113	Rejects
INDIA does not Granger Cause THAILAND	2932	1.54693	0.2131	Accepts
THAILAND does not Granger Cause INDIA	2932	0.37628	0.6864	Accepts

Sources: <http://finance.yahoo.com/> using E-views

Rejection of Null Hypothesis when the Probability value is less than or equal to 0.05.

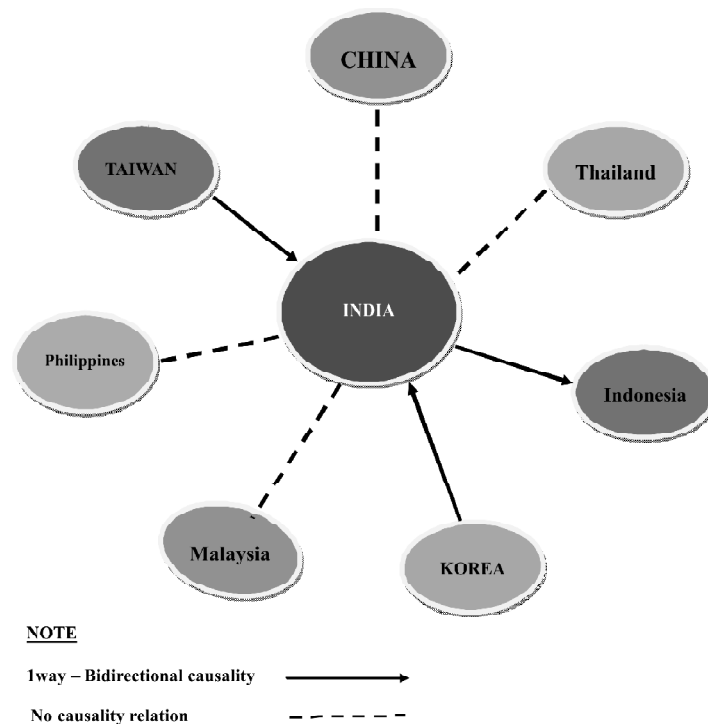


Figure 2: The Co-Movement of Stock Market between India and Seven Emerging Asian countries during from 01st January 2002 to 31st December 2013

indices (SSE Composite Index - China, FTSE Bursa Malaysia (KLSE) - Malaysia, Philippine Stock Index - Philippines and SET Index - Thailand) did not record any causal relationship with S&P CNX Nifty (India).

11. DISCUSSION AND CONCLUSION

The present study suggests that the investment in emerging Stock Markets indices of Asian Countries' in the long-run should be beneficial. Based on the results, the Pairwise Granger Causality test to test the Dynamic linkages between Asian emerging stock markets with India market were significant. There were no substantial opportunities for global investors to improve their portfolio risk-return performance during the study period. However, there was still substantial opportunity to improve the risk-return performance. The daily closing returns result of descriptive statistics was another important evident for identified the highly performed index during the study period. An attempt was made to study co movements, inter linkages and causal relationship of the returns of the S&P CNX Nifty with emerging Asian exchanges indices (SSE Composite Index (SSE), Jakarta Composite Index (JKSE), Korea Stock Exchange Index (KOPSI), FTSE Bursa Malaysia (KLSE), Philippine Stock Index and TSEC Weighted Index (TWII) and Stock Exchange of Thailand SET Index. The daily closing returns varied from 63.97 to 272.89 percent. The average daily return of Indonesia was higher than other emerging Asian stock markets, with 272.89 percent, followed by Indian NSE S&P CNX Nifty with 215.78 percent. China recorded the least return value of 63.97 percent. It is clear that among the sample indices of Asia, Indonesia (272.89%) provided better return than that of India (215.78%) during the study period. According to the analysis, better opportunities existed for diversification among the Asian emerging stock markets in general and stock exchange of Indian CNX Nifty index in particular. The analysis of this study clearly shows that in the long run, four countries, namely, China, Malaysia, Philippines and Thailand exerted the greatest influence on India. The stock exchange of India CNX Nifty index also exercised influence on Taiwan during whole study period. Out of the remaining seven markets, only three markets (Taiwan, Korea and Indonesia) recorded one way bidirectional causality relationship with India. The other four emerging Asian markets (China, Malaysia, Philippines and Thailand) did not record Inter Linkages and Co Movements with India during the study period. The four emerging markets (China, Malaysia, Philippines and Thailand) recorded higher risk than Taiwan, Korea and Indonesia.

Notes

1. Remy Briand and Giacomo Fachinotti (2008), Emerging markets: A 20 -year's perspectives - MSCI Barra- 2008 report.
2. http://www.msci.com/products/indices/country_and_regional/em/ retrieved on 02.02.2014
3. <http://www.nseindia.com/>

References

- 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.
- Chaker Aloui and Bisma Hkiri (2014), Co-movements of GCC emerging stock markets: New evidence from wavelet coherence analysis, *Economic Modelling*, 36, 421–431.
- Claudio Morana and Andrea Beltratti (2008), Comovements in international stock markets. *Journal of International Financial Markets, Institutions and Money*, 18, 31-45.
- 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.
- 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. <http://dx.doi.org/10.1016/j.intfin.2004.07.001>.
- Gong-meng Chen, Michael Firth and Oliver Meng Rui (2002), Stock market linkages: Evidence from Latin America. *Journal of Banking & Finance*, 26, 1113–1141. <http://dx.doi.org/10.1016/j.jbf.2009.03.005>.
- Jan G. De Gooijer and Selliah Sivarajasingham (2008), Parametric and nonparametric Granger causality testing: Linkages between international stock markets. *Physica A*, 387, 2547–2560.
- Jarl Kallberg and Paolo Pasquariello (2008), Time-series and cross-sectional excess comovement in stock indexes. *Journal of Empirical Finance*, 15, 481–502.
- Kasilingam Lingaraja, Professor Murugesan Selvam and Vinayagamoorthi Vasanth (2014). Co Movements and Inter-Linkages among Emerging and Developed Stock Markets in Asia with Reference to Singapore Stock Exchange. *International Research Journal of Finance and Economics*, 122, 102-120. http://www.internationalresearchjournaloffinanceandconomics.com/ISSUES/IRJFE_Issue_122.htm.
- Kasilingam Lingaraja, Murugesan Selvam and Vinayagamoorthi Vasanth (2014)b. The Stock Market Efficiency of Emerging Markets: Evidence from Asian Region. *Asian Social Science*, 10 (19), 158-168. <http://dx.doi.org/10.5539/ass.v10n19p158>.
- Lee K. Lim (2009), Convergence and interdependence between ASEAN-5 stock markets, *Mathematics and Computers in Simulation*, 79, 2957–2966. <http://dx.doi.org/10.1016/j.matcom.2008.12.004>.
- 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.
- 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. <http://dx.doi.org/10.1016/j.iref.2005.09.003>.
- Orawan Ratanapakorn and Subhash C. Sharma (2002), Interrelationships among regional stock indices. *Review of Financial Economics*, 11, 91-108.
- Queensly Jeyanthi. B. J and M. Albert William SJ (2009), An Empirical Analysis of Dynamic Linkages: A Case of India, Japan, Singapore and USA Stock Markets, *SMART Journal of Business Management Studies*, 5 (1), 58-64. <http://www.smartjournalbms.org/smj51.php>

- Remy Briand and Giacomo Fachinotti (2008), Emerging markets: A 20 -year's perspectives - MSCI Barra- 2008 report.
- Selvam Murugesan, Raja, M and Yazh Mozli, P (2007), Forecasting the Time Volatility of Emerging Asian Stock Market Index, *Asia-Pacific Business Review*, 8(2), 27-37. <http://dx.doi.org/10.1177/097324700700300205>.
- Shamila A. Jayasuriya (2011), Stock market correlations between China and its emerging market neighbors. *Emerging Markets Review*, 12, 418-431. <http://dx.doi.org/10.1016/j.ememar.2011.06.005>.
- 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.
- 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.
- 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.
- 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.
- 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.