Long Run Dynamic Linkages Between Emerging Stock Markets in Asia and a Developed Stock Market (DJIA)

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Abstract: The dynamic linkages between emerging Asian stock market indices and developed stock market index are examined in this study. Asian stock markets attract huge inflows of portfolio investments which promote the economic development in the continent. The purpose of the study is to make a better-quality point with respect to Dynamic Linkages among the Emerging Stock Market returns in Asia and Developed Stock Market (USA-Dow Jones Industrial Average). 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 and Granger Causality Test were employed. It was found that the emerging stock market indices of Asia, namely, S&P CNX Nifty (India), FTSE Bursa (Malaysia) and Philippine Stock Index (Philippines), recorded dynamic linkages with Dow Jones Industrial Average (USA) and the other five Asian emerging market indices (i.e., SSE Composite Index (China), Jakarta Composite Index (Indonesia), Korea Stock Exchange Index (Korea), TSEC Weighted Index (Taiwan) and SET Index (Thailand)) did not develop dynamic linkages with USA (DJIA), a developed country. The findings of this study would help the investors in making efficient investment decisions in the indices of emerging stock markets in Asia.

Key words: Asian emerging stock markets, dynamic linkages, correlation matrix, descriptive statistics, granger causality, inter linkages, unit root test, dow jones industrial average

INTRODUCTION

The dynamic linkages between emerging and developed stock markets have naturally become a fertile field for international financial research. A large number of Asian markets have launched a series of reforms, including the modernization and liberalization of their markets. Major aggressive reforms were introduced in the emerging markets from the 20th century. The impact of these reforms was felt in the later stages of liberalization. The present research study examines the dynamic linkages between emerging stock market indices over a long period of time. International investors including Foreign Institutional Investors (FIIs), formulate their investment decisions, taking into account the impact of such reforms on the country's fundamentals (Fujii, 2005). The research study of this nature would help us to understand and to improve the level of pricing efficiency. Besides, it would help the present as well as the potential foreign investors to reap the gains from international portfolio diversification. The study of this nature would facilitate a comparison of the results of emerging markets in Asia with a developed market (NYSE-Dow Jones Industrial Average).

Emerging stock markets: In 1988, for the first time, the Morgan Stanley Capital International (MSCI) launched a comprehensive emerging markets index. The research study, based on MSCI emerging markets index would help all the stakeholders in general and the retail investors in particular. The list of Asian emerging markets is given in Fig. 1.
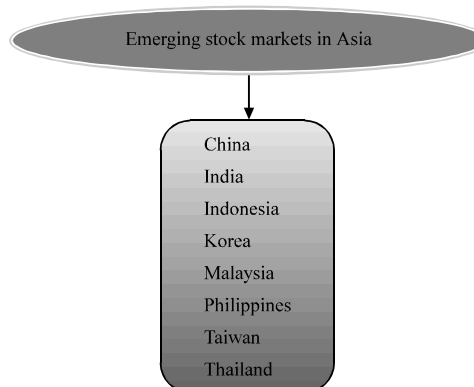

Fig. 1: List of emerging stock markets in Asian Region; Retrieved from http://www.msci.com on 15.08.2014

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Table 1: Summary of notable studies on dynamic linkages of emerging stock markets

Researchers and year	Period of the study	Tools used for analysis	Samples and inputs	Findings of the study
Ratanapakorn and Sharma (2002)	From January 1, 1990 to March 30, 2000	Unit Root Test (ADF and PP), Co integration, Granger Causality and Vector Error Correction Model	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 was found that the US stock market was the most influential one among regional markets during the study period
Chen *et al.* (2002)	From 1st February, 1995 to 30th June, 2000	Summary statistics, autocorrelation, correlation, unit root, VECM and Co integration	Brazil, Mexico, Chile, Argentina, Colombia and Venezuela	The behavior of stock prices in six major Latin American stock exchanges was analyzed, using univariate and multivariate approaches. It was found that the Latin American stock markets offered limited risk diversification until 1999
Jeon and Jang (2004)	From July 1, 1996 and ending February 9, 2001	Unit Root Test, VAR, VECM, correlation and Co integration	US-S&P 500 Index and Korea-Korea Composite Stock Price Index	This stydy investigated the interrelationships between stock prices in the United States and Korea. 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 USA, was found to be minimal
Fujii (2005)	From January 1, 1990 to November 14, 2001	Descriptive statistics, correlation matrix, residual cross-correlation Function tests, GARCH models and 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 data 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 become more interdependent on each other
Pan *et al.* (2007)	From January 1988 to October 1998	Granger Causality test, VAR, Unit Root test, Co Integration 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. 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
Morana and Beltratti (2008)	1973-2004	Conditional correlations, Granger causality and volatility	Closing price index returns for Germany, Japan, the US and the UK	This study examined the linkages across stock markets from several perspectives. The evidence of strong linkages across markets, as measured by co movements in prices and returns and in volatility processes was found
Kallberg and Pasquariello (2008)	From January 5, 1976 and December 31, 2001	Descriptive statistics and regressions analysis	82 industry indexes in the US stock market	This study investigated the excess co movement among 82 indices in the US stock market. It was found that excess square correlation was positively related to the dispersion and copiousness of analysts' earnings forecasts and negatively related to market volatility
Chan *et al.* (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 was found that there was relationship between country's openness and capital market interactions
Lim (2009)	From 1990-2008	Summary statistics, Correlation, Granger Causality test, converging, VAR and Co integration	Association of Southeast Asian Nations' (ASEAN) five countries	This study 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
Ozdemir *et al.* (2009)	From 1st January, 1985 to 24th March 2006	Unit Root Test, Multivariate Co Integration Test and Pair wise Granger-Causality Test	Eight emerging markets 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
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 identified inter linkages of stock return behavior between China and three of its emerging market neighbors in the East Asia and Pacific region. It was found that a common group of investors actively traded in international equity markets

Table 1: Continue

Researchers and year	Period of the study	Tools used for analysis	Samples and inputs	Findings of the study
Tudor and Popescu-Dutaa (2012)	From January 1997 to March 2012	Descriptive statistics and granger causality tests	Seven developed markets and five emerging markets	This study investigated the issue of Granger causality between stock prices and exchange rates movement for developed and emerging financial markets. It was found that the equity market and the evolution of the exchange rate were two interactive time series in the case of Korea
Selvam *et al.* (2013)	From 01/07/2005 to 30/06/2013	Descriptive statistics, graphical exposition correlation and granger causality	USA (developed country) and India (developing country) SME were taken	This study covered the stock market integration of sample SMEs Indices of India and USA. It is to be noted that small and mid cap stocks had produced superior returns over long periods of time during the study period
Lingaraja and Vasanth (2014)	From January 2002 to December 2013	Descriptive statistics, Unit Root test, correlation analysis, linear regression and Granger Causality test	China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan, Thailand and Singapore (developed)	This study examined the inter linkages and Co Movements among the emerging markets and developed market in Asia. It was found that the five emerging markets, namely, China, Indonesia, Korea, Malaysia and Thailand, recorded higher risk than India, Taiwan and Philippines
Aloui and Hkiri (2014)	Periods from 2005-2010	Descriptive statistics, Wavelet, 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 was found that co-movement depends on both frequency and time and it is strongly affected by the occurrence of financial crisis
Lingaraja *et al.* (2014)	From January 2004 to December 2013	Descriptive statistics, Unit Root test, GARCH (1, 1) Model, Autocorrelation and Runs test	Eight emerging Asian countries markets, namely China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand	This study examined the market efficiency and performance among the emerging stock markets in Asia. It was found that the four emerging Asian countries indices namely, India, Indonesia, Malaysia and Philippines were random distribution at 95% confidence level and highly efficient during the study period

Compiled from various journals/books as given in the reference

Literature review: An attempt has been made to review the earlier research studies undertaken in the area of emerging Asian stock markets to identify research gaps and to understand the tools used and findings of earlier studies. Table 1 presents the review of earlier studies and they clearly reveal that there was no comprehensive study exclusively covering the dynamic linkages between the emerging stock markets in Asia and developed market in recent years. As pointed out, 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. An attempt has been made to fill the time gap of researches on dynamic linkage between emerging stock markets in Asia and developed stock market.

Statement of problem: The fluctuations in the emerging markets all over the world in general and in Asia in particular are attributed heavily to cross border capital flows. The fluctuations are also due to the reaction of Asian market to global market cues. Countries like China and India which till date had limited trade and investment interests in most of the Asian countries are expanding their economic ties with several countries in the region. It is to be noted that the recent years witnessed greater cross-border acquisitions within Asian region. 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 the attention of researchers. Among these three regions, the Asian Region has been considered significant from the viewpoint of international portfolio diversification. The diversification strategy provides effective risk minimization and return maximization. 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. This study will help them to identify the best Asian markets for their investment and to use the diversification strategy on par with that of developed market like New York Stock Exchange. Against this background, an attempt has been made in this study to examine dynamic linkages between Emerging Stock Markets in Asia and a Developed (United States) Stock Market.

Need and importance of the study: The present research study is important on the grounds that Asia attracts huge volume of portfolio investments compared to other emerging markets in the region. 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 dynamic linkages between Asian emerging stock markets and developed market is useful for international portfolio managers in making asset allocation decision. The dynamic linkages between Asian emerging stock markets and a developed market are vital to international equity investments both in terms of managing the risk and maximizing the returns. By estimating the extent of dynamic linkages between emerging stock markets in Asian countries and developed USA market, one could assess the potential benefits available to investors through international diversification. The study of this nature could reduce the time of domestic as well as Foreign Institutional Investors (FIIs) for taking decisions on better diversification strategy. This study would provide some useful information to foreign investors about linkages between stock markets in Asia and a developed market.

Objectives of the study: The main objective of this study is to examine and compare the dynamic linkages between the emerging stock markets in Asia (China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand) and a developed stock market like New York Stock Exchange.

Hypotheses of the study: For the purpose of this study, the following four null hypotheses were put to test.

- NH_1: there is no normal distribution among the indices of Asian emerging markets and developed stock market
- NH_2: there is no stationarity among the indices of Asian emerging markets and developed market
- NH_3: there is no co-relation between the indices of Asian emerging markets and the developed USA market
- NH_4: there is no dynamic linkages between the indices of emerging Asian markets and developed USA stock market

MATERIALS AND METHODS

Period of study: This research study covered a period of 12 years from January 1, 2002 through December 31, 2013.

Sample design: In order to examine, the dynamic linkages between the sample stock indices of emerging markets in Asia and a developed market, the study selected all the eight Asian emerging equity markets as identified by the Morgan Stanley Capital International (MSCI) and one developed market index the Dow Jones Industrial Average from the United States of America (USA). It is the oldest and most influential index in the world (Wall Street Journal). The information about sample design is given in Table 2.

Sources of data: The daily closing price of each of the sample index series was collected from MSCI emerging market database, Yahoo Finance database (www.finance. yahoo.com) and website of National Stock Exchange (NSE). Finally, the daily stock market index data used in the study were transformed by taking natural logarithm of the raw index data.

Tools used for analysis: The following tools were used for the analysis:

- Descriptive statistics (to find out the normal distribution of returns of stock markets)
- Unit Root test (to test stationarity among the sample markets)
- Correlation matrix (to find correlation between the Asian emerging markets and USA)
- Granger Causality test (to examine the dynamic linkages between the emerging Asian markets and a developed market)

The computation of data for this study was made by using E-Views (Version 7.0) and SPSS (Version 21.0).

Limitations of the study: The study suffers from the following limitations.

Table 2: The details of sample countries and sample stock market indices

Sample countries	Name of the sample stock market	Name of sample indices	Period of the study	No of ob's
Emerging Asian markets				
China	Shanghai Stock Exchange	SSE Composite Index (SSE)	1st Jan 2002 to 31st Dec. 2013	3046
India	National Stock Exchange	S&P CNX Nifty	1st Jan 2002 to 31st Dec. 2013	2997
Indonesia	Indonesia Stock Exchange	Jakarta Composite Index (^JKSE)	1st Jan 2002 to 31st Dec. 2013	2928
Korea	Korea Stock Exchange	Korea Stock Exchange Index (KOPSI)	1st Jan 2002 to 31st Dec. 2013	2969
Malaysia	Malaysia Stock Exchange	FTSE Bursa Malaysia (KLSE)	1st Jan 2002 to 31st Dec. 2013	2965
Philippines	The Philippine Stock Exchange, Inc.	Philippine Stock Index	1st Jan 2002 to 31st Dec. 2013	2937
Taiwan	Taiwan Stock Exchange	TSEC Weighted Index (TWII)	1st Jan 2002 to 31st Dec. 2013	2966
Thailand	Stock Exchange of Thailand	Thailand SET Index	1st Jan 2002 to 31st Dec. 2013	2934
Developed market				
United States of America	New York Stock Exchange	Dow Jones Industrial Average	1st Jan 2002 to 31st Dec. 2013	3019

Retrieved from Morgan Stanley Capital International (MSCI) (http://www.msci.com) on 04.08.2014

- This study considered only nine sample indices as identified by MSCI (indices of eight emerging Asia 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
- The number of trading days of the sample market was not equal. However, the analysis was made based on observations of common trading days

Analysis of dynamic linkages between indices of Asian emerging markets and a developed stock market: The analysis of dynamic linkages between the sample indices of emerging Asian markets and a developed stock market is presented as follows:

- Descriptive statistics for sample indices of Asian emerging markets and a developed market
- Unit Root test for sample indices of Asian emerging markets and a developed market
- Correlation analysis between the sample indices of Asian emerging stock markets and a developed market
- Pair wise Granger Causality test between the sample indices of Asian emerging markets and a developed stock market index (USA)

Descriptive Statistics for sample indices of Asian emerging markets and a developed market: Table 3 shows the results of Descriptive statistics for sample indices of Asian emerging markets and a developed market. It is clear from Table 3 that out of nine sample indices, the Indonesia Stock Market (JKSE) earned high mean value of 0.000932 followed by Indian stock market (Nifty) with a value of 0.00072 during the study period. The values of JKSE and S&P CNX Nifty were greater than that of other Asian sample indices considered for this study. It is worth noting that the mean value for all the sample indices showed positive sign which indicates the fact that all the nine sample indices earned high return

during the study period. It is to be noted that out of nine indices, only 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 some 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 (0.015994) earned the highest risk value followed by India (0.015731), Korea (0.015032), Indonesia (0.01467), Thailand (0.013858), Taiwan (0.013582), Philippines (0.013314), USA (0.012819) and Malaysia (0.010726). In other words, there was high risk (in respect of sample indices like SSE Composite Index, S&P CNX Nifty, Jakarta Composite Index, Kospi Index, KLSE, Philippine stock Index, TSEC weighted Index, SET Index and Dow Jones Industrial Average) which opened up better opportunity for speculators to earn high returns but investors are advised to carefully study the market risk and take investment decisions of portfolio diversification. The analysis of skewness vividly shows that the values of skewness for all sample indices, except India (0.025075) and Malaysia (0.010726) were negative. It is significant to note from Table 3 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 analysis of Jarque-Bera (JB) values for the sample indices clearly revealed 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 (NH_1). There is no normal distribution among the Indices of Asian emerging markets and Developed Stock Market was rejected and the Alternate Hypothesis, namely. There is normal distribution among the Indices of Asian emerging markets and Developed Stock Market is accepted.

Unit Root test for the sample indices of Asian emerging markets and a developed market: The results of the

Table 3: The results of descriptive statistics for sample indices returns during the study period from 01-01-2002 to 30-12-2013

Descriptive statistics	Emerging Asian countries								
	China	India	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand	USA
Mean	0.000210	0.00072	0.000932	0.000457	0.000396	0.00064	0.000237	0.00059	0.000247
Median	0.000000	0.001202	0.001386	0.000946	0.000522	0.000587	0.00061	0.000841	0.00041
Maximum	0.094549	0.177441	0.079215	0.119457	0.2197	0.098178	0.067422	0.111567	0.173927
Minimum	-0.08840	-0.12237	-0.103753	-0.10570	-0.17507	-0.122683	-0.06678	-0.14839	-0.14719
Std. Dev.	0.015994	0.015731	0.01467	0.015032	0.010726	0.013314	0.013582	0.013858	0.012819
Skewness	-0.01085	0.025075	-0.532686	-0.29849	1.905172	-0.414521	-0.18417	-0.54599	0.516689
Kurtosis	7.153316	12.91989	9.041185	7.930896	135.4433	9.240686	5.682545	12.51171	26.82813
Jarque-Bera	2189.376	12288.55	4590.974	3051.901	2168866	4850.147	906.08	11206.05	71556.3
Probability	0	0	0	0	0	0	0	0	0
Observations	3046	2997	2928	2969	2965	2937	2966	2934	3019
Mean return (mean = X total No. of observations) (%)	63.97	215.78	272.89	135.68	117.41	187.97	70.29	173.11	74.57

http://finance.yahoo.com/ and computed using E-Views 7 Version

Table 4: The results of unit root test for sample 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 values	Critical values	p-values	Statistical values	Critical values	p-values	Statistical values	Critical values	p-values
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
USA (%)									
1	-44.051	-3.43233	0.0001	-3.41791	-2.56573	0.0001	-63.8504	-3.43233	0.0001
5	-44.051	-2.8623	0.0001	-3.41791	-1.94093	0.0001	-63.8504	-2.8623	0.0001
10	-44.051	-2.56722	0.0001	-3.41791	-1.61663	0.0001	-63.8504	-2.56722	0.0001

http://finance.yahoo.com/ and computed using E-Views 7 Version; critical value at 1, 5 and 10% level of significance

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 in respect of sample stock market indices, during the period from 1st January, 2002 to 31st December, 2013 are illustrated in Table 4. It is to be noted that the sample indices of emerging markets in Asia and a developed market, 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 USA Dow Jones Industrial Average (DJIA). Besides, the values of test critical for all sample indices of Asian emerging stock markets and one developed stock market were analysed at three significant levels of 1, 5 and 10%.

According to the results of Table 4, on the basis of all the three tools used for the analysis, the probability value for all the nine sample indices was zero during the study period. 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 (-44.051) USA. Similarly, the statistical values of DF-GLS test for all the 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 (-3.41791) USA 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 (-63.8504) USA. These values were less than that of test critical values at 1, 5 and 10% levels of significance. The results of Unit Root test reveal that the returns data of all sample Asian emerging market indices

and one developed market index attained stationarity during the study period. Hence, the Null Hypothesis (NH_2), namely there is no stationarity among the indices of Asian emerging markets and developed market is rejected and the alternate hypothesis, namely, there is stationarity among the Indices of Asian emerging markets and developed market is accepted. This all nine time series data, i.e., indices were perfectly good for proceeding with further test.

Correlation between the sample indices of Asian emerging markets and a developed USA market: As a general indicator of stock market, a correlation matrix was used. Table 5 shows the results of correlation among the sample indices of Asian emerging markets and a developed market. According to the results of Table 5, the values of correlation ranged from -0.035 (USA-Philippines) to 0.116 (Korea-Philippines) during the study period. Similarly, some indices (i.e., Dow Jones Industrial Average-Philippine Stock Index with the value of -0.035), (India-Korea with the value of -0.023) and (China-Taiwan with the value of -0.015) were negatively correlated. At the same time, it is significant to note from the correlation values earned by Asian emerging market indices that all the indices, namely, SSE Composite Index-China (-0.002), S&P CNX Nifty-India (0.048), Jakarta Composite

Index-Indonesia (-0.019), Korea Stock Exchange Index-Korea (-0.033), FTSE Bursa Malaysia-Malaysia (-0.016), Philippine Stock Index-Philippines (-0.035), TSEC Weighted Index-Taiwan (-0.010) and SET Index-Thailand (0.037) did not correlate with the developed USA market Dow Jones Industrial Average Index during the study period. Hence, the Null Hypothesis (NH_3), there is no co-relation between the Indices of Asian emerging markets and the developed USA market was accepted.

From the overall analysis of correlation, it was found that out of eight Asian emerging market indices, only two indices, namely, S&P CNX Nifty (Indian) and SET index (Thailand) did record effective co movements with Dow Jones Industrial Average (USA) with values of 0.048 and 0.037, respectively. It is to be noted that these two indices performed on par with DJIA (USA) during the study period.

Pair wise Granger Causality test between the sample indices of Asian emerging markets and developed market: An attempt has been made to study the dynamic linkages and bidirectional causality relation between all emerging Asian stock market indices and a developed market, using Pair Wise Granger Causality test. Table 6 shows the results of Granger Causality for testing the inter linkages of USA New York stock market index (DJIA)

Table 5: The results of correlation matrix for sample index returns during the study period from 01-01-2002 to 31-12-2013

Samples	China	India	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand	USA
China	1								
India	0.010	1							
Indonesia	0.010	-0.007	1						
Korea	-0.014	-0.023	0.051**	1					
Malaysia	-0.011	-0.004	0.016	0.067**	1				
Philippines	0.030	0.029	0.050**	0.116**	0.028	1			
Taiwan	-0.015	0.051**	0.007	0.037*	0.022	0.092**	1		
Thailand	-0.004	0.023	0.040*	0.015	0.015	0.030	0.055**	1	
USA	-0.002	0.048**	-0.019	-0.033	-0.016	-0.035	-0.010	0.037*	1

**Correlation is significant at the 0.01 level (2-tailed); *Correlation is significant at the 0.05 level (2-tailed); http://finance.yahoo.com/ and computed using SPSS 21 Version

Table 6: The results of granger causality for testing the dynamic linkages of developed USA with eight Emerging Asian Markets during from 01-01-2002 to 31-12-2013

Null hypothesis	Obs.	F-statistic	Prob.	Results
USA does not granger cause China	3017	2.12146	0.12000	Accepted
CHINA does not granger cause USA	3017	2.16047	0.11540	Accepted
USA does not granger cause India	2995	8.00672	0.00030	Rejected
INDIA does not granger cause USA	2995	3.13026	0.04380	Rejected
USA does not granger cause Indonesia	2926	0.22189	0.80100	Accepted
INDONESIA does not granger cause USA	2926	2.36471	0.09420	Accepted
USA does not granger cause Korea	2967	0.26836	0.76460	Accepted
KOREA does not granger cause USA	2967	0.27873	0.75680	Accepted
USA does not granger cause Malaysia	2963	3.43791	0.03230	Rejected
MALAYSIA does not granger cause USA	2963	2.71828	0.06620	Accepted
USA does not granger cause Philippines	2935	3.43623	0.03230	Rejected
PHILIPPINES does not granger cause USA	2935	2.67305	0.06920	Accepted
USA does not granger cause Taiwan	2964	1.33303	0.26380	Accepted
TAIWAN does not granger cause USA	2964	0.35146	0.70370	Accepted
USA does not granger cause Thailand	2932	0.25265	0.77680	Accepted
THAILAND does not granger cause USA	2932	1.85879	0.15600	Accepted

http://finance.yahoo.com/ using E-views (Version-7); rejection of null hypothesis when the probability value is ≥0.05

2 way: Bidirectional causality
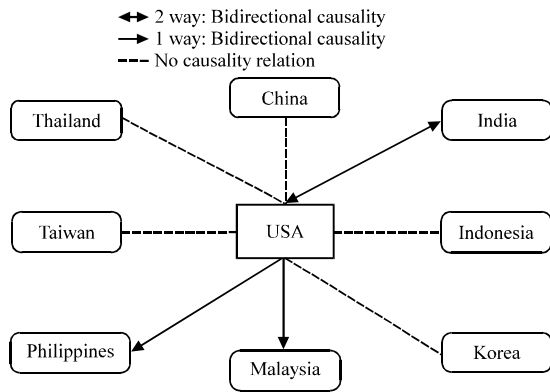1 way: Bidirectional causality
--- No causality relation

Fig. 2: The dynamic linkages of stock markets between USA with Emerging Asian countries during from 1st January, 2002 to 31st December, 2013; the results of Table 6

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 dynamic linkages with the developed USA market on the basis of two way bidirectional causality relation (as per F-statistics, India_USA (3.13026) and USA_India (8.00672)). It was further observed that out of remaining seven emerging Asian markets, only two markets (Philippines and Malaysia) 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, Indonesia, Korea, Thailand and Taiwan) did not experience causality relation with USA. Hence, the Null Hypothesis (NH$_4$), There is no Dynamic Linkages between the Indices of Emerging Asian markets with the Developed USA Stock market was partially accepted.

The dynamic linkages of stock market indices of eight Asian emerging markets with the developed stock market of USA Dow Jones Industrial Average index, during the study period from 1st January, 2002 to 31st December, 2013 are shown in Fig. 2. Figure was created from the results of Granger Causality test, shown in Table 5. Out of eight emerging markets, India registered a high degree of dynamic linkages (two way) with USA market while two other emerging markets (Malaysia and Philippines) recorded lesser degree of linkages (single side causal relationship) with the developed USA market. The remaining five emerging stock market indices (China, Indonesia, Korea, Thailand and Taiwan) did not record any causal relationship with the developed USA market during the study period.

RESULTS AND DISCUSSION

An attempt was made to study dynamic linkages between 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 the New York Stock Exchange Dow Jones Industrial Average (DJIA) USA. The daily closing returns varied from 63.97-272.89%. The average daily returns of Indonesia were higher than that of eight other emerging Asian stock markets with 272.89%, followed by NSE with 215.78%. China recorded the least return value of 63.97% while the developed market (USA-DJIA) earned a value of 74.57%. It is clear that among the sample indices, India (215.78%) provided better return than that of developed market USA (74.57%) during the study period. According to the analysis of this study, better opportunities existed for diversification among the Asian stock markets in general and among India, China and USA in particular.

CONCLUSION

The analysis of this study clearly shows that in the long run, three countries, namely, India, Malaysia and Philippines exerted the greatest influence on the developed USA. The developed market (USA-DJIA) also exercised influence on India during the whole study period. It is to be noted that India was highly inter linked with USA, i.e. (two way bidirectional causality relationship). But out of remaining seven Asian emerging markets, only two markets (Philippines and Malaysia) recorded one way bidirectional causality relationship and dynamic linkages with the developed market (USA-DJIA). The other five emerging Asian markets (China, Indonesia, Korea, Taiwan and Thailand) did not record dynamic linkages with the developed USA Market during the study period. The five emerging markets (China, Indonesia, Korea, Taiwan and Thailand) recorded higher risk than India, Malaysia and Philippines.

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