Inter-Linkages, Co Movements and Causal Relationship among Emerging Stock Markets in Asia with Reference to Stock Exchange of Thailand

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Abstract: The study of Inter-Linkages, Co Movement and Causal Relationship among emerging stock market indices returns in Asia, has gained momentum. Asian stock markets attract huge inflows of portfolio investments which promote the economic development in the Continents. The favorable regulatory changes and technological advancement have brought about significant changes in the Asian emerging markets. The purpose of the paper is to study Inter Linkages, Co Movements and Causal Relationship among the emerging stock market returns 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, Correlation Matrix and Granger Causality Test were employed. Investors are increasingly interested in international diversification due to the emergence of liberalization of stock markets in recent years. 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, International Diversification.

1. Introduction

Foreign investors need better diversification for their portfolio in order to reap gains from their investment. Inter – Linkages, Co Movements and Causal Relationship are fertile areas for research because it could suggest better solutions to the foreign investors. Research in this area has been considered significant from the viewpoint of international portfolio diversification because cross – border acquisitions are witnessed in Asia also. Countries like China, Thailand and India, which till recently had limited trade and investment interests in majority of Asian countries, are expanding their economic ties with several countries in the region. Against this background, an attempt has been made in this study to examine inter-linkages, co-movements and causal relationship among emerging stock markets in Asia, with reference to Thailand Stock Exchange. Major aggressive reforms have been introduced in the emerging markets in the recent past (Fiji Fujii**, 2005).** Hence this study might facilitate comparison between the results of emerging markets in Asia (listed in Morgan Stanley Capital International index) in general and Thai Stock Market (SET index) in particular.

In May 1974, long-awaited legislation establishing, The Securities Exchange of Thailand (SET) was enacted. By 1975 the basic legislative framework was in place and on April 30, 1975, The Securities Exchange of Thailand officially started trading. On January 1, 1991, its name was formally changed to, The Stock Exchange of Thailand (SET). The Securities and Exchange Act of 1992 (SEA) has created the Securities and

Exchange Commission (SEC) as a single unified supervisory agency to be the regulator of the Thai Capital Market.

The SET Index is a composite market capitalization-weighted price index that compares the Current Market Value (CMV) of all listed common stocks with their market value on the base date of 30 April 1975 (Base Market Value or BMV), the date on which the stock market was established. The initial value of the SET index on the base date was set at 100 points. The formula for calculating the SET index is as follows (Phaisarn Sutheebanjard**, 2010**).

$$\text{SET Index} = \frac{\text{Current Market Value} \times 100}{\text{Base Market Value}}$$

2. Review of Literature

Orawan Ratanapakorn and Subhash C. Sharma **(2002)** studied the short-term and long-term relationships in five regional stock indices (namely, 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. 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)** investigated the behavior of stock prices in six major Latin American stock exchanges using univariate and multivariate approaches. The samples for this research were Brazil, Mexico, Chile, Argentina, Colombia and Venezuela markets. It was found that investing in various Latin American stock markets offered limited risk diversification until 1999. 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. Ming-Shiun Pan, et al **(2007)** demonstrated the dynamic linkages between the foreign exchange and stock markets of seven East Asian countries during the period from January 1988 to October 1998. 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 - Japan, Hong Kong, India, Korea, China, Taiwan, Singapore, Malaysia, Thailand and Indonesia - during the period from January 2000 to December 2006. This study found evidence of time varying volatility, [i]clustering, high persistence and predictability for almost all the Asian market indices. They also examined the emerging markets except India and China, which exhibited low returns. 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) 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 during the study period. It was found that there was relationship between country's openness and capital market interactions. 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. 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

zdemira, Hasan Olgun and Bedriye Saracoglu **(2009)** analyzed the dynamic linkages between the equity markets of a center (the US) and in its emerging markets periphery during the period from 1st January, 1985 to 24th March 2006. This indicated that a kind of center - periphery relation existed in international stock markets. Shamila A. Jayasuriya **(2011)** investigated the inter linkages of stock return behavior between China and three of its emerging markets (Thailand, Indonesia and Philippines) in the East Asia and Pacific region during the study period from November 1993 to July 2008. It was found that a common group of investors actively trading in international equity markets might be a likely determinant of financial integration across markets. Chaker Aloui and Besma Hkiri **(2014)** estimated the 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. It was found that statistical tools like Descriptive Statistics, Wavelet, wavelet squared Coherence Test, Unconditional cross correlation and VAR were used to determine the co-movement on both frequency and time and it co-movement depended 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. It was found that there was significant time-varying correlation between the two times series.

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 seven emerging Asian stock markets and Thailand Stock Market.

3. Empirical Methodology

The assessment of linkage dynamics, co movements and causality of emerging 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. 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 and Taiwan and Thailand) in Asia, with special reference to Thailand Stock Exchange. For the purpose of examining the dynamic linkages and co movement among sample stock indices of selected emerging markets in Asia, the study covered a period of 12 years from January 1, 2002 through December 31, 2013. 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).

3.1. Movements of Emerging Markets with Thai SET index in Asia

In order to study the movements of indices, the line chart was used. The movements of Thailand SET index was compared with all the seven indices of emerging market indices 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) in Asia.

Figure 1 gives the movements for all the emerging eight indices of Asian stock markets during the study period. 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 of 2008. But from 2008 to 2013 period, all the eight emerging Asian market indices gradually increased their movement upward.

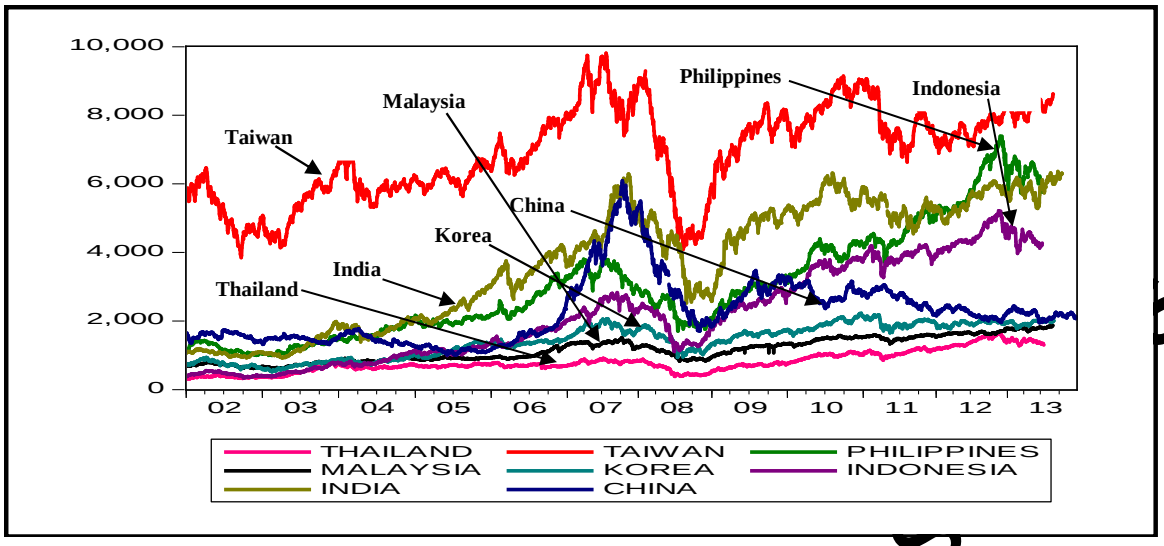


Figure – 1: Movements of Indices of Emerging Asian Stock Market (From 2002 to 2013)

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

The movement of stock exchange of Thailand SET index from 2002 to 2013 is shown in **Figure 2**. It is clearly observed that the index of Thailand was highly volatile during the study period from 2003 to 2013. Hence the performance of stock exchange of Thailand SET index assumed a low level of risk and return to the retail investors from 2009 to 2013.

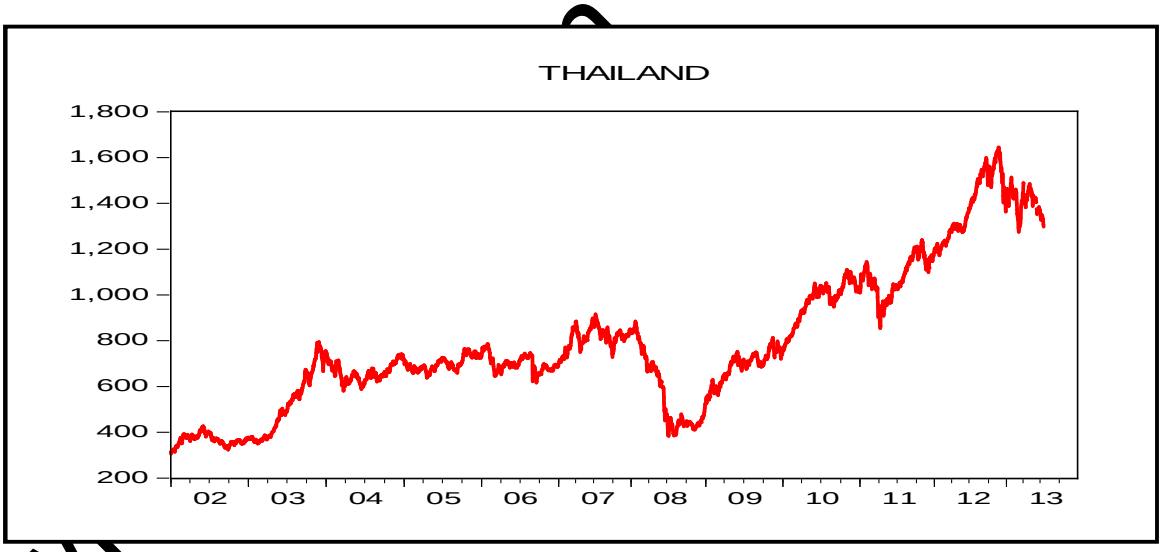


Figure – 2: Movement of Index of Thailand Stock Market (From 2002 to 2013)

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

3.2. Descriptive Statistics for the Indices of Asian emerging markets.

Table - 1 shows the results of descriptive statistics for sample stock market indices in Asia (emerging) during the study period. It is to be noted that the summary of statistics, namely, mean, minimum,

maximum, median, standard deviation (SD), skewness, kurtosis and the Jarque- Bera was 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 which indicated the fact that all the indices earned positive 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 0.000237, respectively. The mean returns of sample indices i.e. Philippines (0.00064) and Thailand (0.00059), Korea (0.000457) and Malaysia (0.000396) improved and came closer to Indonesia and India. In terms of market unpredictability, as measured by the standard deviation of daily returns, China recorded high 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 indicated the fact that there was high risk in respect of SSE Composite Index, S&P CNX Nifty, Jakarta Composite Index, Kospi Index, KLSE, Philippine stock Index, TSEC weighted Index and SET Index, which was useful for speculators but the investors had to carefully study the market risk and take studied investment decision of portfolio diversification. The analysis of skewness showed that the 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 made 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.

Table – 1: 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 / Descriptive Statistics	China	India	Indonesia	Korea	Malaysia	Philippines	Taiwan		Thailand
Mean	0.000210	0.00072	0.000932	0.000457	0.000396	0.00064	0.000237		0.00059
Median	0.000000	0.001202	0.001386	0.000946	0.000522	0.000587	0.00061		0.000841
Maximum	0.094549	0.177441	0.079215	0.119457	0.219770	0.098178	0.067422		0.111567
Minimum	-0.088840	-0.122377	-0.103753	-0.105705	-0.175076	-0.122683	-0.066789		-0.148395
Std. Dev.	0.015994	0.015731	0.01467	0.015032	0.010726	0.013314	0.013582		0.013858
Skewness	-0.010085	0.025075	-0.532686	-0.298497	1.905172	-0.414521	-0.184178		-0.545991
Kurtosis	7.153316	12.91989	9.041185	7.930896	135.4433	9.240686	5.682545		12.51171
Jarque-Bera	2189.376	12288.55	4590.974	3051.901	2168866	4850.147	906.08		11206.05
Probability	0	0	0	0	0	0	0		0
Observations	3046	2997	2928	2969	2965	2937	2966		2934
Mean return (mean = X total no.	**63.97**	215.7	**272.89**	135.68	117.41	187.97%	70.29		173.11

of observations) (%)	**%**	8%	**%**	%	%		%	%

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

3.3. Correlation for the Indices of Asian emerging markets with Thailand SET index.

As a general indicator of market, a correlation matrix was used. **Table 2** shows the results of correlation among the sample indices of emerging stock markets and Thailand 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 (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 - Korea with the value of -0.014) were negatively correlated. It is significant to note from the correlation values earned by emerging market indices in Asia India (0.023), Indonesia (0.040), Korea (0.015), Malaysia (0.015), Philippines (0.030) and Taiwan (0.055) were positively correlated with Thailand. At the same time, only one index, namely, Shanghai Stock Exchange Composite index of China (-.004) was negatively correlated with Thailand.

Table – 2: 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**
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
**. 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

3.4. Pair wise Granger Causality Test for the Indices of emerging Asian markets and Thailand market.

An attempt has been made to study the Co Movements and Bidirectional Causality relation among all emerging Asian stock market indices with Thailand market in Asia, using Pair Wise Granger Causality Test. Table – 3 shows the results of Granger Causality for testing the inter linkages of Thailand market, with seven 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, Indonesia, was perfectly fit and recorded Co Movement with Thailand market on the basis of two way bidirectional causality relation (as per F – Statistics, Indonesia→ Thailand (13.0371) and Thailand→ Indonesia (13.4698)). It is to be noted that out of remaining six emerging markets, only three markets (Korea, Philippines and Taiwan) were significant and recorded causality relationship on the basis of one way bidirectional causality (F – Statistics and Probability values). Further, the remaining three indices (China, India and Malaysia) had no causality relation with Thailand.

The co-movements of stock market indices of Thailand and seven indices of emerging Asian countries during the study period, are shown in **Figure 3.** This figure was created from the results of Granger Causality test shown in Table 7. It is to be noted that out of eight emerging markets, Indonesia registered a high degree of Co Movements (two way) with Thailand market while three other emerging markets (Korea, Philippines and Taiwan) recorded lesser degree of co movements (single side causal relationship) with Thailand. The remaining three indices (China, India and Malaysia) did not register any causal relationship with Thailand.

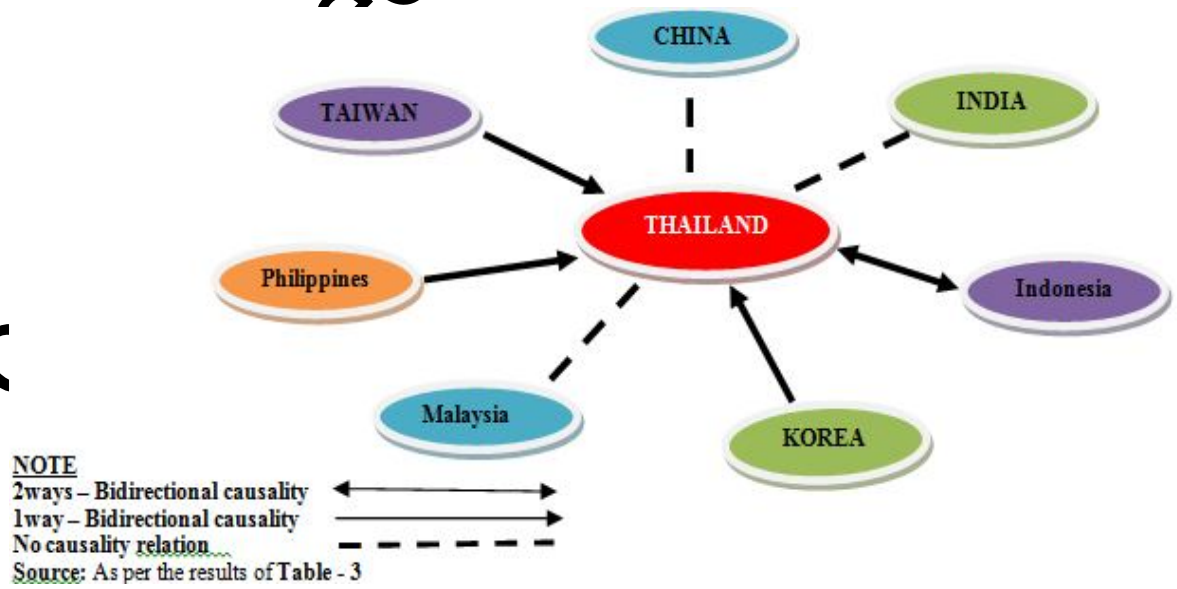
Table – 3: The Results of Granger Causality for testing the Co Movements of Thailand Market with Seven Emerging Asian Markets during from 01-01-2002 to 31-12-2013

Null Hypothesis:	Obs	F- Statistic	Prob.	Results
THAILAND does not Granger Cause CHINA	2932	0.91079	0.4023	Accepts
CHINA does not Granger Cause THAILAND	2932	0.13239	0.8760	Accepts
THAILAND does not Granger Cause INDIA	2932	0.37628	0.68640	Accepts
INDIA does not Granger Cause THAILAND	2932	1.54693	0.21310	Accepts
THAILAND does not Granger Cause INDONESIA	2926	13.4698	0.00000	**Rejects**
INDONESIA does not Granger Cause THAILAND	2926	13.0371	0.00000	**Rejects**
THAILAND does not Granger Cause KOREA	2932	1.71658	0.17990	Accepts
KOREA does not Granger Cause THAILAND	2932	6.84903	0.00110	**Rejects**
THAILAND does not Granger Cause MALAYSIA	2932	1.85054	0.15730	Accepts
MALAYSIA does not Granger Cause THAILAND	2932	0.38936	0.67750	Accepts
THAILAND does not Granger Cause PHILIPPINES	2932	0.91838	0.39930	Accepts
PHILIPPINES does not Granger Cause THAILAND	2932	4.41371	0.01220	**Rejects**
THAILAND does not Granger Cause TAIWAN	2932	0.27479	0.75980	Accepts
TAIWAN does not Granger Cause THAILAND	2932	3.38661	0.03400	**Rejects**

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 – 3: The Co-Movement of Stock Market between Thailand and Seven Emerging Asian countries during from 01st January 2002 to 31st December 2013.



4. 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 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 returns of Indonesia were 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 while Thailand SET index earned a value of 173.11 percent. It is clear that among the sample indices of Asia, Indonesia (272.89%) provided better return than that of Thailand (173.11%) 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 Thailand SET index in particular.

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

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