

LINKAGES BETWEEN INDIA AND THREE ASEAN STOCK MARKETS: A CO-INTEGRATION APPROACH

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Abstract Today, an investor has an array of investment choices including the opportunities to approach overseas market which were unavailable a few decades ago. In literature, the integration of stock markets has been widely discussed and analysed. This paper examines the relationship between Indian stock market and the three stock markets of the ASEAN countries viz. Indonesia, Malaysia, and Singapore. Using the daily closing prices of the indices over a period of ten years i.e. 2004 to 2014, the study examined the inter-linkages of Indian stock market with the three markets. The Granger-causality and co-integration test were used to check the causal relationship. The study found that there is a significant short-term unidirectional influenced from the Indian stock market to the three ASEAN countries stock markets while no long-term relation (no co-integration) are found between the Indian equity market with that of three ASEAN countries viz. Indonesia, Malaysia, and Singapore equity markets.

Keyword: Inter-linkages, Stock Market, Granger's Causality Test, Co-integration, SENSEX, ASEAN

INTRODUCTION

There have been significant changes happening in the global financial markets. A new market framework has been coming into shape with the developments taking place in the financial markets. The new opportunities provided by the technology have given new impetus to the development of stock exchanges worldwide. The dynamism of financial markets, technological advances and new regulation has contributed the expansion of trading opportunities. Today, an investor has an array of investment choices which were unavailable a few decades ago. Investors have opportunities to approach overseas market. The global markets have become more accessible. In literature also, the integration of stock markets has been widely discussed and analysed. The knowledge of international stock market is significant for portfolio managers and investors. Due to this fact, the researchers world-wide have keen interest in the performances of the stock markets and its inter-linkages.

Over the years there has been rapid reference to the linkages of the global financial markets. Casual observations of the behaviour of the world markets crashes witnessed in recent past lend support to this view. There have been instances when the equity market in one market was followed by sharp declines in markets world-wide. However the effects of the events vary across different regions. There have been number of academic studies that found the linkages of the markets. Contrarily, there are also a number of studies that found high degree of independence among the

stock markets. The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967. The Member States of the Association are Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. The ASEAN Secretariat is based in Jakarta, Indonesia. Among ten nations of ASEAN, Indonesia, Malaysia, Philippines, Singapore, and Thailand are the original five member nations who formed the bloc to promote political and economic cooperation and regional stability. The present study is an analysis of the inter-linkages of the Indian stock market with the stock markets of three original ASEAN countries viz. Indonesia, Malaysia, and Singapore.

The paper attempts to examine the inter-linkages and causal relationship between the Jakarta Composite Index (JCI) of Indonesia Stock Exchange in Indonesia, Kuala Lumpur Composite Index (KLCI) of Malaysia Stock exchange in Malaysia and the Strait Times Index (STI) of the Singapore Stock Exchange in Singapore with the BSE Sensex in India during the period of the period January 01, 2004 to November 30, 2014.

JCI is a major stock market index which tracks the performance of all companies listed on the Indonesia Stock Exchange. KLCI is a major stock market index which tracks the performance of 30 largest companies by full market capitalisation listed on Malaysia Stock Exchange (Bursa Malaysia). The STI is a major stock market index which tracks the performance of the top 30 companies listed on the Singapore Stock Exchange. SENSEX is a free-float market-weighted stock market index of 30 well established

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and financially sound companies listed on Bombay Stock Exchange.

REVIEW OF LITERATURE

Various theories of finance, suggest that investors should hold a well-diversified portfolio to reduce risk. According to the Portfolio theory of Markowitz (1952), the diversification of portfolio is beneficial when the correlation among the assets is negative. International investors are interested to understand whether diversification can give some gain or not. If the stock markets move together then investing in different national stock market would not generate any gain. Therefore, the analysis of the relationship between the stock markets will facilitate global investors in reaching a better decision.

Various studies have examined the interdependence among the world stock exchanges. Palac-McMiken (1997) examined stock markets linkages of five ASEAN member countries of Indonesia, Malaysia, Thailand, Philippines, and Singapore. Using the monthly price indices from Indonesia (JCSPI), Malaysia (KLSE-Composite), Philippines (PSE Composite), Singapore (SES-All), and Thailand (SET) during the period of January 1987 to July 1995, the study adopted co-integration approach in testing the integration of the ASEAN stock markets. The study found that all the markets except Indonesia are linked with each other. Thai stock prices can be used to predict stock price movements in Singapore, Malaysia, and the Philippines. The stock price movements in Singapore can be predicted using stock price movements in Malaysia and vice-versa. The paper observes that the absence of a link between the Indonesian market and other ASEAN market still provides room for efficient portfolio diversification even at the regional level.

In another study using the Johansen and Juselius multivariate co-integration procedures, Granger-causality tests and variances decomposition analysis, Phuan, Lim, & Ooi (2009) examine the relationship of financial liberalisation and stock markets integration among ASEAN-5 stock markets: Indonesia, Malaysia, the Philippines, Singapore, and Thailand. They have used the daily closing values of the indices covering the period of 2/01/1986 to 30/06/1997. The study analysed the behaviour of the market by dividing the sampled period into three sub-periods. The study provides different findings on the co-integrating relationships over each sub-periods. The study found that the stock market indices have long-run relationships in the second and third period but not in the first period. They have observed that there is an increase in integration among ASEAN-5 stocks markets after the financial liberalisation on stock markets.

Roca, Selvanathan, & William (1998) investigate the extent and structure of price linkages among five ASEAN markets:

Malaysia, Singapore, the Philippines, Indonesia, and Thailand, both in the long run and in the short run. The weekly data covering the period 1988-1995 were tested using co-integration based on the Johansen (1988) procedure, Granger causality, forecast variance decomposition and impulse response analyses. The study found no co-integration among the markets as a group indicating no significant long-term price linkage among ASEAN equity markets. However, these markets are all significantly linked each other in the short-term. The analysis indicates a bidirectional causality between Malaysia and Singapore, Singapore and Thailand, and Malaysia and Thailand. A unidirectional causality occurs between the Philippines and Singapore with causality running from the former to the latter. The forecast variance decomposition analyses show that Malaysia is the most, and Indonesia is the least, influential among the ASEAN markets.

In attempting to understand the international transmission mechanism of stock market movements, Eun & Shim (1989) estimated a nine-market vector-autoregressive system using daily rates of return on the stock market indices from the period January 1980 through December 1985. The daily return data from the nine markets viz. Australia, Canada, France, Germany, Hong Kong, Japan, Switzerland, United Kingdom, and United States were used. The study found that a substantial amount of interdependence exists among national stock markets. The U.S. stock market is found to be, by far, the most influential market in the world. No national stock market is nearly as influential as the U.S. in terms of its capability of accounting for the error variances of other markets.

Cochran & Mansur (1991) found the existence of significant unidirectional and bidirectional effects which suggests that the international equity markets are not completely integrated. They have studied the causality taking the sample of the eight countries viz. Canada, Germany, France, Netherlands, Switzerland, United Kingdom, Japan, and United States using pair-wise Granger tests.

A paper by Ahmad, Ashraf, & Ahmed (2005) analyses the inter-linkages and causal between the Nasdaq composite index of US, the Nikkei of Japan with that of NSE Nifty and BSE Sensex in India during the period January 1999 to August 2004 using daily closing data. The study using the co-integration test and Granger causality test found out that there was no long-term relation (no co-integration) of the Indian equity market with that of US and Japanese however, the US and Japanese market had the short-term causal influence over Indian stock market for the study period.

A paper by Singh & Sharma (2012) studying the linkages between the Stock exchanges of Brazil, Russia, India, and China found that the Russian, Indian and Brazilian stock exchanges affects each other and get affected by their own return but none of these affect Chinese stock exchange.

Table 1: Stock Exchange and Stock Indices

Sl. No	Country	Stock exchanges	Index	Symbol
1	India	Bombay Stock Exchange	Sensitive Index	SENSEX
2	Indonesia	Indonesia Stock Exchange	Jakarta Composite Index	JCI
3	Malaysia	Malaysia Stock Exchange	Kuala Lumpur Composite Index	KLCI
4	Singapore	Singapore Stock Exchange	Strait Times index	STI

The Granger's causality model, Vector Auto Regression (VAR) model and Variance Decomposition Analysis were performed by using the data of 60 months from 1st April, 2005 through 31st March, 2010.

The stock markets integration has been analysed by researchers (Vanitha, Srinivasan, & Karpagam, 2011; Lamba, 2008; Agmon, 1972; Hilliard, 1968; Tripathi, Seth, & Kumar, 2013; Daly, 2003; Yang, Khan, & Pointer, 2003; Dhal, 2009 etc.). The inter-linkages has been checked with equity markets of both developed and the emerging markets. The results have been found mixed evidence in the study above mentioned.

RESEARCH OBJECTIVES

This study has been undertaken to cater the following objectives:

- To find whether Indian stock market is interlinked with those of ASEAN countries in the long-run.
- To examine any changes in the long-run inter-relationship of Indian stock market with those of the ASEAN countries over the period.
- To determine the short-term relationship between the Indian stock market and the stock markets of the ASEAN countries
- To examine any changes in the short-term relationship of Indian stock market with those of the ASEAN countries over the period.

METHODOLOGY

Sample

The present study is based on a time-series of daily data for the period January 2, 2004 to December 8, 2014. Table 1 shows the sampled stock exchanges and their respective details.

Data

The daily closing prices for the indices are collected from yahoofinance.com. The daily indices in the sample stock

markets are matched by the calendar date. To make the paired series comparable and the observation equal, the holidays and days with no trading have been omitted from the paired series. Thus, if there is a holiday in any of the country, the data have been removed for all the countries. The period is divided into two sets of years i.e. 2004-2009 and 2010-2014 in order to capture the effect and movement of stock exchanges with each other during different sub periods.

Tools used

In order to achieve the objective of the paper and examine the nature and causality of the selected time series data, the following tests were undertaken:

- Testing for stationarity of the data is done by using the Augmented Dickey-Fuller method (ADF) and Philips-Perron (PP) tests.
- For Causality Test, the co-integration test and Granger test is used to identify whether one series has a significant explanatory power for the other series or not.

Hypotheses

- H_{01} : SENSEX does not Granger-cause JCI or KLCI or STI
- H_{02} : There is no co-integration between Indian equity markets and the ASEAN countries equity markets.

EMPIRICAL ANALYSIS

Unit Root Test Results

The first step in examining the empirical causality by Granger causality is to identify the nature of the time series data. Stochastic process having a unit root is said to be non-stationary. The theoretical condition for the successful application of Granger-causality test is that the time series should be stationary. The unit root test was thus conducted of the four indices selected. The ADF and PP tests for stationarity are applied in three forms: without drift and time trend; with drift and no time trend; and with drift and time trend.

Table 2: Unit Root Test on Indices

Variables	ADF Test			PP test		
	2004-2014	2004-2009	2010-2014	2004-2014	2004-2009	2010-2014
SENSEX	-0.46797	-1.07649	0.542486	-0.32047	-1.00098	0.425484
JCI	-0.29212	-0.90094	-1.59994	-0.27925	-0.8687	-1.5877
KLCI	-0.99077	-1.10472	-1.75126	-0.99005	-1.23866	-1.75821
STI	-1.91951	-1.4283	-2.20936	-1.95207	-1.41403	-2.40169
dSENSEX	-45.5049*	-33.586*	-30.7712*	-45.3717*	-33.4267*	-30.7258*
dJCI	-31.0823*	-34.2813*	-21.896*	-47.1997*	-34.1799*	-32.1823*
dKLCI	-52.0843*	-34.4607*	-38.7763*	-52.0350*	-34.6898*	-38.8551*
dSTI	-49.7366*	-36.8367*	-33.5189*	-49.7513*	-36.8426*	-33.5751*

Note: MacKinnon critical values for the rejection of unit root test at 1% are -3.432792, -3.434906 and -3.436014 for respective sample sizes
Null Hypothesis: the series in non-stationary

The three alternative specifications of ADF test are as follows:

$$\Delta y_t = \lambda y_{t-1} + \sum_{i=1}^p \gamma_i \Delta y_{t-1} + \mu_t \tag{1}$$

$$\Delta y_t = \alpha_0 + \lambda y_{t-1} + \sum_{i=1}^p \gamma_i \Delta y_{t-1} + \mu_t \tag{2}$$

$$\Delta y_t = \alpha_0 + \beta_0 t + \lambda y_{t-1} + \sum_{i=1}^p \gamma_i \Delta y_{t-1} + \mu_t \tag{3}$$

To test for stationarity, the null hypothesis is:

$$H_0: \lambda=0$$

and alternative hypothesis is:

$$H_1: \lambda < 0$$

All the three forms to test the series for stationarity have estimated and found that the results are invariant to the model specification except minor differences in the ADF and PP values. Therefore, only the results of ADF and PP tests based on drift and without time trend are reported in Table 2. It can be concluded that the index series are non-stationary in the total time periods as well as sub-periods 2004-2009 and sub-period 2010-2014, whereas the unit root test results for its first difference for the entire sample period and the sub-sample periods show that the stock markets are stationary. The same results are obtained by both the ADF and PP tests indicating the robustness of the findings.

Granger Causality Test Result

Granger causality test shows the short-term relationship of precedence among variables. It is applied on the stationary series. Hence, it is applied on the first differences of the indices series. Thus, Granger causality test is conducted to

analyse the significance and direction of causality between Indian stock markets and the ASEAN countries stock markets. According to Granger (1969), this test will answer the question of whether *X series* causes another series *Y*.

Y is said to be Granger-caused by *X* if *X* helps in the prediction of *Y*, or equivalently if the coefficient on the lagged *X* are statistically significant. To show that *X* Granger cause *Y*, first step is to consider an autoregression for *Y*. Next, lagged values of *X* are added as the extra independent variables. Granger Causality test results are very sensitive to the number of lags used in the analysis. There are different criteria for specifying the lag length. This study adopts Akaike information criterion (AIC) in which lag 3 is found to be the optimal lag. The equation for the pair-wise Granger causality tests are as follow:

$$X_t = \sum_{i=1}^n \alpha_i y_{t-i} + \sum_{j=1}^n \beta_j X_{t-j} + \mu_{1t} \tag{4}$$

$$Y_t = \sum_{i=1}^n \lambda_i Y_{t-i} + \sum_{j=1}^n \delta_j X_{t-j} + \mu_{2t} \tag{5}$$

where, X_t and Y_t = daily stock market index return for country *X* and *Y* respectively; μ_{1t} and μ_{2t} are uncorrelated error term at time *t* with zero means and finite variance, *i* and *j* are number of lags and *n* is the suitable maximum number of lagged observation included in the model which is a positive integer.

The F test is used to test the hypotheses of the Granger Causality as follow:

$H_{0a}: \beta_j = 0$; the null hypothesis that Y_t does not Granger-cause X_t is rejected if β_j 's, $j > 0$ in (5) are jointly different from zero using the F test. Similarly, $H_{0b}: \delta_j = 0$; the null hypothesis that X_t does not Granger-cause Y_t is rejected if δ_j 's, $j > 0$ in (6) are jointly significantly different from zero using the F test.

As such, the null hypothesis is rejected if the computed F-value exceeds the critical F value at the chosen level of

Table 3: Pair-wise Granger Causality Tests Total time period (2004-2014)

Null Hypothesis:	Observation	F-Statistic	Prob.
DJCI does not Granger Cause DSENSEX	2481	1.2095	0.3047
DSENSEX does not Granger Cause DJCI		17.4513	3.00E-11**
DKLCI does not Granger Cause DSENSEX	2481	0.07086	0.9755
DSENSEX does not Granger Cause DKLCI		33.8918	2.00E-21**
DSTI does not Granger Cause DSENSEX	2481	1.70964	0.1629
DSESEX does not Granger Cause DSTI		8.07794	2.00E-05**
DKLCI does not Granger Cause DJCI	2481	1.08528	0.3540
DJCI does not Granger Cause DKLCI		20.164	7.00E-13**
DSTI does not Granger Cause DJCI	2481	5.17487	0.0014**
DJCI does not Granger Cause DSTI		0.59702	0.6169
DSTI does not Granger Cause DKLCI	2481	30.8693	1.00E-19**
DKLCI does not Granger Cause DSTI		2.72107	0.0430*

*significant at 5%

**significant at 1%

significance (0.05). This implies that X does Granger cause Y. The test is performed in pair-form between Indonesia and India; Malaysia and India; and Singapore and India.

Granger Causality in the Total Time Period (2004-2014)

The results of the Granger causality test of the total time periods are summarized in Table 3 and it indicates whether

there exists significant Granger Causality and if it exists, then in which direction such causality exists among the various stock markets. The table elucidates that significant causality are found between seven pairs. The STI has influenced the stock market of JCI. The JCI has influenced the KLCI. There is a bi-directional causality between KLCI and STI. The test found no influence of Indian equity market on any of the three ASEAN equity markets rather there is a significant unidirectional influenced from the Indian Stock Market to all the three ASEAN countries stock markets over the period.

Table 4: Pair-wise Granger Causality Tests of period (2004-2009)

Null Hypothesis:	Observation	F-Statistic	Prob.
DJCI does not Granger Cause DSENSEX	1369	0.66522	0.5735
DSENSEX does not Granger Cause DJCI		12.4405	5.00E-08**
DKLCI does not Granger Cause DSENSEX	1369	1.25693	0.2878
DSENSEX does not Granger Cause DKLCI		19.4458	2.00E-12**
DSTI does not Granger Cause DSENSEX	1369	2.08425	0.1005
DSENSEX does not Granger Cause DSTI		4.15914	0.0061**
DKLCI does not Granger Cause DJCI	1369	0.54227	0.6534
DJCI does not Granger Cause DKLCI		5.38737	0.0011**
DSTI does not Granger Cause DJCI	1369	2.52425	0.0562
DJCI does not Granger Cause DSTI		2.77311	0.0403*
DSTI does not Granger Cause DKLCI	1369	13.1861	2.00E-08**
DKLCI does not Granger Cause DSTI		3.1943	0.0228*

*significant at 5%

**significant at 1%

Table 5: Pair-wise Granger Causality Tests Total period (2010-2014)

Null Hypothesis:	Observation	F-Statistic	Prob.
DJCI does not Granger Cause DSENSEX	1112	3.07946	0.0267*
DSENSEX does not Granger Cause DJCI		6.85795	0.0001**
DKLCI does not Granger Cause DSENSEX	1112	1.49531	0.2142
DSENSEX does not Granger Cause DKLCI		13.0324	2.00E-08**
DSTI does not Granger Cause DSENSEX	1112	1.55595	0.1984
DSENSEX does not Granger Cause DSTI		6.81883	0.0001**
DKLCI does not Granger Cause DJCI	1112	1.24197	0.2932
DJCI does not Granger Cause DKLCI		14.9606	1.00E-09**
DSTI does not Granger Cause DJCI	1112	2.61102	0.0501
DJCI does not Granger Cause DSTI		4.38675	0.0044**
DSTI does not Granger Cause DKLCI	1112	15.0637	1.00E-09**
DKLCI does not Granger Cause DSTI		2.14492	0.0929

*significant at 5%

**significant at 1%

Granger Causality in the Sub-Period (2004-2009)

The results of the granger causality test of the sub-period (2004-2009) are summarized in Table 4. The table elucidates that null hypothesis of no granger causality is rejected in case of KLCI and STI. It means that both ways causality exists in these two stock markets in the sub-period. There is also unidirectional influenced from JCI to KLCI and STI. As shown in the table, in this sub-period also, there is a significant unidirectional influenced from Indian stock market to the three ASEAN countries stock markets.

Granger causality in the sub-period (2010-2014)

The results of the Granger causality test of the sub-period (2010-2014) are summarised in the Table 5. In this sub-period, the null hypothesis of no granger causality is rejected in case of SENSEX and JCI. It means there is a bi-directional causality between these two stock markets in the sub-period. The table also reveals that there is a significant unidirectional influenced from JCI to KLCI and STI. There is also a unidirectional influenced from STI to KLCI market in this sub-period.

Co-integration Test

The purpose of co-integration test is to determine whether groups of non-stationary series are co-integrated or not. Two

variables will be co-integrated if they have a long-term, or equilibrium relationship between them (Gujarati, Porter, & Gunasekar, 2009). The presence of a co-integrating relation forms the basis of the Vector Error Correction (VEC) model specification. The test for the presence of co-integration is performed when all the variables are non-stationary and integrated to the same order. The assumption is that a pair of non-stationary variables may actually be co-integrated and possess a long-term relationship despite the variables' tendency to drift extensively overtime. The Johansen (1991) method is applied in the present study. The method can be illustrated by using the following general autoregressive representation for the vector Y.

$$Y_t = A_1 Y_{t-1} + \dots + A_2 Y_{t-2} + \dots + \dots + A_p X_{t-p} + \varepsilon_t \dots \quad (6)$$

where, Y_t is a (n x 1) vector on non-stationary I(1) variables, p is the number of lags, ε_t is an independently and identically distributed n-dimensional vector with zero mean and variance matrix

The above equation can be reparametrized and turned into a vector correction model as:

$$\Delta Y_t = A_0 + \pi Y_{t-1} + \sum_{i=1}^{p-1} \pi_i \Delta Y_{t-i} + \varepsilon_t \dots \quad (7)$$

Where,

$$\pi = -(I - \sum_{i=1}^p A_i) \quad (8)$$

and,

$$\pi = - \sum_{j=i+1}^p A_j \quad (9)$$

Table 6: Johansen Co-integration TestResult (2004-2014)

SENSEX and	No. of Hypothesized CE(s)	Trace Statistics	Critical Value	Prob. Value	Max-Eigen value statistics	Critical value	Prob. Value
JCI	None	6.05219	15.4947	0.6894	5.89234	14.2646	0.6271
	At most 1	0.15986	3.84147	0.6893	0.15986	3.84147	0.6893
KLCI	None	8.63545	15.4947	0.4002	8.10219	14.2646	0.3684
	At most 1	0.53326	3.84147	0.4652	0.53326	3.84147	0.4652
STI	None	12.2941	15.4947	0.1434	11.1312	14.2646	0.1478
	At most 1	1.16289	3.84147	0.2809	1.16289	3.84147	0.2809

significant at 5%

Table 7: Johansen Co-integration TestResult (2004-2009)

SENSEX and	No. of Hypothesized CE(s)	Trace Statistics	Critical Value	Prob. Value	Max-Eigen value statistics	Critical value	Prob. Value
JCI	None	12.2896	15.4947	0.1436	11.623	14.2646	0.1256
	At most 1	0.66662	3.84147	0.4142	0.66662	3.84147	0.4142
KLCI	None	4.9005	15.4947	0.8193	3.99502	14.2646	0.8598
	At most 1	0.90548	3.84147	0.3413	0.90548	3.84147	0.3413
STI	None	4.64866	15.4947	0.8449	3.17353	14.2646	0.9345
	At most 1	1.47514	3.84147	3.84147	1.47514	3.84147	0.2245

significant at 5%

Table 8: Johansen Co-integration TestResult (2010-2014)

SENSEX and	No. of Hypothesized CE(s)	Trace Statistics	Critical Value	Prob. Value	Max-Eigen value statistics	Critical value	Prob. Value
JCI	None	6.05219	15.4947	0.6894	5.89234	14.2646	0.6271
	At most 1	0.15986	3.84147	0.6893	0.15986	3.84147	0.6893
KLCI	None	8.63545	15.4947	0.4002	8.10219	14.2646	0.3684
	At most 1	0.53326	3.84147	0.4652	0.53326	3.84147	0.4652
STI	None	12.2941	15.4947	0.1434	11.1312	14.2646	0.1478
	At most 1	1.16289	3.84147	0.2809	1.16289	3.84147	0.2809

significant at 5%

The π can be interpreted as a long-run coefficient matrix, since in equilibrium, all the ΔY_{t-p} will be zero, and setting the error terms, ϵ_t to their expected value of zero will leave $\pi \Delta Y_{t-p} = 0$. The key feature in (7) is the rank of the matrix π , the rank of π is equal to the number of independent co-integrating vectors. The Johansen test centres on the examination of the π matrix via eigen values. If the rank $\pi = 0$, the matrix is null and (7) becomes the usual VAR model in first difference. If the rank $\pi = 1$, there is a single co-integrating vector and the expression πY_{t-1} is the error correction term. For other cases in which $1 < \text{rank}(\pi) < n$, there are multiple co-integrating vectors.

We can obtain the estimates of π and its characteristics roots. To test for the number of characteristics roots that are significantly different from unity can be conducted using the Trace test and Maximum Eigenvalue statistics (Enders, 2010).

Co-integration Test Results

To check the long-term relationship, the Johansen co-integration test between the indices for the total time periods as well as the two sub-periods was conducted. The test has been conducted using lag 4 for the total time period as

well as for the sub-period 2010-2014 while lag 7 was used for the sub-period 2004-2009 as found suitable by AIC lag selection criteria for the respective sample sizes. As indicated in Tables 6, 7 and 8 the co-integration test results of the three sample periods namely 2004-2014, 2004-2009, and 2010-2014 respectively show that the hypothesis of no co-integration fails to be rejected at 1% and 5% for all the sampled total period as well as two sub-periods. Thus, the result of the Johansen co-integration test suggests there is no co-integration between the indices as indicated both by trace statistics as well as Maximum Eigenvalue test for all the three periods. Therefore, it can be concluded that there is no evidence of long-term relationship between Indian stock market and the three ASEAN countries stock markets over the period under study.

CONCLUSION

India's engagement with the ASEAN came into being with its Look East Policy of 1991. Since the sectoral dialogue partnership in 1992 to a full fledged dialogue partnership in December 1995 and further elevation to the level of annual ASEAN-India Summit level in 2002, there has been significant progress made in the ASEAN-India relationship. ASEAN and India signed the ASEAN-India Trade in Goods (TIG) Agreement in Bangkok on 13 August 2009. There has been continuous growth in the ASEAN-India bilateral trade. From 2006-2008, trade in goods between ASEAN and India increased at an average annual rate of 28 percent the fastest among ASEAN's major trading partners. The share of ASEAN-India trade in relation to total trade of ASEAN and India continued to increase and India remains ASEAN's seventh largest trading partner. (The Seventh AEM-INDIA Consultations, August 13, 2009)

This paper examines the relationship between Indian stock markets and the three stock markets of the ASEAN countries. Using the daily closing prices of the indices over a period of ten years i.e. 2004 to 2014, the study examined the inter-linkages of Indian stock market with the three markets by dividing the periods into two different sub-periods viz. 2004-2009 and 2010-2014. The period was divided to examine any changes in the relationship of Indian stock market with those of the ASEAN countries over the period. In the total time periods under study, it is found that there is a significant unidirectional influence from the Indian Stock Market to the three ASEAN countries stock markets. Similar results are found in the sub-period (2004-2009) also. In the sub-period (2010-2014) however, there is a bidirectional causality in case of SENSEX and JCI (India and Indonesia). Among the three ASEAN nations, in the total time period there is a unidirectional causality from STI to JCI; JCI to KLCI. However, bi-directional causality is found between KLCI and STI in the total time period. In terms of long-term relationships also, as revealed by the result of the Johansen

co-integration test, there is no co-integration between the indices in the sampled total period under study as well as in the sub-periods 2004-2009 and 2010-2014.

The study thus found that there is no long-term relation (no co-integration) of the Indian equity market with that of three ASEAN countries viz. Indonesia, Malaysia, and Singapore equity markets. It also fails to show any increase over the periods. This study has important implications for investors who are looking beyond their domestic markets. The result indicates the existence of opportunities for portfolio diversification among these markets.

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