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Cointegration and Causality of FDI Inflows Between India, China and Asean 5: An Econometrical Analysis

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Abstract

The scarcity of capital is one of the most common economic indicators of developing economies of the world. The level of competition among developing economies, especially Asian economies, is very high in attracting foreign direct investments to fulfill their investment need. ASEAN 5 economies have been putting lot of efforts by framing suitable economic policies for attracting foreign direct investments at par with China and India. The main objective of the present treatise is to econometrically identify the existence of short-run and long-run relationship in FDI inflows of India, China and ASEAN 5 economies. The yearly data on FDI inflows of these economies from 1970 to 2015 was collected and analysed in order to investigate the influence of FDI inflows of one economy on the FDI inflows of these neighboring economies. The stationarity, cointegration and causality were tested by Ng and Perron test, augmented Dickey–Fuller test, autocorrelation and partial autocorrelation function, Ljung-Box Q-statistics, Johansen co-integration test, vector error mechanism and block exogenity test. The results of statistical tests confirmed the non-stationarity of data in level form and stationarity in first differencing form. The econometrical analysis of the data confirmed the existence of strong short-run and long-run relationship and causality among some economies. These findings may help in prediction of FDI inflows in short as well as long run on the basis relationship and causality among these economies.

Keywords: Block Exogenity, Causality, Cointegration, Foreign Direct Investment Inflows, Vector Error Mechanism.

JEL Classification: F30, G11, O16, P3

Paper Classification: Research Paper

Introduction

The lack of savings of an economy in response to its investment needs is known as scarcity of capital. This scarcity has been more in underdeveloped and developing economies as compared to developed economies. Foreign direct investment inflows (FDI inflows) are channels that help in filling this lacuna and put recipient economies on the path of growth. The studies conducted by Alfaro et al. (2004); Busse and Groizard (2005) and Ozturk (2007) confirmed the positive association between FDI inflows and growth rate.

The economies facing scarcity of capital have been putting lot of efforts in understanding and improving the key factors which drive foreign direct investment inflows.

Elteto and Sass (1998), Zhang and Fu (2008) highlighted key factors driving FDI inflows worldwide. They concluded that the quantum of foreign direct investments in a country depend on its various economic, socioeconomic, political and firm specific factors. Carstensen and Toubal (2003) concluded that the market considerations have been the most important factor in attracting FDI inflows. Mahendra (2004) explored FDI regimes in South Asia. He concluded that substantial fraction of FDI inflows was explained by selected economic variables of country-specific factors in China and India. Karl (2005) in his study highlighted that the foreign direct investment inflows are the supporting instruments of economic growth in BRIC (Brazil, Russia, India, China). Pradhan (2009) studied the relationship between foreign direct investments and economic growth in Indonesia, Malaysia, Philippines, Singapore and Thailand in the period 1970-2007. He applied cointegration and causality test at the individual as well as panel level. His results confirmed that FDI and growth were cointegrated at the panel level. However the presence of long run equilibrium relationship between FDI and growth was true only for Singapore and Thailand in case of individual country level. He further revealed that there was bidirectional causality between FDI and growth in all nations covered in the study except Malaysia. The UNCTAD's World Investment Report (2011) concluded that Asian regions received maximum foreign direct investments globally. This report also highlighted that East Asian region was leading in terms of overall regional FDI inflows. This report also highlighted that South, East and South-East Asia outperformed the other developing regions in attracting FDI inflows. Alguacil, Cuadros and Orts (2011) studied the role of external and internal environment for inward foreign direct investments and growth in developing economies with the help of GMM and OLS method. Ahmed (2012) in his treatise confirmed the presence of FDI inflows spillsover effects on economic growth of Malaysia. Temiz and Gokmen (2014) studied the relationship between FDI inflows by MNCs and economic growth in Turkey. They found no short or long run relation between the FDI entry and economic development in Turkey. Flora and Agrawal (2015) analyzed co-integration and causality of East Asia, South Asia and South East Asia. They used Johansen co-integration test and Granger causality test for the estimation of long run relationship and causal linkages between the FDI inflows of East Asia, South Asia and South East Asia. They statistically proved the presence of co-integration and long-term relationship among these economies. Tan and Tang (2016) empirically analysed the linkages among domestic investment, FDI, interest rate, trade and economic growth in the ASEAN-5 economies. Their results confirmed the existence of long-term causality between FDI and domestic investment for these economies. Their study also revealed the interrelation between domestic investment, growth and FDI in the majority of ASEAN-5 economies.

Many researchers have highlighted the determinants and importance of attracting foreign direct investments from different perspectives. But there are very few studies on the investigation of short-run as well as long-run relationship between FDI inflows of India, China and ASEAN 5 economies. This present treatise aims to econometrically identify the existence of short-run and long-run relationship between FDI inflows of India, China and ASEAN 5 economies in order to investigate the influence of FDI inflows of one economy on the FDI inflows of these neighboring economies.

Objective of the study

The main aim of the present study is to investigate cointegration and causality among FDI inflows of India, China and ASEAN 5 economies (Association of South East Asian Nations) viz. Malaysia, Indonesia, Philippines, Thailand and Vietnam.

Data

The present study is based on the yearly data of forty six years on FDI inflows in India, China and ASEAN 5 economies starting from 1970 to 2015. The data on FDI inflows was collected from UNCTAD Statistical database and analyzed with the help of EViews7.

Methodology

The time series of FDI inflows in India, China and ASEAN 5 economies were initially studied for stationarity with the help of graphs, Ng and Perron test, augmented Dickey–Fuller test, ACF, PACF and Ljung-Box Q-statistics. The rigorous study of stationarity was vital for the appropriate application of Johansen cointegration test, vector error correction model (VECM) and Granger causality test. Note that the Johansen cointegration test can only be applied to non-stationary time series whereas the VECM and Granger causality test can only be applied to stationary time series. The non-stationary time series are needed to be transformed into stationary series by appropriate method so that VECM and Granger causality test can be used for estimation. There are many unit root statistics that have been developed by many researchers. These statistics are broadly divided into conventional tests (augmented Dickey–Fuller; Phillips–Perron) and modern tests (Elliot, Rotherberg and Stock point optimal; Ng and Perron). The time series in the present treatise were initially studied with the help of modern Ng-Perron tests. The augmented Dickey–Fuller test was also employed to corroborate the results of Ng-Perron tests. The augmented Dickey–Fuller test encompasses following autoregressive model to test unit root in a time series:

$$\Delta y_t = \propto + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \cdots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t \quad (1)$$

But one peculiar point to note here is that the traditional unit root tests including the ADF have size problems and severe finite sample power. Ng and Perron (2001) proposed an alternative procedure to resolve these problems. They constructed test statistics based upon the generalised least square detrended data. These test statistics namely MZa ,MZT ,MSB and MPT are modified forms of statistics that were developed by Phillips (1987); Phillips and Perron (1988); Bhargava (1986); and Elliot, Rotherberg and Stock (1996) respectively. The definitions of these modified statistics are as follows:

$$MZa = (T^{-1}\, yT\, 2 - f0)2k \quad (2)$$

$$MZt = MZa \times MZB \quad (3)$$

$$MSB = (kf0\,)1/2 \quad (4)$$

$$MPT = (ć2k - ćT^{-1}\, yT\, 2)f0\ (ć2k - (1-ć)T^{-1}\, yT\, 2)f0 \quad (5)$$

Autocorrelation function (ACF): Tintner (1953) defined autocorrelation as "lag correlation of a given series with itself, lagged by a number of time units". The autocorrelation at lag t by is given by r_t is given by

$$r_t = (X_i - X\, ni{=}k{+}1)(X_{i-k} - X\,)\ (X_i - X\, ni{=}1)2 \quad (6)$$

All autocorrelations at lags 1, 2….n together make up the autocorrelation function.

Partial auto-correlation function (PACF): Partial autocorrelation function measures the relationship between Xt and $Xt{-}k$in time series after removing the effects of other time lags 1, 2,...,k – 1.The return is white noise in case the ACF and PACF coefficient lie within the critical values i.e. ±1.96(1/N).

Ljung-Box Q-statistics: The Ljung and Box (1978) developed following Q statistics to test randomness on the basis of number of lags:

$$Q=n\ n+2\ pk2n-khk=1\ (7)$$

Note that in case the time series is not based upon the results of autoregressive integrated moving average (ARIMA) estimation, then as per the null hypothesis, Q is asymptotically distributed as a chi-squared distribution with df equal to the number of autocorrelations. The critical region for rejection for significance level (α) is $> {}^{2}_{1\ -\propto,h}$.

Johansen cointegration test: Johansen (1991) developed a procedure to test the cointergration of several time series integrated at order one. This test allows more than one cointegrating relationship. This test evaluates the long run or equilibrium relationship. If residuals from the regression equation of series (which are non stationary in level but are stationary after first differencing) are stationary then it confirms that the series are cointegrated. Note that the vector error correction mechanism can be applied to co-integrated series only and if series found to be non co-integrated then vector autoregression models are applied. **Vector error correction mechanism** examines the long run causality and short run causality between variables. There may be disequilibrium in short run in cointegrated series having long run relationship. The error generated from such cointegrated series is termed as equilibrium error. The error correction mechanism equation, stating the dependence of Δ on Δ and equilibrium error, is:

$$\Delta Y_t=\propto_0+\ \propto_1\Delta X_t+\ \propto_2(Y_{t-1}-\beta_1-\ \beta_2X_{t-1})+\varepsilon_t\ (8)$$

Where $\Delta Y_t=Y_t-Y_{t-1}\ \Delta X_t=X_t-X_{t-1}$

ε_t= Random error term

Block exogenity test: This test examines causality in vector autoregression model framework with of Granger causality test. It tests the joint significance of lagged coefficients of one variable in the equation of another variable. It determines whether one time series can be used in forecasting another time series or not. This test can be applied only if the time series is stationary and if the time series is non stationary then it is done using first differences. The lagged value which is significant and adds explanatory power to the model is retained in the regression equation. The null hypothesis of this test is the absence of significant Granger causality. The $_0$ is not rejected in case any lagged values of an explanatory variable have not been retained in the equation. The first step in this test procedure is to find proper lagged values of *y*. The next step is to include the proper lag value in an autoregression.

Basic Statistics of FDI inflows of India, China and ASEAN 5 Economies

The basic statistics of FDI inflows of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam are portrayed in table 1.

Table 1: Table showing the basic statistics of FDI inflows

Descriptive Statistics	India	China	Indonesia	Malaysia	Philippines	Thailand	Vietnam
Mean	8403.865	27842.63	3613.209	3644.885	1137.961	3659.490	2228.680
Median	392.0500	6231.596	631.5000	2542.079	628.0000	2059.500	700.1248
Maximum	47138.73	135610.0	21886.00	12197.58	6813.000	16652.00	11800.00

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Minimum	-36.06000	-267.2206	-4550.000	94.00000	-1.040000	38.86538	-0.890000
Std. Dev.	14223.89	42414.09	6305.343	3627.927	1365.037	4523.901	3342.782
Skewness	1.589102	1.542079	1.645598	0.949451	2.206412	1.481225	1.491090
Kurtosis	3.988656	3.936821	4.674886	2.779608	8.950441	4.411161	3.772293
Jarque-Bera	21.23364	19.91353	26.13800	7.004270	105.1881	20.63769	18.18884
Probability	0.000025	0.000047	0.000002	0.030133	0.000000	0.000033	0.000112
Observations	46	46	46	46	46	46	46

Source: *Author's calculations*

The mean statistics clearly indicate that the average FDI inflows in China are more than three times of the average FDI inflows in India. ASEAN 5 economies are lagging far behind. China is also leading the group in terms of variability in FDI inflows. The series of FDI inflows of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam are positively skewed.

The value of kurtosis statistics is more than three for all series except in case of Malaysia. Note that the kurtosis value of FDI inflows series of Malayasia is little less than three. It clearly indicates that the data is leptokurtic i.e. more peaked as compared to the normal curve. FDI inflows series have too many values near the mean and in the tails of their distribution. All the aforesaid economies have similar feature of non-normality in FDI inflows.

The correlation and covariance analysis in Table 2 and Table 3 clearly shows that the FDI inflows of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam are positively related and there is evidence of simultaneous changes in the FDI inflows of these economies.

Table 2: Table showing correlation of FDI inflows among India, China and ASEAN 5 economies

Countries	China	Indonesia	Malaysia	Philippines	Thailand	Vietnam
India	0.88877	0.813097	0.756928	0.700390	0.658308	0.96132
China		0.876795	0.844016	0.780409	0.737914	0.925079
Indonesia			0.867236	0.726725	0.635680	0.872916
Malaysia				0.774774	0.714152	0.840219
Philippines					0.600868	0.778544
Thailand						0.743963

Source: *Author's calculations*

Table 3: Table showing covariance analysis of FDI inflows among India, China and ASEAN 5 economies

Countries	India	China	Indonesia	Malaysia	Philippines	Thailand	Vietnam
India	197920846.74	524532975.73	71338512.25	38210792.66	13303240.54	38741405.75	44714561.06
China	524532975.73	1759847504.24	229388372.72	127049878.22	44200924.66	129492318.92	128307368.55
Indonesia	71338512.25	229388372.72	38893059.94	19407049.03	6118966.97	16583453.66	17998820.83
Malaysia	38210792.66	127049878.22	19407049.03	12875729.64	3753468.49	10719558.63	9968129.12
Philippines	13303240.54	44200924.66	6118966.97	3753468.49	1822819.37	3393526.47	3475283.39
Thailand	38741405.75	129492318.92	16583453.66	10719558.63	3393526.47	17498509.32	10289331.68
Vietnam	44714561.06	128307368.55	17998820.83	9968129.12	3475283.39	10289331.68	10931275.15

Source: Author's calculations

A peculiar point to note here is that this correlation and covariance analysis cannot tell the relative integration and causality of the relationships. The cointegration and causality of FDI inflows of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam are investigated with the help of unit root tests, Johansen cointegration test, vector error correction mechanism and block exogenity test.

The time series of FDI inflows are tested for stationarity firstly by graphical method and then by applying Ng and Perron test, augmented Dickey–Fuller test, ACF, PACF and Ljung-Box Q-statistics. The graphical presentation in Figure 1 indicates that all time series are non-stationary.

Figure 1. FDI Inflows in India, China and ASEAN 5 Economies

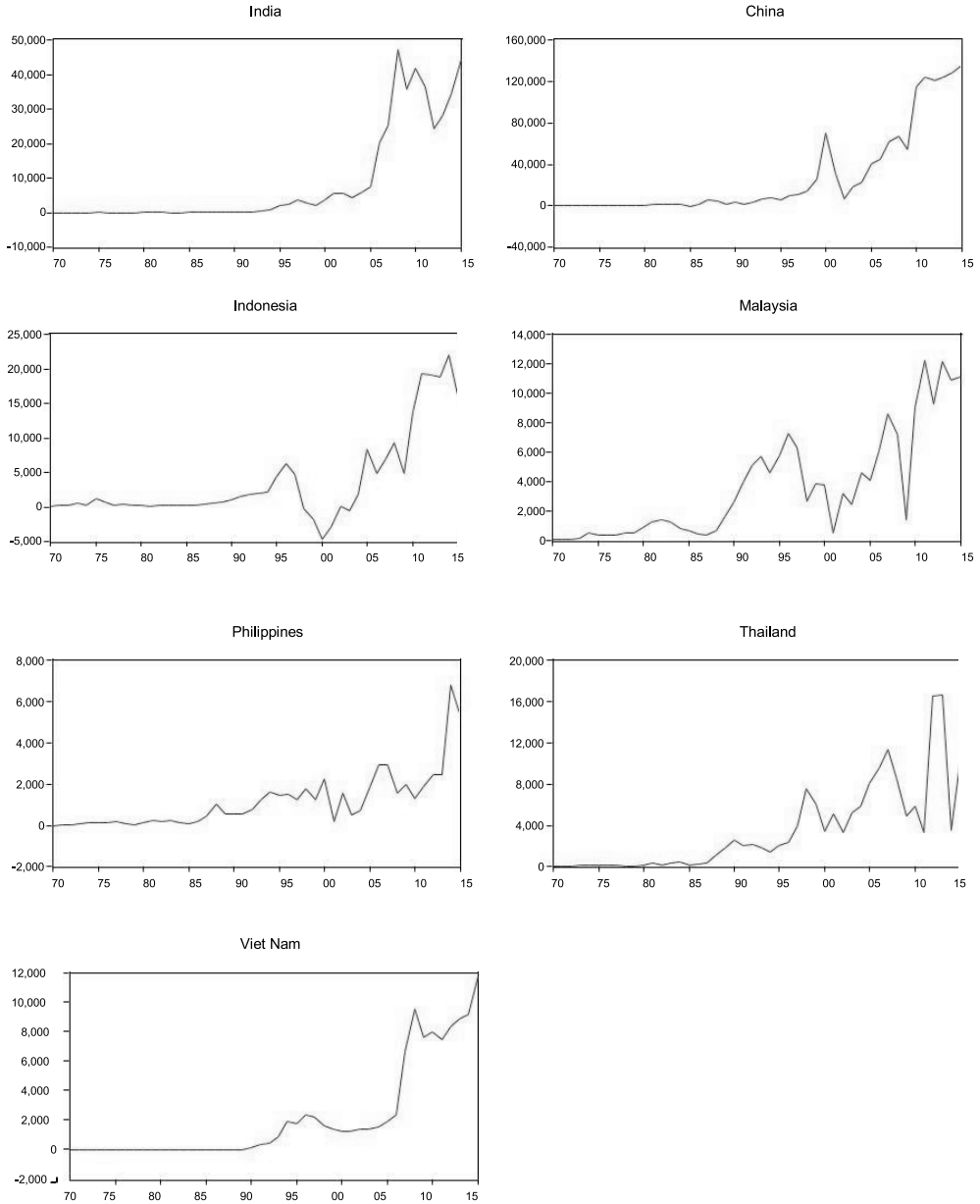

Table 4: Table showing results of autocorrelation and partial autocorrelation function at level

Lag	India		China		Indonesia		Malaysia		Philippines		Thailand		Vietnam	
	ACF	PACF	ACF	PACF	ACF	PACF	ACF	PACF	ACF	PACF	ACF	PACF	ACF	PACF
1	. |******	. |******	******	. |******	. |******	. |******	. |******	. |******	. |*****	. |*****	. |*****	. |*****	. |******	. |******
2	. |******	. |*.	. |*****	. |.	. |*****	** |.	. |*****	. |*.	. |***	. |.	. |****	. |*.	. |*****	. |.
3	. |*****	. |.	. |*****	. |.	. |****	. |.	. |****	. |*.	. |**	. |*.	. |****	. |*.	. |*****	. |.
4	. |****	. |*.	. |****	.*|.	. |***	*** |.	. |****	.*|.	. |**	. |.	. |***	.*|.	. |****	. |.
5	. |****	.*|.	. |***	.*|.	. |**	. |*.	. |**	.*|.	. |**	. |*.	. |****	. |**	. |****	. |.
6	. |***	.*|.	. |**	.*|.	. |*.	. |*.	. |**	. |.	. |**	. |.	. |****	. |*.	. |***	.*|.
7	. |**	. |.	. |**	. |**	. |*.	. |.	. |**	. |**	. |**	. |*.	. |***	. |*.	. |**	. |.
8	. |*.	*** |.	. |**	.*|.	. |.	.*|.	. |*.	. |.	. |**	. |.	. |***	.*|.	. |*.	** |.
9	. |*.	. |*.	. |*.	. |.	. |.	. |.	. |*.	.*|.	. |**	. |.	. |**	. |.	. |*.	. |.
10	. |.	. |.	. |*.	. |*.	. |.	** |.	. |.	. |.	. |*.	.*|.	. |**	** |.	. |*.	. |**
11	. |.	. |.	. |*.	.*|.	.*|.	. |*.	. |*.	. |*.	. |.	. |.	. |*.	.*|.	. |*.	. |*.
12	. |.	. |*.	. |*.	. |.	.*|.	. |*.	. |.	.*|.	. |*.	. |*.	. |*.	.*|.	. |.	. |.
13	. |.	. |.	. |*.	. |.	.*|.	. |*.	. |.	. |**	. |.	.*|.	. |*.	. |.	. |.	. |.
14	. |.	.*|.	. |*.	.*|.	.*|.	. |.	. |*.	. |.	. |*.	. |*.	. |*.	. |.	. |.	. |.
15	. |.	. |.	. |.	.*|.	. |.	. |.	. |*.	. |.	. |*.	. |.	. |*.	. |.	. |.	. |.

Source: Author's calculations

The autocorrelation function and partial auto-correlation function are further estimated upto lags 15 to confirm the results of stationarity. The fifteen lags are 1/3rd of the sample size that have been taken as per the general rule. Table 4 portrays the ACF and PACF of FDI inflows series of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam.

The gradual going down of autocorrelation function of all series indicates that probably the time series are non stationary. The spikes are outside the line suspecting the non stationarity of time series. The results of Ljungbox test Q statistic in Table 5 indicate that the null hypothesis of stationarity is not accepted as the probability value at all fifteen lags is 0. So, the time series of FDI inflows of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam are not stationary.

Table 5: Table showing results of Ljung-Box Q-statistics at level

Lag	India		China		Indonesia		Malaysia		Philippines		Thailand		Vietnam	
	Q-Stat	Prob	Q-Stat	Prob	Q-Stat	Prob	Q-Stat	Prob	Q-Stat	Prob	Q-Stat	Prob	Q-Stat	Prob
1	36.411	0.000	36.837	0.000	37.211	0.000	30.566	0.000	22.068	0.000	21.533	0.000	36.524	0.000
2	65.854	0.000	64.941	0.000	62.285	0.000	52.088	0.000	31.212	0.000	36.698	0.000	65.250	0.000
3	88.370	0.000	87.044	0.000	79.264	0.000	70.338	0.000	36.536	0.000	50.428	0.000	87.527	0.000
4	107.010	0.000	103.170	0.000	87.343	0.000	82.979	0.000	40.056	0.000	58.193	0.000	104.410	0.000
5	121.020	0.000	113.840	0.000	90.805	0.000	89.094	0.000	44.088	0.000	70.957	0.000	117.620	0.000
6	130.280	0.000	119.820	0.000	92.860	0.000	92.572	0.000	48.700	0.000	84.040	0.000	126.640	0.000
7	136.810	0.000	124.720	0.000	93.875	0.000	96.576	0.000	55.389	0.000	96.050	0.000	132.590	0.000
8	138.950	0.000	127.480	0.000	94.151	0.000	99.159	0.000	62.182	0.000	106.200	0.000	134.710	0.000
9	139.760	0.000	128.850	0.000	94.192	0.000	99.856	0.000	66.109	0.000	112.890	0.000	135.230	0.000
10	139.880	0.000	130.180	0.000	94.373	0.000	100.180	0.000	66.845	0.000	115.810	0.000	135.610	0.000
11	139.900	0.000	131.030	0.000	95.449	0.000	101.000	0.000	66.990	0.000	117.150	0.000	135.960	0.000
12	139.900	0.000	131.630	0.000	96.830	0.000	101.170	0.000	67.706	0.000	117.880	0.000	136.270	0.000
13	139.910	0.000	132.060	0.000	98.007	0.000	101.490	0.000	67.906	0.000	118.250	0.000	136.530	0.000
14	140.000	0.000	132.450	0.000	98.611	0.000	102.490	0.000	68.469	0.000	119.640	0.000	136.700	0.000
15	140.280	0.000	132.550	0.000	98.657	0.000	104.380	0.000	69.090	0.000	120.120	0.000	136.760	0.000

Source: Author's' calculations

The Ng and Perron test is further applied to test the null hypothesis of unit root. Table 6 indicates the results of the Ng and Perron test for FDI inflows.

Table 6: Table showing results of Ng and Perron Test at level

Countries	MZa	MZt	MSB	MPT
India	0.57511	0.22134	0.38486	15.2721
China	1.12034	0.45836	0.40913	17.6181
Indonesia	-1.99474	-0.69234	0.34708	9.45963
Malaysia	-4.10355	-1.10003	0.26807	6.33037
Philippines	1.48116	0.48196	0.3254	14.1839
Thailand	1.57446	1.68898	1.07273	88.0491
Vietnam	3.19148	1.52774	0.47869	28.0918
Asymptotic critical values* at: 1%	-13.8	-2.58	0.174	1.78
5%	-8.1	-1.98	0.233	3.17
10%	-5.7	-1.62	0.275	4.45

Source: Author's calculations

The results clearly indicate that for all the time series of FDI inflows of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam, the null hypothesis of non-stationary cannot be rejected at 1 per cent, 5 per cent and 10 per cent significance level by any of the Ng-Perron tests. The Augmented Dickey–Fuller test also corroborates the results in table 7.

Table 7: Table showing results of augmented Dickey–Fuller test at level

Countries	t-Statistic	Prob.*
India	5.673820	1.0000
China	0.299983	0.9758
Indonesia	-0.799830	0.8095
Malaysia	-1.458475	0.5452
Philippines	0.779393	0.9926
Thailand	0.453393	0.9829
Vietnam	1.342125	0.9985

Source: Author's calculations

The null hypothesis that FDI inflows series of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam have unit root cannot be rejected as the probability value is greater than 0.05. Hence it can be concluded that all the time series of FDI inflows of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam are non stationary at level forms.

Transformation of non-stationary time series to stationary time series

These non-stationary series are transformed to stationary series by estimating differentiated FDI inflows. The transformation of these series cannot be done by estimating the log differences as the data of FDI inflows includes some negative values. Again all tests are applied on the differentiated FDI inflows to test the null hypothesis of unit root. The graphical presentation of the differentiated FDI inflows in the Figure 2 indicates the transformation of non-stationary series to stationary series.

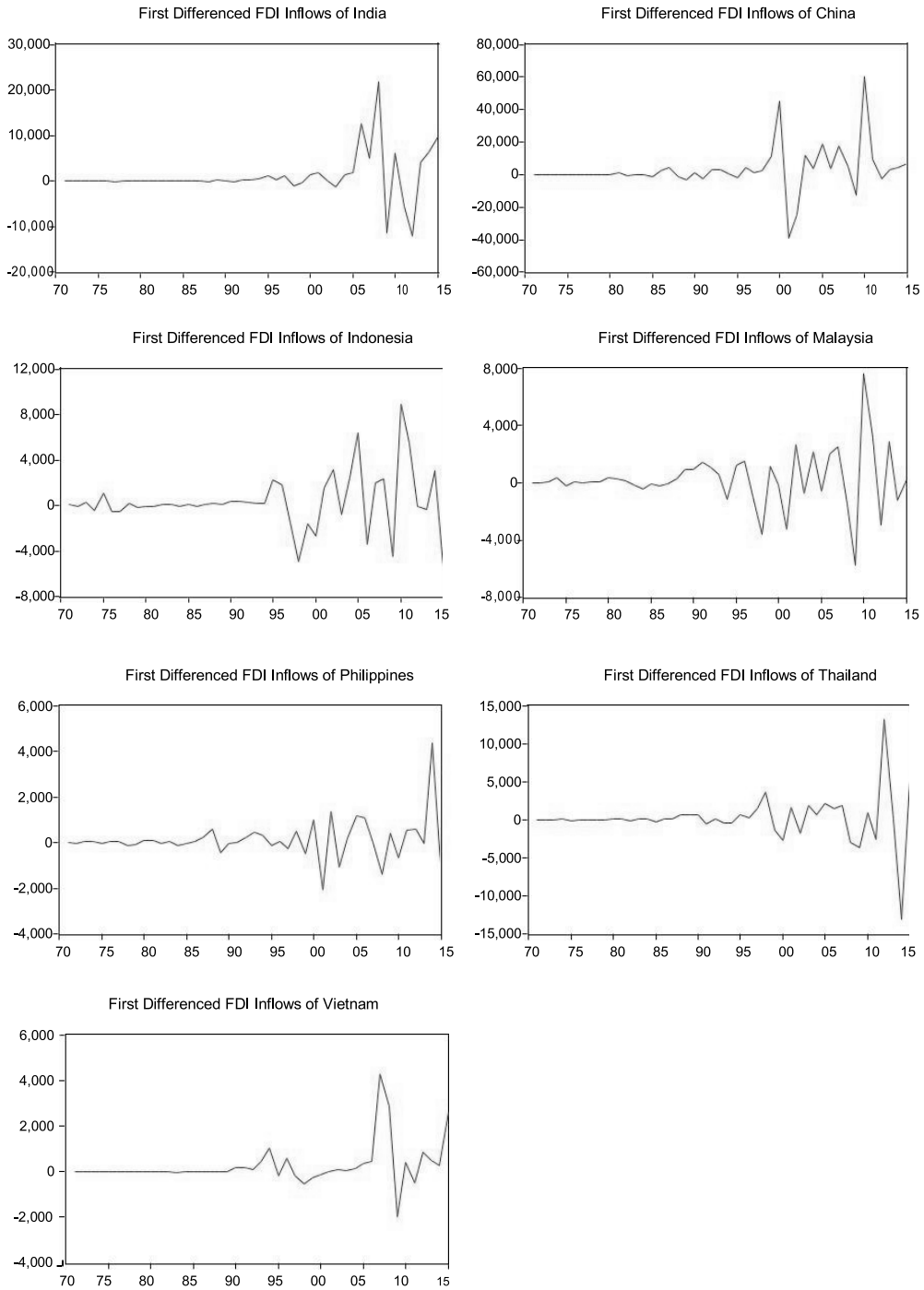

Figure 2. The Differentiated FDI Inflows in India, China and ASEAN 5 Economies

The ACF and PACF are further estimated upto lags 15 on first differenced time series of FDI inflows of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam. Table 8 portrays the ACF and PACF of differentiated FDI inflows series.

Table 8: Table showing results of autocorrelation and partial autocorrelation function of first differenced series

Lag	India		China		Indonesia		Malaysia		Philippines		Thailand		Vietnam	
	ACF	PACF	ACF	PACF	ACF	PACF	ACF		ACF	PACF	ACF	PACF	ACF	PACF
1	.*| . |	.*| . |	.*| . |	.*| . |	.*| . |	.*| . |	**| . |	**| . |	***| . |	***| . |	**| . |	**| . |	. |*. |	. |*. |
2	. |** |	. |** |	**| . |	**| . |	.*| . |	.*| . |	**| . |	***| . |	. |*. |	. | . |	***| . |	***| . |	.*| . |	.*| . |
3	.*| . |	.*| . |	. |*. |	. | . |	. |** |	. |** |	. |** |	. | . |	.*| . |	. | . |	. |*. |	.*| . |	. | . |	. | . |
4	**| . |	***| . |	. | . |	.*| . |	**| . |	**| . |	. | . |	. | . |	.*| . |	**| . |	.*| . |	***| . |	.*| . |	.*| . |
5	.*| . |	. | . |	. |*. |	. |*. |	**| . |	**| . |	.*| . |	. | . |	. | . |	.*| . |	. |*. |	.*| . |	. | . |	. |*. |
6	.*| . |	. | . |	. | . |	. | . |	. |** |	. |** |	. | . |	.*| . |	.*| . |	.*| . |	. | . |	**| . |	.*| . |	**| . |
7	. |** |	. |*. |	. |*. |	. |** |	.*| . |	. | . |	. | . |	.*| . |	. |*. |	. | . |	. | . |	.*| . |	. |*. |	. |** |
8	. |*. |	. | . |	. | . |	.*| . |	. | . |	. | . |	. |*. |	. | . |	. |*. |	. | . |	**| . |	. |*. |	. | . |
9	. |*. |	.*| . |	***| . |	**| . |	. |** |	. | . |	.*| . |	.*| . |	. |*. |	. |*. |	. |*. |	. |*. |	.*| . |	. | . |
10	. | . |	. | . |	. |** |	. |*. |	.*| . |	. | . |	.*| . |	**| . |	.*| . |	. | . |	. | . |	. | . |	.*| . |
11	. | . |	. |*. |	. |*. |	. | . |	.*| . |	. | . |	. |** |	. |*. |	.*| . |	.*| . |	. | . |	. |** |	. |*. |	. |*. |
12	. | . |	. |*. |	. | . |	. |*. |	.*| . |	***| . |	.*| . |	.*| . |	. |** |	. |** |	. | . |	. |*. |	. | . |	.*| . |
13	. | . |	. | . |	. | . |	. | . |	.*| . |	. | . |	.*| . |	.*| . |	**| . |	.*| . |	.*| . |	. |*. |	. | . |	. |*. |
14	. | . |	. | . |	. | . |	. |*. |	. | . |	. | . |	. |*. |	.*| . |	. |** |	. | . |	. |*. |	. |*. |	. |*. |	. | . |
15	. | . |	. | . |	. | . |	.*| . |	. |*. |	. | . |	. |*. |	. | . |	.*| . |	. | . |	. |*. |	.*| . |	.*| . |

Source: Author's calculations

The ACF and PACF coefficients are not significant as they do not fall in the rule of thumb range of +0.14 to -0.14. The autocorrelation function of all series indicates that the first differenced time series are stationary. The spikes are within the line suspecting the stationarity of time series. The results of Ljungbox test Q statistic in Table 9 also indicate the stationarity of all first differenced FDI inflows series.

Table 9: Table showing results of Ljung-Box Q-statistics of first differenced series

Lag	India		China		Indonesia		Malaysia		Philippines		Thailand		Vietnam	
	Q-Stat	Prob	Q-Stat	Prob	Q-Stat	Prob	Q-Stat	Prob	Q-Stat	Prob	Q-Stat	Prob	Q-Stat	Prob
1	0.257	0.612	0.476	0.490	0.220	0.639	3.206	0.073	7.484	0.006	3.493	0.062	1.508	0.219
2	3.169	0.205	2.970	0.227	0.630	0.730	8.238	0.016	8.800	0.012	9.452	0.009	1.977	0.372
3	5.091	0.165	3.306	0.347	4.324	0.229	11.758	0.008	9.351	0.025	10.795	0.013	1.981	0.576
4	8.695	0.069	3.331	0.504	8.788	0.067	11.789	0.019	10.058	0.039	12.744	0.013	2.654	0.617
5	9.177	0.102	4.331	0.503	12.048	0.034	12.436	0.029	10.216	0.069	13.639	0.018	2.940	0.709
6	9.613	0.142	4.399	0.623	17.841	0.007	12.455	0.053	11.807	0.066	13.810	0.032	3.626	0.727
7	12.194	0.094	6.626	0.469	19.233	0.007	12.474	0.086	13.443	0.062	13.871	0.054	4.591	0.710
8	12.571	0.128	6.858	0.552	19.354	0.013	12.907	0.115	13.472	0.097	13.887	0.085	6.848	0.553
9	13.257	0.151	15.456	0.079	24.353	0.004	13.847	0.128	14.393	0.109	14.260	0.113	7.127	0.624
10	13.258	0.210	19.792	0.031	26.182	0.004	15.629	0.111	14.802	0.139	14.455	0.153	7.235	0.703
11	13.262	0.277	20.654	0.037	26.980	0.005	22.008	0.024	16.066	0.139	14.495	0.207	7.578	0.751
12	13.314	0.347	20.657	0.056	27.323	0.007	24.073	0.020	20.427	0.059	14.499	0.270	7.608	0.815
13	13.424	0.416	20.659	0.080	29.588	0.005	25.614	0.019	27.269	0.011	15.802	0.260	7.768	0.858
14	13.434	0.493	20.661	0.111	29.773	0.008	26.719	0.021	30.474	0.007	18.139	0.201	8.414	0.867
15	13.453	0.567	20.714	0.146	31.330	0.008	27.403	0.026	31.932	0.007	18.327	0.246	8.756	0.890

Source: Author's calculations

The Ng and Perron test is further applied to test the null hypothesis of unit root. Table 10 displays the results of Ng and Perron test for first differenced FDI inflows.

Table 10: Table showing results of Ng and Perron Test of first differenced series

Countries		MZa	MZt	MSB	MPT
India		-48.828	-4.86674	0.09967	0.69111
China		-21.7921	-3.29609	0.15125	1.14097
Indonesia		-21.9821	-3.10508	0.14125	1.8181
Malaysia		-50.6057	-5.03014	0.0994	0.48428
Philippines		-18.8793	-2.9569	0.15662	1.70692
Thailand		0.41474	0.21459	0.51741	21.4824
Vietnam		-20.9705	-2.99776	0.14295	1.97962
Asymptotic critical values* at:	1%	-13.8	-2.58	0.174	1.78
	5%	-8.1	-1.98	0.233	3.17
	10%	-5.7	-1.62	0.275	4.45

Source: Author's calculations

The results clearly indicate that for all the time series of first differenced FDI inflows of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam, the null hypothesis of non-stationary is not accepted at 1 per cent, 5 per cent and 10 per cent level of significance level by any of the Ng-Perron tests. The Augmented Dickey–Fuller test also corroborates the results in Table 11.

Table 11: Table showing results of augmented Dickey–Fuller test of first differenced series

Countries	t-Statistic	Prob.*
India	-4.616316	0.0006
China	-7.158975	0.0000
Indonesia	-6.461923	0.0000
Malaysia	-7.810257	0.0000
Philippines	-9.747295	0.0000
Thailand	-7.963357	0.0000
Vietnam	-4.839854	0.0003

Source: Author's calculations

The null hypothesis that first differenced FDI inflows series have unit root is rejected as the probability value is less than 0.05. So, the differenced FDI inflows series are non-stationary at level form and stationary at the first difference. So it can be concluded that all FDI inflows series are I(1) series and these series may be cointegrated. Further, Johansen cointegration test is applied to determine either these seven series are cointegrated or not. Table 12 portrays the result of Johansen cointegration test on FDI inflows series of seven economies.

Table 12: Table showing results of Johansen Cointegration test

Trend assumption: Linear deterministic trend
Series: India China Indonesia Malaysia Philippines Thailand Vietnam
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.950009	409.4428	125.6154	0.0000
At most 1 *	0.918087	277.6227	95.75366	0.0000
At most 2 *	0.850093	167.5302	69.81889	0.0000
At most 3 *	0.703115	84.02972	47.85613	0.0000
At most 4 *	0.327928	30.59567	29.79707	0.0404
At most 5	0.254883	13.11050	15.49471	0.1108
At most 6	0.003745	0.165089	3.841466	0.6845

* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.950009	131.8200	46.23142	0.0000
At most 1 *	0.918087	110.0925	40.07757	0.0000
At most 2 *	0.850093	83.50052	33.87687	0.0000

At most 3 *	0.703115	53.43405	27.58434	0.0000
At most 4	0.327928	17.48517	21.13162	0.1503
At most 5	0.254883	12.94541	14.26460	0.0799
At most 6	0.003745	0.165089	3.841466	0.6845
denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

Source: Author's calculations

The FDI inflows time series are cointegrated having error terms as confirmed by the result of Johansen cointegration test. The trace test indicates five and the max-eigen value test indicates four cointegrating equations at 0.05 level. As these series are cointegrated, the VECM is applied to explore the dynamism of equilibrium process in short term as well as long term. Table 13 portrays the results of VECM for FDI inflows series of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam. The lag of two years was selected on the basis of Schwartz information criteria.

Table 13: Table showing vector error correction estimates

Cointegrating Eq:	CointEq1	CointEq2	CointEq3	CointEq4	CointEq5
INDIA(-1)	1.000000	0.000000	0.000000	0.000000	0.000000
CHINA(-1)	0.000000	1.000000	0.000000	0.000000	0.000000
INDONESIA(-1)	0.000000	0.000000	1.000000	0.000000	0.000000
MALAYSIA(-1)	0.000000	0.000000	0.000000	1.000000	0.000000
PHILIPPINES(-1)	0.000000	0.000000	0.000000	0.000000	1.000000
THAILAND(-1)	1.751470	0.031031	1.101649	-1.567508	-0.366942
	(0.90015)	(2.09259)	(0.06737)	(0.60585)	(0.10611)
	[1.94575]	[0.01483]	[16.3511]	[-2.58729]	[-3.45814]
VIETNAM(-1)	-5.196905	-11.00520	-2.820916	0.547906	0.045150
	(1.31478)	(3.05647)	(0.09841)	(0.88491)	(0.15499)
	[-3.95268]	[-3.60062]	[-28.6653]	[0.61916]	[0.29132]
C	-3407.571	-3524.731	-1575.800	946.2070	152.8546

Error Correction:	**D(India)**	**D(China)**	**D(Indonesia)**	**D(Malaysia)**	**D(Philippines)**	**D(Thailand)**	**D(Vietnam)**
CointEq1	**-1.588044**	**0.743289**	**-0.540110**	**0.154462**	**-0.139075**	**-0.166920**	**-0.039978**
	(0.26846)	**(0.74291)**	**(0.38666)**	**(0.20254)**	**(0.05394)**	**(0.18099)**	**(0.05952)**
	[-5.91531]	**[1.00051]**	**[-1.39686]**	**[0.76261]**	**[-2.57857]**	**[-0.92226]**	**[-0.67170]**
CointEq2	**0.246008**	**-1.494057**	**0.007039**	**-0.063148**	**-0.003122**	**-0.116172**	**0.028728**
	(0.05830)	**(0.16134)**	**(0.08397)**	**(0.04399)**	**(0.01171)**	**(0.03931)**	**(0.01293)**
	[4.21934]	**[-9.26004]**	**[0.08382]**	**[-1.43556]**	**[-0.26650]**	**[-2.95547]**	**[2.22255]**
CointEq3	**0.652424**	**3.091762**	**-1.192124**	**-0.106075**	**0.068463**	**0.048341**	**0.086871**
	(0.31392)	**(0.86870)**	**(0.45213)**	**(0.23684)**	**(0.06307)**	**(0.21164)**	**(0.06959)**
	[2.07832]	**[3.55908]**	**[-2.63669]**	**[-0.44788]**	**[1.08555]**	**[0.22841]**	**[1.24825]**
CointEq4	**-0.230894**	**-2.635641**	**-0.601190**	**-0.306564**	**0.089925**	**-0.975821**	**0.128499**
	(0.42615)	**(1.17927)**	**(0.61377)**	**(0.32151)**	**(0.08561)**	**(0.28730)**	**(0.09447)**
	[-0.54181]	**[-2.23498]**	**[-0.97950]**	**[-0.95352]**	**[1.05035]**	**[-3.39654]**	**[1.36014]**

CointEq5	-7.855388	-4.762334	-3.433581	0.784622	-1.684189	2.392160	-0.740078
	(1.97955)	(5.47794)	(2.85109)	(1.49348)	(0.39770)	(1.33456)	(0.43886)
	[-3.96826]	[-0.86937]	[-1.20430]	[0.52537]	[-4.23485]	[1.79247]	[-1.68638]
D(INDIA(-1))	1.134700	-2.802513	0.132379	-0.296872	0.105902	-0.149256	0.103896
	(0.25169)	(0.69649)	(0.36250)	(0.18989)	(0.05057)	(0.16968)	(0.05580)
	[4.50831]	[-4.02374]	[0.36518]	[-1.56340]	[2.09436]	[-0.87962]	[1.86199]
D(INDIA(-2))	2.184240	-0.942938	0.301110	-0.029412	0.044119	0.082177	0.246862
	(0.24354)	(0.67394)	(0.35076)	(0.18374)	(0.04893)	(0.16419)	(0.05399)
	[8.96873]	[-1.39915]	[0.85844]	[-0.16008]	[0.90172]	[0.50051]	[4.57224]
D(CHINA(-1))	-0.045241	0.565174	-0.082816	-0.021123	-0.009937	0.041898	-0.027045
	(0.03582)	(0.09912)	(0.05159)	(0.02702)	(0.00720)	(0.02415)	(0.00794)
	[-1.26309]	[5.70209]	[-1.60537]	[-0.78166]	[-1.38095]	[1.73509]	[-3.40588]
D(CHINA(-2))	-0.087331	0.472461	0.087485	0.017287	0.010772	0.110662	-0.000636
	(0.04142)	(0.11461)	(0.05965)	(0.03125)	(0.00832)	(0.02792)	(0.00918)
	[-2.10863]	[4.12239]	[1.46664]	[0.55326]	[1.29462]	[3.96331]	[-0.06928]
D(INDONESIA(-1))	-0.087204	-1.719760	0.165703	0.246020	0.052975	-0.011575	-0.155706
	(0.16574)	(0.45864)	(0.23871)	(0.12504)	(0.03330)	(0.11174)	(0.03674)
	[-0.52616]	[-3.74970]	[0.69417]	[1.96751]	[1.59098]	[-0.10359]	[-4.23768]

Source: *Author's calculations*

The equations of the vector error correction mechanism in case of FDI inflows series of India, China, Malaysia, Indonesia, Philippines, Thailand and Vietnam are as follows:

i. D(INDIA) = C(1)*(INDIA(-1) + 1.75*THAILAND(-1) - 5.19*VIETNAM(-1) - 3407.57) + C(2)*(CHINA(-1) + 0.03*THAILAND(-1) - 11.00*VIETNAM(-1) - 3524.73) + C(3)*(INDONESIA(-1) + 1.10*THAILAND(-1) -

2.82*VIETNAM(-1) - 1575.79) + C(4)*(MALAYSIA(-1) - 1.56*THAILAND(-1) + 0.54*VIETNAM(-1) + 946.20) + C(5)*(PHILIPPINES(-1) - 0.36*THAILAND(-1) + 0.045*VIETNAM(-1) + 152.85) + C(6)*D(INDIA(-1)) + C(7)*D(INDIA(-2)) +

C(8)*D(CHINA(-1)) +C(9)*D(CHINA(-2))+C(10)*D(INDONESIA(-1))+ C(11)*D(INDONESIA(-2)) + C(12)*D(MALAYSIA(-1)) + C(13)*D(MALAYSIA(-2)) + C(14)*D(PHILIPPINES(-1)) + C(15)*D(PHILIPPINES(-2)) +

C(16)*D(THAILAND(-1)) + C(17)*D(THAILAND(-2)) + C(18)*D(VIETNAM(-1)) + C(19)*D(VIETNAM(-2)) + C(20)

ii. D(CHINA) = C(21)*(INDIA(-1) + 1.75*THAILAND(-1) - 5.19*VIETNAM(-1) - 3407.57) + C(22)*(CHINA(-1) + 0.03*THAILAND(-1) - 11.00*VIETNAM(-1) - 3524.73) + C(23)*(INDONESIA(-1) + 1.10*THAILAND(-1) -

2.82*VIETNAM(-1) - 1575.79) + C(24)*(MALAYSIA(-1) - 1.56*THAILAND(-1) + 0.54*VIETNAM(-1) + 946.20) + C(25)*(PHILIPPINES(-1) - 0.36*THAILAND(-1) + 0.04*VIETNAM(-1) + 152.85) + C(26)*D(INDIA(-1)) + C(27)*D(INDIA(-2)) +

C(28)*D(CHINA(-1)) + C(29)*D(CHINA(-2)) + C(30)*D(INDONESIA(-1))+ (31)*D(INDONESIA(-2)) + C(32)*D(MALAYSIA(-1)) + C(33)*D(MALAYSIA(-2))+C(34)*D(PHILIPPINES(-1))+C(35)*D(PHILIPPINES(-2))+C(36)*D(THAILAND(-1))+C(37)*D(THAILAND(-2)) + C(38)*D(VIETNAM(-1)) + C(39)*D(VIETNAM(-2)) + C(40)

iii. D(INDONESIA) = C(41)*(INDIA(-1) + 1.75*THAILAND(-1) - 5.19*VIETNAM(-1) - 3407.57) + C(42)*(CHINA(-1) + 0.03*THAILAND(-1) - 11.00*VIETNAM(-1) - 3524.73) + C(43)*(INDONESIA(-1) + 1.10*THAILAND(-1) -

2.82*VIETNAM(-1) - 1575.79) + C(44)*(MALAYSIA(-1) - 1.56750796714*THAILAND(-1) + 0.54*VIETNAM(-1) + 946.20) + C(45)*(PHILIPPINES(-1) - 0.36*THAILAND(-1) + 0.04*VIETNAM(-1) + 152.85) + C(46)*D(INDIA(-1)) + C(47)*D(INDIA(-2)) + C(48)*D(CHINA(-1)) + C(49)*D(CHINA(-2)) + C(50)*D(INDONESIA(-1)) +

C(51)*D(INDONESIA(-2)) + C(52)*D(MALAYSIA(-1)) + C(53)*D(MALAYSIA(-2)) + C(54)*D(PHILIPPINES(-1))+C(55)*D(PHILIPPINES(-

2))+C(56)*D(THAILAND(-1))+C(57)*D(THAILAND(-2))+C(58)*D(VIETNAM(-1))+C(59)*D(VIETNAM(-2)) + C(60)

iv. D(MALAYSIA) = C(61)*(INDIA(-1) + 1.75*THAILAND(-1) - 5.19*VIETNAM(-1) - 3407.57) + C(62)*(CHINA(-1) + 0.03*THAILAND(-1) - 11.00*VIETNAM(-1) - 3524.73) + C(63)*(INDONESIA(-1) + 1.10*THAILAND(-1) -

2.82*VIETNAM(-1) - 1575.79) + C(64)*(MALAYSIA(-1) - 1.56*THAILAND(-1) + 0.54*VIETNAM(-1) + 946.20) + C(65)*(PHILIPPINES(-1) - 0.36*THAILAND(-1) + 0.04*VIETNAM(-1) + 152.85) + C(66)*D(INDIA(-1)) + C(67)*D(INDIA(-2)) + C(68)*D(CHINA(-1)) + C(69)*D(CHINA(-2)) + C(70)*D(INDONESIA(-1)) + C(71)*D(INDONESIA(-2)) +

C(72)*D(MALAYSIA(-1)) + C(73)*D(MALAYSIA(-2)) + C(74)*D(PHILIPPINES(-1))+C(75)*D(PHILIPPINES(-2))+C(76)*D(THAILAND(-1))+ C(77)*D(THAILAND(-2)) + C(78)*D(VIETNAM(-1)) + C(79)*D(VIETNAM(-2)) + C(80)

v. D(PHILIPPINES) = C(81)*(INDIA(-1) + 1.75*THAILAND(-1) - 5.19*VIETNAM(-1) - 3407.57) + C(82)*(CHINA(-1) + 0.03*THAILAND(-1) - 11.00*VIETNAM(-1) - 3524.73) + C(83)*(INDONESIA(-1) + 1.10*THAILAND(-1) -

2.82*VIETNAM(-1) - 1575.79) + C(84)*(MALAYSIA(-1) - 1.56*THAILAND(-1) + 0.54*VIETNAM(-1) + 946.20) + C(85)*(PHILIPPINES(-1) - 0.36*THAILAND(-1) + 0.04VIETNAM(-1) + 152.85) + C(86)*D(INDIA(-1)) + C(87)*D(INDIA(-2)) + C(88)*D(CHINA(-1)) + C(89)*D(CHINA(-2)) + C(90)*D(INDONESIA(-1)) + C(91)*D(INDONESIA(-2)) +

C(92)*D(MALAYSIA(-1)) + C(93)*D(MALAYSIA(-2)) + C(94)*D(PHILIPPINES(-1))+C(95)*D(PHILIPPINES(-2))+C(96)*D(THAILAND(-1))+C(97)*D(THAILAND(-2)) + C(98)*D(VIETNAM(-1)) + C(99)*D(VIETNAM(-2)) + C(100)

vi. D(THAILAND) = C(101)*(INDIA(-1) + 1.75*THAILAND(-1) - 5.19*VIETNAM(-1) - 3407.57) + C(102)*(CHINA(-1) + 0.03*THAILAND(-1) - 11.00*VIETNAM(-1) - 3524.73) + C(103)*(INDONESIA(-1) + 1.10*THAILAND(-1) -

2.82*VIETNAM(-1) - 1575.79) + C(104)*(MALAYSIA(-1) - 1.56*THAILAND(-1) + 0.54*VIETNAM(-1) + 946.20) + C(105)*(PHILIPPINES(-1) - 0.36*THAILAND(-1) + 0.04*VIETNAM(-1) + 152.85) + C(106)*D(INDIA(-1)) +

C(107)*D(INDIA(-2))+C(108)*D(CHINA(-1))+C(109)*D(CHINA(-2))+C(110)*D(INDONESIA(-

1))+C(111)*D(INDONESIA(-2))+C(112)*D(MALAYSIA(-1))+C(113)*D(MALAYSIA(-2)) + C(114)*D(PHILIPPINES(-1)) + C(115)*D(PHILIPPINES(-2)) + C(116)*D(THAILAND(-1)) + C(117)*D(THAILAND(-2)) + C(118)*D(VIETNAM(-1)) +

C(119)*D(VIETNAM(-2)) + C(120)

vii. D(VIETNAM) = C(121)*(INDIA(-1) + 1.75*THAILAND(-1) - 5.19*VIETNAM(-1) - 3407.57) + C(122)*(CHINA(-1) + 0.03*THAILAND(-1) - 11.00*VIETNAM(-1) - 3524.73) + C(123)*(INDONESIA(-1) + 1.10*THAILAND(-1) -

2.82*VIETNAM(-1) - 1575.79) + C(124)*(MALAYSIA(-1) - 1.56*THAILAND(-1) + 0.54*VIETNAM(-1) + 946.20) + C(125)*(PHILIPPINES(-1) - 0.36*THAILAND(-1) + 0.04*VIETNAM(-1) + 152.85) + C(126)*D(INDIA(-1)) +

C(127)*D(INDIA(-2))+C(128)*D(CHINA(-1))+C(129)*D(CHINA(-2))+C(130)*D(INDONESIA(-

1))+C(131)*D(INDONESIA(-2))+C(132)*D(MALAYSIA(-1))+C(133)*D(MALAYSIA(-2)) + C(134)*D(PHILIPPINES(-1)) + C(135)*D(PHILIPPINES(-2)) + C(136)*D(THAILAND(-1)) + C(137)*D(THAILAND(-2)) + C(138)*D(VIETNAM(-1)) +

C(139)*D(VIETNAM(-2)) + C(140)

C(1), C(5), C(9), C(11), C(22), C(24), C(26), C(30), C(33), C(36), C(37), C(43), C(58), C(81), C(85), C(96), C(98), C(102), C(104), C(115), C(116), C(117), C(128) and C(130) are coefficients of integrated models that indicate the speed up adjustment towards long run equilibrium. These coefficients are significant as their corresponding probability values are less than 0.05 and the signs of coefficient are also negative indicating that there is long run causality from independent variables to dependent variable. So, there is long run causality from China, Indonesia, Thailand,

Vietnam, Philippines to India; from Vietnam, Malaysia, Thailand, India and Indonesia to China; from Thailand and Vietnam to Indonesia; from Thailand and Vietnam to Philippines; from China, Malaysia, Vietnam and Philippines to Thailand; from China and Indonesia to Vietnam. The block exogeneity Wald test or VEC Granger causality test is applied on the first differencing inflows to test any short term causal relationship between these seven FDI inflows series. The result of the test is portrayed in Table 14.

Table 14: Table showing results of Granger casualty test

VEC Granger Causality/Block Exogeneity Wald Tests Included observations: 43 Dependent variable: D(INDIA)			
Excluded	Chi-sq	df	Prob.
D(CHINA)	16.12916	2	0.0003
D(INDONESIA)	9.712291	2	0.0078
D(MALAYSIA)	21.98982	2	0.0000
D(PHILIPPINES)	10.47670	2	0.0053
D(THAILAND)	13.55480	2	0.0011
D(VIETNAM)	12.36900	2	0.0021
All	283.2534	12	0.0000

Dependent variable: D(CHINA)			
Excluded	Chi-sq	df	Prob.
D(INDIA)	23.40634	2	0.0000
D(INDONESIA)	0.536538	2	0.7647
D(MALAYSIA)	9.237948	2	0.0099
D(PHILIPPINES)	1.934463	2	0.3801
D(THAILAND)	0.182633	2	0.9127
D(VIETNAM)	1.042137	2	0.5939
All	49.95651	12	0.0000
Dependent variable: D(INDONESIA)			
Excluded	Chi-sq	df	Prob.
D(INDIA)	12.42833	2	0.0020
D(CHINA)	4.382294	2	0.1118
D(MALAYSIA)	14.58532	2	0.0007
D(PHILIPPINES)	1.619689	2	0.4449
D(THAILAND)	1.653423	2	0.4375
D(VIETNAM)	3.364598	2	0.1859
All	34.18189	12	0.0006

Dependent variable: D(MALAYSIA)			
Excluded	Chi-sq	df	Prob.
D(INDIA)	20.32873	2	0.0000
D(CHINA)	0.208690	2	0.9009
D(INDONESIA)	1.856054	2	0.3953
D(PHILIPPINES)	14.47616	2	0.0007
D(THAILAND)	5.082389	2	0.0788
D(VIETNAM)	1.318550	2	0.5172
All	74.06311	12	0.0000
Dependent variable: D(PHILIPPINES)			
Excluded	Chi-sq	Df	Prob.
D(INDIA)	0.075939	2	0.9627
D(CHINA)	2.840751	2	0.2416
D(INDONESIA)	3.702121	2	0.1571
D(MALAYSIA)	9.102002	2	0.0106
D(THAILAND)	20.06455	2	0.0000
D(VIETNAM)	3.947206	2	0.1390
All	139.1716	12	0.0000
Dependent variable: D(THAILAND)			
Excluded	Chi-sq	Df	Prob.
D(INDIA)	1.024209	2	0.5992
D(CHINA)	4.762061	2	0.0925
D(INDONESIA)	3.851357	2	0.1458
D(MALAYSIA)	15.34938	2	0.0005
D(PHILIPPINES)	11.97043	2	0.0025
D(VIETNAM)	18.26489	2	0.0001
All	138.8316	12	0.0000
Dependent variable: D(VIETNAM)			
Excluded	Chi-sq	Df	Prob.
D(INDIA)	71.09001	2	0.0000
D(CHINA)	16.01788	2	0.0003
D(INDONESIA)	25.85701	2	0.0000
D(MALAYSIA)	62.65161	2	0.0000
D(PHILIPPINES)	43.00791	2	0.0000
D(THAILAND)	14.65049	2	0.0007
All	354.6652	12	0.0000

Source: *Author's calculations*

The result of VEC Granger casualty test indicates that there is short run causality from independent variable to dependent variable i.e. from FDI inflows of China, Malaysia, Indonesia, Philippines, Thailand and Vietnam to India; from India and Malaysia to China; from India and Malaysia to Indonesia; from India and Philippines to Malaysia; from Malaysia and Thailand to Philippines; from Malaysia, Philippines and Vietnam to Thailand; from India, China, Malaysia, Indonesia, Philippines and Thailand to Vietnam.

Discussion

Alfaro et al. (2004), Busse and Groizard (2005), Karl (2005), Ozturk (2007), Pradhan (2009), Alguacil, Cuadros and Orts (2011), Ahmed (2012), Temiz and Gokmen (2014), Tan and Tang (2016) highlighted the positive association of FDI inflows and growth. This positive association has increased the level of competition among underdeveloped and developing economies in attracting foreign direct investments. These economies have been putting lot of efforts by framing suitable economic policies for attracting foreign direct investments inflows by focusing on key driving factors. Elteto and Sass (1998), Carstensen and Toubal (2003), Mahendra (2004) and Zhang and Fu (2008) highlighted various economic, socioeconomic, political and firm specific factors driving FDI inflows. Many researchers have highlighted the determinants and importance of attracting foreign direct investments in various economies from different perspectives. But there are few studies on the investigation of cointegration and causality of FDI inflows especially in China, India and ASEAN 5 economies. The present treatise is a humble attempt to fill this lacuna. The empirical results of the present treatise confirmed that the FDI inflows series of China, India and ASEAN 5 economies from 1970 to 2015 were non-stationary and had to be differenced in order to make them stationary.

All these series were cointegrated in the same order as confirmed by Johansen cointegration test results. The statistical results clearly indicated the presence of long run causality from China, Indonesia, Thailand, Vietnam, Philippines to India; from Vietnam, Malaysia, Thailand, India and Indonesia to China; from Thailand and Vietnam to Indonesia; from Thailand and Vietnam to Philippines; from China, Malaysia, Vietnam and Philippines to Thailand; from China and Indonesia to Vietnam. The result of VEC Granger casualty test confirmed that there was short run causality from FDI inflows of:

- China, Malaysia, Indonesia, Philippines, Thailand and Vietnam to India
- India and Malaysia to China
- India and Malaysia to Indonesia
- India and Philippines to Malaysia
- Malaysia and Thailand to Philippines
- Malaysia, Philippines and Vietnam to Thailand
- India, China, Malaysia, Indonesia, Philippines and Thailand to Vietnam.

A peculiar point to note here is that the scope of present treatise is limited as the results are based on the yearly data on FDI inflows in India, China and ASEAN 5 economies only. The present treatise can be further improved by inculcating quarterly data of FDI inflows and FDI outflows.

Conclusion

The developing and underdeveloped economies of the world face the problem of scarcity of capital. These economies put the issue of foreign direct investments as one of the most

important policy agenda at national and international level. FDI inflows in Asian economies have contributed to strong growth paths for their assimilation into the world economy. The competition level is very high among these economies in attracting foreign direct investments. ASEAN 5 economies (Malaysia, Indonesia, Philippines, Thailand and Vietnam) have been putting lot of efforts by framing suitable economic policies for attracting foreign direct investments at par with China and India. The results of the present treatise clearly indicated that China has been leading the group followed by India in terms of quantum and variability in FDI inflows. ASEAN 5 economies have been lagging far behind. The vector error correction estimates indicated the presence of long run causality and the results of VEC Granger causality test confirmed the short run causality. The findings of present study can be used for prediction of FDI inflows in China, India and ASEAN 5 economies in the short as well as long run on the basic relationship and causality among these economies.

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