Interlinkages Between Indian and Global Stock Market Returns : Evidence from G5 Countries

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Abstract

Globalization has brought the world nations together with respect to trade and strategic alliances. The present study focused on investigating interlinkages between Indian and global stock markets. For this purpose, a group of five budding countries of the 21st century was selected, that is, Brazil, China, India, Mexico, and South Africa, also known as G5. Considering a data from 2001 to 2017, the study attempted to examine the relationship, causality, and impact between Indian and global stock market returns. The results indicated a strong positive relationship between Indian and global stock market returns, and such relation was found to be highest with the Shanghai Composite Index returns (China). The study also evidenced bidirectional causality between Indian and global stock market returns. Also, a significant positive impact of global stock market returns was noticed. The results will be helpful for investors belonging to G5 countries to frame short term and long-term investment strategies.

Keywords : G5 countries, stock returns, Bai-Perron test

JEL Classification : G1, F32, F36

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Linkage of global markets has chief implications for worldwide diversification and for home economies. Frail market linkage provides prospective gains from worldwide diversifications, while intense linkage decreases the lagging of home market from several global shocks. Overall in the world, stock markets have become more integrated, in particular, in the post globalization phase.

At present, transversely in the world, stock markets are in occurrence of associated price plus volume trends because of globalization, monetary sector reforms, superior bilateral trade, intelligibility and technical progressions in stock trade. Rising interlinkages have been evident, mostly through overseas portfolio investments, along with overseas catalogue of MNCs. It is frequently monitored that stock value is likely to vary along with financial news broadcasts. Whatever on earth takes place, it has an effect on every stock market in the world. The intent of the present study is to scrutinize the interlinkages among worldwide stock markets by taking G-5 countries and examining how these interlinkages between countries influence the level of their stock market comovements. G-5 is basically made up of five budding economies of the 21st century : Brazil, India, Mexico,

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China, and South Africa. The linkages among stock markets are pretty composite. There are bounteous prospective channels for linkage. Thus, trade linkages among countries are competent to function as one of the channels regards to which shocks may be passing on from market-to-market.

Review of Literature

A deep insight of existing literature pertaining to studies concerning interlinkages between global stock markets is presented in the current section. Liu, Pan, and Shieh (1998) elaborated the formation of worldwide transmission in each day returns of six chosen nationwide stock markets via the VAR model. Their results pointed out that (a) the scale of interdependence between nationwide stock markets had enhanced considerably subsequent to the stock market hurtle in 1987, (b) the U.S. market performed the dominant task of persuading the Pacific Basin market, and (c) Japan along with Singapore jointly had a considerable constant collision with the other Asian markets.

Chiang and Zheng (2010) observed herding behaviour in international markets by considering daily data of 18 countries commencing from May 25, 1988 till April 24, 2009 and found the proof of herding in highly developed stock markets (apart from the U.S. market) including the Asian markets. They disclosed that there was absence of herding into Latin American markets and furthermore stated that except in U.S. and Latin America, herding was there equally in upward and downward markets. Also, they uncovered the fact that herding was greater in Asian markets at the time of intensifying markets. Facts also implied that crisis generates herding actions in the crisis country and that creates contamination effect which, in turn, broadens the crisis to the next door countries. Bali and Cakici (2010) conducted a study for finding various methods for projecting measures of risk, diverse investment horizons along with subsequent scheming for the aggregate bonus yield of countries, inflation threat, switch rate uncertainties, aggregate instability risk, etc. The key outcome indicated the insensitivity to the option of single factor v/s numerous models employed to predict systematic plus idiosyncratic measures of risk.

Syllignakis and Kouretas (2011) used the DCC multi-variant GARCH model. The key verdict of this scrutiny was that there was presence of statistically noteworthy boost in provisional correlations among U.S. as well as the German stocks along with CEE stock returns, mainly through the 2007 - 2009 monetary crisis, entailing that these budding markets rendered exterior shocks with a considerable rule shift in provisional association. Finally, they verified that domestic along with overseas monetary variables plus exchange rate movements had a noteworthy collision on the corresponding provisional associations.

Li (2012) used 4*4 asymmetric GARCH - BEKK techniques along with a series of likelihood ratio tests to find out China's provincial and universal linkages among 1992 and 2010 for the duration of three sub - phases denoting the stages of the Chinese transformation. The outcome showed that China's market was tied up with foreign country markets and the alteration allowed spillovers from China's market to these markets. The consequent regression study of the time changeable correlations, in the existence of rising economic incorporation, exchange rate threat, and financial unrest further pointed out that interdependence between both China and the local markets boosted due to the execution of liberalization guidelines. In a similar study, we also noticed application of GARCH - BEKK technique by Kumar and Khanna (2018) and examination of spillovers between global stock markets by Singh and Kaur (2015). Graham, Kiviaho, Nikkinen, and Omran (2013) examined co-movement of stock markets in the midst of U.S. stock market plus the provincial co-movement along with these markets from the period of June 2002 till June 2010. The researchers applied the scrutiny of wavelet quadrangle coherency along with stimulated assurance bounds. It enables the concurrent assessment of small and lengthy term in co-movement of stock market and sense alterations in market connections over time. Evidence put forward an unpretentious degree of stock returns' co-movements among stock markets at superior frequencies that entailed improved undersized diversification gains.

Dimitriou, Kenourgios, and Simos (2013) undertook a study and investigated the contagion consequences of the international financial catastrophe in a multivariate fractionally integrated asymmetric power ARCH (FIAPARCH) plus DCC structure throughout the era of 1997 - 2012. They focused on mainly the five vital budding equity markets, specifically BRICS, along with USA through diverse stages of the crisis. The experimental proof did not verify a contagion consequence for BRICS in the early phases of the crisis, representing signs of segregation and found that correlation among all BRICS and USA were raised from early 2009 onwards, implying that their reliance was superior in bullish than in bearish markets. Li (2014) applied the test to discover if asymmetric comovements were in existence in universal stock markets. They disclosed the result that asymmetric co-movements were present among the stock markets of U.S. and Canada, France plus Germany along with U.K., however, the data was incapable to refuse illogical proposition pertaining to symmetric co-movements among the U.S. plus stock markets of Japan.

Sclip, Dreassi, Miani, and Paltrinieri (2016) made an attempt to examine the instability behaviour and the co-movements among *sukuk* and global stock indices. They used multi- variant GARCH models in the company of DCC, which were predicted under student - *t* distribution. They presented the proof of elevated correlations between *sukuk* and U.S. & EU stock markets, devoid of finding the recognized flight to superiority behaviour disturbing Islamic bonds. They also found that the volatility association among *sukuk* and local market indexes was highest at the time of financial crisis. Co-movement and integration among 14 stock markets was examined by Patel (2017) and causality investigation was examined by Sharma et al. (2013).

The review of literature shows substantial contribution in linkages between international stock markets. The current study infringes this gap and inspects the impact of global stock markets on India's stock market and the relationship between Indian and preferred global stock markets. The alliance has been analyzed by picking a group of five budding countries, that is, Brazil, China, India, Mexico, and South Africa. The present study examines four selected stock indices of each country and their impact on the Indian stock market, that is, the Nifty 50 Index. The present study is also unique as it utilizes the Bai - Perron approach to examine the impact which takes into consideration the presence of structural breaks. The following hypothesis is framed for the purpose of the study :

✤ **H0 :** There exists no significant impact of global stock markets on the Indian stock market.

Research Design

The present study aims to examine the association between the Indian stock market with the selected global stock markets, analyze the impact of global stock indices on the Indian stock market, and determine the causation effect between the global stock indices and the Indian stock market. The data engaged in this study are daily closing prices of five selected stock market indices, including India (Nifty 50 Index), Brazil (Ibovespa Index), China (Shanghai Composite Index), Mexico (Inmex Index), and South Africa (FTSE Index). The data were retrieved from the official website of investing.com. Daily rates of return were calculated by taking the natural logarithms of the stock index returns. The period that has been chosen for the current study is from April 1, 2001 to March 31, 2017, that is, 16 years.

The required analysis has been performed using E-Views, SPSS, and MS - Excel. To analyze the data, statistical methods have been used such as graphical analysis, summary statistics (i.e., mean, standard deviation, skewness, and kurtosis), and unit root test is used to check the stationarity in a time series. To assess the linear relationship between the selected variables, Pearson's correlation test has been used. Also, an attempt has been made in the current study to examine the causal effect between the Indian stock market and global stock markets by using the Granger causality test. Bai - Perron assessment has been performed for the purpose of identifying

structural breaks and examines the impact of global stock indices on the Indian stock market. In addition, the study utilizes CUSUM test to evaluate the stability of the model.

The following equations are developed for the purpose of the study :

$$\text{Nifty 50 Index Returns} = \alpha_1 + \beta_1 \text{Ibovespa Returns} + \varepsilon_1 \tag{1}$$
$$\text{Nifty 50 Index Returns} = \alpha_2 + \beta_2 \text{ Shanghai Composite Returns} + \varepsilon_2 \tag{2}$$
$$\text{Nifty 50 Index Returns} = \alpha_3 + \beta_3 \text{Inmex Returns} + \varepsilon_3 \tag{3}$$
$$\text{Nifty 50 Index Returns} = \alpha_4 + \beta_4 \text{ FTSE Returns} + \varepsilon_4 \tag{4}$$

where,

$\alpha_1, \alpha_2, \alpha_3,$ and α_4 are intercept terms,

$\beta_1, \beta_2, \beta_3,$ and β_4 are slope coefficients,

$\varepsilon_1, \varepsilon_2, \varepsilon_3,$ and ε_4 are disturbance terms,

Nifty 50 Index Returns is dependent variable,

Ibovespa Returns, Shanghai Composite Returns, Inmex Returns, and FTSE Returns are regressors.

Analysis and Results

(1) Graphical Analysis : From the Figure 1, it can be clearly seen that the prices of stocks of all the selected G5 countries increased tremendously from 2001 to 2007. This is due to the global financial crisis in 2008 wherein there was a sudden fall in the prices of stocks as a result of excessive borrowing and unsound financial modelling as also illustrated by Singh and Shrivastav (2018). Similarly, again in 2012, there was a drop in prices due to the global economic crisis. The study finds many fluctuations till 2012, but then it started showing a rising trend. In case of Ibovespa (Brazil), after the fall in 2008, the graph shows an upper trend, followed by many fluctuations thereafter. In case of the Shanghai Composite Index, the graph shows a remarkable ascend from 2006 - 2007 and subsequently shows a descend till 2014. While in case of Inmex (Mexico), the graph shows a rising movement throughout till 2017 except the fall in prices in the year 2007-08 as a result of the crisis. Lastly, in the case of FTSE (South Africa), the graph shows an upward trend except the fall in the prices in the year 2008. As a whole, the Figure 1 shows the impact in price movement due to the global financial crisis in the year 2008 and the global economic crisis in the year 2012.

(2) Summary Statistics : The Table 1 demonstrates the mean, standard deviation, skewness, and kurtosis for the stock market returns pertaining to G5 countries' stock indices. Mean measures the performance. For the chosen global stock indices, the mean value of Nifty 50 returns is the highest, that is, 0.064898 followed by returns of Inmex, FTSE, Ibovespa, and Shanghai Composite Index (0.06154, 0.055419, 0.046128, and 0.015047, respectively). Standard deviation quantifies the deviation in the data. Lower deviation is treated as favourable. From the Table 1, we can notice that FTSE returns have lower standard deviation among all. Skewness determines the association between mean, median, and mode. In the Table 1, the β of all the variables is negatively skewed. Kurtosis measures whether the data is heavy tailed or light tailed. We can clearly notice that the β of Nifty 50 returns, Ibovespa returns, Shanghai Composite Index returns, Inmex returns, and FTSE returns is greater than 3, which is considered as leptokurtic.

(3) Unit Root Test : Unit root test examines whether a time series variable is stationary, that is, it does not possess a unit root. As the computed p - values are lower than the required level of significance for all the indices returns as

Figure 1. Trends in Stock Markets of G5 Countries
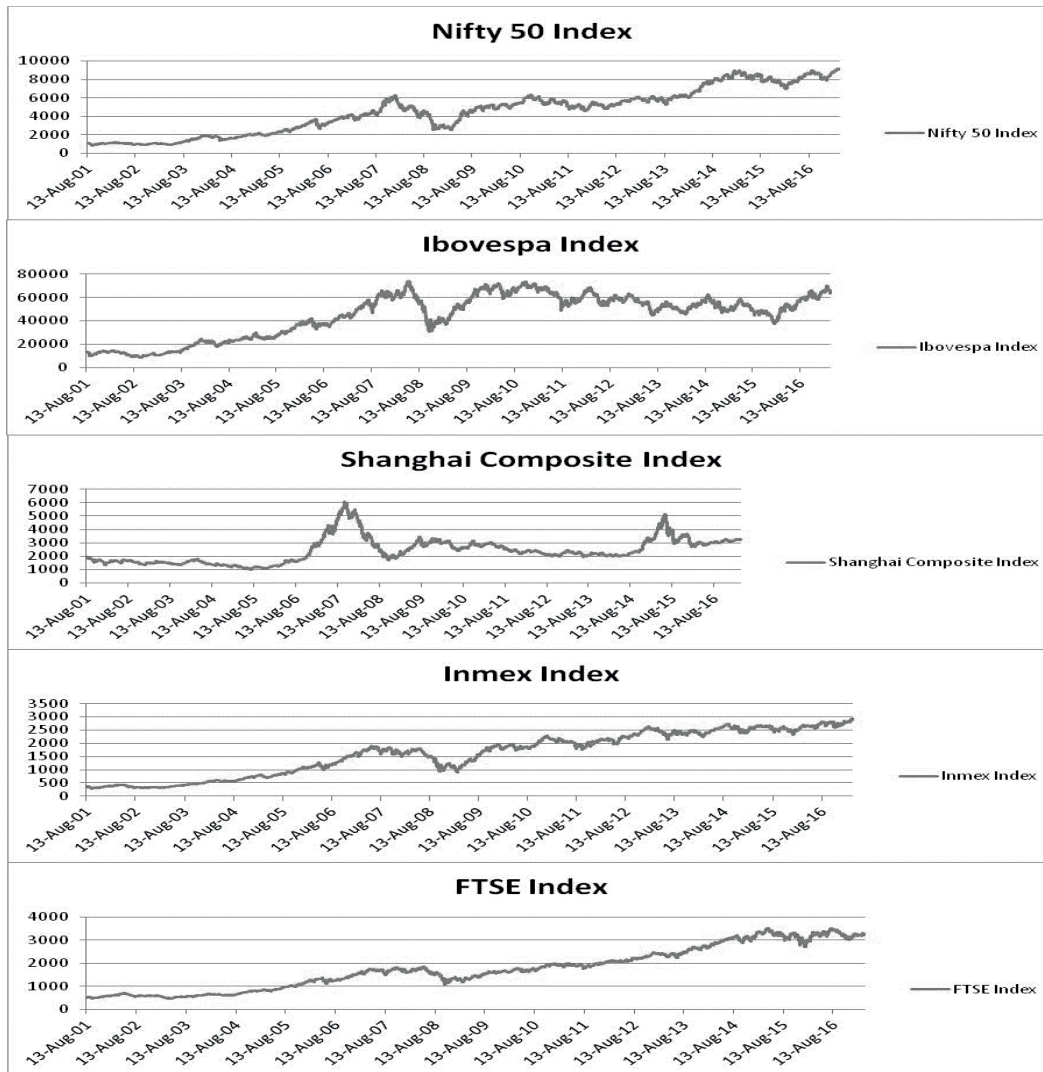
Note. X axis represents period and *Y* axis represents closing prices of respective indices.

Table 1. Summary Statistic Results of Global Stock Market Returns

	Mean	Standard Deviation	Skewness	Kurtosis
Nifty 50 Returns	0.064898	1.589873	-0.304329	14.37806
Ibovespa Returns	0.046128	2.029921	-0.388609	11.60804
Shanghai Composite Returns	0.015047	1.794841	-0.428208	8.411254
Inmex Returns	0.06154	1.4616	-0.378422	17.81156
FTSE Returns	0.055419	1.275328	-0.379898	10.02821

Table 2. Stationarity Results of Global Stock Market Returns

	ADF Test Statistics	p - value
Nifty 50 Returns	-41.8662	0.0000***
Ibovespa Returns	-58.7121	0.0001***
Shanghai Composite Returns	-56.7822	0.0000***
Inmex Returns	-41.6657	0.0000***
FTSE Returns	-42.6148	0.0001***

Table 3. Results Showing the Relationship Between Indian and Global Stock Market Returns

	Pearson's Correlation	Sig (2 - tailed)
Ibovespa Returns	0.271	0.000***
Shanghai Composite Index Returns	0.417	0.000***
Inmex Returns	0.324	0.000***
FTSE Returns	0.231	0.000***

reflected in Table 2, we reject the null hypothesis. Thus, there exists no unit root for the series, and as such, the data is said to be stationary.

(4) Correlation Analysis : The Table 3 shows the relationship between Nifty 50 with four global indices, that is, Ibovespa index, Shanghai Composite Index, Inmex index, and FTSE index. The current study observes that there is a positive relationship between Nifty 50 and Shanghai Composite Index followed by Nifty 50 and Inmex, Nifty 50 and Ibovespa, and finally between Nifty 50 and FTSE, and such a relationship is observed to be significant. Such a positive correlation was also evidenced by Patel (2017).

(5) Causation Analysis : The current study intends to examine the causality between the Indian and global stock market returns as reflected in the Table 4. To carry out this analysis, Granger causality test has been utilized. The study observes the causal indication of Ibovespa returns Granger cause Nifty 50 returns at the 1% level of significance. The test also recognizes that Shanghai Composite returns Granger cause Nifty 50 returns at the 5% significance level ; whereas, Nifty 50 Returns Granger cause Shanghai Composite Index returns at the 1% level of significance. Also, the results depict that Inmex returns do Granger cause Nifty 50 returns as the p - value is 0.00, which is less than 0.01 at the 1% level of significance ; thus, we reject H0. Also, the FTSE returns do Granger cause Nifty 50 returns at the 1% significance level. Thus, the study notices bidirectional causality between Indian and

Table 4. Results Showing Causation Effect Between Indian and Global Stock Market Returns

	Causality from Global Stock Market Returns to Indian Stock Market Returns		Causality from Indian Stock Market Returns to Global Stock Market Returns	
	F - Statistic	Prob.	F - Statistic	Prob.
Ibovespa Returns	25.4482	0.0000***	7.83883	0.0004***
Shanghai Composite Index Returns	3.07097	0.0465**	8.3267	0.0002***
Inmex Returns	76.877	0.0000***	3.12945	0.0439**
FTSE Returns	14.6621	0.0000***	4.19804	0.0151**

Note. **5% Level of significance, ***1% level of significance

Table 5. Results Showing the Impact of Global Stock Market Returns on Indian Stock Market Returns

	Variable	Coefficient	Standard Error	*t* - Statistic	*p* - Value
Ibovespa Returns	8/13/2001 - 9/12/2008	0.149736	0.01866	8.024627	0.000***
	9/17/2008 - 3/22/2012	0.441218	0.022877	19.28654	0.000***
	3/23/2012 - 3/31/2017	0.018421	0.027396	0.672418	0.5014
Shanghai Composite Returns	8/13/2001 - 7/30/2007	0.051474	0.025679	2.004535	0.0451**
	7/31/2007 - 11/28/2011	0.383382	0.023735	16.15271	0.000***
	11/29/2011 - 3/31/2017	0.137124	0.027722	4.946378	0.000***
Inmex Returns	8/13/2001 - 7/30/2007	0.051474	0.025679	2.004535	0.0451**
	7/31/2007 - 11/28/2017	0.383382	0.023735	16.15271	0.000***
	11/29/2011 - 3/31/2017	0.137124	0.027722	4.946378	0.000***
FTSE Returns	8/13/2001 - 3/28/2006	0.359343	0.041444	8.670597	0.000***
	3/29/2006 - 5/10/2010	0.703851	0.029457	23.89394	0.000***
	5/11/2010 - 3/31/2017	0.385778	0.0333245	11.57629	0.000***

Note. **5% Level of significance, ***1% level of significance

global stock market returns. The results are in line with the findings obtained by Sharma, Mahendru, and Singh (2013).

(6) Bai - Perron Test : The structural breaks were categorized via Bai - Perron test and presented in the Table 5. The test has identified assorted structural breaks across indices. The sampling faults in the data have been revealed via standard error. As can be seen in the Table 5, the standard error for all the selected global indices is close to zero, and therefore, it is favourable. The Bai - Perron test is basically used to identify the structural breaks and investigate whether there is an impact of global stock markets on the Indian stock market. As per the above result, it can be seen that Ibovespa returns have an impact on Nifty 50 Index as the *p* - value is less than 0.01 for two structural breaks. While in the second case, the Shanghai Composite Index has a significant impact on the Indian stock index followed by Inmex Index and FTSE index returns. Overall, the test demonstrates the strong impact of global stock indices on the Indian stock market and such impact is found to be positive as indicated by beta coefficients. The study finds the models to be stable using CUSUM test. The results of CUSUM test are presented in the Appendix.

Conclusion

The stock market of one country has consequences on the stock markets of numerous countries. In the present study, an attempt has been made to uncover the interlinkages between global stock markets considering G - 5 countries. The study considers data from 2001 to 2017. The impact of global stock markets on the Indian stock market is scrutinized using Bai - Perron test, where Ibovespa returns, Shanghai Composite Index returns, Inmex returns, and FTSE returns are presumed to be regressors and Nifty 50 returns are the dependent variable and the test demonstrates significant impact of global stock indices on the Indian stock market. The models are found to be stable using CUSUM test. To test the stationarity of the data concerning the Nifty 50 returns, Ibovespa returns, Shanghai Composite Index returns, Inmex returns, and FTSE returns across the chosen indices, the Augmented Dickey-Fuller test is utilized, and the data are found to be stationary. The study observes that there is a strong positive relationship between Nifty 50 and Shanghai Composite Index followed by Nifty 50 and Inmex, Nifty 50

and Ibovespa, and Nifty 50 and FTSE using Pearson's correlation test. The study observes bi-directional causality between Indian and global stock market returns.

Research Implications, Limitations of the Study, and Scope for Further Research

The study recommends the investors to be attentive about the market news as whatever happens in one country has an effect on other countries' markets. If there is crisis in any of the G-5 countries, it will definitely have a considerable impact on the Indian stock market. The investor must have an eye on day today's trends in the market before making an actual investment. As the market is highly volatile, the investor must decide when to buy and hold a long position and when to take short position after doing proper analysis. The present study faces some drawbacks as it deals with only G-5 countries and ignores other major countries of the world. The study can be extended further by performing the analysis for various other economic groups of countries. The results will be helpful for investors belonging to G - 5 countries to frame short-term and long-term investment strategies.

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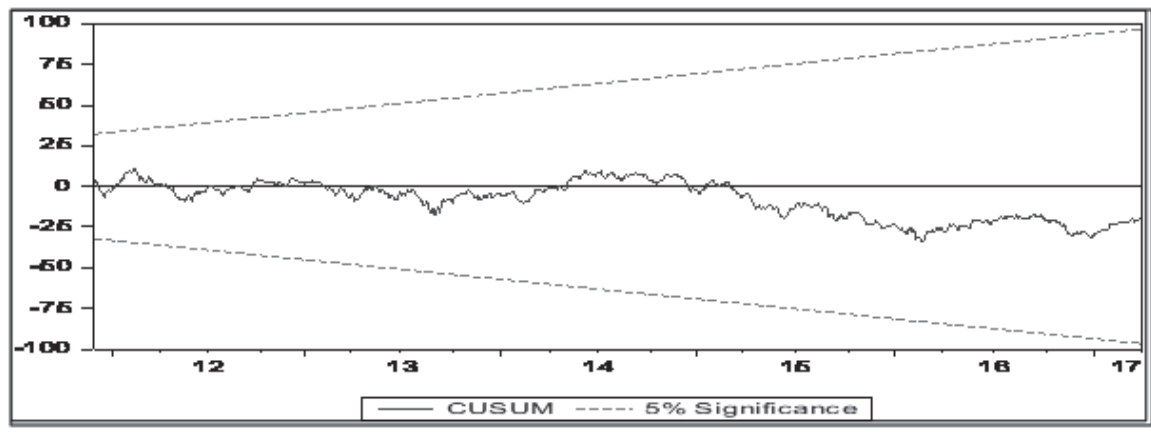
Appendix

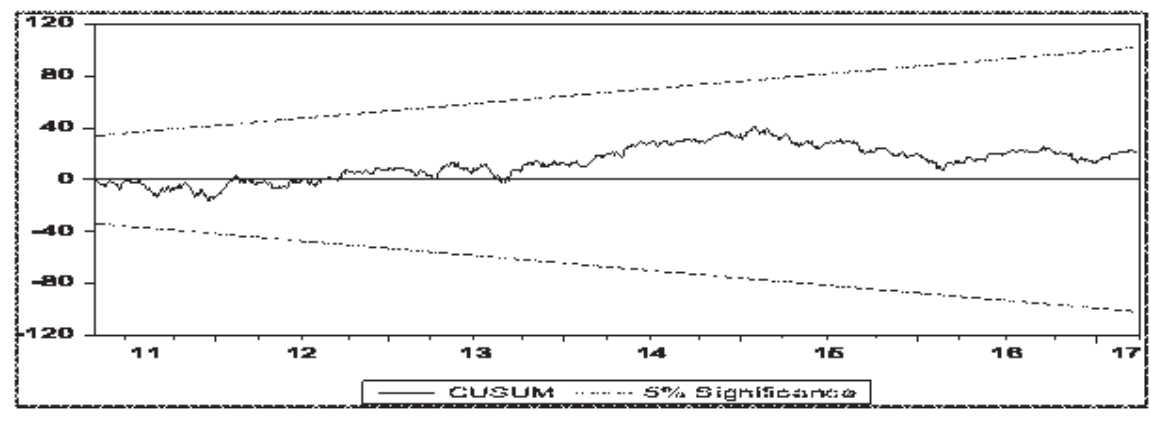**Results of Cusum Test (*Y* = Returns, *X* = Years)**

Appendix Figure A1. Stability Test of Nifty 50 and Ibovespa
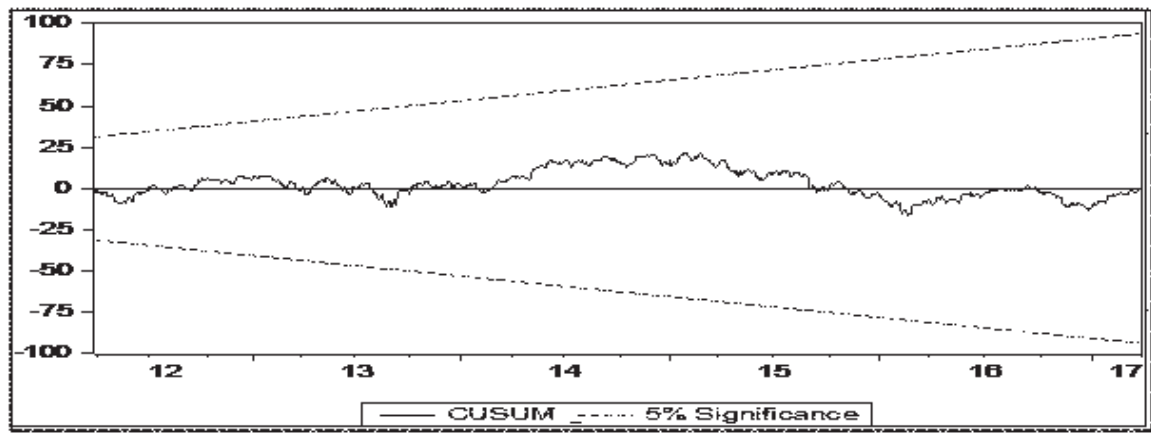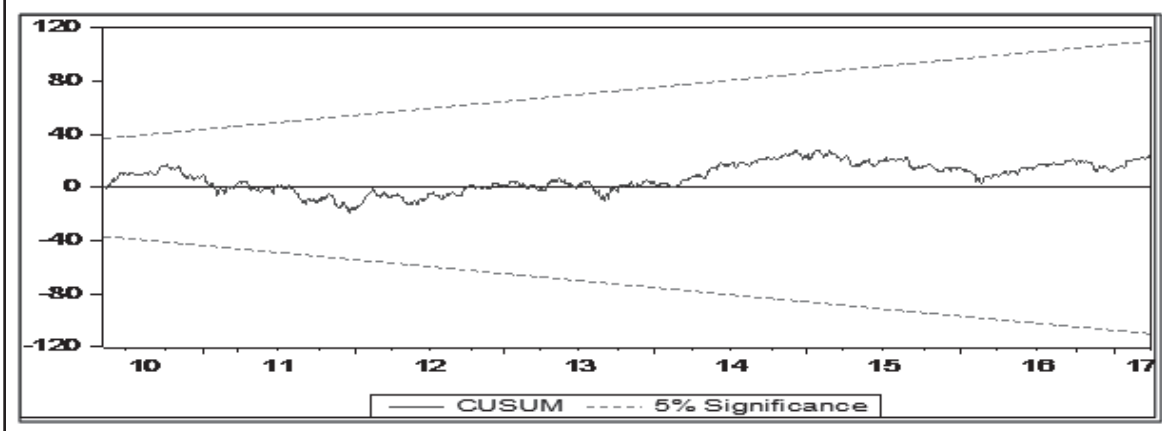

Appendix Figure A2. Stability Test of Nifty 50 and Shanghai Composite SSEC

Appendix Figure A3. Stability Test of Nifty 50 and INMEX

Appendix Figure A4. Stability Test of Nifty - 50 and FTSE

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