A STUDY ON INTEGRATION OF STOCK MARKETS: EMPIRICAL EVIDENCE FROM NATIONAL STOCK EXCHANGE AND MAJOR GLOBAL STOCK MARKETS

Malabika Deo[1] and P. Arun Prakash[2]

[1]Department of Commerce, School of Management, Pondicherry University, India
[2]School of Management Studies, Bannari Amman Institute of Technology, India

Abstract

This study empirically examines the co integration of the Indian stock market with special reference to National Stock Exchange, with the major stock exchanges in the world. The study of the existence of interlink ages among international capital markets has considerable implications on determining the extent of portfolio diversification as well as macroeconomic policies of individual countries. The changing conditions in the international stock market have led global investors to think of other leading market which offers immense returns. Asian Markets have emerged as desired investors centre for the global players. However, their movement is also subject to the volatility prevailing in the international markets. The results of Johansen cointegration test confirmed the existence of long term relationship between NSE Nifty and other indices of major stock exchanges in the world.

Keywords:

Stock Market Integration, Long Run Relationship, Global Stock Markets, Johansen Cointegration Test and Granger Causality Test

1. INTRODUCTION

The nexus between the stock markets of the world are witnessing momentum increase over the years due to the impact of globalization. The pace of global integration and the intensification of international economic linkages among nations are high. The future also gives space for continual integration between the nations. The financial markets around the world have expanded beyond the frontiers with money moving from one country to another in different forms such as loans, FDI, foreign currency markets etc. The interdependence of stock has also grown rapidly with the removal or relaxation of restrictions on financial flows across national borders, deregulation of financial institutions and international financial innovations. The term stock market cointegration in this analysis refers to identifying the existence of long term relationship between two stock markets.

With this few introductory note, the study has been organised into five sections. Section 2 reviews the previous literature in this area, section 3 describes the research design, section 4 discusses the empirical results and section 5 concludes.

2. LITERATURE REVIEW

Debjiban Mukherjee [1] compared the Indian stock market with the international stock markets using the indices of New York Stock Exchange (NYSE), Korea Stock Exchange (KSE), Russian Stock Exchange (RSE), Tokyo Stock Exchange (TSE) and Hong Kong Stock Exchange (HSE). He found that Indian stock markets witnessed high cointegration with other exchanges in the world since many Indian companies listed their GDR and ADR there. He highlighted that the markets were started to

integrate after 2002-2003. He concluded that Indian markets reacted to global cues and any happening in global scenario. Tripathi and Sethi [2] examined the integration of Indian stock markets with major global stock markets such as Japan, the UK, USA and China for the period starting from January 1 1998 to 31st October 2008 using econometrics tools such as Johansen and Engle-Grangle cointegration test, and Granger Causality test. The analysis of daily data showed the Indian stock market is cointegrated with the US stock markets but not with that of Japan, the UK and China. The correlation matrix showed that the NIFTY movements were highly correlated with DJIA and least with NIKKIE. Unidirectional causality was observed in case such as FTSE, DJISA and S&P 500 granger caused NIFTY implying that the developments in UK and US were transmitted to the Indian stock market. Subha and Nambi [3] analysed the extent of between the major stock exchanges with the prominent stock America such as New York Stock Exchange and NASDAQ using Engle Grangle Test of cointegration for the period Jan 2000 to Dec 2008. The results indicates that the Indian stock markets showed no interdependence with the NASDAQ and S&P 500 confirming the absence of cointegration between the Indian and American Stock Markets. Gupta and Agarwal [4] found the correlation of Indian stock markets with five other major Asian economies such as Japan, Hong Kong, Malaysia, Indonesia and Korea. The weak correlation confirmed that the Indian stock market offered diversification benefits to institutional and international investors. He also observed non normality feature in the stock market return distribution of six Asian economies including India. The Indian market revealed the features of platykurtic distribution, the volatility of its weekly returns were similar to its international counterparts. He also observed that the negative skewness of returns, both in the short run and long run confirmed that the concentration of these returns towards higher returns and good opportunity for investment.

Anghelache and Ciobanu [5] evaluated the importance of contagion effects on the capital markets using Johansen Cointegration test. The study confirmed the long term relationship among three stock exchange indices namely the Dow Jones (United States), DAX 30 (Germany) and BET (Romania) stock exchange indices. It is also found from the Granger test of causality test that DAX 30 and DJ are caused by BET. However, there exists causality relations between DJ and DAX. So, it is concluded that German market is caused by the American market. Srikanth and Aparna [6] studied the degree of stock markets cointegration using the month-wise average prices of BSE Sensex, NYSE, NASDAQ, S&P 500, Hangseng, NIKKIE 225, SSE Composite index and FTSE-100. They observed that there was substantial integration between domestic and international stock markets. It was also found that BSE Sensex had witnessed high fluctuations which had been indicated by very high co-efficient of variation compared with other stock indices. It was

further found that Sensex showed a strong association with NYSE and Hang Seng. NIKKIE 225 had strong correlation with all select indices except Sensex, Hang Seng and SSE Composite index. FTSE 100 revealed a strong correlation with all the US stock markets and NIKKIE 225.

Talwar and Bhattachary [7] studied the currency movements and equity market indices of the tiger economies. They found the uni-directional and bidirectional causality between the markets using Granger causality test. The empirical results showed integration in stock indices and exchange rate movements within the Asian markets with the exception of Hong Kong exchange rate movement, due to its peg against the US dollar. Rajwani and Mukherjee [8] analysed the linkages between Indian stock markets with other Asian stock markets such as, Hong Kong, Indonesia, Japan, South Korea, Malaysia, Taiwan and China. The study has applied unit root test in the presence of endogenous structural breaks that uses a Lagrange Multiplier (LM) test statistics and the Gregory and Hansen cointegration technique that allows for endogenous determined structural break in the relationship. The lack of evidence on interlinkage of Indian stock markets with other Asian markets confirmed that the trend of Indian markets is not in integration with other markets, owing to differences in macroeconomic structure.

Horobe et al. [9] investigated the level of co-movements between three emerging stock markets - Czech Republic, Hungary and Poland – and three developed markets from the European Union - Austria, France and Germany using econometrics tools such as unit root, correlations, Johanson cointegration and Granger Causality test. The results showed a statistically significant positive trend in cross-market correlations between 1999 and 2008, before the emergence of the global financial crisis. It is also observed from the analysis that movements in national stock markets are not fully synchronized, but changes in market volatilities led to changes in cross-country correlations. The results of Cointegration test confirmed the existence of long-term relationship between some of these countries' capital markets.

Ncube [10] determined the long-run relationship between the five select African stock markets and world stock markets using Johansen and Julius cointegration method based on monthly data for the period 2000-2008. The empirical results also revealed that African stock markets are highly segmented. The Estimates of Vector error correction model revealed the short-run positive relationship between JSE and BSE. It was also found from the VAR Granger causality/Wald Exogeinity test that African stock markets are still not fully integrated. The variance decomposition and impulse response results showed that the JSE index has more influence on the BSE index but the markets are still segmented from each other, primarily because of the difference in operational capacity and efficiency in the markets.

Saxena and Chadha [11] examined the extent of cross-country returns co-movement between the stock markets of India and US. For this purpose, they investigated the long run relationship and short term interlink ages between BSE and NASDAQ by using the daily data of Sensex and Nasdaq composite from April 2004-2013. The results showed the statistically significant relationship between Indian Stock Market and American Stock Market. The results of Johansen Cointegration test confirmed the cointegrating relationship between BSE and NASDAQ. Granger causality test

also revealed that there was unidirectional relationship running from NASDAQ to BSE.

Dengjun [12] examined the link between financial cooperation in the Nordic region and the interdependence in the stock markets using the exponential generalized autoregressive conditionally heteroskedastic model. The existence of two cointegration during the sample period showed that the markets depend on each other to some extent. The recursive estimation of Johansen's model further denoted that the interdependence had been greatly improving until late 2008. The interdependence between those markets is also confirmed through the short-term dynamics, implying that the spill over effects between most pairs of stock volatilities are witnessed in the empirical analysis.

3. RESEARCH DESIGN

3.1 STATEMENT OF THE PROBLEM

In general, the volatility in the stock market is pertaining heavily to cross border capital flows in the form of FDI, FII and other macroeconomic variables. The US Subprime crisis is a costly lesson for other exchanges who were victims of the crisis in 2008. Recently, Chinese devaluation has led to a collapse in the Asian stock markets. Reaction of stock exchanges due to fluctuations in international financial markets is inevitable. Indian stock exchanges are no exception to this phenomenon. In this scenario, understanding the relationship and dependence of various exchanges on each other is much significant. This study compares global stock markets which are from fundamentally different on the basis of geopolitics-socio-economic areas. Capital flow to a country has witnessed a tremendous change coupled with the relaxation of bureaucratic restrictions bringing various stock exchanges tangent in terms of system and regulations; so, it can be assumed reasonably that a particular stock exchange will have some impact on other exchanges movement. In this backdrop, the researchers have evinced interest in finding out the long term and causal relationship between Indian stock markets with special reference to NSE and other major stock exchanges in the world. In this context, the researchers have attempted to find answers for the following questions.

1. Does the NSE have long term relationship with other stock exchanges?

2. Does the movement of other stock exchange have any instant implication on NSE?

3.2 OBJECTIVES OF THE STUDY

The objectives of this study of the study have been set in tune with the above research questions

- To analyse the movements of the Indian Stock Market with special reference to NSE in comparison to the indices of major stock exchanges in the world.

- To examine the long term and causal relation between NSE and other major stock exchanges in the world

3.3 STATEMENT OF HYPOTHESIS

The following hypothesis is framed in conjunction with the above objectives.

- H_{01}: NSE and Major Stock Exchanges do not have long term relationship with each other.
- H_{02}: NSE and Major Stock Exchanges do not have causal relationship with each other.

3.4 RESEARCH METHODOLOGY

The data for the cointegration analysis encompasses of daily adjusted closing price for the major stock market index for each country. Data on stock market indices prices was drawn from Yahoo Finance. Since the stock prices evolve in a clearly monotonous nonlinear fashion, the natural logarithms of all the series have been taken. The researchers have chosen stock market indices based on what had been used extensively in previous literature and what was considered as the most comprehensive index for the country. The details of indices and country are given in the index. The time frame for my analysis was from 1st January 2006 to 31st December 2015. The researchers have chosen the start year to be 2006 because 10 years is a sufficient period to be considered long-run.

3.4.1 Research Instruments:

For the purpose of the analysis, the study has applied various econometrics tools such unit root test, Johansen cointegration test and Granger Causality test.

- *Descriptive Statistics*: Descriptive statistics is generated to give overall description of the data used in the model and enable to scrutinize the data for any unusual figure. The key descriptive measures are the mean, standard deviation, the minimum and the maximum values of the variables over the period under consideration. Mean explains the average value of observations and standard deviation indicates deviation/ change of data from mean.

- *Correlation Analysis*: A correlation coefficient is a statistic used for measuring the strength of a supposed linear association between two variables. Multiple correlation analysis helps to identify how two variables vary together, including the strength and direction of their relationship. Correlation matrix table shows the association among independent variables and their direction.

- *Stationarity Test*: It is a preliminary test used before applying major econometrics tools. It is the conditional test which proceeds the next set of econometrics tools such as Unit root, Johansen Cointegration and Granger causality test. Time series data used in the study should be stationary. It implies that the movement of time series data should revolve around a mean value. It should not reflect any fluctuations during the period. Otherwise, it is assumed as having unit root. In other words, non-existence of unit root denotes stability of the data. If data set with unit root elements applied in the analysis, it would lead to spurious or nonsensical regression. So, existence of stationarity is tested through Augmented Dickey–Fuller (ADF) Unit Root test.

- *Co-Integration:* Cointegration is one of the econometric analysis predominantly used in studies based on time series data. This tool is similar to correlation analysis. But, it is used not just to find out the correlation. It is used to find the long term relationship or association existing between the endogenous and exogenous variables. (i.e. dependent and independent variables). If the two variables are cointegrated with each other, then they are presumed to have long term relationship. In this study, Johansen Cointegration Test has been used to analyze the cointegrating relationship between variables.

- **Granger Causality Test:** Granger Causality test is mainly applied to analyse the short term relationship between explained and explanatory variables. It is highly useful to predict the movement of one variable with the help of another variable. Granger Causality Analysis is a statistical hypothesis test for determining whether one times series data is useful in predicting another. It exhibits two types of output, namely, unidirectional relationship and bidirectional relationship.

Table.1. Index showing Summary of Codes used for the variable

Country	Index	Code Used
India	Nifty 50	NSE
Australia	S&P ASX 200	AUSTRALIAN
Korea	KOSPI composite	KOREA
Switzerland	SMI	TMX
Germany	DAX	DEUTSCHE
China	SZSE comp sub	SHENZEN
China	SSE composite	SHANGHAI
Hong kong	Hang sang	HANGSANG
Japan	Nikkie 225	NIKKIE
London	FTSE 100	LSE
Europe	Euronxt 100	EURONXT
New York	NYSE	NYSE
USA	NASDAQ	NASDAQ

4. EMPIRICAL ANALYSIS AND DISCUSSION

The empirical evidence on the integration of NSE in India with major stock indices based on data of indices over the period 2006-2015 is presented in this section. This section highlights the descriptive statistics of the selected variables, the correlation matrix and finally the econometrics analysis.

The Table.2 presents the summary of descriptive statistics of the NSE and other major stock indices used in the econometrics analysis. It is particularly noted from the table that NSE of India present a high disparity with a minimum of 6.071% and a maximum of 9.646%. Concerning the other major stock indices, LSE has the highest standard deviation of 0.3539% and it has a mean value of 6.784%.

The summary statistics indicate that the stock indices are normally distributed with the Jarque-Bera statistics probability value greater than the benchmark of 0.05 and no essential variables are omitted from the descriptive statistics analysis.

Table.2. Descriptive Statistics of NSE NIFTY and Major Stock Indices

	NSE	NYSE	NASDAQ	LSE	SHENZEN	HANGSANG	NIKKIE	AUSTRALIAN	KOREA	EURONXT	TMX	SHANGHAI	DEUTSCHE
Mean	8.569	9.036	7.929	6.784	9.150	9.9500	9.442	8.5019	7.460	6.617	3.57	7.8628	3.9653
Median	8.579	9.036	7.868	6.741	9.198	9.9822	9.497	8.5075	7.530	6.604	3.56	7.8292	3.8674
Maximum	9.646	9.327	8.560	7.851	9.879	10.362	9.946	8.8289	7.709	6.982	4.05	8.7147	4.9099
Minimum	6.071	8.349	7.145	5.633	7.959	9.3071	8.861	8.0537	6.844	6.074	2.84	7.0571	3.1606
Std. Dev.	0.308	0.190	0.305	0.466	0.378	0.1656	0.281	0.1449	0.172	0.194	0.26	0.3095	0.3539
Skewness	-0.65	-0.71	0.296	0.371	-0.92	-0.9009	-0.03	-0.287	-1.04	-0.112	-0.22	0.2771	0.7819
Kurtosis	6.242	3.358	2.612	2.586	3.888	4.0098	1.599	2.8925	3.241	2.236	2.14	3.2671	2.7988
Jarque-Bera	1248	220.3	38.62	426.5	120.9	94.70	200.5	449.40	51.20	435.2	65.0	253.6	34.91
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000
Sum	20987.8	22131.32	19419.58	16615.5	22410.46	24367.66	23124.01	20821.25	18270.32	16207.20	8746.68	19256.07	9710.91
Sum Sq. Dev.	233.3	88.57	229.0	531.6	350.7	67.16	193.7	51.40	73.21	92.59	177	234.46	306.62

Table.3. Correlation Matrix of NSE NIFTY and Major Stock Indices

Indices	Correlation Results		T- Statistics Result		
	Correlation Co-efficient	**Level of Correlation**	**t value**	**P value**	**Conclusion of Hypothesis**
NSE & NYSE	.600	Moderate	-93.506	000	Rejected H_0
NSE & NASDAQ	.759	Strong	148.655	000	Rejected H_0
NSE & LSE	.641	Moderate	246.819	000	Rejected H_0
NSE & SHENZEN	.429	Weak	-77.264	000	Rejected H_0
NSE & HANGSANG	.721	Strong	-308.550	.000	Rejected H_0
NSE & NIKKIE	.336	Weak	-126.703	000	Rejected H_0
NSE & AUSTRALIAN	.375	Weak	11.696	.000	Rejected H_0
NSE & KOREA	.760	Strong	261.606	.000	Rejected H_0
NSE & EURONXT	.247	Weak	300.369	.000	Rejected H_0
NSE & TMX	.605	Moderate	953.213	000	Rejected H_0
NSE & SHANGHAI	.357	Weak	99.809	000	Rejected H_0
NSE & DEUTSCHE	-.119	Weak	458.937	.000	Rejected H_0

Table.4. Unit Root Test of Major Stock Indices

Variables	Augmented Dickey Fuller Test		
	Level	**First Difference**	**Order of Integration**
NSE	-1.854102	-46.25216*	I (1)
NYSE	-1.437581	-39.30553*	I (1)
NASDAQ	-0.243594	-38.79808*	I (1)
LSE	-0.857471	--51.38407*	I (1)
SHENZEN	-2.460622	-48.30644*	I (1)
HANGSANG	-2.407882	51.55290*	I (1)
NIKKIE	-1.187409	-52.01318*	I (1)
AUSTRALIAN	-2.035859	-52.45618*	I (1)
KOREA	-2.108286	-48.82541*	I (1)
EURONXT	-1.444577	-51.41107*	I (1)
TMX	-1.599157	-49.30718*	I (1)
SHANGHAI	-2.093992	-22.31110*	I (1)
DEUTSCHE	-1.904026	-50.29781*	I (1)

Table.5. Bivariate Cointegration Test of NSE NIFTY and other Major Stock Exchanges

Pair wise Cointegration	Eigen value	Trace statistic	Critical value (5%)	Max-Eigen value	Critical value (5%)
NSE- AUSTRALIAN	0.006163	18.37165	15.49471	15.35562	14.26460
	0.001213	3.016030	3.841466	3.016030	3.841466
NSE- DEUTSCHE	0.005840	18.94307	15.49471	14.54936	14.26460
	0.001767	4.393706	3.841466	4.393706	3.841466
NSE- EURONXT	0.005850	16.71457	15.49471	14.57360	14.26460
	0.000862	2.140965	3.841466	2.140965	3.841466
NSE- HANG_SANG	0.012426	37.22620	15.49471	31.05972	14.26460
	0.002479	6.166482	3.841466	6.166482	3.841466
NSE- KOREA	0.011950	33.68909	15.49471	29.76524	14.26460
	0.001583	3.923849	3.841466	3.923849	3.841466
NSE- LSE	0.012899	32.48187	15.49471	32.24920	14.26460
	9.37E-05	0.232672	3.841466	0.232672	3.841466
NSE- NASDAQ	0.013862	34.93635	15.49471	34.67369	14.26460
	0.000106	0.262656	3.841466	0.262656	3.841466
NSE- NIKKIE_225	0.006925	17.67804	15.49471	17.10750	14.26460
	0.000232	0.570532	3.841466	0.570532	3.841466
NSE- NYSE	0.009332	24.68422	15.49471	23.28999	14.26460
	0.000561	1.394233	3.841466	1.394233	3.841466
NSE- SHANGHAI	0.005182	17.24246	15.49471	12.86341	14.26460
	0.001767	4.379054	3.841466	4.379054	3.841466
NSE- SHENZEN	0.005330	18.62758	15.49471	13.06090	14.26460
	0.002275	5.566677	3.841466	5.566677	3.841466
NSE- TMX	0.009325	24.52464	15.49471	23.27179	14.26460
	0.000504	1.252851	3.841466	1.252851	3.841466

Table.6. Granger Causality Test of NSE NIFTY and Major Stock Indices

Null Hypothesis H_o	F- Statistic	P - Value	Conclusion
AUSTRALIAN does not Granger Cause NSE	5.72157	0.0033	Rejected H_o
NSE does not Granger Cause AUSTRALIAN	1.86511	0.1551	Accepted H_o
DEUTSCHE does not Granger Cause NSE	0.79302	0.4526	Accepted H_o
NSE does not Granger Cause DEUTSCHE	3.42696	0.0326	Rejected H_o
EURONXT does not Granger Cause NSE	3.14070	0.0434	Rejected H_o
NSE does not Granger Cause EURONXT	1.08199	0.3391	Accepted H_o
HANG_SANG does not Granger Cause NSE	24.8982	2.E-11	Accepted H_o
NSE does not Granger Cause HANG_SANG	6.73416	0.0012	Rejected H_o
KOREA does not Granger Cause NSE	32.9075	8.E-15	Accepted H_o
NSE does not Granger Cause KOREA	0.9873	0.0456	Rejected H_o
NASDAQ does not Granger Cause NSE	49.4645	9.E-22	Accepted H_o
NSE does not Granger Cause NASDAQ	2.23404	0.0173	Rejected H_o
NIKKIE_225 does not Granger Cause NSE	8.33836	0.0002	Rejected H_o

NSE does not Granger Cause NIKKIE_225	0.29121	0.0474	Rejected H_o
NYSE does not Granger Cause NSE	23.2414	1.E-10	Accepted H_o
NSE does not Granger Cause NYSE	2.23806	0.1069	Rejected H_o
SHANGHAI does not Granger Cause NSE	4.39375	0.0125	Rejected H_o
NSE does not Granger Cause SHANGHAI	2.95851	0.0521	Rejected H_o
SHENZEN does not Granger Cause NSE	5.26105	0.0052	Rejected H_o
NSE does not Granger Cause SHENZEN	2.14324	0.1175	Accepted H_o
TMX does not Granger Cause NSE	21.3309	7.E-10	Accepted H_o
NSE does not Granger Cause TMX	2.14630	0.1171	Accepted H_o

The Table.3 represents the results of correlation analysis and t-statistics results. The correlation matrix explains the relationship between NSE-Nifty 50 and other select indices of major stock exchanges in the world. The Table.3 clearly indicates that null hypothesis is rejected and alternate hypothesis is accepted in all the cases. Hence, there exists a significant relationship between NSE Nifty 50 and other major stock indices of the world. It is also further observed in all the cases that correlation co-efficient is significant at 1% level of significance, implying the strong integration of National Stock Exchange with major world stock markets. Though, National Stock Exchange is found to have weak correlation with SHENZEN, NIKKIE, AUSTRALIAN, EURONXT, SHANGHAI and DEUTSCHE the relationship was statistically significant as it is revealed in t-test. As shown in Table.3, highest correlation was observed between NSE Nifty and HANG SANG & NASDAQ. NYSE, LSE and TMX exhibited moderate correlation with NSE Nifty. All the indices have shown a positive correlation with NSE Nifty except DEUTSCHE which showed negative relationship.

The Table.4 displays the unit root test results of all the indices of all major stock exchanges in the world. It is important that variables used in the study must be stationary. If the variables are not stationary, it is assumed that they include stochastic or deterministic trends. In order to check whether the time series data are stationary or non-stationary, Augmented Dickey-Fuller (ADF) Unit Root test has been applied. The analytical results reveal that all the variables are stationary at first difference. The rejection of null hypothesis against the alternative hypothesis implies that all the time series variables are stationary and integrated the order of zero i.e., 1(1).

After checking the time series of properties of each variable through Unit Root Test, the study is proceeded to test the cointegrating relationship between NSE and indices of other major stock exchanges in the world. Johansen Cointegration analysis helps to determine whether there is a cointegrating relationship between the variables or not. It enables to identify more than one cointegration relationship between time series data. The study has applied Johanson Maximum Likelihood method of cointegration to find whether there is more than one cointegration relationship between the variables. In order to accept the cointegrating relationship between variables, Trace and Max-Eigen Statistics value should be higher than the critical value at 5% significance level. The results indicate that all the variables are cointegrated with NSE Nifty.

The Table.6 represents the results of Granger Causality Test of indices of NSE and Other Major Stock Exchanges. Granger Causality Analysis is a statistical hypothesis test for determining whether one times series data is useful in predicting another. Granger causality test results have shown the bi-directional relationship between NSE and NIKKIE 225, SHANGHAI, Similarly, it showed unidirectional relationship between NSE and, AUSTRALIA, DEUTSCHE, EURONXT, HANG SANG, NASDAQ, NYSE and SHENZE.

4.1 SUMMARY OF FINDINGS

Based on the empirical analysis, the study has observed the following results.

- The correlation analysis showed the positive correlation coefficients between all the chosen international stock indices (excluding DEUSTCHE) and NSE Nifty.
- The unit root test analysis confirmed the existence of Stationarity in the data set.
- The Johansen Cointegration test also indicated the long term relationship between NSE Nifty and all other exogenous variables. (i.e., indices of other stock markets).
- The results of Granger Causality test denoted the bi-directional relationship between NSE and NIKKIE 225, SHANGHAI, Similarly, it showed unidirectional relationship between NSE and, AUSTRALIA, DEUTSCHE, EURONXT, HANG SANG, NASDAQ, NYSE and SHENZE.

4.2 RESEARCH IMPLICATIONS

In general, stock market operations are having strong nexus with the macroeconomic policy framework. Key macroeconomic factors are having considerable influence on the movement of indices. However, stock market functions are also subjected to interdependence with other major stock exchanges in the world. The major historical episodes such a US sub-prime crisis, Asian crisis, Chinese currency devaluations and the very recent BREXIT are no exceptions to this phenomenon. The outcome of this present study would be immensely useful for global investors to exert better investment decisions. The unidirectional relationship showed by causality analysis implies that there is a wide scope for investment and speculation activities in these markets. This study will be a good source to grasp effect of policy implemented by other countries on Indian Stock Market.

4.3 LIMITATIONS OF THE STUDY AND SCOPE FOR FUTURE RESEARCH

The study has examined the extent of co-integration among major markets in the world for the period 2006-2015. Though various econometric tools are used in the analytical part, the study has ignored to measure the existence of structural break during the study period. The study has considered only NSE index. It has totally eliminated BSE Sensex which is the robust index and gives the clear cut picture of the movement of Indian stock market. These lacunae would be rectified in the future research.

The future research in the area can be extended after giving due considerations to the following aspects:

1. Foreign Direct Investments and Foreign Institutional Investments are the two major key segments that interfere and alter the very nature of cointegration among stock markets. So, future work can be given thrust on these areas. FDI and FII could be taken as dependent variable along with the NIFTY.

2. This study has focused cointegration only among stock markets in the world. Depository receipts and money market could be combined and included in the future paper so as to reflect the overall cointegration in the financial markets.

3. The outcomes of the study could be validated further by applying sophisticated econometrics models like impulse response functions, variance decomposition, vector error correction and vector autoregressive models.

5. CONCLUSION

The integration of Indian stock market with special reference to NSE and the major markets in the world has been examined using econometrics tools such as Johansen cointegration test and Granger causality test. This study has empirically examined the NSE's dependency with the leading international stock markets for the period 2006-2015. The results of Johansen cointegration test confirmed the long term relationship between NSE and other indices of major stock exchanges in the world. So it can be concluded that all the chosen indices are cointegrated with NSE Nifty during the study period. The results of Granger causality test have revealed the bi-directional relationship between NSE and NIKKIE 225, SHANGHAI, Similarly, it delineated a unidirectional relationship between NSE and, AUSTRALIA, DEUTSCHE, EURONXT, HANG SANG, NASDAQ, NYSE and SHENZEN.

REFERENCES

[1] Gabriela-Victoria Anghelache and Andreea Negru Ciobanu, "Correlating Stock Exchange Indices under both Normal and Financial Crisis Conditions", *Theoretical and Applied Economics*, Vol. 19, No. 11, pp. 75-84, 2012.

[2] Gail Ncube and Kapingura Forget Mingiri, "Stock Market Integration in Africa: The case of Johannesburg Stock Exchange and Selected African Countries", *International Business and Economic Research Journal*, Vol. 14, No. 2, pp. 367-372, 2015.

[3] Nupur Gupta and Vijay Agarwal, "Comparative Study of Distribution of Indian Stock Markets with other Asian Stock Markets", *International Journal of Enterprise Computing and Business Systems*, Vol. 1, No. 2, pp. 1-20, 2011.

[4] Alexandra Horobet, Lucian Belascu and Roxana Georgiana Olaru, "Integration of Capital Markets from Central and Eastern Europe: Implications of EU Investors", *Expert Journal of Finance*, Vol. 2, No. 2, pp. 1-9, 2014.

[5] Debjiban Mukherjee, "Comparative Analysis of Indian Stock with International Market", *Great Lakes Herald,* Vol. 1, No. 1, pp. 39-71, 2007.

[6] Sakshi Saxena and Neetu Chadha, "BSE Vs NASDAQ", *SCMS Journal of Indian Management*, Vol. 12, No. 2, pp. 64-73, 2015.

[7] P. Srikanth and K. Aparna, "Global Stock Market Integration-A Study on selected World Major Stock Markets"*, International Journal of Public Administration And Management Research*, Vol. 3, No. 1, pp. 3-17, 2012.

[8] Shegorika Rajwani and Jaydeep Mukherjee, "Is the Indian Stock Markets co-integrated with Asian Stock Markets", *Management Research Review*, Vol. 36, No. 9, pp. 899-918, 2013.

[9] M.V. Subha and T. Nambi, "A Study on Cointegration between Indian and American Stock Markets", *Journal of Contemporary Research in Management*, pp. 105-113, 2010.

[10] Shalini Talwar and Nupur Gupta- Bhattacharya, "Tiger Economies: Asian Scene", *SCMS Journal of Indian Management*, Vol. 2, No. 2, pp. 55-63, 2015.

[11] Vanita Tripathi and Shruti Sethi, "Integration of Indian Stock Market with Major Global Stock Markets", *Asian Journal of Business and Accounting*, Vol. 3, No. 1, pp. 117-134, 2010.

[12] Zhang Dengjun, "Interdependence between Nordic Stock Markets and Financial Cooperation", *Review of Accounting and Finance*, Vol. 14, No. 2, pp. 172-188, 2015.