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# LONG-TERM ASSOCIATION BETWEEN SENSEX AND SHANGHAI COMPOSITE INDEX

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## ABSTRACT

*This study investigates the long-term association between sensex and Shanghai composite index. Indian and Chinese stock markets plays a positive role in the international trade as well as offers the best advantages of diversification, which is a remarkable concern for those investors. This research work is based on daily time series data collected from yahoo.finance for the period between January 4, 2010 and September 7, 2016. The empirical results show that there is no long-run association exist between sensex and Shanghai composite index.*

**KEY WORDS:** *Indian stock market, Chinese stock market, ADF unit root test, cointegration test.*

## 1. INTRODUCTION

The stock market is a heart of any economy either it is a developing or developed one. The stock market is the mirror of any economy, India is not the exception. If the stock market is in good condition or increasing day by day, it indicates that the economy is growing rapidly. On the other hand, if the stock market is a sign of negativity or continuously same level, in that case the economy does not significantly or wall place. The Indian economy is measured through agricultural production, per capita income, some heavy industry, banking and import export business condition before taking liberalisation, privatisation and globalisation policy. There has been an outstanding change in the Indian stock market because of liberalisation, privatisation and globalisation policy and financial reform, better profitability of companies, new import-export policy, new planning and foreign investments etc. (Bhunia and Ganguly, 2015).

The Indian economy is very much dependent on some emerging Asian economies including China. China is the major trading partner

relating to export import business. Indian and Chinese stock markets always has a positive role in the international trade and will offer the best advantages of diversification is a remarkable concern for those investors. In terms of market capitalization, Bombay stock exchange and Shanghai stock exchange are major stock exchanges in the world economies. Empirical researches show that many investors of China have been motivated to invest in Indian stock market for which Indian stock market has been benefited much. Now the question may arise, whether the Indian stock market is cointegrated in the long-run or not. Keeping in view of the above, this study examines long-run relationship between the Indian stock market and Chinese stock market.

## 2. LITERATURE REVIEW

This section of this research work seeks to evaluate the various past studies related to compare the relationship with the Indian stock market and different economies stock market. Patel and Shah (2016) examined the pattern of associations and causal relationship between Indian stock market and selected Asian stock markets, that is, Bombay

stock exchange, Shanghai stock exchange, Nikkei, Hang Sang and Jakarta stock exchange before and after the change in trading time on Bombay stock exchange. After analysis, it has proved that there were more fluctuations in stock prices comparable to 'after trading time change' with 'before trading time change'. It was found that Bombay stock exchange has maximum correlation among Hang Sang and Jakarta, but less correlation with Nikkei and Hang Sang and Jakarta have more impact on Bombay stock exchange stock prices. Bhattacharjee and Swaminathan (2016) explained the cointegration of Indian stock market with the rest of the world stock market. It was found that cointegration of Indian stock market in the midst of other stock markets was more and more improving over the years with financial liberalization. Bhunia and Ganguly (2015) investigated the influence of macroeconomic indicators on stock market indices in India. This study has inspected that how the stock market index in India is basically being influenced by two commodity factors, GDP growth rate and exchange rates. The empirical results show that there is a long-term cointegration steady relationships exist and Indian stock market indices was extremely dependant on the international crude oil price, gold price, exchange rates and GDP growth. Chien et al. (2015) observed the dynamic process of convergence between five ASEAN countries and cross-border stock markets in China use recursive cointegration test. This study enclosed China and five ASEAN countries, that is, Malaysia, Indonesia, Thailand, Singapore and Philippines which are the original members of ASEAN and had the biggest and most important developed stock markets in the relationship. As a result, the overall regional economic integration among China and ASEAN-5 countries has progressively enlarged. The error correction coefficients are statistically significant and negative with China and Indonesia, though the coefficients of other countries are not significant. Biswas (2015) explained the comparative performance of Indian and other emerging stock markets. Arekar and Jain (2015) analysed the short-run and long-run association between Indian and World major stock market. This study considered the secondary data for the period from 2003 to 2013. The result showed that the Indian stock market was extremely correlated with the Singapore stock market. On the other hand, the return time series found non-stationary at level and stationary at the first differenced. The Ganger Causality subsisted between Indian stock market with Malaysia as well as Taiwan stock indices. However, it depicted that there was no causality subsisted between Indian stock market and USA, Indian stock market and Singapore. Bhunia and Ganguly (2015) illustrated by the study of does Indian stock market rely on other Asian stock markets? And the main objective of the study was whether the Indian stock market index is persuaded by choosing an Asian country's stock market or not. Johansen multivariate co-integration

test indicates that Indian stock market indices are associated with selected eight countries' stock market indices in the long-run. Granger causality test revealed that bi-directional causality existed between the chosen variables of stock market indices. Patel (2014) investigated the interdependence of Indian stock market and other Asian equity markets in the vein of Sri Lanka, Pakistan, Korea, Malaysia, Japan, Singapore, Taiwan and China. He found that all Asian stock indices are first difference stationary and long run stable relationship existed among Asian markets. The major implication of this study derives was that Indian government should observe the movements of Asian equity markets strongly, as crisis in any Asian country may influence the performance of Indian stock market. Kishor and Singh (2014) observed the stock return volatility relationship of emerging economies from 2007 to 2013 which moreover includes the financial crisis of 2008 and its influence on the emerging economies of the world. The study found that BRICS stock market other than Brazil and Chinese stock market had been significantly persuaded by the news of on US stock market. Bhatia and Binny (2014) examined the nature of volatility in Indian and Chinese stock markets and examined the inter-linkage between them. The results showed that the volatility was at its highest level in the year 2008 in both the countries. However, the Indian stock market was found to be more volatile than the Chinese stock market, but returns in Indian stock market were comparatively more than in China. Lingaraja et al. (2014) explained study of inter-linkage, co-movement and causal relationship of Indian stock market with promising stock market indices returns in Asia. This paper empirically investigated the co-movement, association and interdependence of Nifty with other emerging markets in Asia. Bhat et al. (2014) focussed on analyzing and comparing the efficiency of the capital markets of India and Pakistan. The results derived by using different statistical tests undoubtedly reject the null hypothesis of the stock markets of India and Pakistan being proficient in weak appearance. The study offered vital indications to investors, hedgers, arbitragers and speculators along with the significance of basic and technical analysis as far as the investing in the capital markets of India and Pakistan is concerned. Rajwani and Mukherjee (2013) indicated that the Indian stock market was not associated with other Asian stock markets either independently or jointly and Indian stock market was not sensitive to the dynamics in these markets in the long run. Palamalai et al. (2013) examined the stock market integration between leading stock markets of up-and-coming Asia-Pacific nations, viz. India, China, Malaysia, Taiwan, Hong Kong, Indonesia, Singapore, Japan and South Korea. Saha and Bhunia (2012) observed the causal relationship between the US and Indian equity markets using Johansen's cointegration and variance decomposition analyses.

The Johansen’s co-integration test revealed that there existed long term equilibrium relationship between the preferred variables. Thea and Daly (2012) observed the influences of the global financial crisis on Southeast Asian equity market integration using bivariate cointegration test and multivariate cointegration test. The results revealed that a bi-directional long-run association existed among selected markets.

**3. MATERIALS AND METHODS**

This research work considered daily time series data of Indian stock market and Chinese stock market, which was obtained from yahoo.finance. The daily time series data was taken for the period from January 4, 2010 to September 7, 2016 for two stock markets. Then the daily time series data of ten stock price indices were transformed into natural logarithm for reducing heteroskedasticity problem (Bhunia, 2012). With the intention of observe the causal relationship; this research work selected purposively Indian stock market and Chinese stock market. After taking

natural logarithm, these indices were used in this study as lscx (Sensex) and lsci (Shanghai Composite Index). For determining empirical results, statistics include descriptive statistics and correlation statistics and financial econometric techniques include Augmented Dickey-Fuller unit root test both at level and 1st differenced, Johansen cointegration test, vector auto regression and Granger pairwise causality test were used. All the results were computed using Eviews 9 software.

**4. EMPIRICAL RESULTS AND ANALYSIS**

**4.1 Descriptive statistics:-**

Descriptive statistics (table 1) explained that the mean value (9.95) of Indian stock market (lscx) was higher than Chinese stock market (lsci). It showed a hopeful indication in terms of average daily return in case of Indian stock market; while Chinese stock market (lsci) marked a lowest mean (7.87) which indicated low average daily return.

**Table -1: Descriptive Statistics**

	<b>lsci</b>	<b>lscx</b>
Mean	7.870099	9.955885
Median	7.848704	9.898781
Maximum	8.549922	10.29829
Minimum	7.575590	9.627410
Std. Dev.	0.201317	0.188856
Skewness	0.761381	0.324796
Kurtosis	3.265908	1.643181
Jarque-Bera	162.3871	153.7847
Probability	0.000000	0.000000

Standard deviation indicates the market volatility. It was highest (0.20) in Indian stock market, which indicated that Indian stock market took high market risk followed by China stock market in case of daily return. Skewness and kurtosis results revealed that kurtosis is more than skewness in case of both the stock markets, which means the distribution was platikurtic. The

probability of Jarque-Bera statistics confirmed that all the series were not normally distributed.

**4.2 Correlation statistics:-**

Correlation statistics (table 2) demonstrated that Indian stock market and Chinese stock market were positively associated (0.40).

**Table - 2: Correlation Statistics**

	<b>lsci</b>	<b>lscx</b>
lsci	1	0.4024
lscx	0.4024	1

It evidenced successful co movements with Chinese stock market significantly under the study period.

**4.3 Unit root test results:-**

With crucial theory of the stationarity test, Augmented Dickey-Fuller unit root test method used during the level and first differenced of the two series under study casing the prerequisite in line

that the null hypothesis is stationary, so floating reply of the unit root hypothesis advocated stationarity. ADF unit root test results based on SIC are shown in table 3. Table 3 revealed that both the series were not stationary at level but stationary at 1st differenced.

**Table - 3: ADF Unit Root Test Results**

	<b>ADF t-stat</b>	<b>C.V. at 5%</b>	<b>Decision</b>	<b>ADF t-stat</b>	<b>C.V. at 5%</b>	<b>Decision</b>
lsci	-1.44	-2.86	NS	-38.59	-2.86	S

lsx	-1.55	-2.86	NS	-37.97	2.86	S
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\*NS = Non-stationary and S = Stationary

Since the time series data was non-stationary at level, it is apparent that regular regression may generate unauthentic regression. At that moment it is healthier to test out Johansen cointegration test whether there are long-run association between two stock markets or not.

#### 4.4 Johansen cointegration test results:-

Johansen cointegration test is significant for examining unambiguous long-run association between Indian stock market and Chinese stock market since both the meticulous series were non-

stationary at level but after converted the raw data into 1<sup>st</sup> differenced it was stationary and integrated in same order. In this study, linear deterministic trend supposed to work out how these deterministic factors were really integrated in the analysis. Lag length 4 was considered on SIC. A critical value of Osterwald-Lenum (1992) at 5 percent level was considered for the particular test. In addition, a corresponding inspired deduction method of the deterministic factors was considered on the stipulation that the linear trend can be supposed to be at deeply linear and not quadratic.

**Table – 4: Johansen Cointegration Test Results (Lags Interval - 4)**

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
$r \leq 0$	0.0042	11.25	15.49	0.19
$r \leq 1$	0.0026	3.27	3.84	0.13
Trace test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
$r \leq 0$	0.0042	6.97	14.26	0.14
$r \leq 1$	0.0026	3.27	3.84	0.12
Max-eigenvalue test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

The Johansen cointegration test results have been revealed in table 4. Two likelihood ratios of the maximum-eigen value statistics and the trace statistics have been measured. The results demonstrated that trace statistics was less than its critical values between  $r \leq 0$  and  $r \leq 1$  with no cointegrating equation and maximum eigen value statistics was less than its critical values between  $r \leq 0$  and  $r \leq 1$  with no cointegrating equation, which was not significant at 5% level. Therefore, both the test statistics test results confirmed that there was no long-run association between two stock markets.

#### 5. CONCLUSIONS

This study basically investigated the long-term association between Sensex and Shanghai composite index. Descriptive statistics showed that the mean value of Indian stock market was higher than Chinese stock markets under study, which specified that the investors were benefited much from Indian stock market in terms of daily return. Correlation statistics established that Indian stock market was positively associated with Chinese stock market, which indicated that Chinese stock market was striking in case of Indian stock market during the study period. ADF unit root test results confirmed that the time series data was not stationary at level but after converted it into the first differenced, the series were stationary. Two

likelihood ratios of maximum-eigen value statistics and the trace statistics under Johansen cointegration test method confirmed that there was no long-run association between two stock markets.

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