A STUDY OF RELATIONSHIP BETWEEN INDIAN STOCK MARKET AND INTERNATIONAL STOCK MARKET

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ABSTRACT

We have conducted the study to know the relationship between Indian stock market and international stock markets. As in today's time period people are investing comparatively more in stock market, so it becomes essential to take calculative risk. As we know after globalization, Indian investors have been trading globally and so for minimizing their risk in stock market, which is due to volatility and other factors. This study will help investors to know about the trend of past 10 years for its inter linkages between the stock markets of countries namely India, US, Japan and China.

For minimizing the loss in stock market, we have tested the daily data from January 2010 to December 2020 by applying Unit Root Test and Engle-Granger Cointegration Test. The results of Augmented Dickey Fuller Test shows that the data of all stock markets are stationary at first difference. And the results of Engle-Granger Causality Test shows that there exists cointegration between the stock markets.

This test has given the results that stock market of India is interlinked with US, Japan and China. Now it can be said that decision affecting the stock market of US, Japan or China [in any of the mentioned countries] will also affect the Indian stock market.

Investors now can take decision wisely about their international trading in stock market. As the stock markets are interlinked with Indian stock markets, this also means that decisions or changes or the factors affecting the Indian stock market will also affect the stock markets of US, Japan and China.

Key words:

I. INTRODUCTION

To make the economy financially stable and efficient, financial market play a key role. After liberalization and globalization in India, the policy approved foreign investments in September 1992. To liberalize foreign trade policies, FDI

and FII were encouraged. Thus, paperless trading in the stock emerged. Foreign companies started listing their shares in India through IDR (Indian Depository Receipts). Similarly, Indian companies also started cross listing of shares through ADR (American Depository Receipts).

With the growth in an economy due to changes in investment decisions, policies, the major international capitalization was possible due to variables like growth of MNC's, technology advancement, relaxation in exchange policies etc. resulted to more capital movements. Global integration among the nations is high. Investors find it beneficial to invest in stock market both domestically and internationally for reducing the risk of portfolio and thus they diversify the risk of portfolio.

Emerging market economies were helped by the International Financial Interlinkages through the enhanced market liquidity. There was huge expansion in listing of companies globally comparing from 1990's to early 20's. Studies found that global crisis had both positive and negative perspective. Positive perspective examines that global crisis occurred due to the inappropriate pricing of stock market, so if the correction is done it will enhance the stock market. While the negative perspective arrives from theoretical and applied perspectives.

The cointegrated and inter linked markets can even lead to crisis due to a worldwide crash in one country. Studies found that long run equilibrium doesn't have any scope of reaping benefits of risk diversification by investors and portfolio managers. If there are short term linkages among Asian and other developed nations in world in context to stock market than it is beneficial for investors to invest for profitable returns.

To understand the direction and interdependence between global stock markets, which will ultimately result in generating portfolio diversification gain for investors, it becomes important for investors to know the estimation of degree and nature of relationship before investing. Like if the stock markets are moving in together, it would not generate diversification gains. And, the way the economies are growing it also important for policy makers to understand this integration to make appropriate policies and for handling global stock market crisis too, when all stock markets crash together. Therefore, a study on integration of stock markets is important in present scenario.

The present study will examine interlinkages between Indian stock market and international stock markets, and it will be helpful for the investors to understand whether the Indian stock market is affected by other stock markets globally or vice versa. Further this study will be helpful for investors to gain from the stock market or predict the stock market return, speculators will be able to take benefit.

II. LITERATURE REVIEW

Bose and Mukherjee in 2004 have examined the co-movement of the Indian Stock Market with US, Japan and other Asian stock markets. For this study they used data from 1999- 2004 and applied pairwise and groupwise cointegration and Granger-causality tests; they concluded that India had a high degree of interlinkage with Asian stock market and there is a scope of gaining benefits of portfolio diversification by investing in India. Similar studies were conducted for the period of 1996-2004 by Mukherjee and Mishra in their article in 2004 to study the long term interlinkages among Indian and other developed stock markets. They used Granger Causality Test and test of cointegration; and Geweke measures of feedback, where they concluded that expect for Indonesia, Malaysia, Philippines, Korea, Thailand and Greece, none of the other are integrated with Indian stock market. And other study was conducted for the time period of 1991-2004 by Chen, Lobo and Wong in their article in 2006 for examining the bilateral relations between BSE national index, All Shares Index and S&P500 index and used Fractionally Integrated Vector Error Test and GARCH which concluded that US stock market plays a dominant role in relations with the other two and there exists an interactive relationship between Indian and Chinese stock market.

Tripathi and Sethi [2010] and Chittedi [2010] examined India and global stock market linkages for China, UK, US, Japan and other countries for the data of late 90's and early 20's by using Granger Causality, Co-integration and Error correction model. And concluded that India and developed countries market highly cointegrated during the period of study.

Siddiqui [2008], Panda [2008], Subha and Nambi [2008], Sarat Dhal [2008], Gurcharan Singh and Pritam Singh [2010], Srikanth and Aparna [2012] examined India and China, South Korea, Indonesia, Taiwan, Israel for the data of 2000-2008 by using Augmented Dickey-Fuller test, Johansen Co-integration and

Jarque-Bera test. And concluded that Indian market had a unilateral causality with all developed markets.

Dasgupta [2012], Subhani, Muhammad Imtiaz and Hasan, Syed Akif and Mehar, Dr, Ayub and Osman, and Ms. Amber [2011], Saha and Bhunia [2012], Kapoor and Singh [2013], Subha and Nambi [2013], Mehta and Sharma [2013], Patel [2019] examined India and Japan, Indonesia, Brazil, London, Taiwan, Nepal, Pakistan for the data of 2000-2012 by using Johansen and Juselius's and Engle and Granger's cointegration tests. And concluded that India's index didn't have any linkage with Singapore and Taiwan and thus no long-term equilibrium was found.

Sriram [2015], Chougala and Srivatsa [2016], Mohanty and Pathak [2017], Aggarwal and Saqib [2017], Deo and Arun Prakash [2017], Samadder and Bhunia [2018] examined New York. Switzerland, Australia, France, South Korea, London and India for the year 2000-2016 and used rate of exchange, relative strength index, Moving Average Convergence and Divergence (MACD). They concluded that index of South Korea was most volatile and BSE was least volatile.

Mane [2018], Chellaswamy and Faniband [2021], Joshi, Mehta, Patel and Patel [2021], Rehman, Ali Abro, Mustafa, Ullah and Khatakk [2021] examined Sri Lanka, America, Europe, India, Pakistan and China for the year of 2001-2019 and used Descriptive Statistics, Unit Root Test, Correlation Matrix, Johansen Co-Integration Test, Granger Causality Test, Variance Decomposition, VECM, Impulse Response Function (IRF) and Quantile Regression. They concluded that BSE is affected by lagged values of its own and there is interdependence and bilateral causality among stock markets.

After reviewing 30 papers, we have come across that the data taken in these papers were mostly from late 90's to early 20's. This means the data doesn't include the effect of Covid-19. While our study will include the daily data from January 2010 to December 2020 which means the effect of Covid-19 is also included. Further, taking the most recent data will be helpful for the investors to predict about the future volatility in stock market as well as to speculate for global trade in stock market.

Further, the research gap found was about the selection of stock markets. In above papers, authors have selected stock markets mostly of Asian countries, European countries, while here we will be analysing the stock markets of US, Japan and China with Indian stock market individually.

III. METHODOLOGY

The objectives of the studies were:

- To study the volatility of Indian and International stock market.
- To study the relationship between Indian and International stock market.
- To help the investors to benefit from this relationship, if any.

Type of research methodology we are undertaking is Descriptive in nature. The data in this study are from BSE [India], NASDAQ [USA], Nikkei [Japan] and Shanghai Composite [China]. The sampling method used is Judgmental. (Refer Table 1)

Data consist of the daily stock prices of the above index form January 2010 to December 2020, amounts to 2330 observations with data omitted when any one of the stock markets was closed.

Following hypothesis were tested using Unit Root Test- Augmented Dickey Fuller Test

H0: There is trend in the data and data is non stationery.

H1: There is no trend in the data and data is stationery.

Following hypothesis were tested using Engle-Granger Cointegration Test

For Sensex and Nasdaq

H0: There is no cointegration between variables.

H1: There is cointegration between variables.

For Sensex and Nikkie

H0: There is no cointegration between variables.

H1: There is cointegration between variables.

For Sensex and Shanghai Composite

H0: There is no cointegration between variables.

IV. RESULTS and DISCUSSIONS

For our first objective of studying the volatility of Indian and International stock market, we calculated the standard deviation and variance of the data available of daily 10 years data of India, US, Japan and China. And the results of which are as follows-(Refer Table 2)

From the above table, we can say that India's stock market [Sensex] is most volatile while China's stock market Shanghai Composite is the least volatile.

For our second objective of studying the relationship between Indian and International stock markets, we used the Augmented Dickey Fuller Test and Cointegration Test to check the interdependence of various stock markets on each other.

Before applying Cointegration Test, we need to make sure that there is no trend in the data itself and the data is stationary. So, we have used Augmented Dickey Fuller Test to check the stationarity of the data.

Firstly, to see if there is any trend prevailing in the data, we firstly saw time series graph of Sensex, which is as follows- (Refer figure 1)

The graph (figure 1) shows that there is trend in the data. This is also proved by Augmented- Dickey Fuller Test with asymptotic p-value 0.9543, that is more than 0.05, so we fail to reject the null hypothesis that says that there is trend in the data.

To remove this trend, we took first difference of this data. The graph and the results of ADF Test of first difference is as follows- (Refer figure 2)

The asymptotic p-value 8.853e-23, this makes the data stationery now. Similar test was conducted for Nasdaq, Nikkei, Shanghai and data was made stationary after first difference. Refer below table 3 for results.

Cointegration tests are used to identify the degree of sensitivity of two variables to the same average price over a specified period of time. So Cointegration Test was performed between Sensex - Nasdaq, Sensex - Nikkei and Sensex – Shanghai. The null hypothesis was there is no cointegration between variables.

There is evidence for a cointegrating relationship if:

(a) The unit-root hypothesis is not rejected for the individual variables, and

(b) the unit-root hypothesis is rejected for the residuals (uhat) from the cointegrating regression

Here, the unit root for individuals was already checked and the unit root hypothesis for Sensex, Nasdaq, Nikkei and Shangai was failed to be rejected. This meets the first evidence of cointegration relationship Then the next evidence was testing hypothesis regarding the residual, which will be rejected if the asymptotic p value of cointegration regression is less than 0.05. Accordingly refereeing the results, all there p value measuring the cointegration between Sensex and Nasdaq, Sensex and Nikkei and Sensex and Shangai are 1.332e-31, 1.068e-30 and 3.893e-36 which is less than 0.05. This means all the stock market under study are cointegrated with Sensex (Refer Table 4 & appendix 1)

V CONCLUSION

For the first objective, we can conclude that India's stock market [Sensex] is most volatile and that of China [Shanghai Composite] is the least volatile.

For the second objective of studying the relationship between the stock markets, we can conclude that there exists cointegration between the markets and the investors can predict one market based on another.

For the third objective, we can conclude that this interdependence would help investors for their investments. They can predict the opening of one market based on the closing of another, like investors can look at the closing price of Nasdaq as it closes on 01:30, and if it closed at high, then investors can invest money in Sensex as it will also open up at high.

Disclaimer- This relationship can be used for gaining short-term profits only, and not for long term profits. Predication from this relationship will only benefit speculators [who want to do intra-day trading or for short term gains] and not investors [who invest for long period and for long term gains].

Limitation of the Study

The data used for this study examines the daily data from 2010-2020, which limits to a specific time period. This means the data neither includes the past volatility in stock market nor the global crises of past [2008-09]. This limitation of time frame becomes an obstacle for the investors to take decision before investing.

As the stock markets studied for this research are selective in nature, this again becomes limitation as the particular stock studied cannot be relied for investing in that whole country. This study has been selective upto 4 stock markets

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Table 1

Country	Index used	Opening time	Closing time
India	SENSEX	09:00	15:30
United States	NASDAQ	19:00	01:30
Japan	Nikkie	05:30	11:30
China	Shanghai Composite	07:00	12:30

Table 2

Stock Markets	Standard Deviation	Variance
India	7907.111	15814.222
US	2533.165	5066.329
Japan	5160.466	10320.931
China	523.812	1047.624

Table 3

Asymptotic p-value	Nasdaq	After 1st Difference
	1	1.769e-17
	Nikkei	After 1st Difference
Asymptotic p-value	0.925	8.76e-34
	Shanghai Composite	After 1st Difference
Asymptotic p-value	0.2218	4.207e-19

Table 4 Cointegrations results

Cointegration Variables	Asymptotic p-value
Sensex – Nasdaq	1.332e-31
Sensex – Nikkei	1.068e-30
Sensex – Shanghai	3.893e-36

Gretl result

Cointegration results
For Sensex and Nasdaq
Cointegrating regression
Cointegrating regression -
OLS, using observations 2010-01-07:2018-12-11 (T = 2329)
Dependent variable: d_BSESENSEX

	coefficient	std. error	t-ratio	p-value
const	7.60485	6.38696	1.191	0.2339
d_NASDAQ100	1.13844	0.0766279	14.86	9.06e-048 ***

Mean dependent var 12.96157 S.D. dependent var 321.9366
Sum squared resid 2.20e+08 S.E. of regression 307.7412
R-squared 0.086635 Adjusted R-squared 0.086243
Log-likelihood –16647.15 Akaike criterion 33298.30
Schwarz criterion 33309.81 Hannan-Quinn 33302.50
rho –0.051517 Durbin-Watson 2.102895

testing for a unit root in uhat

Augmented Dickey-Fuller test for uhat
including 10 lags of (1-L)uhat
sample size 2318
unit-root null hypothesis: a = 1

test without constant
model: (1-L)y = (a-1)*y(-1) + ... + e
estimated value of (a - 1): -0.968113
test statistic: tau_c(2) = -14.0935
asymptotic p-value 1.332e-31
1st-order autocorrelation coeff. for e: -0.000
lagged differences: F(10, 2307) = 2.979 [0.0010]

For Sensex and Nikkei
cointegrating regression
Cointegrating regression -
OLS, using observations 2010-01-07:2018-12-11 (T = 2329)
Dependent variable: d_BSESENSEX

	coefficient	std. error	t-ratio	p-value
const	9.34408	6.22101	1.502	0.1332
d_NIKKEI225	0.501812	0.0267288	18.77	2.46e-073 ***

Mean dependent var 12.96157 S.D. dependent var 321.9366
Sum squared resid 2.10e+08 S.E. of regression 300.0801
R-squared 0.131545 Adjusted R-squared 0.131172
Log-likelihood –16588.44 Akaike criterion 33180.88
Schwarz criterion 33192.38 Hannan-Quinn 33185.07
rho –0.068847 Durbin-Watson 2.137454

testing for a unit root in uhat
Augmented Dickey-Fuller test for uhat
including 10 lags of (1-L)uhat
sample size 2318
unit-root null hypothesis: a = 1

test without constant
model: (1-L)y = (a-1)*y(-1) + ... + e
estimated value of (a - 1): -0.944274
test statistic: tau_c(2) = -13.8085
asymptotic p-value 1.068e-30
1st-order autocorrelation coeff. for e: -0.000
lagged differences: F(10, 2307) = 2.774 [0.0021]

For Sensex and Shanghai Composite
Cointegrating regression

Cointegrating regression -
OLS, using observations 2010-01-07:2018-12-11 (T = 2329)
Dependent variable: d_BSESENSEX

coefficient std. error t-ratio p-value

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const	12.9429	6.66570	1.942	0.0523 *
d_SHANGHAICOMPOS~	0.313656	0.145473	2.156	0.0312 **

Mean dependent var 12.96157 S.D. dependent var 321.9366
Sum squared resid 2.41e+08 S.E. of regression 321.6846
R-squared 0.001994 Adjusted R-squared 0.001565
Log-likelihood –16750.36 Akaike criterion 33504.71
Schwarz criterion 33516.22 Hannan-Quinn 33508.90
rho –0.014363 Durbin-Watson 2.028629

testing for a unit root in uhat

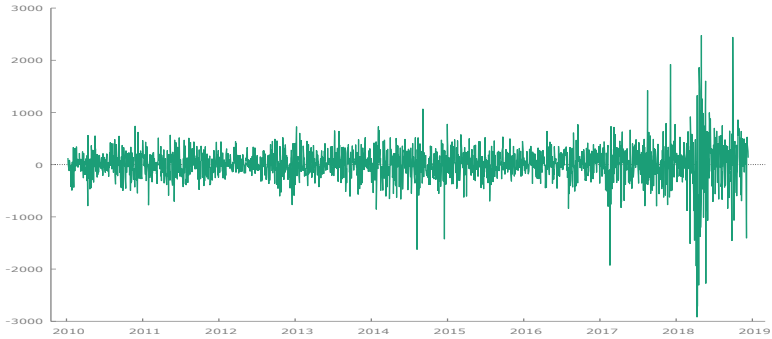
Augmented Dickey-Fuller test for uhat
including 7 lags of (1-L)uhat
sample size 2321
unit-root null hypothesis: a = 1

test without constant
model: (1-L)y = (a-1)*y(-1) + ... + e
estimated value of (a - 1): -0.86855
test statistic: tau_c(2) = -15.5842
asymptotic p-value 3.893e-36
1st-order autocorrelation coeff. for e: -0.000
lagged differences: F(7, 2313) = 5.124 [0.0000]

List of Charts

Chart 1- Sensex

Chart 2- Difference of Sensex



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