

THE STUDY ON CO-MOVEMENT & INTERDEPENDENCY OF INDIAN STOCK MARKET WITH SELECTED FOREIGN STOCK MARKETS

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ABSTRACT

Bombay stock exchange is one of the oldest markets in world. Various markets may have impact on each other. The Study was done to examine the causal relationship among equity markets to better understand how shocks in one market are transmitted to other markets. The study was done by taking stock price data of BSE, FTSE, Hangseng, JKSE, NIKKEI, CSE, SMI, SSE and TSEC Stock Market from 4/1/2001 to till 29/12/2011. The Correlation Shows that BSE is highly correlated with FTSE (96%), HANGSENG (95%), JKSE (95%), TSEC (87%), CSE (82%) & SSE (73%). The ADF Test reveals that the null hypothesis of first difference of series of all indices cannot be accepted at 5% level and 10% significant level as t-statistic values are less than critical values. The granger causality test reveal that BSE is not affected by any of the selected market & BSE causes to FTSE, Hangseng, JKSE, CSE, and TSEC. It means that these markets are dependent on BSE.

Keywords: Interdependence, Co movement, Granger causality test, Correlation

INTRODUCTION:

Bombay Stock Exchange is popularly known as the BSE. It was established as "The Native Share & Stock Brokers' Association" in 1875. The FTSE Bursa Malaysia Index is a comprehensive range of real-time indices, which cover all eligible companies listed on the Bursa Malaysia Main Board which was introduced to Bursa Malaysia's investors on 2006. The Hangseng Index is a free float-adjusted market capitalization-weighted stock market index in Hong Kong. It is used to record and monitor daily changes of the largest companies of the Hong Kong stock market. Indonesia Stock Exchange is a stock exchange based in Jakarta, Indonesia. It was previously known as Jakarta Stock Exchange (JSX) before its name changed in 2007 after merging with Surabaya Stock Exchange (SSX). Nikkei is a stock market index for the Tokyo Stock Exchange (TSE). It has been calculated continuously since September 7, 1950. The Colombo Stock Exchange (CSE) is the main stock exchange in Sri Lanka. It is one of the most modern exchanges in South Asia, providing a fully automated trading platform. The Swiss Market Index (SMI) is Switzerland's blue-chip stock market index, which makes it the most important in the country. The Shanghai Stock Exchange (SSE) was founded on Nov. 26th, 1990 and in operation on Dec.19th the same year. It is a membership institution directly governed by the China Securities Regulatory Commission (CSRC). The Taiwan Stock Exchange Corporation is a financial institution, located in Taipei 101, in Taipei, Taiwan. The TSEC was established in 1961 and began operating as a stock exchange on 9 February 1962.

LITERATURE REVIEW:

A study was done by Michalis Glezakos, Anna Merika & Haralambos Kaligosfiris on, "Interdependence of Major World Stock Exchanges: How is the Athens Stock Exchange Affected?" The interdependency among major world financial markets is more than evident. The paper covers the period 2000-2010 using monthly data and investigates and examines the short and long-run relationships between major world financial markets with particular attention to the Greek stock exchange. The research methodology employed includes testing for stationarity, both with the Dickey- Fuller and the Phillips-Perron tests, the use of a VAR model for the implementation of the Granger Causality test, and Co integration tests according to Johansen-Juselious. The results confirm the dominance of the USA financial market and the strong influence of DAX and FTSE on all other markets of the sample. The influence of Germany and the DJ index is especially noticeable on the Athens stock exchange.

Ismail Aktar has done a study on, "Is there any Co movement Between Stock Markets of Turkey, Russia and Hungary? " This study investigates whether there exists long run relationship and Granger Causality between Turkish, Russian and Hungarian stock indices for the period of January 5, 2000 and October 22, 2008. Applying to ADF test shows that the series are nonstationary. Yet, once we difference them, the series become stationary. We find the cointegration among the stock indices by using Johansen estimation technique. This tells us that there is a short run relationship and causality among the stock indices. Applying to Granger Causality test reveals that the bidirectional causality for the Turkish and Russian stock indices. We also find that Hungarian stock market does Granger cause to Turkish stock market but not vice versa. Furthermore, Russian stock market does Granger cause to Hungarian stock market but not vice versa.

Masih and Masih (1997) investigated the dynamic relation between South Asian countries, Taiwan, South Korea, Singapore, Hong Kong and developed countries US, Germany, UK, and Japan. They found cointegration between these two. Wu and Su (1998) did another study about Asia and US. They found cointegration among the US, Japan, UK and Hong Kong stock markets. Jochum, Kirchgitssner and Platek, (1999) analyzed the long run relationship between Eastern European stock markets for the period 1995-1998 and the 1997/98 Crisis in Emerging Markets. They found cointegration for these markets before the crisis using the Johansen methodology. In the third quarter of 1997, the long run equilibrium is gone and there was massive changes in short run behavior of the markets. Goh (2005) looked at the dynamic relationship among the five ASEAN markets, namely, Singapore, Malaysia, Indonesia, Thailand and the Philippines. They found that the cointegration among the stock indices before the crisis but not during the crisis. Panayotis Alexakis has investigate the possibility of short and long term statistical relationships among the organized stock markets of Greece and the U.K.during the period 2001-2005. The theory of cointegration and Granger "causality" tests provide a method of testing the extent of possible links among the above equity markets. The statistical results indicate the existence of long term dynamics but no short run dynamics. The long run dynamics are observed in the "bull" sub period 2003-2005. The paper provides evidence that the integration of the national markets as expressed by co integration dynamics can be attributed to the investors' behavior operating in these markets.

RESEARCH METHODOLOGY:**OBJECTIVES OF THE STUDY:**

1. To examine the causal relationship among equity markets to better understand how shocks in one market are transmitted to other markets.
2. To study the co-movement of Indian stock markets index with other selected markets.
3. To find dependence, if any, of Indian market over the selected markets.

DATA & METHODOLOGY USED:

The study was done by taking data from 4/1/2001 to till 29/12/2011. The study was done by taking stock price data of BSE, FTSE, Hangseng, JKSE, NIKKEI, CSE, SMI, SSE and TSEC Stock Market. Various analytical tools such as correlation, unit root test (ADF test) and granger causality test were applied in study to find co movement & dependency of Indian market over selected markets.

DATA ANALYSIS:**TABLE 1 DESCRIPTIVE ANALYSIS**

| Particulars | BSE | FTSE | Hangseng | JKSE | NIKKEI | CSE | SMI | SSE | TSEC |
|--------------------|---------|--------|----------|--------|---------|--------|--------|--------|--------|
| Mean | 10439.4 | 1018.4 | 16619.36 | 1615.6 | 11776.7 | 2446.8 | 6517.6 | 2250.1 | 6600.4 |
| Median | 10041.1 | 923.61 | 15528.06 | 1313.7 | 10967.0 | 2150.6 | 6348.0 | 1939.3 | 6443.3 |
| Mode | 3312.2 | 711.33 | 10243.46 | 428.47 | 11433.2 | 416.76 | 6210.3 | 1396.7 | 5846.1 |
| Standard Deviation | 5797.9 | 289.77 | 5047.52 | 1084.6 | 2760.21 | 1852.6 | 1253.1 | 1012.0 | 1407.3 |
| Kurtosis | -1.50 | -1.14 | -0.88 | -0.74 | -0.56 | 1.09 | -0.44 | 1.56 | -0.86 |
| Skewness | 0.13 | 0.35 | 0.33 | 0.64 | 0.73 | 1.38 | 0.50 | 1.30 | 0.13 |

The Above table shows descriptive statistics of selected stock markets. The table shows that mean, median are different for each of the selected market which means that data are not normally distributed. Skew is a measure of symmetry. Here, it was found that skeness of distribution is a greater than 0.00. A normal distribution has skew=0. So it can be said that this distribution is not symmetric. Kurtosis is a measure of peakeness and the fat-tails that associate with less density in the middle; a normal distribution has kurtosis = 3.0 or excess. Here kurtosis is less than 3.00. So it can be said that our distribution is not symmetric.

TABLE 2 CORRELATION AMONG SELECTED MARKETS

| MARKET | BSE | FTSE | HANGSENG | JKSE | NIKKEI | CSE | SMI | SSE | TSEC |
|----------|------|------|----------|------|--------|------|------|------|------|
| BSE | 1.00 | | | | | | | | |
| FTSE | 0.96 | 1.00 | | | | | | | |
| HANGSENG | 0.95 | 0.91 | 1.00 | | | | | | |
| JKSE | 0.95 | 0.97 | 0.86 | 1.00 | | | | | |
| NIKKEI | 0.19 | 0.14 | 0.37 | 0.00 | 1.00 | | | | |
| CSE | 0.82 | 0.88 | 0.69 | 0.93 | -0.11 | 1.00 | | | |
| SMI | 0.43 | 0.37 | 0.59 | 0.25 | 0.91 | 0.12 | 1.00 | | |
| SSE | 0.73 | 0.71 | 0.83 | 0.64 | 0.31 | 0.39 | 0.51 | 1.00 | |
| TSEC | 0.87 | 0.90 | 0.92 | 0.82 | 0.42 | 0.71 | 0.59 | 0.73 | 1.00 |

TABLE 3 CORRELATION OF MARKET RETURNS

| MARKET | BSE | FTSE | HANGSENG | JKSE | NIKKEI | CSE | SMI | SSE | TSEC |
|----------|------|------|----------|------|--------|------|------|------|------|
| BSE | 1.00 | | | | | | | | |
| FTSE | 0.30 | 1.00 | | | | | | | |
| HANGSENG | 0.56 | 0.42 | 1.00 | | | | | | |
| JKSE | 0.48 | 0.41 | 0.57 | 1.00 | | | | | |
| NIKKEI | 0.42 | 0.37 | 0.64 | 0.47 | 1.00 | | | | |
| CSE | 0.08 | 0.07 | 0.10 | 0.09 | 0.10 | 1.00 | | | |
| SMI | 0.37 | 0.22 | 0.46 | 0.33 | 0.43 | 0.06 | 1.00 | | |
| SSE | 0.19 | 0.21 | 0.35 | 0.22 | 0.20 | 0.02 | 0.12 | 1.00 | |
| TSEC | 0.40 | 0.38 | 0.60 | 0.49 | 0.55 | 0.10 | 0.34 | 0.19 | 1.00 |

The above table shows correlation among all selected market over a period of time. Correlation is statistical tool which measures the degree of relationship between two and more variable. Here, by term relationship, we mean the tendency of variable to move together. In the sense, it denotes interdependency amongst variables. The movement of variable may be in positive or negative direction. The Correlation of BSE with FTSE is 96% which indicates that BSE is highly correlated with FTSE. We can see that BSE is also highly correlated with HANGSENG (95%), JKSE (95%), TSEC (87%), CSE (82%) & SSE (73%). BSE also somewhat positively correlated with SMI (43%) & NIKKEI (19%).

The correlation of BSE return with HANGSENG is 56% which indicates that BSE return has highly correlated with HANGSENG market return among all the selected market. We can also see that BSE return is also somewhat positively correlated with return of JKSE (48%), NIKKEI (42%), TSEC (40%), SMI (37%), FTSE (30%) and SSE (19%). Among all the selected market CSE market return has lowest positive return of 8% with BSE Return.

TABLE 4 UNIT ROOT TEST (ADF TEST)

| Market | T-Statistic Value | |
|----------|-------------------|---|
| | level (Intercept) | First Difference (With Trend & Intercept) |
| BSE | -1.06 | -15.93 |
| FTSE | -0.49 | -15.55 |
| Hangseng | -1.43 | -15.26 |
| JKSE | 0.56 | -12.57 |
| NIKKEI | -1.43 | -16.87 |
| CSE | 0.67 | -29.99 |
| SMI | -1.79 | -15.24 |
| SSE | -1.43 | -45.47 |
| TSEC | -1.77 | -45.90 |

The ADF test has null hypothesis $\delta = 0$ in $\nabla y_t = \delta y_{t-1} + u_t$, where ∇ is the first difference operator. The augmented Dickey–Fuller test addresses this issue by introducing lags of ∇y_t as regressors in the test equation.

$$DF_{\tau} = \frac{\hat{\gamma}}{SE(\hat{\gamma})}$$

The t- statistics critical value at 5% and 10% are -2.86254 and -2.56735 respectively. T-statistics values for all the indices in level form are greater than critical value -2.86 at 5% significant level. So we cannot accept the null hypothesis that all the indices series are non stationery in level form. The null hypothesis of first difference of series of all indices cannot be accepted at 5% level and 10% significant level as t-statistic values are less than critical values. The rejection of a null hypothesis on last test concludes that a Granger Causality test on logarithm transformed stock price series can be conducted.

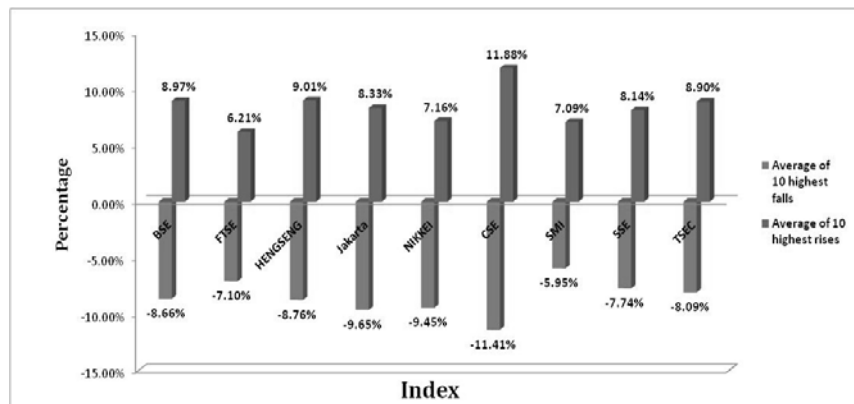
TABLE 5 BIVARIATE GRANGER CAUSALITY TEST

| Null Hypotheses | F Value ¹ | P- Value | Remarks | Causality Direction |
|---|----------------------|----------|----------|---------------------|
| BSE does not granger cause to FTSE | 12.28 | 0.00046 | Rejected | Unidirectional |
| FTSE does not granger cause to BSE | 0.0014 | 0.969 | Accepted | |
| BSE does not granger cause to HENGSENG | 6.0755 | 0.013 | Rejected | Unidirectional |
| HENGSENG does not granger cause to BSE | 0.125 | 0.723 | Accepted | |
| BSE does not granger cause to JKSE Market index | 5.22 | 0.0223 | Rejected | Unidirectional |
| JKSE Market index does not granger cause to BSE | 0.635 | 0.425 | Accepted | |
| BSE does not granger cause to NIKKEI | 0.456 | 0.499 | Accepted | No Causality |
| NIKKEI does not granger cause to BSE | 0.195 | 0.658 | Accepted | |
| BSE does not granger cause to CSE | 3.196 | 0.043 | Rejected | Unidirectional |
| CSE does not granger cause to BSE | 0.021 | 0.883 | Accepted | |
| BSE does not granger cause to SMI | 0.065 | 0.797 | Accepted | No Causality |
| SMI does not granger cause to BSE | 0.682 | 0.408 | Accepted | |
| BSE does not granger cause to SSE | 0.645 | 0.421 | Accepted | No Causality |
| SSE does not granger cause to BSE | 0.604 | 0.436 | Accepted | |
| BSE does not granger cause to TSEC | 4.206 | 0.040 | Rejected | Unidirectional |
| TSEC does not granger cause to BSE | 0.383 | 0.535 | Accepted | |

¹ @ 5% Significance Level

The above table shows results of bivariate granger causality test. The rejection of null hypothesis indicates that causal relationship exists between to two countries. We can reveal that BSE is not affected by any of the selected market. We can also see that BSE causes to FTSE, Hangseng, JKSE, CSE, and TSEC. It means that these markets are dependent on BSE.

GRAPH 1 AVERAGE OF TEN MAJOR ONE DAY RISES AND FALLS OF SELECTED STOCK MARKETS



From the above graph we can see that CSE have highest fluctuation in terms of major ups(11.88) and downs(-11.41). After that all the markets are fluctuated between 5% to 10%. The minimum spread between fall and rise is observed in SMI(7.09% to -5.95%), followed by FTSE, and SSE.

CONCLUSION:

The Correlation Analysis reveals that the BSE is highly correlated with FTSE (96%), HANGSENG (95%), JKSE (95%), TSEC (87%), CSE (82%) & SSE (73%). BSE also somewhat positively correlated with SMI (43%) & NIKKEI (19%). The correlation of BSE return with HANGSENG is 56% which indicates that BSE return has highly correlated with HANGSENG market return among all the selected market. Study also shows that BSE return is also somewhat positively correlated with return of JKSE (48%), NIKKEI (42%), TSEC (40%), SMI (37%), FTSE (30%) and SSE (19%). Among all the selected market CSE market return has lowest positive return of 8% with BSE Return. From Granger causality test it can be reveal that BSE is not affected by any of the selected market but BSE does granger cause to FTSE, Hangseng, JKSE, CSE, and TSEC. It means that these markets are dependent on BSE.

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