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Stock Market Integration: A Study of Linkages between the Indian Stock Markets and American Stock Markets

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Abstract: ***In recent years, with the increase in globalization integration among world capital markets has increased. This increased interdependence among the worldwide stock markets affects global investors and their international portfolio allocation decision. It also affects the economic policies of different nations. Hence, there is need to study that whether Indian stock markets are integrated with the world stock markets or not. In this paper, stock market integration of Indian stock markets and American stock markets over a period of January 2008 to January 2013, using monthly closing prices is analyzed. Results of the study indicates that Indian stock markets are integrated with the American stock markets.. The high degree of correlation and similarities in the graphic movement of BSE Sensex and DJIA has been observed. Granger causality between BSE Sensex and DJIA is not observed.***

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INTRODUCTION

The financial markets in general and the equity market in particular have now become more closely interlinked the world over than ever before despite the differences in risk perceptions of the markets or the country profiles. The dynamics of cross-country trade and payments have evolved to such an extent that the economic slowdown of a country is bound to affect other countries as clearly indicated from the recent movement in the global stock prices. The close integration between the emerging and the developed markets has even led to sentiment spillover from one market to another. A possible contributor to the similar volatility profile across the markets is the listing of stocks at dual or multiple stock exchanges all over the globe (Bennett and Keller, 1988). Their movement in tandem powered by the instinct of arbitrage could have contributed to the emergent cross-country co-movement of stock prices. With the financial sector reforms initiated in 1991, Indian stock market has since joined the integration process.

The globalisation of the Indian stock market is reflected in catching up with the best international practices, *inter alia*, dematerialisation of shares, replacement of the Indian carry forward trading system called *badla* by the index-based and scrip-based futures and options; rolling settlement in place of the account period settlement; internet trading and so on and so forth. More significantly, the domestic market movement has come to be largely determined by the undercurrent of the global markets. This was reflected in an increase in correlation coefficient of the indices of Indian stock market with those in the developed countries.

Today, stock markets are not segmented by national orders. The volatility of the stock market indices have been driven not just by the macro and micro factors of the domestic economy but by global movement of stock market indices. The recent effect of US financial crisis on stock markets of different economies is the clear indication of increasing linkages of world stock markets.

The degree of linkages or integration among the stock markets provides important implications for the potential benefits of the international portfolio diversification and financial stability of a country (Ibrahim, 2005). With the globalization of the stock markets worldwide, dual or multiple listing of stocks across the globe has emerged as the latest trend. The Indian stock market has witnessed a major transformation and structural change from the past 22 years as a result of ongoing economic and financial sector reforms initiated by the government of India since 1991. Along with various measures, opening of home market for the foreign investors is one of the important steps taken by the Indian government that may lead the Indian stock market to be strongly integrated with the stock markets of the rest of world.

The present study is undertaken to examine the integration of stock Indian stock markets and American stock markets following the increasing liberalization, globalization and free flow of foreign investment.

A SURVEY OF LITERATURE

The merits of international diversification in containing the systematic risk are long recognized in the literature with one of the earliest attempts by Grubel (1968). Initial studies in this direction focused upon the inter-dependence of the national equity markets. The reported low or statistically insignificant correlation of stock returns across the countries pointed to the determining role of the domestic factors as also the scope for international diversification (Lessard, 1973). The global crash of October 1987 stimulated worldwide interest in this line of study. Bennet and Keller (1988) brought out evidence of strong international equity market linkages. The US market was found to have the greatest influence on all other markets. Such inter-linkages however put a limit on the gains out of international diversification.

While a number of hypotheses were put forward to explain the interdependence of stock returns, Heston and Rouwenhorst (1994) attributed their interdependence to four factors: global business cycle, global industry factor, country specific factor and firm level effect. Out of the four, the global industry effect was considered the most important with the globalization of world economy (Hobijin and Jovanovic, 2000).

In the Indian context, Ignatius (1992) compared returns on the BSE Sensex with those on the NYSE S&P 500 Index. He, however, did not find any evidence in favour of integration. In a study across 21 developed and 19 emerging countries including India, Brooks and Catao (2000) found evidence of stock market integration during period of March 1986 to August 2000, operating through the channel of information technology (IT) industry. In another study for 1999-2000 to 2000-01, Hansda and Ray (2002) observed a unidirectional causality from Nasdaq to BSE or NSE. The relation as well as direction of causation held good for the technology segment of the NYSE and BSE or NSE. However, domestic prices of technology stocks and overall domestic share prices were found to be independent of each other. By using the cointegration approach, Palac-McMiken (1997) found that, with the exception of Indonesia, all the five founding members of the ASEAN markets were linked with each other during the period 1987-1995. Hee (2000) explored the linkages and the degree of financial market integration among the ASEAN stock markets over the period 1970-1995 through the use of correlation and cointegration analysis.

Ibrahim (2000) explored the degree of financial integration and benefits of portfolio diversification among the ASEAN equity markets from the Malaysian perspective from January 1988 to June 1997. From the cointegration analysis and error correction model, he found the existence of long-run co-movements among the ASEAN and the US equity markets. The short-run interactions between ASEAN markets were mostly contemporaneous. He also found that the ASEAN markets were highly integrated with the US markets.

Robert-Paul Berben and W Jos Jansen (Nov 2009) have investigated whether there has been a structural increase in financial market integration in nine European countries and the US in the period 1980 to 2003. Their test produces strong evidence of greater co-movement across the board for both stock markets and government bond markets. Dates of change and speeds of adjustment vary widely across country linkages. Stock market integration was found more gradual process than bond market integration. The impact of European Monetary Union (EMU) was found limited, as it has mainly affected the timing of bond market integration and has had little effect on stock market integration.

Michel Beine, Antonio Cosma and Robert Vermeulen (Jan 2010) have measured stock market co-exceedances and concluded that macroeconomic variables asymmetrically impact stock market co-movement across the return distribution. Financial liberalization significantly increases stock market integration. The introduction of the euro increases co-movement across the euro area thereby significantly reducing the benefits of portfolio diversification within the euro area.

INDIAN STOCK MARKET INDEX

To represent Indian stock market, BOMBAY STOCK EXCHANGE (BSE Ltd.) is selected. This stock exchange is selected because it is the oldest and world famous stock exchange of India. Established in 1875, BSE Ltd. is Asia's first Stock Exchange and one of India's leading exchange groups. Over the past 137 years, BSE has facilitated the growth of the Indian corporate sector by providing it an efficient capital-raising platform. BSE provides an efficient and transparent market for trading in equity, debt instruments, derivatives, mutual funds. It also has a platform for trading in equities of small-and-medium enterprises (SME). More than 5000 companies are listed on BSE making it world's No. 1 exchange in terms of listed members. The companies listed on BSE Ltd command a total market capitalization of USD 1.32 Trillion as of January 2013. It is also one of the world's leading exchanges (3rd largest in 2012) for Index options trading (Source: World Federation of exchanges). BSE also provides a host of other services to capital market participants including risk management, clearing, settlement, market data services and education. It has a global reach with customers around the world and a nation-wide presence. BSE systems and processes are designed to safeguard market integrity, drive the growth of the Indian capital market and stimulate innovation and competition across all market segments. BSE is the first exchange in India and second in the world to obtain an ISO 9001:2000 certification. It is also the first Exchange in the country and second in the world to receive

Information Security Management System Standard certification for its On-Line trading System (BOLT). BSE's popular equity index - the S&P BSE SENSEX - is India's most widely tracked stock market benchmark index. It is traded internationally on the EUREX as well as leading exchanges of the BRCS nations (Brazil, Russia, China and South Africa).

AMERICAN STOCK MARKET INDEX

To represent American stock market, DOW JONES INDUSTRIAL AVERAGE (DJIA) index is selected. This is the most popular and widely recognized stock market index in the world. The Dow Jones Industrial Average, also called the Industrial Average, the Dow Jones, the Dow Jones Industrial, the Dow 30, or simply the Dow, is a stock market index, and one of several indices created by Wall Street Journal editor and Dow Jones & Company co-founder Charles Dow. It was founded on May 26, 1896. The average is named after Dow and one of his business associates, statistician Edward Jones. It is an index that shows how 30 large publicly owned companies based in the United States have traded during a standard trading session in the stock market. It is the second oldest U.S. market index after the Dow Jones Transportation Average, which was also created by Dow. The Industrial portion of the name is largely historical, as many of the modern 30 components have little or nothing to do with traditional heavy industry. The average is price-weighted and to compensate for the effects of stock splits and other adjustments, it is currently a scaled average. The value of the Dow is not the actual average of the prices of its component stocks, but rather the sum of the component prices divided by a divisor, which changes whenever one of the component stocks has a stock split or stock dividend, so as to generate a consistent value for the index. The Dow is among the most closely watched U.S. benchmark indices tracking targeted stock market activity.

OBJECTIVES OF THE STUDY

The objective of this study is to examine stock market integration of Indian stock markets with the American stock markets. The study aims:

- To examine the behaviour of the Indian stock market index and the American stock market index.
- To examine the extent to which the stock market index of India is correlated with American stock market index.
- To find whether causality exists between Indian stock market index and the American stock market index.
- To examine the co-movement of Indian stock market index with the major global stock market indices.

HYPOTHESES OF THE STUDY

- There is no significant difference between the risk and return characteristics of Indian and American stock markets.
- There is no significant correlation between Indian stock market index and American stock market index.
- No significant causality exists between Indian stock market index and American stock market index.
- Indian stock market is not significantly integrated with the American stock markets.

SOURCES OF DATA

The present study is based on secondary data related to the monthly closing figures of Bombay Stock Exchange Sensex (Indian stock market index) and Dow Jones Industrial Average (American stock market index) over the period from January 2008 to January 2013. The data is obtained from the website of these stock exchanges and from website of Yahoo Finance.

TOOLS OF ANALYSIS

Various statistical and econometric techniques like mean, standard deviation, coefficient of variation, correlation, coefficient of determination, regression, t-test, F-test, granger casualty test, etc. are used for analyzing the data. For analyzing the long term comovement of stock prices in Indian stock market and American stock market graphical analysis of monthly closing prices of BSE Sensex and DJIA has been made over the period under study.

FINDINGS OF THE STUDY

1. For testing the null hypothesis that there is no significant difference between the risk and return characteristics of Indian and American stock markets, it was observed that standard deviation of BSE Sensex is high at 5438.46 in comparison to standard deviation of DJIA at 1634.39. Similarly, higher variance is observed in BSE Sensex in comparison to DJIA. It indicates more volatility in BSE stock prices over the period under study. Skewness in both BSE Sensex (1.31) and DJIA (0.57) has been observed positive which suggests that stock prices in both the stock markets is not normally distributed. Average return in stock prices in Bombay stock markets was found 12.43 per cent over the period under study, while the average return in stock prices in Dow Jones

Industrial Average (American stock markets) was found 9.12 percent. It indicates that risk and return behavior of Indian and American stock markets is not same. Indian stock markets have higher returns but risk factor in Indian stock markets measured in terms of higher volatility in stock prices is also high. So we reject our first null hypothesis.

2. For testing the null hypothesis that there is no significant correlation between Indian stock market index and American stock market index Karl Pearson coefficient of correlation was computed between the monthly closing prices of BSE Sensex and DJIA. High correlation coefficient was found in these stock prices. Its value was recorded at 0.68. Using t-test, the significance of this coefficient of correlation value was measured and as the computed value was found more that the tabulated value using 5 per cent level of significance, so the relationship of both stock prices was found to be significant. Further, coefficient of determination was found at 46.24 percent, which indicates that 46.24 per cent variation in one stock market can be explained by the other stock market prices. So we reject our second null hypothesis and conclude that both Indian stock markets and American stock markets are integrated with each other.

3. For testing the null hypothesis that there is no significant causality is found between Indian stock market index and American stock market index, Granger Causality test was applied. For this purpose, pair-wise Granger Causality was computed to test this hypothesis and to further verify the correlation for the direction of influence. This test was applied to find out that which stock market from BSE and Dow Jones acts as a cause to affect the prices of other. Two sub hypotheses were tested, i.e. is BSE Sensex granger cause DJIA or is DJIA granger cause BSE Sensex. It was observed that both BSE Sensex and DJIA do not granger cause each other. This test suggests independence of both sets of data (BSE Sensex and DJIA) as both regression coefficients are not found statistically significant using F statistics. For both pair of observation the computed value was observed as more than the tabulated value of F test using 5 per cent level of significance. It further implies that we accept our third null hypothesis and conclude that both Indian stock markets and American stock markets do not have any causality and the both stock markets are independent of each other.

4. For testing the null hypothesis that Indian stock market is not significantly integrated with the American stock markets long term comovement is analysed using closing monthly prices of BSE Sensex and Dow Jones Industrial Average (DJIA) over the period under study. For the purpose of analyzing the comovement of BSE Sensex and DJIA stock prices indices three figures have been constructed.

Figure 1 analyses the movement of BSE sensex closing monthly prices over the period under study. Figure 2 shows the movement of Dow Jones Industrial Average values and figure 3 exhibits the comovement of BSE Sensex and DJIA stock prices indices. Analysis of these figures clearly reflects the following conclusions:

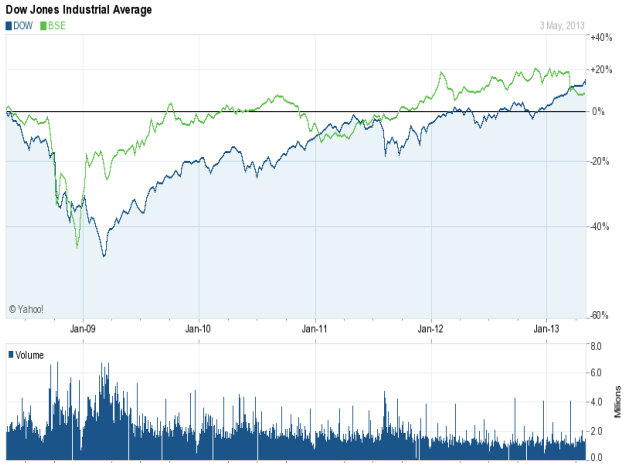
- Both BSE Sensex and DJIA were at almost same level in January 2008.
- Both BSE Sensex and DJIA were at their bottom around January 2009, it was the effect of financial crisis in America.
- In January 2013 curves of both the indices have reached at their highest levels which reflects that recovery in stock prices in India as well as in America has resulted due the recovery of world economy. Further the timings of this recovery in both the nations were almost same.
- In recent years Indian stock markets have performed better than the American stock markets.

Form the figure 1 ,2 and 3 it can be concluded that both BSE Sensex and DJIA have similar comovements. So we reject our fourth null hypothesis.

FIG. 1 - MOVEMENT OF BSE SENSEX MONTHLY CLOSING PRICES

FIG.2 - MOVEMENT OF DOW JONES INDUSTRIAL AVERAGE MONTHLY CLOSING PRICES

FIG. 3 - COMOVEMENT OF BSE SENSEX AND DJIA MONTHLY CLOSING PRICES



CONCLUSION

In this study it was found that Indian stock market is integrated with the American stock market under the period of study, i.e. from January 2008 to January 2013. The correlation in the prices of BSE Sensex and DJIA was found high. This calls for a active role of policymakers. The world economy is passing through the euro zone crisis, so preventive efforts have to be taken by the policy makers of India to check possible spillover of global crisis in the domestic economy. More return in Indian stock markets will act as a major factor for global investors to divert their portfolio investment into Indian capital markets.

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