

Relationship between Indian and US Stock Returns Before, During and After Financial Crisis

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ABSTRACT

This study suggests substantial diversification benefits depending on the time period under consideration between Indian and the US equity markets. This is particularly true after the financial crisis when correlations between the Indian and the US markets became

negative suggesting substantial risk reduction if a portfolio is constructed between the US and Indian stocks. However, the benefits of diversification vanished during financial crisis when every market displayed strong positive correlations.



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INTRODUCTION

Our study examines the nature and extent of linkage between the US and the Indian stock markets before, during and after financial crisis. Despite the growing interdependence of world economy, current literature on the issue found only unilateral impact of the US markets on Indian markets but not vice versa. In other words there is a response asymmetry in return and volatility from the US to Indian markets. However, most of these studies were completed by 2009. Significant changes have taken place in the last few years, and there is literature to support the idea that due to growing interdependence, the diversification benefits are decreasing. Many Indian companies have started to raise money in the US stock exchanges and few US companies have now been acquired by the Indian conglomerates. There is now a significant presence of multinationals in India. All of these factors have motivated us to explore the spillover and contagion effect, in the context of spillover of changes in price (or returns) and volatility, between the US and Indian stock markets. This is especially pertinent during the financial crisis of 2008/09 when global markets declined concurrently. This was not only confined to equity markets, but other markets such as real estate that showed similar steep declines globally. There are wide range of applications of this study from the point-of-view of fund managers, hedge funds, private equity firms, mutual funds, retirement funds, and sovereign wealth funds especially on how they can insulate their portfolios during market bubbles.



LITERATURE REVIEW

Arshanapalli et al, (2001) hypothesized that the Indian stock market was not interrelated to the US markets for the entire sample period from January 1991 to December 1999. As the liberalization measures started to take effect after 1998, the Bombay Stock Exchange (BSE) became more integrated with NASDAQ but did not influence these markets. During the same time, markets of many other countries started to become increasingly interdependent with the US market. Rafiqul et al, (2016) investigated the effect of both return and volatility spillover from the US market to the BRICS markets and among the Brazil, Russia, India, China and South Africa (BRICS) markets. The results suggest that the US stock market has a significant mean return and volatility spillover effect on the BRICS stock markets. Aggarwal and Leal (1996) examined the ten largest emerging stock markets of Asia and Latin America. They observed greater day-to-day linkages between the Asian emerging markets (Korea, Malaysia, the Philippines, Taiwan, and Thailand) and the US markets, but the linkages were not as strong for the Latin American markets (Argentina, Brazil, Chile, and Mexico) with the US.

Similar results were shown in many studies of the Indian stock markets. Kumar and Mukhopadhyay (2002) used Granger causality test and univariate GARCH model to study the return and volatility linkage between the Indian and the US markets. They found significant return and volatility spillover from the US to India. Similarly, Nair and Ramanathan (2003) reported

unidirectional spillover of returns from the US to Indian market. Lamba (2004) found that the Indian market is influenced by the large developed equity markets, including the US, UK and Japan, and that this influence has strengthened during the more recent time period (January 2000-February 2003).

Choudhry (2004) found a two-way linkage between Indian and Pakistani markets, while one-way influence of the US market on these two markets. Wong et al. (2005) also reported only fractional integration of the Indian stock market with developed markets of the US, the UK and Japan. They showed that the developed markets significantly influenced the Indian market, but not vice versa. Recent study by Taner and Mercan (2016) examined behavior of emerging stock markets during financial crisis that established commonalities during boom and bust periods and found reaction to negative shocks is larger than positive news.

As mentioned earlier, most of the studies found a unilateral impact of the US stock markets on Indian stock markets but not vice versa. However, we believe that the economic, technological, and political situation has changed significantly for India and the US over the last 10 years and the spillover effect between the two countries warrant another look.



DATA AND METHODOLOGY

The data that spans from July 31, 1997 to October 31, 2017 was downloaded from Yahoo Finance. The Indian stock index SENSEX is a market capitalization index of 30 well established companies and was introduced by the Bombay Stock Exchange in 1986. The S&P 500 and NASDAQ are also market capitalization weighted indices introduced in 1957 and 1971 respectively. The following statistical model was used to find correlations between Indian and US stock returns:

$$\rho = \text{Cov}(\text{SENSEX}, \text{SP500}) / \sigma_{\text{SENSEX}} \alpha_{\text{SP500}}$$

Where ρ is the correlation coefficient, Cov is the covariance between SENSEX and SP500, σ_{SENSEX} is the standard deviation of SENSEX's returns and α_{SP500} is the standard deviation of S&P 500 returns.

$$\text{Cov}(\text{SENSEX}, \text{S\&P 500}) = E(\text{SENSEX} - \mu_{\text{SENSEX}})(\text{SP500} - \mu_{\text{SP500}})$$

Where E is the expectations operator and μ_{SENSEX} is the mean of SENSEX returns and μ_{SP500} is the mean of SP500 returns. A similar equation would apply for correlation and covariance between SENSEX and NASDAQ.



RESULTS

Yearly returns for the three stock market indices are shown in Table 1. From the results, it is evident that there are periods when SENSEX returns diverged from the returns of both the S&P 500 index and NASDAQ. For instance, in the period prior to the financial crisis, SENSEX returns for 2004 to 2007 were 14.07%, 41.42%, 35.10% and 22.51% respectively,

whereas S&P 500 returns for the corresponding period were 8.61%, 2.96%, 12.77%, 3.47% and NASDAQ returns were 8.24%, 1.36%, 9.09% and 9.36%. Therefore, for this period the Indian stock market was appreciating rapidly as most emerging markets were displaying much higher economic growth than the developed markets. The post financial crisis period from 2010 onwards displays sometimes similar and sometimes divergent returns for SENSEX and the US markets. For instance, in 2012 SENSEX returns were 14.59% whereas S&P 500 and NASDAQ returns were 12.58% and 14.76%, displaying similar numbers. But, in 2014, SENSEX returns were 35.25% whereas S&P 500 and NASDAQ returns were 10.79% and

TABLE 1: Yearly Returns in Percentage for the period 7/31/97 to 10/31/17

	SENSEX	S&P 500	NASDAQ
1998	2.79	23.64	33.38
1999	45.10	17.84	61.83
2000	-18.49	-10.69	-49.90
2001	-26.76	-13.98	-23.64
2002	-1.85	-26.61	-37.87
2003	56.09	23.41	40.55
2004	14.07	8.61	8.24
2005	41.42	2.96	1.36
2006	35.10	12.77	9.09
2007	22.51	3.47	9.36
2008	-62.74	-48.59	-51.99
2009	55.14	21.07	36.39
2010	11.37	12.03	15.62
2011	-6.39	-0.01	-1.82
2012	14.59	12.58	14.76
2013	3.06	25.93	32.44
2014	35.25	10.79	12.57
2015	-15.99	-0.73	-5.57
2016	10.62	9.11	8.37
2017	10.62	13.29	8.37

12.57%, showing a subdued effect on the US market versus a much elevated effect on the Indian market. Also, there was a divergent trend in 2015 when SENSEX returns were -15.99% whereas S&P 500 and NASDAQ returns were -0.73% and -5.57%. These results indicate that the two markets prior to the financial crisis display interdependence. During the financial crisis of 2008/2009, the linkages are much stronger as all markets showed steep declines with elevated levels of volatilities across all three indices. A similar result was obtained by Ang and Bekaert (2002) who found increased correlation for steeply declining international equity markets.

In Table 2, cumulative returns for the three periods, before, during and after the financial crisis are shown. From the data, it is clear that overall returns before the financial crisis were 121.86% for SENSEX and 35.90% and 47.79% for S&P 500 and NASDAQ, which implies that the Indian stock market performed better than the US market for this period. During the financial crisis, there was a much larger decline of -82.49% for the Indian market versus a decline of -58.41% for S&P 500 and -58.91% for NASDAQ. Although, the financial crisis mainly

occurred in the US and developed markets, the contagion effect of this crisis was felt more severely by the emerging markets, in particular, the Indian markets with trillions of dollars of market capitalization being evaporated in a very short time period. However, after the financial crisis all three markets rose almost equally with SENSEX's cumulative return of 89.49% versus 60.21% for S&P 500 and 95.63% for NASDAQ.

From Table 2, it can also be seen that the level of risk or volatility during the financial crisis is much higher for the Indian market as can be seen from the standard deviation of returns which stood at 36.40% for SENSEX against 21.30% for S&P 500 and 26.32% for NASDAQ. Overall, the Indian market is much riskier than the US market. The risks declined significantly after the financial crisis when standard deviation of returns stood at 18.42% for SENSEX against 13.09% for S&P 500 and 14.96% for NASDAQ.

These changes in the stock return distributions can have a number of implications such as portfolio optimization, risk management, valuation and hedging of derivative securities for the portfolio managers and other market participants. This also has policy implications from the point-of-view of governments and monetary authorities globally who had to cooperate with each other to mitigate the fallout on the wild swings and massive decline of the financial markets, failure of the firms, and other negative consequences of financial crisis.

TABLE 2: Descriptive Statistics for the period 7/31/97 to 10/31/17

	SENSEX	S&P 500	NASDAQ
Overall Period			
Cumulative Returns (%)	203.48	106.09	151.55
Mean	0.84	0.44	0.62
Standard. Dev.	23.87	15.14	23.73
Before Financial Crisis			
Cumulative Returns (%)	121.86	35.90	47.79
Mean	0.92	0.27	0.36
Standard. Dev.	26.02	15.07	27.96
During Financial Crisis			
Cumulative Returns (%)	-82.49	-58.41	-58.91
Mean	-1.43	-2.53	-2.16
Standard. Dev.	36.40	21.30	26.32
After Financial Crisis			
Cumulative Returns (%)	89.49	60.21	95.63
Mean	1.17	1.20	1.50
Standard. Dev.	18.42	13.09	14.96

Table 3 displays the correlation during, before and after the financial crisis between Indian and the US markets. From the numbers, it is quite evident there is a very small positive correlation between the SENSEX and S&P 500 index and NASDAQ. The correlation stood at 0.122 and 0.124 between SENSEX versus S&P 500 index and SENSEX and NASDAQ respectively before the financial crisis. However, during the

financial crisis the correlation between SENSEX and NASDAQ at 0.546 became very positive. Despite the fact that the Indian market was largely insulated from the US market, the contagion effect of this magnitude is more related to the fear in the global financial markets rather than any other fundamental factors. This effect was confirmed by Ang and Bekaert (2002) who suggested similar contagions effect during falling global markets when the levels of correlation increased as a result of financial crisis. However, during the post

TABLE 3: Correlation Between US and Indian Markets for the Period 7/31/97 to 10/31/17

	S&P 500	NASDAQ
Overall Period		
SENSEX	0.129	0.123
Before Financial Crisis		
SENSEX	0.122	0.124
During Financial Crisis		
SENSEX	0.546	0.642
After Financial Crisis		
SENSEX	-0.215	-0.244

financial crisis period, the correlation between the returns of Indian and the US markets is negative, suggesting substantial portfolio diversification benefits.



CONCLUSIONS

This study suggests substantial diversification benefits depending on the time period under consideration between Indian and the US equity markets. However, the benefits of diversification vanished during the financial crisis when every market displayed strong positive correlations. In fact, emerging markets such as India declined significantly as compared to the developed markets such as the US. This is contrary to what should have occurred given the fact that the emerging markets were relatively insulated from the basic causes of the financial crisis. There are wide range of applications of this study from the point-of-view of fund managers, hedge funds, private equity firms, mutual funds, retirement funds, and sovereign wealth funds especially on how they can insulate their portfolios during market bubbles.

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