

Is Indian Stock Market Highly Volatile? - A Comprehensive Study Author

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Introduction

According to M.T. Raju Anirban Ghosh (2004) “Peripatetic stock prices and their volatility, which have now become endemic features of securities markets add to the concern. The growing linkages of national markets in currency, commodity and stock with world markets and existence of common players, have given volatility a new property - that of its speedy transmissibility across markets.” To many among the general public, the term volatility is simply synonymous with risk: in their view high volatility is to be deplored, because it means that security values are not dependable and the capital markets are not functioning as well as they should. **Merton Miller, the winner of the 1990 Nobel Prize**¹ in Economics defined volatility as “By volatility public seems to mean days when large market movements, particularly down moves, occur. These precipitous market wide price drops cannot always traced to a specific news event. Nor should this lack of smoking gun be seen as in any way anomalous in market for assets like common stock whose value depends on subjective judgment about cash flow and resale prices in highly uncertain future. The public takes a more deterministic view of stock prices; if the market crashes, there must be a specific reason”. Volatility refers to the amount of uncertainty or risk about the size of changes in a security's value. A higher volatility means that a security's value can potentially be spread out over a larger range of values. This means that the price of the security can change dramatically over a short time period in either direction. A lower volatility means that a security's value does not fluctuate dramatically, but changes in value at a steady pace over a period of time. This paper has been divided into following sections to fulfill the objectives of the study.

Section I	Literature overview
Section II	Research Methodology
Section III.....	Limitation of the study
Section IV	Indian Stock market
Section V.....	Volatility in Indian Stock Market
Section VI.....	Data analysis & Interpretations
Section VII.....	Conclusion and suggestions

Section I : Literature overview

Batra(2004)² in his paper attempts to analyze the time variation in volatility in the Indian stock market during 1979-2003. Various models like naïve model and augmented GARCH model were used for the study. It was found out that sudden shifts in volatility and the possibility of coincidence of these sudden shifts with significant economic and political events both of domestic and global origin. Stock market cycles have also been analyzed for variation in amplitude, duration and volatility of the bull and bear phases over the reference period. Research paper provides a detailed analysis of volatility in equity market indexes from developed and emerging markets. Total 19 indexes have been included in this study, one index each from 17 countries and two indexes from India. Statistical tools such as skewness, kurtosis etc. were used to find out the volatility. It was found out that first, developed and

emerging markets show distinct pattern in return and volatility behavior. Both daily returns and standard deviation are higher for emerging markets over developed markets. **Mantri & Gahan, (2012)³** in the paper studies the volatility pattern of BSE sensitive index (Sensex) and NSE nifty (nifty) during the post derivative period. For this, it used models such as MA (Q,P), GARCH (Q, P), EGARCH (Q, P) AND IGARCH (Q, P) have been employed for the calculation of volatility in Sensex and nifty during pre-derivative period, past-derivative period and whole period of study. The impact of financial derivatives on the volatility of BSE Sensex and NSE nifty is significant under all the models. It is due to the derivatives, the daily volatility during post derivative period is low in comparison to pre-derivative and whole period. **Roy, (2013)⁴** Wrote in his about behavior of stock prices and volatility during the period of pre and post-recession period. to calculate volatility, intraday and inter day index levels were used. Data were collected from nifty and Sensex. after the study of the stock market volatility it has been concluded that the volatility during the phase of economic recession i.e. 2008 was high in the Indian market. **Eichengreen,(2003)⁵** in the paper studies the volatility of stock markets in the long run. The paper focusses on various countries and it was found out that that monetary policy became increasingly volatile in a number of countries in the 1970s and 1980s thus may be part of the explanation for why stock Markets have been more volatile in recent decades. **GROUARD,(2000)⁶** in the paper studied that there are wide swings in stock market prices in both Europe and the united states in recent years have revived the financial community's interest in the concept of volatility. Recent volatility patterns stem primarily from the lasting and substantial decline in stock prices from the highs reached in 2000, a large number of shocks affecting the financial economy, heightened uncertainty about geopolitical and macroeconomic developments and investors' growing doubts about the quality of financial assets against the background of weaker corporate capital structures. In addition to these cyclical factors, this article examines how the way markets work may also have an impact on volatility. **Raju,(2004)⁷** in his paper says that volatility estimation is important for several reasons and for different people in the market. Pricing of securities is supposed to be dependent on volatility of each asset. the study has been extended to emerging markets of India and china. it was found out that some countries (us) provide as high as 0.04 percentage return while some of the emerging markets such as Indonesia recorded negative returns of -0.01 percentage. India is a bright spot. **William, (1989)⁸** studied the relation of stock volatility with real and nominal macro-economic variables. To find his stock volatility and bond return volatility was calculated. Standard deviations from daily and monthly returns were calculated to find out the volatility. It was concluded that there were small movement in stock volatility during 1929-1939. **Sergiy Ladokhin, (2009)⁹** studied the problem of volatility forecasting in the financial Markets. The paper examines the accuracy of several of the most popular methods used in volatility forecasting: historical volatility models (including Exponential Weighted Moving Average), the implied volatility model, and autoregressive and heteroskedastic models (including ARMA model and GARCH family of models).

Section II : Research Methodology

In this paper Exploratory research design has been used. **Secondary data** has been used for analysis. Data were collected from Sensex and Nifty for return and volatility. These are indexes of BSE (Bombay Stock Exchange) and NSE (National Stock Exchange).. Data were taken from 2008- 2013. Daily Data has been used to calculate volatility.

Data were collected from the websites of NSE and BSE. Daily data of sensex and nifty has been taken for 2008-2014. The sites used for data collection are as follows:

1. www.nseindia.com
2. www.bseindia.com
3. 1

Methods used

- i) **Return-** Various statistical formulas have been used to calculate return and volatility. Return is calculated using logarithmic method as follows:

$$rt = (\log pt - \log p_{t-1}) * 100$$

Where,

rt = Market return at the period t

Pt = Price index at day t

Pt-1 = Price index at day t-1 and

Log = Natural log

- ii) **Volatility-** Volatility has been calculated by using following formulas:

ii) (a) **Inter day volatility:** It consists of open to open and close to close volatility.

ii) (a) i- **Close to close volatility-** Close-to-Close volatility measures the price variability of an asset. It is represented by the standard deviation of the prices over a given observation period. VOLAC is usually reported as annualized percentage rate. For computing close to close volatility, the closing values of the Nifty and Sensex are taken. Close to close volatility (standard estimation volatility) is measured with the following formula

Where

$$\sigma = \sqrt{1/(n-1) \sum (rt - s)}$$

n = The number of trading days

rt = Close to close return (in natural log)

s = Average of the close to close return

- ii) (a) ii - **Open to open volatility-** Open to open volatility is considered necessary for many market participants because opening prices of shares and the index value reflect any positive or negative information that arrives after the close of the market and before the start of the next day's trading .

$$\sigma = \sqrt{1/(n-1) \sum (rt - r)^2}$$

Where

n = The number of trading days

t = Open to open return (in natural log)

s= Average of the open to open return

- ii) (b) **Intra-day Volatility**-The variation in share price return within the trading day is called intra-day volatility. It indicates how the indices and shares behave in a particular day. Intra-day volatility is calculated with the help of Parkinson Model.

$$\sigma = k \sqrt{1/n \sum \log(H - L)^2}$$

Where

σ = High-Low volatility

k = 0.601

Ht = High price on the day

Lt = Low price on the day

n = Number of trading days

Need for present study-There is a need for a study on volatility in Indian stock markets after 2000 to see whether changes in market microstructure have resulted in changes in volatility pattern and facilitating international comparison of volatility. comparison of time series volatility of Indian equity market with other emerging and developed markets, distributional characteristics of the variance process and evidence if any, of asymmetries in volatility under different market conditions may shed interesting light on the evolving characteristics of Indian equity market. The increased participation of institutional investors, global economic crisis and its aftermath on world stock markets in general and India in particular calls for a comparative study on volatility in emerging and developed stock markets with special reference to India. At the level of investor, frequent and wide stock market variations cause uncertainty about the value of an asset and affect the confidence of the investor. Risk averse investors may shy away from market with frequent and sharp price movements. An understanding of volatility over a period of time is important from the point of view of individual investors. , organizations entrusted with the job of regulating the market also need a clear idea regarding the pattern of volatility for framing policies to protect the interest of investors. So an understanding of the market volatility is thus important from the regulatory policy perspective as well.

Research Objectives: Following are the objectives of the research paper -

1. To find out the volatility in Indian stock market in terms of BSE and NSE.
2. To find out the volatility with respect to open to open, close to close and high- low.
3. To suggest the measures to improve the volatility.

Section III : Limitation of the study

1. Non availability of data, some of the data like opening prices and high prices for some years were not available for Sensex due to which open to open volatility were not calculated.
2. Numbers of trading days are different for Sensex and nifty.

Section IV: Indian Stock market

Securities market in India has a long history. Indian stock market marks to be one of the oldest stock market in Asia. The first stock exchange was set up in Bombay in 1875. Since then, the number of stock exchanges has grown to 23 including over the counter exchange of India and national stock exchange. These stock exchanges are regulated by SEBI (Securities and Exchange Board of India). The major stock exchanges in India are NSE and BSE. Almost all the significant firms of India are listed on both the exchanges. NSE enjoys a dominant share in spot trading, with about 70% of the market share, as of 2009, and almost a complete monopoly in derivatives trading, with about a 98% share in this market, also as of 2009. Both exchanges compete for the order flow that leads to reduced costs, market efficiency and innovation. Trading at both the exchanges takes place through an open electronic limit order book, in which order matching is done by the trading computer. There are no market makers or specialists and the entire process is order-driven, which means that market orders placed by investors are automatically matched with the best limit orders.

- 1) **Bombay Stock Exchange (BSE)**-The stock exchange, Mumbai, popularly known as "BSE". BSE was established in 1875 as "The Native Share and Stock Brokers Association". It is the oldest one in Asia, even older than the Tokyo Stock Exchange, which was established in 1878. It is a voluntary non-profit making Association of Persons (AOP) and has converted itself into demutualized and corporate entity. It has evolved over the years into its present status as the Premier Stock Exchange in the country. It is the first Stock Exchange in the Country to have obtained permanent recognition in 1956 from the Govt. of India under the Securities Contracts (Regulation) Act, 1956. The Exchange, while providing an efficient and transparent market for trading in securities, debt and derivatives upholds the interests of the investors and ensures redressal of their grievances whether against the companies or its own member-brokers. The BSE has helped develop the country's capital markets, including the retail debt market, and helped grow the Indian corporate sector. The index of BSE is called Sensex.
- 2) **National Stock Exchange (NSE)**- The National Stock Exchange came into existence in June 1994. The National Stock Exchange is located in [Mumbai, India](#). NSE provides a modern, fully automated screen-based trading system, with over two lakh trading terminals, through which [investors](#) in every nook and corner of [India](#) can trade. NSE has played a critical role in reforming the Indian securities market and in bringing transparency, efficiency and market integrity. NSE has a market capitalization of more than US\$989 billion and 1,635 companies listed as on July 2013. Its index is called nifty.

Section V : Volatility in Indian Stock Market

Volatility is a because of a highly liquid stock market. Pricing of securities depends on volatility of each asset. An increase in stock market volatility brings a large change in stock prices. Investors interpret a raise in stock market volatility as an increase in the risk of equity investment.as a result of this, they invest in a less risky asset. It has an impact on business investment spending and economic growth through a number of channels. Changes in local or

global economic and political environment influence the share price movements and show the state of stock market to the general public. The issues of return and volatility have become increasingly important in recent times to the Indian investors, regulators, brokers, policy makers, dealers and researchers with the increase in the FII's investment. Volatility is one of the best phenomenon without which stock markets will lose its charms. The volatility of the stock market is the tendency of the market fluctuation, which is indicated through it's the indices over a period of time. The higher the indices, the higher are the volatility. In fact, it is the ups and downs of the stock prices which add spice to the market behavior. The ups and downs of the stock market add spice to the market behavior.

i) Benefits of stock market volatility

1. Many investors when they foray wonder what to do when the stock market falls. They seller just sit on the fence and wait for the downward trend to cave in. but the reality is that they actually begin to invest when the stock market is on the higher side.
2. If you are an experienced investor, you will not be getting into such an odd thing, you will be applying something very different instead. You will be purchasing when the market is collapsing and that will be against the market.
3. As you are constructing your portfolio for the long term you don't need to be bothered about the present stock market falls. Every descending movement is a prospect for you to choose the stock. Dollar cost averaging is an alternate way to view it.
4. The key aspect that you need to be careful about while employing the stock market volatility for your advantage is the fact that you need to do a decent research and analysis before venturing into a particular stock. You should pick a stock that you consider is good enough to be held for a minimum of ten years and will earn you money after the decade.
5. The volatility of the market has its own implications as prudent investors can take advantage of buying on dips and sell on highs for profit booking.
6. Volatility is also a sign of healthy markets as it leads to correction, if there is any over valuation of prices.

ii) Disadvantages of stock market volatility

1. The disadvantage is that the greater volatility lowers the confidence of the investor in the market which prompt them to transfer their investment in less risky options due to unexpected market behavior.
2. Affects business investment spending and economic growth through a number of channel.

iii) Why study volatility?-The study of financial assets volatility is important to academics, policy makers, and financial market participants for several reasons.

1. Prediction of financial market volatility is important to economic agents because it represents a measure of risk exposure in their investments.
2. Second, a volatile stock market is a serious concern for policy makers because instability of the stock market creates uncertainty and thus adversely affects growth prospects. Recent evidence shows that when markets are perceived as highly volatile, it “may act as a potential barrier to investing”.
3. The stock market volatility causes reduction in consumer spending.
4. Pricing of derivative securities and pricing of call option is a function of volatility.
5. Stock return forecasting is in a sense volatility forecasting, and this has created new job opportunities for the professionals those who are experts in volatility forecasting.

iv) Causes of volatility- Some of the causes for volatility in Indian stock market are as follows:

1. Hike or reduction in the Cash Reserve ration or Interest rates by Reserve bank of India.
2. Bankruptcy by some of the financial institutions like the fiasco caused by Satyam.
3. Strictness made in the regulations of an Initial public offer.
4. Government announcement of purchase of shares and bonds of Indian companies through participatory notes.
5. Rate of dividend declared by companies.
6. Economy of other nations. For example: US recessions on Jan 21, 2008 saw the biggest ever fall of 1408 points.
7. Volatility in economic variables such as inflation, GDP, industrial production etc.
8. Factors affecting industry and company i.e. internal factors. For example, in the oil sector, a major weather storm in an important producing area can cause prices of oil to jump up. As a result, the price of oil-related stocks will follow suit. Some benefit from the higher price of oil, others will be hurt. This increased volatility affects overall markets as well as individual stocks.
9. Investors` reactions to the updates information about a particular stock.
10. Changes in economic variables. For example, in many countries, the [central bank](#) sets the short-term interest rates for overnight borrowing by banks. When they change the [overnight rate](#), it can cause stock markets to react, sometimes violently.

Indian equity markets display greater volatility compared with many other emerging markets. Markets in China, Brazil and Russia, too, show much lower volatility. And volatility in Indian markets is almost five times the average volatility of developed markets. The higher volatility is due to increasing ratio of foreign equity inflows to domestic equity savings. This has exposed Indian markets to global capital market cycles. A classic example was the recent

crash in Indian markets when negative sentiment led by a falling rupee and an improving US economy triggered selling. Perhaps the volatility would be lower if domestic equity savings were also rising in tandem with global flows. On the contrary, domestic risk capital formation has been low. **The Reserve Bank of India's Handbook of Statistics (September 2013)**¹⁰ shows that investment in shares and debentures constituted barely 3.1% of the incremental financial assets of the household sector in fiscal year 2013. This yardstick is down from 6.6% and 9.6% in fiscal years 2007 and 2008, respectively. Retail investor participation in the equity market is very low.

Bank deposits account for about 54% of the household financial savings, indicating the low appetite for risk assets. And that's not taking into account the fact that the bulk of household savings are in physical assets. Thus it can be seen that the study of stock market volatility is very important and can be helpful for the formulation of economic policies and framing rules and regulations related to stock market volatility.

Section VI : Data analysis & Interpretations

- i) **Mean** – Average return given below in the table shows the return on Nifty and Sensex from Year 2008 to 2013.

Year	Nifty	Sensex
2008-2009	3726.859	12308.21
2009-2010	4657.768	15724.21
2010-2011	5583.545	18599.52
2011-2012	5240.385	17430.82
2012-2013	5520.338	18184.91

Table 1 Mean of index values

Mean has been calculated by using the daily closing prices of Sensex and Nifty. The above table shows that both Sensex and Nifty had highest mean values in the year 2010-2011 i.e. 18599.52 and 5583.54 respectively. However, both the indexes had lowest mean in the year 2008-2009.

- ii) **Standard Deviation**- The table below shows the risk of Nifty and Sensex from 2008 to 2013

Year	Nifty	Sensex
2008-2009	863.9914	3015.122
2009-2010	526.6366	1853.35
2010-2011	356.5371	1163.755
2011-2012	325.9064	1082.178
2012-2013	350.9112	1146.285

Table 2 Standard deviation of Sensex and nifty

Standard deviation for Sensex and Nifty has been calculated using daily closing index values. In 2008-2009, there was highest standard deviation as compared to other years for both the indexes. It was 863.99 for nifty and

3015.12 for Sensex. It shows that there was high fluctuation in prices in that year. There was lesser deviation in prices in the year 2012-2013.

iii) Percentage Return-Return is the motivating factor that induces the investors to invest money in shares.

Return means the profit earned as a result of rise in share prices. Return helps the investor to compare the benefits available in the alternative investment avenue. Descriptive statistics are used to analyze the return of the Nifty, and Sensex. This section presents the results of the measurement of daily returns on the domestic (Sensex and Nifty) during the period of study. The daily returns have been calculated as the difference between the natural logarithms on daily closing prices on the consecutive days. From, these average daily return (e.g. simply a mathematical average) in a month, year and over the full period of study have been calculated as follows:

Year	Nifty	Sensex
2008-2009	2.3	2.3
2009-2010	-0.6	-0.6
2010-2011	0.4	0.33
2011-2012	0.5	-0.2
2012-2013	-0.6	-0.05

Table.3 Return from Sensex and nifty

The daily average return of nifty and Sensex during the year 2008-2009 was 2.3. After scaling new heights of 20000+, Sensex & 6000+, Nifty entered year 2008 with rosy pictures. But the rosy picture soon turned gloomy. The skyrocketing Sensex & Nifty suddenly started heading south and there was saw the biggest absolute fall in history. The fall was triggered as a result of weakness in global markets, but the impact of the global rout was the biggest in India. The market tumbled on account of a broad based sell-off that emerged in global equity markets. After the worst January in the last 20 years for Indian equities, February turned out to be a flat month with down. India finished the month as the second worst emerging market. The volatility was significantly higher during the period of

February 2008 to March 2009: the period when stock market was sliding. In the year 2009-2010, market return showed a drastic fall. The market return was negative in the year 2009-2010 for both sensex and nifty. It was -0.6. The return again rose in the year 2010-2012. Though market suffered recession the year 2008-2009, the return is highest because market crashed in the month of December 2008.

iv) Volatility-Stock market volatility indicates the degree of price variation between the share prices during a particular period. A certain degree of market volatility is unavoidable, even desirable, as the stock price fluctuation indicates changing values across economic activities and it facilitates better resource allocation. But frequent and wide stock market variations cause uncertainty about the value of an asset and affect the confidence of the investor. The risk averse and the risk neutral investors may withdraw from a market at sharp price movements. Extreme volatility disrupts the smooth functioning of the stock market. The overall stock market volatility has fluctuated over the time with no discernible trend and some authors have argued

that volatility is higher during the bear markets. In this study, inter-day and intra-day volatility are calculated for each year and for different phases.

iv) (a) Close to close volatility

Year	Nifty	Sensex
2008-09	2.6	2.7
2009-2010	1.88	1.69
2010-2011	1.11	1.01
2011-2012	1.29	1.12
2012-2013	0.81	0.70

Table 4 Close to Close Volatility of Sensex and nifty

The close to close volatility moved in a range from 0.70 to 2.7 for both Sensex and nifty. Nifty and Sensex had highest volatility in the year 2008-2009 and had negative returns also in the subsequent year. The market was highly volatile in the year 2008-09 because of the recession. Volatility was very less in the year 2012-2013 for both Sensex and Nifty.

iv)(b) Open to open volatility- Open to open volatility is considered necessary for many market participants because opening prices of shares and the index value reflect any positive or negative information that arrives after the close of the market and before the start of the next day's trading

Year	Nifty	Sensex
2008-09	2.65	3.11
2009-2010	1.87	-
2010-2011	1.08	-
2011-2012	1.42	-
2012-2013	0.91	0.79

Table 5 Open to Open Volatility of Sensex and nifty

Open to open volatility taken into account opening values of indexes. It was very high for sensex in the year 2008-2009. Data was not available for year 2009-2012 for sensex. Open to open volatility is very important for several of the participants. High open to open volatility reveals informational asymmetry and also overflow of information. Any positive or negative information that comes after the close of the market and before the start of the next day's trading, is expected to get reflected in the opening prices of shares and on the index. Significant economic and sociopolitical developments induce price movements and the extent of price movement depends on severity of information.

iv) (c) High low volatility-Parkinson's model has been used for calculating High-Low volatility. It uses intra-day highs and lows, for estimation of intraday volatility. Since, most asset pricing models are based on continuous time the extreme value estimators are more efficient.

Year	Nifty	Sensex
2008-09	10.52	9.82
2009-2010	8.42	7
2010-2011	7.01	4.7
2011-2012	7.14	-
2012-2013	5.97	5.51

Table 6 High- Low Volatility from Sensex and nifty

High low volatility represents intraday volatility. It was very high in the year 2008-2009 for both sensex and nifty. High-low volatility conveys extreme movements and dispersion during the trade time. A very high high-low volatility is likely to scare investors and lead sometimes to panic conditions in the market place. Therefore, regulators, policy makers and SROs strive to implement policies that smoothen information flow and they also ensure certain measures which ensure bounded extremes with the help of circuit breakers, exposure limit, margin etc.

Section VII : Conclusion and Suggestions

It was found that return was highest for the year 2008-09 for both sensex and nifty and after that return gradually decreased because markets started crashing in December 2008. After 2008-2009, return decreased to -0.6 for both the indexes. Close to close volatility was highest for the year 2008-09 i.e. 2.6 and 2.7 for Sensex and nifty respectively because December 2008 showed recession in the markets, thus making markets highly volatile. However, as the markets boost in subsequent years, volatility also decreased. Open to open volatility was also highest in the year 2008-2009 for Sensex and nifty. It reflects positive and negative information from opening values of the index. It was highest in 2008-2009 because of highly volatile market in 2008-2009. Volatility decreased after 2008-2009. Parkinson's model showed highest volatility in the year 2008-2009. It was 10.52 % and 9.82 % for Sensex and nifty respectively. It was high again for the same reason of recession in the market.

This paper provides evidence on the behavior of stock prices and volatility during the post-recession period. After the study of the stock market volatility it has been concluded that the volatility during the phase of economic recession i.e. 2008 was high in the Indian market. The two indices taken for the study confirmed that there is relationship between the economic recession and stock market volatility. Whenever there is recession or financial crisis the stock market reacts negatively thus increasing the volatility. The reason for long term volatility during and after recession can be attributed to corporate leverage as at the time of economic recession the demand for the goods and services comes down thus increasing the fixed operation cost and putting pressure on the operating profits. The sentiment of the market remains negative with panic in minds of investors selling their shares which influence the volatility of the market to a great extent.

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