STOCK MARKET VOLATILITY WITH RESPECT TO SELECTED NIFTY COMPANIES IN INDIA

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In Partial Fulfilment for The Award of The Degree Of

DOCTOR OF PHILOSOPHY
IN
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By

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Declaration

This is to certify that the Thesis entitled **"STOCK MARKET VOLATILITY WITH RESPECT TO SELECTED NIFTY COMPANIES IN INDIA"** submitted to **CMJ University**, is a partial fulfilment for the award of the Degree of **Doctor of Philosophy in Management** is my unique work under the supervision of **Dr. Tarun Kumar Singhal, Associate Professor, Department of Management, CMJ University, Shillong, Meghalaya, India**. The thesis has not been submitted before for the award of any degree, diploma or similar title of this or any other University.

Place: Shillong (Meghalaya)

Date:

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CERTIFICATE

This is to certify that the thesis entitled **"STOCK MARKET VOLATILITY WITH RESPECT TO SELECTED NIFTY COMPANIES IN INDIA"** submitted to **CMJ University** Shillong, Meghalaya, India by **Y. V. M. CHANDRA SEKHAR** for the award of **Doctor of Philosophy in Management** is a record of research work done under my supervision and guidance. This thesis has reached the standards fulfilling the requirements of the regulations for the Degree and it was not previously formed the basis for any other degree or diploma and I additionally affirm that the Thesis speaks to an autonomous work with respect to the Candidate.

Place: Shillong (Meghalaya) **Research Supervisor**

Date: **(DR. TARUN KUMAR SINGHAL)**

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STOCK MARKET VOLATILITY WITH RESPECT TO SELECTED NIFTY COMPANIES IN INDIA

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DEDICATED TO MY MOTHER

YERRALLA
VENKATA LAKSHMI DEVI

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ABSTRACT

One of the most important changes in the financial sector over the past few decades has been the advent of stock futures. The banking industry is undergoing a structural transition with the primary goal of lowering the danger of economic spending plans. NSE has introduced a variety of financial derivatives to keep up with the rest of the globe and maintain the competence and consistency of financial markets. NSE began trading stock futures on November 9, 2001, with a modest number of common shares. The NSE has grown to become a leading global exchange for trading stock futures, and its range of futures contracts is now among the most extensive in the world. Currently, 160 stocks can be traded in the futures market on the NSE.

There are a maximum of three different contract lengths available on the NSE Futures market: one month, two months, and three months. These lengths are determined by the underlying asset, the lot size, and the expiration date of the futures contract. After the expiration of the previous month's contracts, new ones are introduced. Futures contracts expire on the final Thursday of every month. If Thursday is not a trading day, the expiration date will be the day before. The impact of the contract's expiration date is felt in the turnover and prices of underlying securities when buyers and sellers close out their positions on or before the contract's expiration date.

Nifty Bank is one of the most liquid and highly volatile indices in the sector, so this research looked specifically at how expiration days affect the price changes of Nifty Bank equities on the National Stock Exchange. Nifty Bank is made up of the 12 largest and most actively traded banking equities on the National Stock Exchange. Since trading on the Nifty Bank Index began on June 13, 2005, we included data through the year 2012 in our analysis.

The data clearly show that expiration days have more turnover than other days. The considerable increase in turnover on expiration days lends empirical credence to the theory that the expiration-day impact results from arbitrageurs unwinding hedging deals on the expiration day in order to reap the benefits of a risk-free profit.

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Stock prices are used for empirical examination of impact on return, volatility, and price reversal. Due to the winding up of cash positions by arbitrageurs, all trades on both sides were cancelled out, keeping the market balance in some stocks without putting any downward pressure on returns.

The effect of expiration days on the volatility of Nifty Bank Stocks was found to be mixed in the study. While the expiration coefficient is statistically significant for Bank of Baroda, HDFC Bank, ICICI Bank, IDFC FIRST Bank, Ratnakar Bank, and State Bank of India, Axis Bank, Federal Bank, IndusInd Bank, Kotak Bank, Punjab National Bank, and Yes Bank all found the same volatility on maturity days as the rest of the days. If arbitrageurs close all their bets in one direction, together with the increased asymmetry of information, price volatility is likely to be observed.

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CHAPTER - 1

INTRODUCTION

1.1 OVERVIEW

Virtually everybody with even a passing interest in the financial markets will tell you that the markets are more unpredictable than they have ever been, and that this volatility is a major problem. Since volatility can have different meanings to different people, it is challenging to analyse. When discussing volatility, people tend to be vague. There is also a lot of false information floating around regarding volatility. The most fundamental statistical metric for risk is volatility. It is useful for gauging the overall portfolio risk as well as the risk associated with a specific instrument.

Stock price volatility, currency rate volatility, and interest rate volatility are all examples of financial asset price volatility. The degree to which the price of a security, commodity, or market increases or decreases during a short time frame; this is the definition given by Mullins (2000).

The key aspect of this concept is that it includes both price increases and cuts. It is during moments of price decline or "correction" that people tend to worry the most about volatility. The only people who seem to care that the markets are volatile during an intense bull market are the ones who have short bets.

When security prices or returns change greatly over time, as they often do in volatile markets, the market is considered to be volatile, as defined by Reddy (1996). However, in a steady market, prices move smoothly from one equilibrium point to another as new information is gradually included into prices.

In other words, the term "volatility" refers to the extremeness with which an asset's value fluctuates. When there are large price swings up and down in the stock market within a short time frame, we say that the market is volatile. Volatility of stock returns quantifies the unpredictable swings in stock prices. Volatility, or the degree to which stock prices fluctuate over time, is a key indicator of market activity (Gangadhar and Reddy, 2009).

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Volatility can be described in a number of ways, but the standard deviation is the most popular statistical metric for capturing it. Basically, it calculates how much the current price differs from the moving average price. When this discrepancy increases, so does the resulting volatility. Because of this, predicting the future value of a stock is more challenging the more volatile it is. Put another way, stock market volatility is the return volatility of the aggregate market portfolio expressed as a percentage of its standard deviation from the mean value of daily stock returns.

Chairman of the Federal Reserve Board in Washington, Alan Greenspan, used the term "Irrational Exuberance" to describe the situation in a speech he gave in December 1996. Many other explanations have been proposed for this phenomenon; some call it a speculative bubble, others a baby boom effect, and yet others herd behaviour. So, what exactly are they talking about here...? the "volatility" of the stock market. Many traders and authorities monitoring the markets have been kept up at night by the recent spike in volatility.

Many members of the general public equate the word "volatility" with "risk," and they think it's bad when it's high because it indicates that asset prices aren't stable and the financial markets aren't operating as efficiently as they could be. In his book Financial Innovation and Market Volatility (1991), 1990 Nobel Laureate in Economics Merton Miller says.... People often appear to mean bad days in the market when they talk about volatility. These widespread price decreases in the market generally cannot be attributed to a single news item. This lack of a smoking gun shouldn't be viewed as unusual, either, because the value of assets like common stock is based on subjective estimates of future cash flows and resale values. The general public has a more fatalistic outlook on stock market fluctuations, believing that "if the market crashes, there must be a specific reason."

One definition of volatility is the tendency for asset prices to fluctuate at random. Share price volatility is theoretically affected by shifts in the volatility of future cash flows and discount rates. The emergence of new "fads" or "bubbles" is a new source of uncertainty (Schwert, 1989).

To simplify their analysis, Black and Scholes (1973) assumed that the prices of financial assets follow a log-normal distribution (a probability distribution in which the log of the random variable follows a bell-shaped curve). As a result, the differences in logarithmic pricing are typically used to calculate returns on financial assets. Normality characterizes these dissimilarities (the so-called log-relatives). The bell-shaped curve that represents a normal distribution is a universal symbol for it. As depicted in Figure 1.1.

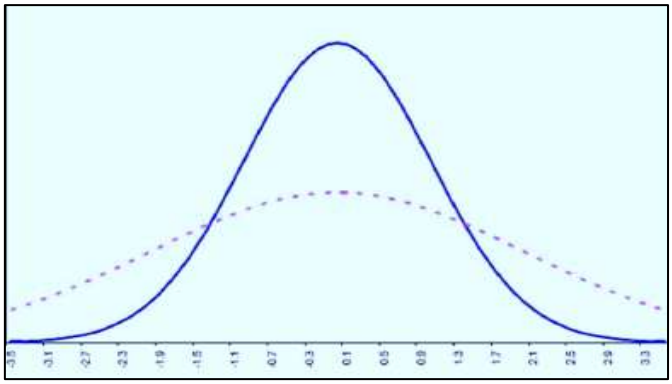

Figure 1.1: Normal Bell-Shaped Cumulative Distribution

The term "volatility" refers to the extent to which an asset's returns deviate from their average. In Figure 1.1, we see two normal distributions. The dotted line is more dispersed than the continuous one, yet they both have the same mean. These two graphs also show how volatility measures the extent to which a return can fluctuate. Volatility readings in the high range indicate a high degree of uncertainty about future returns. Standard deviation is the most used way to quantify dispersion in random variables. A statistical measure of the dispersion of returns for a certain securities or market index," volatility is defined as such by Investopedia. Both the standard deviation and the variance of returns on the same securities or market index can be used as measures of volatility. Higher volatility is usually indicative of a more precarious investment.

Simply said, volatility measures the degree of unpredictability or risk associated with the magnitude of price swings for a given security. When volatility is high, the possible values over which a security can trade are broader. This means the security's price can swing wildly in either way in a relatively short amount of time. When a security's value varies gradually over time rather than abruptly, it is said to have low volatility (Pandian, 2009).

According to Wikipedia, the most common definition of volatility for financial instruments over a given time horizon is the standard deviation of the continuously compounded returns of that instrument. It is frequently employed in order to quantify the instrument's risk during that time frame. Annualized volatility can be written as a whole figure ($5) or as a percentage of the mean (5%). Options and variance swaps allow for the direct trading of volatility in today's markets.

Volatility places greater significance on price fluctuations themselves than on their overall trend or direction. For example, the direction of the price movement could be up, down, or flat, but the volatility of the price could be very similar in all three circumstances. This means that the volatility of prices across the three scenarios is very similar (Singh, 2008).

Various market participants and situations highlight the significance of volatility forecasting. Securities are meant to be priced in accordance with their underlying assets' volatilities. Low volatility and strong returns over the long term are both characteristics of mature and matured markets. Except for India and China, developing markets as a whole had low returns (often negative returns) and considerable volatility in the years leading up to 2006 (Porwal and Gupta, 2006). Market returns in India and China are comparable to those in the United States and the United Kingdom, but the volatility in both nations is far higher.

1.2 VOLATILITY AND ITS IMPORTANCE

Volatility is a measure of risk and, as such, should give investors and others a reason to be wary of the stock market and other financial instruments. For this reason, volatility issues have recently gained prominence among financial professionals, market participants, individual investors, regulators, and researchers.

Investors care about volatility because they want to know how much risk they are taking on when purchasing a stock. The higher the volatility of a stock, the greater the risk it poses, and knowing the volatility of a stock gives an investor an idea of the range of values the stock could take at a future date, helping the investor make more educated investment decisions. However, the future value of a company with a high degree of volatility is notoriously difficult to forecast. Investors, in general, would rather not take

any chances at all, much less the small ones they might incur when trying to make a profit.

Second, policymakers are worried about the impact of a turbulent stock market on economic growth because uncertainty is bred by market volatility. On the other hand, policymakers may worry that heightened stock volatility endangers the stability of financial institutions and the market.

Thirdly, regulators are worried about volatility. Capital market efficiency is affected by market volatility. Small investors avoid the market altogether when volatility is high. In addition, it may undermine investor trust, which in turn decreases market participation and liquidity, and put a pressure on market clearing and settlement requirements.

Finally, the volatility of security prices affects the timing, amount, and type of capital issuance decisions that businesses make. But whether or not price volatility (defined as a significant degree of change in the value of an item) is undesirable is a moot point.

There are two sides to volatility. Most economists believe that the introduction of new information into the market is what causes volatility. The true worth of an item that is being traded on the market is constantly reevaluated as market participants get fresh information. When new information becomes available, the price of a traded asset should change accordingly in a well-functioning market. Volatility can be a byproduct of this procedure. According to the research of Narayan (2006), market volatility is indication of a well-established and informationally efficient market. Volatility is helpful rather than harmful in this context. The potential for increased profits is another plus, provided that the market behaves as predicted. In fact, for an option trader to profit, the underlying asset must be highly volatile. If that happens, an out-of-market option (a call option with a higher strike price than the current market price of the underlying securities, or a put option with a lower strike price than the current market price of the underlying security) may eventually be called. (When the current market price of the underlying asset is lower than the strike price of a call option or higher than the strike price of a put option. The option itself is valuable. But if the market doesn't behave as expected, your investment could go down the drain.

However, volatility that appears to be unrelated to news about the company or the market as a whole may be detrimental and undesired. The effects of stock market volatility on consumer spending are negative (Garner, 1988). Investment spending by corporations is influenced by stock market volatility (Gertler and Hubbard, 1989). Furthermore, the severe volatility may cause structural and regulatory adjustments to be made in order to restore stability to the financial system.

The efficiency of the financial system is affected by the market's volatility. A high level of market volatility discourages casual investors. Aside from that, it may put a pressure on market clearing and settlement requirements, which might cause investors to lose faith and decrease market liquidity and participation.

There are real-world economic ramifications of volatility as well. The capital markets provide a platform for businesses to discuss the viability of various initiatives, the growth prospects of various technology, and the demand for various products. For corporate managers and commercial organizations looking to optimize their company' value, a true reflection of their opinions in security prices would send valuable signals. Firm managers who rely on price signals are essentially responding to nothing but noise if the prices actually contain huge systematic mistakes. Because of this, stock prices lose their significance as a "signal" regarding a company's genuine worth when there is excessive volatility or "noise" that does not appear to be accompanied by any significant news about the firm or market as a whole. The wealth of many families has been significantly reduced as a result of the market's volatility. Investors may react differently to market fluctuations if they associate them with a higher level of risk.

The amount of extrinsic value in an option's pricing is largely determined by its volatility, therefore understanding this concept is crucial. Calls and options have more extrinsic value when volatility rises. As a result, the cost of every available alternative rises. Both the call and put option's extrinsic value diminish as volatility falls. As a result, the cost of every available alternative drops.

1.3 VOLATILITY BETWEEN DAYS OR DURING THE DAY

1.3.1 INTER-DAY SWINGS IN PRICE

Inter-day volatility refers to the swings in the stock market that occur between trading days. Daily fluctuations in the value of any given index level between its open and closing times are used to determine its intraday volatility. Daily fluctuations can be estimated with the help of a standard deviation (Porwal and Gupta, 2006).

1.3.1.1 Closing-Period Fluctuations

The Nifty and Sensex were both measured at their closing prices so that their close-to-close volatility could be calculated. The following equation can be used to calculate close-to-close volatility, also known as standard estimation volatility.

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

Where,

n = The total number of business days

r_t = Return from close (in natural log)

$\bar{r}$ = The average return from close to close

1.3.1.2 Volatility from Open to Open

Many market participants see open-to-open volatility as desirable, as it allows share prices and the index value to react to news, both positive and negative, that comes in between the end of the market and the start of trading the next day. Open-to-open volatility is determined using the following formula:

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

Where,

n = The total number of business days

r_t = Return from open to open in natural log

$\bar{r}$ = The average return from open to open

Only the close-to-close and open-to-open index values are taken into account for intraday volatility, which is calculated using the standard deviation of returns.

1.3.2 DAY-TO-DAY VOLATILITY

Intra-day volatility is the variation in share price return during the trading day. It shows the behaviour of the indices and stocks on a specific day. With the assistance of the Parkinson model and the Garman & Klass model, intraday volatility is estimated.

1.3.2.1 The Parkinson Model

According to Parkinson's (1980) approach, the following formula is used to determine high-low volatility:

$$\sigma = k\sqrt{1/n\sum \log (H_t/L_t)^2}$$

Where,

σ = Low-High Volatility

k = 0.601

H_t = High cost that day

L_t = On-day special pricing

n = Quantity of trading days

1.3.2.2 Model from Garman and Klass

Open-close volatility is determined using this methodology. The formula provided by Garman and Klass in their model dates back to 1980 and is as follows:

$$\sigma = \sqrt{1/n\sum(1/2)[\log (H_t/L_t]^2 - [2\log (2) - 1][\log (C_t/O_t)]^2}$$

Where,

H_t = A Day with a high price

L_t = On-day special pricing

C_t = final value for the day

O_t = The day's initial pricing

n = Days traded in a year

σ = day-to-day volatility across the time period

1.4 MODELING STOCK MARKET VOLATILITY STATISTICS

Volatility in the stock market is widely thought to be predictable. Implications for asset pricing and portfolio management are substantial in light of this finding. When looking to minimize their exposure to risk, investors may rebalance their holdings by decreasing their exposure to assets with projected increases in volatility or by employing more complex dynamic diversification strategies to hedge against such increases. When such methods are in play, the equilibrium values of assets in the market should adjust to reflect investors' aversion to risk and future volatility expectations. Specifically, the value of a derivative asset like a swap or an option will be affected greatly by the volatility of the underlying asset.

Predicting high volatility, as you will see, is equivalent to predicting high variance, or that the extent of the possible price change is large. In light of this, knowing the variance of a market move does not guarantee knowing the magnitude or direction of such move. Predicting volatility is a bit like predicting whether or not it will rain: you can be right about the possibility of rain, but there may still be no rain. Clustering volatility is one of the earliest observed phenomena in economic data. It gives us some insight into the regularity of price swings. If strong market swings are typically followed by additional large swings, in either direction, then volatility should be predictably high after swings of this size. In fact, this is the standard method that traders use to anticipate volatility. To forecast volatility, they calculate standard deviations over a range of time periods and apply the moving average they determine to be most reliable. To better predict future volatility, some people update standard deviations to account for previous events. However, traders who deal in longer-lived assets (long-lived assets are often those assets which are not consumed during the normal course of business, e.g., land and buildings) may be of the opinion that volatility in the far future is insensitive to new information. Better short- or long-term volatility forecasts might lead to more accurate estimations of underlying asset prices. To what extent the market currently reflects the most accurate predictions is an open question (Engle, 1993).

Volatility can be predicted and estimated using one of four main methods. Some examples include Extreme Value Estimators, Conditional Volatility Models, Implied Volatility Models, and Historical Volatility Models.

1.4.1 METHODS FOR PREDICTING PAST VOLATILITY

The standard deviation of a statistical sample of past returns on assets and liabilities is the basis for the volatility measure most commonly used to assess risk. This is the most basic and popular model for capturing volatility. All you have to do is figure out the returns' standard deviation or variance from a certain time period. It's an all-encompassing metric for gauging risk, taking into account both random and regular variables. Dispersion of values (such as closing prices) from the mean is quantified by calculating the standard deviation. The variance is the disparity between the true value (closing price) and the mean closing price. High volatility is associated with a significant standard deviation, which measures the extent to which closing prices deviate from the average. A smaller standard deviation and less volatility can be seen when closing prices are closer to the average. It is a relative metric; thus, we can examine the volatility of stock returns over different time periods by looking at the standard deviation of returns over different time periods. Based on this metric, volatility projections for the next time period can be made (Srivastava and Jain, 2006).

1.4.2 SIMULATIONS OF IMPLIED VOLATILITY

Implied volatility is a more useful, albeit lesser-known, indicator of market risk. From the option's pricing, we can infer its implied volatility. Due to a crucial aspect of derivatives, this metric is derived from two observations of the underlying security's price: the derivative's price and the security's actual market value. It showed the consensus estimate of the stock's or underlying's volatility throughout the remaining contract term. An extremely volatile stock is one that has a large trading range (has fluctuated considerably). Low volatility describes a stock that trades in a tight range (doesn't fluctuate much). For financial gain, arbitrageurs have capitalized on this feature by checking whether or not an asset is mispriced in relation to its derivative (Mullins, 2000). Information from both the cash and derivative prices of a security can be used by students of the financial markets to draw conclusions about the underlying asset. This metric incorporates data from a security's derivatives into a comparison with the price of the underlying security. The implied volatility of a security increases as the magnitude of its price dispersion increases. The difference between actual and implied

volatility can be explained by the fact that the latter is based on the expectations of option traders while the former is a reflection of historical events (Schwert, 1989).

1.4.3 ESTIMATORS OF VERY LARGE NUMBERS

In contrast to conventional estimators, which are based solely on the closing prices of the asset, these also factor in the high and low prices that have been observed.

1.4.4 INDICATORS OF CONDITIONAL VOLATILITY

Conditional Volatility Models (ARCH/GARCH) account for volatility's time-varying nature, as opposed to conventional or extreme value estimators. Conditional heteroscedasticity with homoscedastic unconditional error variance is assumed in the ARCH and GARCH models. That is, deviations from an unconditionally constant variance occur temporarily and at random, and are a result of the realizations of prior errors. The GARCH model's strength lies in its ability to account for the observed clustering of volatility in financial data. Since the market's volatility is sensitive to changes in the rate at which new information enters it, this allows us to make the link between information and volatility clear (Pandey, 2005).

1.5 INDICATORS OF STOCK MARKET DYNAMICS

The causes of volatility can be broken down into two broad classes: internal and external. Endogenous forces are those that originate within a country's own corporate, economic, and political sectors. Micro and macro factors are both at play here. Earnings per share, firm size, and book value per share are all macro elements that contribute to a stock's value, but micro factors, such as dividend decisions, substantial expansion plans, and the receipt of large contracts, also matter. The stock market's behaviour is influenced by the economy as a whole, which is why macroeconomic issues are so important. The stock market's volatility is an obvious reflection of their effects. The tax rate, interest rate, inflation rate, agricultural and industrial production, bank, GDP, government expenditure, foreign institutional investment, exchange rate, union budget, growth rate of imports, current account deficit, money supply, and foreign currency reserves are only few of the variables that can affect a country's economy. Not necessarily will all securities be affected in the same way or to the same extent by these macro level issues. They affect various securities to varying degrees. All the other

sources of uncertainty are exogenous. These influences are not native to the country. These issues are rising to prominence as a result of the increasing interconnectedness of the world's economies in the context of globalization. They are usually of a large scale. With the opening of the Indian economy to global trade, they have risen to prominence. The impact of fluctuating crude oil prices and other international economic factors on the Indian stock market may be seen plainly. No inferences about the near-term market trajectory can be drawn from the index. The stock market's reaction to both concrete and abstract developments drive its volatility.

Media outlets frequently attribute small, day-to-day fluctuations in stock prices to investors' responses to news of major economic developments. When unemployment numbers are bad or inflation numbers are good, commentators will often say that the stock market responded negatively or positively, respectively (Roley, 1985). Variability in stock prices is caused by a number of different things that might make prices go up or down.

1.5.1 MARKET FORCES OF SUPPLY AND DEMAND

Alterations in the demand and supply for a given share in the stock market are a major contributor to the volatility of share values over short time periods. Any time there is a shift in supply and demand, the price goes up and the other way around. At any one time, if there is a bigger demand for a given scrip than there is supply, the dealers will run out of stock and start asking for higher prices. A decrease in price would occur if, on the other side, there were more requests to sell than to acquire. While the quantity of stock on the market at any given moment may fluctuate slightly in response to price changes, it is important to keep in mind that the supply of shares of a certain firm cannot be instantly raised in this way (Garg, 1950).

1.5.2 FUNDING COSTS

Stock market movements are mostly determined by these factors. Since speculators are eager to borrow money at lower rates in order to invest in securities producing a better return, their activity tends to grow whenever the short-term interest rate drops. A rising stock market is supported by a low cost of borrowing money, and vice versa. There is a negative theoretical correlation between interest rates and stock prices. This is

because, in the cash flow discounting model, the present value of a stock is determined by discounting its expected cash flows at an appropriate rate. Current stock prices go down if the discount rate goes up and up if the discount rate goes down. This discount rate is the same as the rate of interest in the economy and represents a risk-adjusted needed rate of return. Stocks' present values decline as a result of a rise in interest rates. When compounded over a long period of time, even a modest increase in interest rates can have a large impact on present values. Cash flow declines as interest rates rise because businesses become less profitable. Both the present value of stocks and their current market price are falling as a result of these two factors. Also true is the converse (Apergis & Eleftheriou, 2002).

The aforementioned theoretical explanation is just one of the few that can be offered to explain the inverse correlation between interest rates and stock prices. For one, bond interest rates are risk-free returns, so as they go up, bond prices go up and stock prices go down. The asset allocation shifts to favour bonds over stocks as a result. The result is a rise in bond prices and a fall in stock prices since money is transferred from the stock market to the bond market. Stock prices consequently drop. When interest rates drop, money flows from the bond market into the stock market, producing a negative result. Second, there are two ways in which a rise in interest rates might reduce a company's profitability:

(1) a decrease in corporations' net earnings after interest; and

(ii) consumers' demand for the goods falls, leading to higher interest rates on loans. Stock prices fall when profits go down and rise when profits go up.

When interest rates rise, investors become pessimistic about the economy and the earnings of companies, which has a negative impact on the stock market. The opposite is also true (Chakradhara, 2008): this drives down stock prices.

There are other economic variables that interact with interest rates to determine a stock's value, making the effects of interest rate fluctuations on a stock's intrinsic value more complex than previously described. A high inflation rate and the absence of real interest rates further reduce the likelihood that investors will shift money from the stock market to the bond market in response to a rise in interest rates. Thus, it is not always

the case that interest rates and stock values are inversely related. There are a number of reasons why this pairing can be fruitful. A rise in interest rates as a result of an overheating economy would, first, be expected to be accompanied by a rise in both corporate profits and stock prices. Second, if inflation is expected to be high, then interest rates should be high. This is anticipated to improve enterprises' pricing power, which in turn leads to faster earnings per share growth. Therefore, the stock valuation formula is adjusted upwards in terms of earnings per share when the discount factor is raised. According to Durre and Giot (2005), this means that lower stock prices are not necessarily required. Third, a fluctuating risk premium can account for the observed positive correlation. For instance, investors shifting their money from equities and other riskier assets to bonds and other safer investments may cause interest rates to fall (Barsky, 1989). Although the negative correlation between interest rates and stock prices is not immediate or perfect, it is inevitable in the long run. Interest rates and stock prices can have either a positive or negative relationship, as we have shown above.

1.5.3 STATE OF POLITICS

Share prices in the stock market are among the most responsive to news and shifts in the political landscape. Operators in the stock market are very quick to assess the consequences of developments like shifts in power or party structure or political leaders and personalities at the center or states, or even changes in their cabinets, which could contribute to shifts in share prices. The stock market is extremely sensitive to such shifts; for example, a speech by a statesman at a specific moment could cause share prices to plummet, causing significant losses for many traders within just a few hours.

1.5.4 GLOBALISATION

It also has a major impact on the cost of stocks. Despite the lack of apparent justification from "fundamental" economic considerations, bullish and bearish movements in an economically significant country, like the U.S.A. or Japan, tend to produce similar movements in the rest of the world. The financial sector believes that the real economy elsewhere will be impacted in a similar method at some point in the future (Chaudhuri, 2007).

1.5.5 CONTRIVANCES AND UNFOUNDED RUMORS

Manipulation in the context of the stock market is nebulous at best. It's a simple metaphor for manipulating market pricing. Examples of such tactics are wash sales and matching orders. To increase the value of a security or make it more appealing to investors, one party may engage in wash sales by making false sales to the other. Through shady dealings, one party has made arrangements with another to purchase the stocks at inflated rates. A large number of naive investors could be duped into paying a premium for the stock as a result of these kinds of acts. However, stock markets forbid this kind of trading.

In the same vein, "match orders" describe the action of utilizing two or more brokers to buy and sell the same stock at the same time in order to drive up or down prices. In this scenario, the same man is buying and selling through the accounts of two different brokers who appear to be completely oblivious to the fact that their client has made them contradictory but equivalent orders. Then, once the target price has been maintained, the dealer may be able to realize his goals.

All sorts of rumours can have a significant impact on the stock market. Both bulls and bears try to influence the market by spreading rumours, some of which may have some basis in reality. These rumours can be the result of insiders sharing information or they can be an accurate prediction of what will happen. Usually, people spread them to advance their own agendas, making their origins harder to pin down. The markets clearly saw back and forth in response to khabar that was either true or false, partially true, or primarily false, rather than facts and developments. Such rumours have been responsible for price swings and shifts in market mood (Sonpal, 2006), thus it's important to keep up with the bear-bull fight in the center of the exchange ring.

1.5.6 BUSINESS TRENDS

During a depression, the market as a whole has a predisposition toward apathy, and production as a whole is drastically reduced. Because many less-well-off dealers are forced to sell securities as a result of recurring business losses, a gloomy perspective on the industry as a whole or on any certain industry in particular leads to a broad decline in the pricing of securities. During a boom, however, the value of virtually every

security tends to increase in price. There is a correlation between periods of economic growth and a rise in industrial profits, which in turn leads to a rise in share values. However, unless it also coincides with an increase in the price of finished products, an increase in the price of commodities used as raw materials would likely lead to a decline in share values. Share prices could momentarily fall during a period of rising prices since the cost of labour, equipment, and maintenance rises at this time, reducing the likelihood of higher profits. Security market traders keep a close eye on commodities markets, and the movement of industrial company stock affects their own market outlook (Sorab and Caroline, 1990).

1.5.7 COMPETITION IN THE TECHNICAL MARKET

Share prices are very sensitive to the market's technical condition. When share prices as a whole are stable, speculative interest in a particular stock's price usually means that the price of that stock will begin to rise, barring the intervention of other major factors. When the market is trending upward, many "bull operators" enter the market, buying above their means in the hopes that prices will continue to rise. In the event of even a little drop in price, these operators would be compelled to liquidate their holdings in order to cut their losses to a manageable level. A further drop in prices would result from these sales, indicating that the market is technically weak (Garg, 1950).

When the market is weak and prices have soared to their top, the market tends to crash on the slightest unfavourable development. Sometimes the opposite of what was anticipated happens when an event that was thought to drive up the price of a particular share or shares instead occurs and the price falls. It is a universal truth in the stock market that traders care more about what might happen than what actually does. Bulls and bears fight because of the excitement of the unknown (Dixit, 1986).

1.5.8 INFLATION

It's yet another major consideration when trying to predict the direction of stock prices. Several researchers, including Jaffe and Mandelker, Feldstein, Fama, and Summers, have looked for explanations for the anomaly.

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A change in fiscal policy, a change in monetary policy, or both may be implemented in response to an unexpected rise in inflation by the government or the central bank. Companies' bottom lines may be hurt if the government instituted measures like price controls or altered tariff rates. If the money supply grows too rapidly, the central bank may raise interest rates through open market operations. Since many businesses reduce interest-sensitive capital expenditures in response to a rise in interest rates, the cost of working capital may rise in the short term and cash flow may suffer in the long term. According to the information effect (Jaffe and Mandelker, 1976), stock market responses can be explained by investors' anticipation of actions taken by the government or the central bank. It was found by Feldstein (1980) that as inflation rises, stock prices fall. In other cases, such in India, unsuitable monetary and credit policies are pursued to curb inflation. This artificially tightens the supply of money, which in turn hinders economic activity and distorts the stock market's portrayal of the economy. Stock prices, which are the present discounted values (PDVs) of future after-tax earnings of enterprises, fall when inflation rises because it reduces real after-tax profits. According to Summers (1981), real, physical assets (such owner-occupied housing) have a higher expected return than other investments when inflation is high. In order to rebalance their holdings, investors sell their shares of stock and use the proceeds into other investments. As a result of these shifts in investor sentiment, the value of a company's shares falls. According to the hypothesis put out by Fama (1981), the positive association between stock returns and real factors, which are more fundamental determinants of equity values, is proxied by the negative relation between real stock returns and inflation. He went on to say that the anecdotal evidence of a correlation between stock market performance and inflation being negative is a result of inflation's inverse relationship to real economic activity. In economics, this theory is known as Fama's proxy hypothesis.

Thus, it is clear that low inflation and high valuations have historically had a robust adverse relationship. The reason for this is that low inflation promotes high multiples, while excessive inflation causes low multiples.

1.5.9 OPINION POLLS AND MEDIA COVERAGE

Investor sentiment, or how people feel about a company's present and future, is the primary factor in how its stock price behaves. Press coverage frequently shapes the public's perception. Sometimes one scrip is preferred, and other times the other. A security that has been ignored because of poor interest or a low price may see a sudden and significant increase in demand as a result of public opinion, which would cause its price to climb in direct proportion to the new demand.

The news has tremendous influence on both the general public and the minds of market participants. The stock market reviews that appear in virtually every daily and commercial and economic journal are eagerly anticipated by the dealers because of their potential to alter share prices through fluctuations in public mood. Overpriced security advice arises, and if a reviewer is well-known in financial circles, his judgement can significantly affect the direction of the market (Singh, 2008).

1.5.10 INVESTORS FROM OVERSEAS INSTITUTIONS

In 1992, India's stock markets became accessible to foreign investors. Since then, FIIs' share of the Indian equities market has grown by leaps and bounds, and it is widely held that FIIs, in particular, have a significant impact on the direction of the top Indian stock indices. When this occurs, the stock market in a developing country becomes more liquid. The influx of foreign investors improves market liquidity by increasing the number of potential buyers and sellers. In contrast, institutional investors are expected to cause stock prices to deviate from fundamentals, which will raise the volatility and autocorrelation of stock returns. Institutional investors have been blamed for having a destabilizing effect on stock prices due to herding, positive feedback trading, and contagion (Mazumdar, 2004).

In this way, 'Positive feedback trading' is the primary route by which capital inflows affect market volatility. Fund managers often engage in positive feedback trading, often known as "trend behaviour," in which they prefer to acquire "winner" stocks while selling "loser" stocks. It's a way of talking about how you should invest your money: in a frenzy when the markets are rising and a panic when they're falling. Batra (2003) provides compelling evidence that, on average, FIIs have been constructive feedback

investors. Positive feedback traders may do so for logical or irrational reasons, depending on the investor. Speculators who sell when the market is down and buy when it is rising are seen as destabilizing to the economy. Destabilizing capital flows are a further consequence of such trading, it is suggested, and it also contributes to the volatility of stock returns. This is because equity investors flock to nations with rising stock markets and avoid those with sinking ones (Bohl and Brzeszczynski, 2005).

Herd behaviour is the second way that an influx of wealth might affect the stock market. The term "herding behaviour" refers to the common occurrence of fund managers and investors blindly mimicking the trading strategies of other fund managers without considering their own unique circumstances. Batra (2003) discovered that international investors tend to herd when it comes to India's stock market.

The contagion effect is the third route by which capital inflows can affect stock market volatility. After a shock to a country (or a set of countries), contagion can be characterized as a dramatic increase in cross-linkages. The employment of contagion tactics by fund managers, in which assets are sold in one country when a crisis affects another in the same region, is common. The herd mentality of investors is amplified through the contagion channel. While herding causes money to flow into a certain region, contagion causes fund managers to flee that region when trouble strikes (Dornbusch et al., 2000).

1.5.11 THE EXPLOSION OF DATA

The speed of media has increased dramatically in recent years, as measured by the amount of time it takes to deliver news from the source to the audience. All hours of the day and night, viewers can tune in to one of the many business news channels (Star News, Zee News, CNBC Asia, Jain TV, etc.) to learn about the latest stock market trends. Investors can also get the data thanks to screen-based trading. The minute-by-minute news updates from Reuter and Bloomberg help keep investors informed. The demand for stocks typically rises when there is more coverage of market fluctuations. As a result, market volatility has increased as markets react more rapidly to new information (Bohart, 2007).

1.5.12 SENTIMENT

The stock market is completely responsive to this factor. If the stock market is having a dull day with a downward trend, investors will likely hold off on making any purchases out of fear that something awful must have happened to the company overnight. As a result of this trend, there has been an increase in the number of sellers relative to buyers, which has pushed prices further down. Before the market turns for the better, a transition phase arises during which astute investors with liquidity money come in and buy shares, changing the mood for the better for no apparent cause and causing prices to rise (Dixit, 1986).

1.5.13 STOCK PRICE EFFECTS OF PSYCHOLOGICAL FACTORS

Human behaviour also has a significant role in determining stock values. An excessive appreciation in stock prices might be attributed to greed. In the wake of breaking news, the market might get frenzied, prices may rise, and investors may choose to buy the stock despite its irrational valuation. Stock prices can drop significantly as investors flee in panic, driving down the market. It may have been assumed that competition between experienced professionals, with judgement and knowledge above that of the average private investor, would rectify the vagaries of the uneducated person left to himself," Keynes (1936) wrote on the topic. They worry about how the market will value an asset three months or a year from now because of the effect of mass psychology rather than how much it is worth to a man who buys it "for keeps." As a result, public sentiment affects stock prices. It's a question of mass psychology rather than the individual psyches of millions of people, even the so-called specialists (Simha, 2002).

1.5.14 ANTICIPATION AND PLANNING

The extent to which prices rise or fall depends heavily on the anticipation and insight of market participants. Prices go smoothly from one equilibrium to another if market players properly predict changes in either fundamental factors or other variables, and if the change or projected change occurs gradually. However, when expectations turn out to be too optimistic or pessimistic, or when there is a sudden shift in these elements or expectations about them, prices move erratically rather than smoothly, leading to larger price swings (Black, 1986).

1.5.15 THE MYTH OF THE INTERNET

The Internet has transformed the world into a global village, with limitless commercial opportunity for those who use it wisely. The Internet is a highly skill-driven and volatile industry because of the importance of concepts and ideas. A pioneering idea can be supplanted by a challenger in a flash. The world's financial markets paid no attention to the ephemeral character of the Internet business. The benefits emphasized by the media much outweighed the drawbacks. The made-up excitement about the company's future did not have any solid financial foundation. As a result, businesses were vastly overvalued on the basis of their projected growth, despite the fact that they were incurring massive losses. Investors who didn't know any better poured a lot of money into Internet Stocks, driving up prices for everyone (Chowhan & Shukla, 2007).

1.5.16 PUBLIC POLICY

The Indian stock market is heavily influenced by the government due to the country's commitment to democratic socialism, planned development, and state control of regulation. Share prices are heavily influenced by government actions, which are reflected in things like laws, budgets, industrial policy, foreign trade strategy, foreign aid and investment possibilities, taxation proposals, custom duties, fiscal measures, policy towards multinationals and foreign investment, etc.

1.5.17 BUDGET SET FOR THE WHOLE COUNTRY

The presentation of the Central Budget causes widespread worry among operators. Share prices would react to the psychological effects of a tariff or tax increase. The bears, for instance, argue to themselves and others that the budget can't be as excellent as it seems. The bulls feel a favourable budget is certain, so they buy shares and convince others to do so as well. This sets bears and their allies against bulls and theirs. The stock markets feel more alive and dynamic because of their risk-taking. Costs go up and drop in erratic ways. Whoever has more faith in its forecasts and more nerve in its actions will be the one to move prices in its favour (Thomas and Shah, 2002).

1.5.18 THE IMPACT OF FEEDBACK

According to the feedback theory, as stock prices go up, they tend to keep going up, creating a self-perpetuating cycle. One possible explanation is that as stock prices rise, investor mood improves and more people want to buy the stock, driving up its price. Stock prices have been rising in this cycle, and they continue to do so at a faster rate than would be expected by the Efficient Market Hypothesis (EMH). Even if at first glance this seems ideal, it actually causes a snowball effect and greater market volatility. The hypothesis that stock prices are more volatile when they are falling than when they are rising was tested. It is also observed that the strengths of these feedback loops vary during Bull and Bear markets. During a market run, price volatility was higher than during a bull run, indicating that investors were providing more input at that time (Kundu, 2007).

1.5.19 SPECULATORS

The ratio of Speculators to all other trades also plays a role in the size of swings. Speculators are typically expected to buy up available inventory during periods of oversupply and sell off unwanted items during periods of overdemand. In contrast, if speculators opt to buy when demand is high and sell when supply is high, the demand-supply mismatch will expand, and the magnitude of price volatility will increase. Increases in the proportion of speculators to other traders lead to the opposite effect of what would be expected: speculators have more of an impact on the direction of price changes rather than their magnitude.

1.5.20 TECHNOLOGY

Technology is a clear contributor to market uncertainty. This entails more diverse financial products, faster dissemination of information, and better trading technologies. The quicker markets receive both favourable and bad news, the more responsive they will be. The price alignment that arbitrages produce is easier to take advantage of now that trading technology has advanced. Finally, having a wider variety of financial instruments gives investors additional options for diversifying their portfolios in response to market fluctuations (Dixit, 1986).

1.5.21 SPECULATION BASED ON INSIDE INFORMATION

Companies' promoters and executives sometimes engage in Insider Trading, which is another aspect in the stock market. When this phenomenon takes on a significant scale, it can be disruptive since it causes market distortions. It's also worth noting that company performance data that goes public isn't always accurate. There is a lot of empty flourishes. Falsifying financial statements is another common practice used to attract investors by presenting an inflated picture of a company's health. Corruption exists between auditors and the company's backers and top brass. Recent evidence suggests that these ills are not limited to less-developed nations; rather, they can be found even in those with relatively strong regulations designed to govern the conduct of businesses and investment institutions in the public's best interest (Simha, 2002).

1.5.22 THE ROLE OF OTHER FACTORS

There are a number of other factors, some more significant than others, that can have an impact on the value of a company's shares.

Wars And Other Times of Crisis: The stock market is not immune to the effects of war, which is a period of massive upheaval that inevitably leads to shifts in all aspects of economic life. Fear, whether warranted or not, can have a dramatic impact on stock prices when international politics takes the wheel from business (Sorab and Caroline, 1990).

Environment Conducive to Creativity and Productivity: Share prices have dropped since production has suffered due to regular shortages of raw materials and components. Share prices can also be negatively impacted by factors like a negative outlook for the industry as a whole, as well as specific factors like strikes and lockouts. Another factor limiting output and dragging down share prices is an inadequate and unreliable power supply or coal supply. Share prices decrease when manufacturing is halted because of a lack of raw materials because of transportation constraints like a lack of wagons and trucks. Share prices fall when production and productivity are hampered, but rise when incentives boost investors' faith in the market (Beltratti and Morana, 2004).

Arbitrage: Moreover, it generates uncertainty. To make a profit on price differences, a trader can engage in arbitrage by purchasing and selling an item at the same time, or as close to the same time, as possible. As a result of arbitrage, markets constantly shift prices. As a result, this facilitates the incorporation of new information into existing market pricing. The fact that arbitrage can occur with only the knowledge of a price difference is surprising in and of itself (Sonpal, 2006).

Natural Disasters: Share prices are significantly impacted by natural disasters such as floods, droughts because of failed monsoons, earthquakes, explosions, devastation, and calamity. In the event of the death of a major shareholder who owns a big number of shares, those shares may be sold on the stock market, which would have a negative impact on the price of the company's stock. It's possible that prices in other marketplaces will decrease in unison, albeit this effect may only last a short while (Sorab & Caroline, 1990).

Holidays: In the days leading up to major holidays like Christmas and Durga Puja, productivity tends to drop and the atmosphere around the office tends to be gloomy because the workers are already thinking about taking time off. A huge number of orders build up over the holidays, all of which must be fulfilled on the first day of business. As a result, there is often a high volume of transactions, and prices tend to rise if other conditions are favourable (Dutta and Mahapatra, 2008).

Impact on Technology: The actual prognosis for a company or the market may have little to do with the ups and downs in share price that can occur for a number of technical reasons. Share prices, for instance, often fall down following a robust rally. This occurs because traders lock in profits by selling part of their recently acquired, higher-priced shares in preparation for a possible reversal in the price. This is what the market is doing right now, and investors call it consolidation (Dhankhar, 1995).

Uncertainty: Uncertainty about the future might also have an impact on the movement of stock prices. The unpredictability of the market and the economy can cause prices to fluctuate. Due to uncertainty about the future of a company, stock price fluctuations can occur even in the absence of fresh information (Barua & Varma, 1983).

Market and Competitor Economic Vitality: Company stock prices typically move in tandem with those of other companies in the same market or industry. Many of the world's most prestigious financial institutions place a premium on broad market and industry trends as driving forces behind pricing changes. When the prognosis for one company drags down the demand for other stocks in the same industry, this is called a "contagion effect" (Obaidullah, 1992).

1.5.23 SPECIFICS TO THE ORGANIZATION

Security prices are affected by many different variables, including the quality and credibility of promoters, the competence and professionalism of management, policies regarding financing, investment, and dividend decisions, and the size, earnings per share, and book value of the company. The following is a comprehensive analysis of them.

- **Profit Sharing and Dividends**

Industrial stock prices are based almost entirely on a company's profitability. It is common knowledge that dividend announcements cause a spike in the price of the company's stock, and that this effect is amplified if the dividend is significantly higher than projected. On the other hand, if the company's earnings are expected to decrease, it will not be able to continue paying out dividends at the same rate. It should be noted, however, that when a firm declares a greater dividend than expected, the price of its shares may fall. This is because speculators drive up prices well before dividends are declared, creating an artificial bubble; once the dividends are announced, the bubble bursts and speculators sell off their holdings in a frenzy to cash in on their profits, potentially causing prices to drop (Bodla and Turan, 2005).

Therefore, the value of a company's stock fluctuates in tandem with its earnings and dividend announcements, and the value of those shares is likely to plummet if the dividend is limited by legislation. The Finance Members made a public statement in the Assembly saying, "Government was considering the question of restricting of the dividends accompanied by provision of compulsory savings," and this came to pass. This had a direct impact on equity share prices as operator morale was lowered,

holdings were liquidated, and the market as a whole experienced a precipitous decline in value (Dutta, 2004).

- **Variation in Corporate Capital Structure**

During times of economic expansion and contraction, share prices rise and fall in tandem with the broader market. A change in the company's capital structure, such as an increase in the share capital, the issuance of bonus shares, the issuance of new debentures, the redemption of existing debentures, the conversion of partially paid shares into fully paid shares, etc., can buck this trend. The market could react differently depending on which capital restructuring program is implemented. The issuance of new debentures, for instance, is seen as a sign of weakness by the Indian investing public, and stock exchange operators believe that the company will not be able to keep paying out its previous level of dividends because so much of its cash flow will go toward paying interest to debenture holders. However, in times like these, people tend to overlook the fact that a company that is already doing well may require additional funding to take it to the next level, at which point it may be able to give its shareholders higher dividends (Garg, 1950).

When a company pays off its debts through the redemption of debentures, it is seen as a positive development because the company will have more money available to distribute to its shareholders in the form of dividends because it will no longer be responsible for paying interest on debentures. Therefore, an increasing trend in share prices would be expected during these periods.

- **Possession Changing Hands**

Share prices are volatile whenever there is a change in the ownership or management of a company. Alterations to a firm's Board of Directors can have far-reaching effects, including on the share price of the company in question. If a member of the Board who is both responsible for and important in the company's operations passes away, it could have a negative effect on the stock price. Share prices can fall if shareholders start to doubt the company's financial soundness because of high turnover in the Board of Directors (Grewal, 2000).

- **Price Movements Due to the Granting of Bonus and Rights Stock**

When a corporation distributes bonus shares, it boosts the value of its stock. The anticipation of a bonus issue generates an upbeat mood and inspires investors to dream of rapid price increases and increased dividend payouts. Companies that give out bonus shares are seen as having promising futures by investors. These market forecasts are grounded in reasonable assumptions. It is not common practice for companies to issue bonus shares unless they are both certain that their future growth will warrant an increase in their equity base and that they will be able to sustain the dividend rate on the increased equity capital resulting from the bonus issue (Gupta, 2006).

Rights shares are typically offered at a little premium or at par value. Always, their prices are drastically lower than the current market average. Rights shares are generally warmly appreciated by the market and exert an upward pressure on the share price of a firm if they are issued only to the existing shareholders and if they are priced carrying just a minor premium. The shareholder can grow his shareholding in a firm through a rights issue at a cheap cost and without changing his ownership stake in the business. The motivations behind a rights issue are also a factor in determining how appealing it will be. When a corporation issue shares to the public in order to raise capital for growth, investors and stockholders alike might expect a positive reaction. However, if a firm issues rights to raise capital in order to improve its working capital, cover unforeseen expenses, or get by in the face of tight credit and money conditions, the move is unlikely to be warmly regarded by investors (Wei and Zhang, 2006).

- **Profits for Business**

Investors are influenced by a company's financial performance. Companies that do well in the marketplace tend to get the attention of more potential shareholders. However, if the companies aren't successful, shareholders may dump their holdings on the open market. An oversupply of a commodity causes its price to fall, thus if many people decide to sell at once, the market will be flooded with shares at a lower price.

- **Profits from The Stock Market**

Stock prices are not a reliable indicator of a company's value. It's not the stock price per se that matters, but rather the market cap of the company. To determine a company's value, or market capitalization, we multiply the stock price by the number of outstanding shares (Malakar & Gupta, 2002).

- **Ratio of Price to Earnings**

The Price-to-Earnings ratio (P/E) provides a rough estimate of how the share price of a firm relates to its earnings. If the stock's price is significantly lower than the company's earnings, it is undervalued and may see price increases in the near future. However, if a stock's price is significantly greater than the company's real earnings, it is considered overvalued and its price may decline at any time (Laxmi, 2006).

- **Business Updates**

The manner that investors evaluate company news also has a significant role in determining share prices. A press release with positive information about a firm can boost its stock price, whereas one with bad information can destroy its value. For instance, if a company issues a caution that business circumstances are difficult, the value of its stock usually falls. However, if a director makes a stock purchase, it could be indicative of rising confidence in the company's future.

Stock market fluctuations can be attributed to a number of factors, including but not limited to: rising interest rates, high inflation fuelled by firm global crude oil prices, a slowdown in the economy and in corporate earnings, fluctuations in currency markets, a slow pace of economic reforms, political instability, a crash in asset prices generally, political tension, and the possibility of terrorist attacks. Political, economic, social, and, most crucially, psychological variables can all influence the direction of the market. Uncertainty about the level of prices, the risk-free interest rate, the risk premium on equities, and the ratio of predicted profits to revenues are the four factors identified by Binder and Merges (2000) as drivers of stock market volatility. Shiller (1987) found that changes in dividends, real interest rates, and a direct measure of intertemporal marginal rates of substitution all reflect shifts in the genuine investment value of the aggregate stock market. Kaur (2004) believes that the market capitalization of a firm,

the leverage of the corporation (including financial and operations leverage), the leverage of the individual, and the state of the economy are all elements that contribute to the volatility of the stock price over the long term. Short-term influences include things like traded volume, news and noise trading, etc., and volatility is greater for stocks of smaller companies. They don't trade as often or for as much as high-cap businesses, therefore their stock prices are far lower. Specifically, Rao (1997) observed that budgets exacerbated market portfolio volatility. Macroeconomic variables such as industrial production, the disparity between long and short interest rates, and expected and unexpected inflation all have an impact on the stock market, according to research by Chen et al. (1986).

1.6 CONTROLLING STOCK PRICE VOLATILITY WITH REGULATORY MEASURES

The Securities and Exchange Board of India (SEBI) has implemented measures like margin requirements, price caps, circuit breakers, and transaction charges to reduce market volatility.

1.6.1 MARGINS

Margin requirements are the first deposits made by traders to cover their stock market risk. Default risk and, by extension, systemic risk can both be reduced with the use of margins. Margin impacts market efficiency and liquidity. Margin requirements are a form of transaction cost for traders since they prevent them from making use of otherwise available funds. As a result, market liquidity is reduced and transaction costs are greater than they would be otherwise. Market price efficiency is reduced and information-based speculators are deterred by the higher transaction costs. Positively, the higher transaction costs may lead to less reckless, uninformed speculation. This is expected to reduce price volatility, which is a goal of regulators (Hseih and Merton, 1990).

1.6.2 COST RESTRICTION

Futures contracts are typically the setting for price caps. Except for the stock markets in India and Japan, they are hardly employed anywhere else. Limits on the day's trading

price can prevent purchases and sales outside of a predetermined band around the previous day's close. Invalid orders outside this window will not be processed. Although trading is restricted to within the aforementioned parameters, the market is not formally closed. Putting a limitation on daily price increases helps reduce default risk. However, the profit potential of time-sensitive knowledge is diminished when prices are capped. As price controls limit the trading techniques of information less speculators, they too would prefer a world without them. Price discovery is slowed down, and traders can't enter or leave the market at will if there's a risk of a market breakdown (when price limits are reached). A market with price ceilings is less appealing because of the reduction in liquidity. Limits on prices are used by regulators to prevent an excessive response to news events (Anshuman and Subrahmanyam, 1999).

1.6.3 OVERLOAD PROTECTORS

The stock market is where you'll typically find circuit breakers in operation. When order imbalance circuit breakers are tripped, markets are unable to clear without substantial price shifts. In order to prevent a total system failure because of a buildup of operational backlog, volume-induced circuit breakers are employed. Finally, price-induced circuit breakers are activated when price shifts exceed a predetermined threshold. Like price controls, circuit breakers can have an impact. Trading must be suspended explicitly when a circuit breaker is activated, unlike with price limitations. The primary goal of circuit breakers is stability regulation. Some argue that a temporary halt in trading gives participants time to "cool down" and make more objective decisions about the situation (Singh, 2008).

1.6.4 TAXES ON BUSINESS TRANSACTIONS

In addition, transaction taxes have the potential to reduce market uncertainty. The intention of this tax is to tame the 'wild' (i.e., uninformed) speculative appetites of investors. However, since it is hard to tell a buyer from a seller, the transaction fees for all buyers and sellers will rise. Because of this, market liquidity deteriorates and price discovery is hampered. Transaction taxes, in contrast to the other measures, may not have much of an impact on default risk (Umlauf, 1993).

All four measures of regulation can theoretically reduce volatility. Comparison of price limitations and circuit breakers with margins and transaction taxes reveals that the latter do not lead to a breakdown in the market. The extent to which information less speculative traders dominate stock markets will determine the effectiveness of these strategies in lowering price volatility. The reaction of noise traders to a new regulation is also crucial to the effectiveness of these efforts. The market liquidity and price efficiency are both negatively impacted by all of the regulatory actions. Thus, reducing volatility, changing liquidity, and promoting pricing efficiency all come with their own costs and benefits.

1.7 NIFTY 508

The NIFTY 50, which used to be called CNX NIFTY until November 9, 2015, is the most important index on the NSE. NIFTY 50 is for India's CRISIL and NSE. The India Index Services and Products Ltd (IISL) is what both groups use to handle the index. IISL is India's first and only company that focuses on an instant product index. NIFTY was found by looking at 50 stocks. NIFTY 50 used the free-floating market capitalization method, where the index ratio shows a rough idea of how much stock was traded on the exchange compared to the previous time, which started on November 3, 1995.

It can be used for many things, like index funds, benchmarking funds, and assets based on an index. Based on research into the economy, the NIFTY 50 is made so that people can buy in and trade Indian stocks. NIFTY 50 is a broad index that accurately shows the whole business. The NIFTY 50 has a better reward-to-risk ratio than other top indexes, so it gives similar returns with lower risk. The simple chance of the NITY 50 happening in the future is lower than the chance of most other index portfolios, NIFTY 50 member shares, and NSE liquidity.

Additionally, the NIFTY 50 is more closely linked to standard Indian portfolio investments compared to other indices. The use of these two factors makes index trading possible. It's easier to tell how liquid stock is by looking at the business benefit cost. When trading an index, it shows costs properly. An investment must constantly

have market effect costs below 0.50 percent in order to be included in the NIFTY 50. The minimum amount to trade in the NIFTY 50 is ₹2 crores.

1.8 OBJECTIVES OF THE STUDY

The following are the goals of the current study:

- To research the volatility tendencies in the Indian stock market.
- To investigate the variables that affect stock price volatility.
- To research how volatility and stock price behaviour interact.
- To arrive at a model of stock market volatility.
- To investigate the Bank Nifty volatility.

CHAPTER - 2

REVIEW OF LITERTAURE

2.1 OVERVIEW

A literature review is an in-depth analysis of relevant published works in a given field. It's a must-do for any serious study. The planned study is contextualized in this document. In it, the most important theories, arguments, topics, procedures, and approaches to a study topic are outlined, compared, contrasted, and evaluated. It is more than just a list of sources consulted or a brief synopsis of the topic's background history.

The purpose of a literature review is to determine whether or not previous research on a topic is relevant to the current study by analysing and assessing the work of previous scholars. The review is useful for pinpointing where more research is needed. It's also a good opportunity to talk about the many research methods that have come before and how they relate to the one you've settled on.

The following groups of studies have been identified as representative of those that should be reviewed:

- The research of share price fluctuations.
- Research into the links between stock prices and broad economic indicators.
- Research on the factors affecting stock prices and individual companies.
- Analyses of a variety of additional influences on the stock market.
- Research into the correlation between market uncertainty and investment returns.
- Research into conditional stock market volatility modelling and forecasting in India.

2.2 VOLATILITY IN THE STOCK MARKET RESEARCH

Dash et al. (2011) Investigated the relationship between market crashes and seasonality in monthly stock market returns in India. The seasonality of stock market returns and the effect of market collapses were evaluated using dummy variable multiple linear regression. The research shows that there is a yearly pattern in the performance of the

Indian stock market, with favourable effects in November, August, and December and negative effects in March. The study also indicates that seasonal effects are mitigated by market crashes.

Singh et al. (2010) The historical volatility of the CNX S&P Nifty and the Nikkie 225 stock markets of India and Japan. They furthermore made an effort to learn how changes in Treasury bond rates will affect insurance firms in Japan and financial institutions in India. The secondary data investigation was purely descriptive. Financial institutions and insurers were selected using a purposeful sampling strategy. Nikkie225's 8 insurance firms and NSE CNX S&P Nifty's 15 banking institutions made up the sample size. Stock market volatility was analysed for both the Indian Nifty and the Japanese Nikkie225 markets. The Nikkie225 stock market was determined to have a high frequency of volatility.

Sinha (2007) Studied stock market fluctuations from 1985 to 1999 in 13 different economies, including India. The Asian markets, he concluded, are more prone to wild swings than their Western counterparts. The year 1987 saw the most volatility in the developed markets. With the exception of India and Chile, 1997 was the most volatile year for emerging markets. The Indian stock market showed the most volatility in 1992, when widespread financial irregularities had a devastating effect on the economy.

Porwal and Gupta (2005) Similarly looked at the question of stock market volatility in India. The study uses S&P CNX Nifty's daily closing prices from 1995–2004 as its data source. Specifically, they highlighted the fact that 1996 was the most unsettling year of the last decade. The lack of effective regulation and political stability are to blame. More importantly, they demonstrated that the impact of increased investment by FIIs led to a rise in volatility in 2004.

Chowhan and Shukla (2004) Examined the burning issue of volatility in the Indian stock markets. They studied fundamentalist view put forward by economists who argue that volatility can be explained by Efficient Market Hypothesis. They also tested that volatility is caused by psychological factors. They found that no fundamental factors emerge for the existence of such high volatility and perceptual factors have led to this mad rush for stocks leading to volatility.

Karamakar (1993) Analysed data on stock market volatility during 1935–1992. He mainly worried about two things: (a) whether or not the recent volatility in the stock market is an indication of a more general tendency, and (b) whether the current trend in share price movement is likely to hinder the development process of the economy. His research revealed that out of a total of 25 turbulent months, just two occur during the relatively peaceful era of the 1960s and 1970s. The Indian stock market experienced its greatest volatility and rate of change in 1992, making it the most recent and exciting year of the 1990s.

Schwert (1989) Used daily data from 1885-1988 to examine the behaviour of stock return volatility. The stock market meltdown in October 1987 was unprecedented in many respects. On October 19, the market experienced its greatest percentage drop in over 29,000 days. Volatility in the stock market rose sharply before, during, and after the collapse. However, it reverted to more normal, lower levels far faster than had been anticipated based on historical precedent. He confirmed this finding with information derived from the prices of call options and estimates of volatility derived from futures contracts on stock indices.

Poterba and Summers (1984) Explored the possibility that stock market volatility changes could affect stock market prices. This finding suggested that volatility shocks do not last long because of the limited serial correlation between individual episodes of volatility. Since variations in volatility only alter predicted necessary rates of return for short times, the effect of these shocks on stock market prices can be minimal. Based on our research, we find it hard to believe that volatility-induced increases in risk premia can account for the 1970s bear market in the stock market.

Schreder (1962) The stock market experienced its highest level of overall commercial activity ever in 1961. He looked into the possibility that this pattern will hold true for the first half of 1962. He made a few predictions about the stock market, the most notable of which are

- Business was still at its peak of the cyclical upturn;
- Business expansion was nevertheless supported by the bank's credit position and policy.

- A continuation of the sharp uptick in profits and dividends, especially in cyclical or fundamental industries; and
- Investors' unwavering faith in long-term inflation and their conviction that carefully picked common stocks remain the best hedged strategy of attaining long-term growth of capital and income have contributed to the market's continued bull run.

2.3 EXAMINATIONS OF THE CONNECTIONS BETWEEN THE STOCK MARKET AND MACROECONOMIC FACTORS

Stock market reactions to news of changes in monetary policy, real economic activity as measured by Gross Domestic Product (GDP), industrial production, foreign institutional investment, inflation, interest rate, and the federal budget have been the subject of much study. Media outlets frequently attribute small, day-to-day fluctuations in stock prices to the impact of news about the economy. When unemployment numbers are bad or inflation numbers are good, commentators will often say that the stock market responded negatively or positively, respectively. (Roley,1985).

The following is a summary of the available empirical research regarding the reaction of markets to monetary events:

- Market Participation by FIIs
- Inflation and the Stock Market
- The Stock Market and Interest Rates
- Centralized Stock Market and Budget.

Many studies have investigated the impact on stock prices of news about the economy as a whole, including interest rate and inflation announcements, as well as disclosures and projections of macroeconomic aggregates.

- **MARKET PARTICIPATION BY FIIs**

There are two primary schools of thought in the literature regarding the connection between FIIs' investments and the stock market, and they are diametrically opposed to one another. One school of thought holds that the introduction of FIIs increases volatility in the stock market because they enter the market to profit and then withdraw

their money, while another school of thought holds that the introduction of FIIs improves information flow, which in turn improves investment options for investors and brings transparency to the market. Here are a few of the most significant studies:

Kumar and Raju (2011) Conducted an analysis on the relationship between Foreign Institutional Investor (FII) flows and the returns of different indexes on the National Stock Exchange. The researchers utilized daily data for the variables spanning from 2000 to 2009. The findings suggest that there is observable evidence of positive feedback trading within the Indian market, specifically in four specific indices: Bank Nifty, CNX Midcap, CNX Nifty Junior, and S&P CNX 500. These indices were selected among a total of fifteen indices that were examined. It has been observed that Foreign Institutional Investors (FIIs) play a dual role in the stock market, acting as both causal agents and being influenced by stock returns.

Sujit (2010) VAR analysis was used to observe the connection between FIIs and the Indian stock market. The research looked at the Indian stock market using two key indices—the BSE Sensex and the NSE Nifty—from November 1, 2007, to November 21, 2008. The research showed that Sensex influences FII in both rising and falling markets. Stock returns are discovered to have a positive feedback strategy and a return chasing tendency, both of which can be used to forecast the movement of FIIs.

Ray (2009) Investigated whether or not foreign institutional investors (FIIs) net investment affects the equity return in the Indian stock market. Using daily data between January 2006 and June 2008, he examined the correlation between FII and BSE stock returns in India. The time series data under consideration for this investigation has had its Stationarity checked using the Augmented Dicker Fuller (ADF) test and the Phillips-Perron (PP) test. According to the Granger Causality test, FII investments tend to generate increases in stock prices.

Gangadhar and Reddy (2008) The impact of foreign institutional investors on the stock market's liquidity and volatility was analysed by tracking both market capitalization and stock indexes. Liquidity and volatility were found to be significantly affected by FII flows, and a strong link was discovered between FIIs' investments and market capitalisation.

Tripathy (2007) Conducted a study to analyse the interplay between the stock market, market capitalization, and net foreign institutional investor (FII) investments in India from June 2002 to June 2005. The researcher employed the Granger Causality Test and Vector Auto Regression Model as analytical tools for this investigation. The findings suggest that there exists a one-way causal connection between market capitalization and the stock market, as well as between net FII investment and the stock market. Once more, the VAR analysis demonstrates that there is a significant relationship between stock return, market capitalization, and net FII investment in the anticipated direction within a limited timeframe.

Mohan (2006) The infusion of foreign direct investment (FDI) into the Indian stock market has had positive effects across the board. They boosted capital flows at a period when the Balance of Payments was precarious. They lowered the cost of accessing international money for Indian businesses, making it more competitive with the domestic cost of capital. Both the functioning of securities markets and corporate governance were significantly altered as a result of these changes. There are no systemic concerns associated with volatility in FII flows, he added. The study suggests that the benefits of FII flows can be driven without having to deal with the uncertainties produced by the Participatory Notes (PN) component, which is the main drawback of FII flows. The costs of sterilizing associated with dealing with potentially volatile FII flows can be reduced or avoided altogether by eliminating the uncertainties that come with PN.

Bohl and Brzeszczynski (2005) Offered empirical proof of the effect of institutional investors on the fluctuating dynamics of the Polish stock market's results. The data, however, does not back the claim that large investors like pension funds and insurance companies have caused stock prices to become unstable. It is plausible to view the findings as evidence that institutional trading has a moderating effect on index stock returns. As a result, it is not necessarily true that institutional traders destabilize stock values through herding and positive feedback trading.

Batra (2003) Looked studied FIIs' trading behaviour and returns in India's stock market using daily and monthly data. For this, he relied on the BSE Index, and he examined data from 1979 all the way through 2002. To determine whether part of FII flows—purchases, sales, or net flows—most significantly affects stock market returns, he looked at all three parts. His research showed conclusively that FIIs followed trends and used positive feedback trading tactics. But he didn't think it would have a disruptive effect on the stock market.

Chakrabarti (2003) Using monthly data, conducted an empirical study to determine the connection between FII flows and equities returns in India. He presented data showing a strong relationship between FII inflows and Indian stock market returns; nevertheless, this connection does not prove that FII inflows cause India's equities market to rise in price. According to his research, before and after the Asian financial crisis, FII flows were inversely related to the Indian market's beta in relation to the S&P 500 Index.

Mukherjee et al. (2002) Used a daily data-set covering the period from January 1999 to May 2002 to investigate the correlation between FII flows and potential variables in the Indian equities market. Covariates, or "any two or more random variables exhibiting correlated variation," can take two forms, and both are taken into account here. Measures of co-movement of returns in local and international stock markets (viz. relevant betas) and variables indicating daily market return and its volatility are examples of the first category. Foreign investors' expectations of future returns in India's stock market are susceptible to changes in a second set of factors, those of a macroeconomic nature such as the exchange rate, short-term interest rate, and index of industrial production (IIP). They discovered that returns from exchange rate variance and the fundamentals of the Indian economy may have influence on FII decisions, but such influence does not appear to be strong, and that returns from the Indian equity market are clearly a major factor that influences FII flows into the nation.

Rao et al. (1999) Researched the mature market using information gathered over the course of eight years (1990–1998). They hypothesized that FII investments would benefit stock markets in two ways: directly, by attracting a larger pool of investors, and indirectly, by putting pressure on regional governments to upgrade their trading

infrastructure. They looked at the trading patterns at the BSE and the investment exposure of five India-focused funds based in the United States and found striking similarities. They reasoned that because of this data, net FII investment must have some effect on Indian stock prices.

Sellin (1996) Studied the connection between a price index for Swedish stocks and the net purchases of Swedish stocks by overseas investors and discovered that such purchases have short-term price effects on a relatively tiny stock market. Foreign investors' net purchases of stocks appear to produce some excess volatility in the market and, on average, look like noise trading.

Josef et al. (1991) Provided empirical support for the existence of herding and trend-chasing behaviour among institutional money managers. Contrary to popular belief, their findings did not yield conclusive evidence suggesting that institutional investors significantly disrupt the stability of individual stock prices. Rather, their research revealed a nuanced perspective wherein institutional investors adopt diverse styles and strategies, resulting in a balancing effect on market prices through offsetting trades.

- **INFLATION AND THE STOCK MARKET**

Many economists and financial specialists have studied the correlation between inflation and the stock market. Many researchers [e.g., Litner (1975), Bodie (1976), Fama (1981), Cohn and Lessard (1981), Gultekin (1983), Geske and Roll (1983), Solnik (1983), and Kaul (1990)] have used regression analysis to examine the impact of expected and unexpected inflation on stock returns. Different countries and time periods have revealed similar evidence of a negative link between stock return and inflation. The correlation between stock returns and inflation in India has been studied by researchers including Mayya (1977), Barua and Raghunathan (1982), Prabhakaran (1989), and Rao and Bhole (1990) across multiple time periods between 1953 and 1987. They came to the conclusion that there was little to no protection from inflation in the form of stock market investing in India. Inflation research includes the following:

Mishra and Singh (2011) Looked at whether or not macroeconomic factors drive the Indian stock market. Using monthly observations from 1998-2008 and a non-parametric test, they sought to identify any variables that showed a non-linear relationship with stock returns and the variability of stock returns. They looked at the impact of macroeconomic parameters such the interest rate, the exchange rate, industrial output, inflation, and foreign institutional investments. In addition, they used a semiparametric method to examine the impact of the macro variables on stock returns and the volatility of stock returns, looking for nonlinear effects. According to the findings, the stock returns and volatility are better explained by the semi-parametric method than by the Ordinary Least Square (OLS) method.

Shehu (2010) Utilizing monthly time series data from two West African nations, Nigeria and Ghana, we tested the impact of inflation on stock market returns and volatility using the generalized autoregressive conditional heteroskedasticity (GARCH) model. Poor news has a more negative impact on stock market volatility than good news of the same magnitude, according to the results, but the converse is true in Ghana. Stock market volatility was also found to be significantly impacted by the inflation rate and its three-month average in the two nations. Therefore, it stands to reason that measures taken to rein in inflation in the two countries would have a positive effect on stock market volatility, return, and investor confidence.

Habibullah et al. (2009) Stock market returns and volatility were studied in India, Japan, Korea, Malaysia, and the Philippines to determine the effect of inflation and GDP growth. Weak predictive potential for stock market returns and volatility has been discovered for macroeconomic volatility, as defined by movement in inflation and production growth, using monthly data from 1991 to 2004 using the GARCH (1, 1) model. Stock market returns are very sensitive to inflation rates and their fluctuations, which can have both a positive and negative effect on the economy as a whole. The conditional volatility of stock returns is positively correlated with countries with relatively higher output volatility, but negatively correlated with countries with relatively lower output volatility. This is despite the fact that fluctuations in output growth have a substantial impact on stock market volatility.

Bordo et al. (2008) Investigated the link between inflation, monetary policy, and the performance of the U.S. stock market in the second half of the twentieth century. To investigate the impact of macroeconomic and policy shocks on the stock market's performance, they estimated a latent variable VAR. In addition, they looked at how different shocks affected market conditions at different times and found that inflation and interest rate shocks had an especially large impact on markets in the post-war era. The market would surge in response to a disinflation shock, and it would crash after an inflation shock. They came to the conclusion that central banks can help maintain order in the financial markets by keeping inflation fluctuations to a minimum.

Saryal (2007) Conditional stock market volatility was estimated using GARCH models with monthly data from Turkey and Canada. In addition, he analysed the effect of inflation and discovered that in Turkey, the rate of inflation has a strong predictive potential for stock market volatility, whereas in Canada, it is weaker but still substantial. That is, he found that inflation rates go up in tandem with stock market risks, suggesting that higher inflation rates are associated with more market volatility. These findings hold true even when conditional volatility is predicted by looking at the rate of inflation change as an explanatory variable.

Knif et al. (2003) Examined the effects of inflation news on the stock market as a whole by categorizing inflation announcements into positive, neutral, and negative shocks, looking at the impact of inflation on the market on a daily and monthly basis, and establishing economic states based on shifts in the levels of industrial capacity utilization. Their findings show that markets react strongly to both positive and negative inflation shocks in the month after the event, while responding more modestly to neutral inflation shocks. They came to the conclusion that stock market reactions to inflation shocks vary widely across economic conditions and inflation shock types. They also found evidence that stock market overreactions can be caused by inflation shocks.

Henry (2002) Estimated that nations with annual inflation rates of over 40% would see a 24% increase in real dollar stock market valuations if they implemented currency stabilization measures. Contrarily, when the inflation rate before stabilization is less than 40%, the typical market reaction is zero. These findings imply that at high inflation rates, the long-term advantages of stability may outweigh the short-term costs, whereas

at low to moderate inflation rates, the gains may be negated by the costs. Responses in the stock market can be used as a predictor of inflation and output one year after each of the 81 stabilization efforts.

Adrangi and Chatrath (1999) Looked into the growing markets of Peru and Chile and the correlation between actual stock returns and inflation. This analysis focuses on Chile between January 1985 and December 1995, and Peru between January 1990 and March 1996. The hypotheses are tested empirically within the framework of Fama's proxy hypothesis, which holds that (i) inflation and real activity are negatively correlated, and (ii) real stock returns are positively correlated with real activity.

Kaul (1990) Looked at how shifts in monetary policy affected the correlation between stock returns and shifts in inflation forecasts. There is a direct connection between these relationships and the operating aims (i.e., money supply or interest rate) of central banks, as shown by post-war evidence from four countries (the United States, Canada, the United Kingdom, and Germany). It is during interest rate regimes, as opposed to money supply regimes, that the negative associations between stock returns and increases in predicted inflation are substantially stronger after the war.

Rao and Bhole (1990) Investigated the link between ROE and price inflation in India. From 1933 to 1987, real rates of return are collected for each individual year and for all holding periods of three years or more. Equities were found to produce a positive real rate of return over longer time periods, while short-term real returns were typically negative, especially during periods of high and unusual inflation. According to the results of a simple regression study, the nominal return on equities in India rose, but not in direct proportion to the rate of inflation. These results are consistent with using either the wholesale or consumer price index to measure inflation.

Rao and Bhole (1990) Looked into the correlation between India’s equity returns and the country’s inflation rate. Between 1933 and 1987, we calculate the real rate of return for every single year and every single multi-year holding term. Equity investments were found to produce a positive real rate of return over longer time periods, while short-term real returns were typically negative, especially during periods of high and unusual inflation. According to the results of a simple regression study, the nominal return on

equities in India rose, but not in direct proportion to the rate of inflation. These results are consistent whether inflation is tracked by changes in wholesale or consumer prices.

Gultekin (1983) Studied the correlation between post-war common stock returns and inflation in twenty-six different nations. Fisher's hypothesis, which argues that real stock returns and expected inflation rates are unrelated and that nominal stock returns vary in a 1:1 relationship with expected inflation, was disproved. Stock market profits did not correlate positively with inflation in the majority of countries.

Solnik (1983) Presented data from actual stock market transactions for nine nations throughout the time frame of 1971-1980, relating stock price movements to inflationary expectations. For all of the world's most important stock exchanges, the Fisherian premise that real returns are unaffected by inflationary expectations is falsified. Data consistently supports the main hypothesis of the Geske and Roll model, which holds that stock price changes reflect (negative) revisions in inflationary expectations as measured by interest rates. Last but not least, a minimal impact of real interest rates was discovered for several of these countries.

Cohn and Lessard (1981) The inflationary impact on eight industrialized nations' business profits and stock values from 1969 to 1979. They estimated two models, one using reported earnings (which are prone to noise) and the other using fully adjusted earnings (which are not prone to noise). They looked at data from a variety of nations and found that falling nominal interest rates and rising inflation were correlated with falling stock values. It was challenging for academics to attribute these findings to a particular theory about investor behaviour. Stock prices fall as inflation causes companies to make less money after taxes.

Firth (1979) Evaluated the correlation between inflation and stock returns in Great Britain between 1955 and 1976. U.K. wholesale pricing (WPI) and the monthly IRP were used. The outcomes were the same for both data sets. For the entire study period, the regression coefficients were positive and statistically significant, showing that investors received returns in excess of the rate of inflation. Over the longer time span, however, from 1935-1976, the regression coefficient was very near to zero, making it statistically insignificant. The research showed that, in the United Kingdom, models based on freely available inflation data cannot produce above-average returns.

Mayya (1977) looked into stock price fluctuations to determine whether or not buying stocks is a good way to protect one's wealth from inflation. From April 1961 through November 1973, data were collected. After noting that stock values fell during certain inflationary years and rose during others, he concluded that stocks are not a stable inflation hedge. Gold and silver investments, the classic kind of "frozen investment," have historically been a safer option than stock market investments.

- **THE STOCK MARKET AND INTEREST RATES**

Following is a selection of research on the correlation between stock market performance and interest rates:

Muthukumaran and Rengasamy (2011) It was calculated by Muthukumaran and Rengasamy (2011) that some economic variables, such as inflation and interest rate, cause equity returns. From April 2005 to March 2011, a total of 72 months of data were used. The research accounted for 91-Treasury bills and the Wholesale Price Index (WPI) as macro factors. Using the Granger causality method, the authors of this article show that there is a correlation between several macroeconomic indicators and stock market returns, both in the short and long term. However, it was shown that stock returns were influenced by interest rates and not the other way around. Last but not least, the Vector Error correction model proves that all economic variables in India have a considerable impact on stock market outcomes. Thus, the study provided empirical proof that macroeconomic variables exerted a substantial effect on Indian stock markets during the study period.

Chakradhara (2008) Studied the dynamics of the link between interest rates and stock prices in India between April 1996 and June 2006, with special attention to the direction of causality. When gauging stock performance, investors typically look at the BSE Sensex and Nifty's monthly averages. Rates of long-term and short-term interest are proxied by the yields on 10-year government securities and TB-15-91 at the end of each month. Long-term interest rates do correlate with stock values, he discovered. Prices of stocks are influenced by interest rates, both long and short term. There is a negative relationship between long-term interest rates and stock prices, while there is a positive relationship between short-term interest rates and stock prices. When interest rates shift, the Sensex reacts more quickly than the Nifty.

Leon (2008) We used weekly KOSPI 200 returns and the NCD 91-day yield between January 31, 1992 and October 16, 1998 to analyse the impact of interest rate changes on the performance of the Korean stock market and its volatility. These connections are probed using a GARCH (1,1) model with interest rates, with the error terms assumed to follow a student's t-distribution. It was discovered that there is a negative and statistically significant relationship between interest rates and the conditional market return, while there is a positive but not statistically significant relationship between interest rates and the conditional variance of returns. Interest rates were found to have a modest predictive power for volatility but a substantial positive power for stock returns.

Scharler (2004) Examined the general equilibrium model's response of stock market returns to monetary shocks. According to the model, shifts in interest rates and dividend yields are the primary channels via which monetary policy shocks are reflected in stock prices. The opportunity cost of stock ownership rises as nominal interest rates rise due to monetary contraction, and dividends fall as businesses borrow less money for working capital. The stock market suffers from the combined effects of these two factors. The results show that the model produces responses that are mostly consistent with their empirical equivalents, albeit with slightly too small magnitudes. In addition, the results imply that the greater vulnerability of bank-dependent enterprises to liquidity shocks cannot entirely account for the observed varied reactions of returns.

Binder and Merges (2000) Data collected monthly from January 1929 through April 1989 were analysed to determine if there was a correlation between economic factors and stock market volatility. They created a basic model of the economy in uncertain times that correlates four economic variables with market volatility: the unknown level of prices, the risk-free interest rate, the risk premium on equity, and the ratio of predicted profits to revenues. Early analyses show that these variables have high explanatory power, explaining more than half of the variance in market volatility between 1929 and 1989. Over 90% of market volatility is explained by these four factors when cluster regression coefficients are permitted to change over time. These findings have implications for both understanding and predicting volatility in the stock market in the future.

Titman and Warga (1989) Looked at the idea that stock returns can help predict future shifts in inflation and interest rates. It was discovered that stock returns reliably predicted future inflation and interest rate fluctuations. When compared to a wide market index, real estate investment trusts, which are highly sensitive to interest and inflation, produce more accurate projections. Lastly, they determined that the period from October 1979 to October 1982, during which the Federal Reserve Board decided not to offset interest rate movements, provided the most evidence in favour of the predictability of stock returns.

Shiller (1987) Noticed that changes in dividends, real interest rates, and a direct measure of intertemporal marginal rates of substitution all affect the underlying investment value of the aggregate stock market. The research looked at stock price fluctuations in the United States from 1871 to 1986 and found that dividend increases seemed to contribute relatively little to justifying that variability. Some of the price volatility in the stock market can be attributed to the other signs, but much of it remains mysterious.

Chen et al. (1986) Explored the hypothesis that innovative moves in macroeconomic variables constitute market-rewarding risks. Stock market returns should, according to financial theory, be affected by the following macroeconomic variables: the difference between long and short interest rates, expected and unexpected inflation, industrial production, and the difference between high- and low-grade bond yields. They discovered that these potential dangers had high prices attached to them. In addition, there is no disaggregated pricing of the market portfolio or total consumption. They also discovered that the stock market does not provide a premium for taking oil price risk.

Flannery and James (1984) Studied the impact of interest rate changes on the firm's stock price and how it relates to the maturity profile of its nominal contracts. The results of this study, which uses a sample of publicly listed commercial banks and stock savings and loan associations, indicate that the return on common stocks is connected with movements in interest rates. The larger the maturity gap between the firm's nominal assets and liabilities, the more closely stock returns and interest rate fluctuations will move together.

- **CENTRALIZED STOCK MARKET AND BUDGET**

Sharma and Mehta (2010) The effect of the union budget declaration on banking sector equities was analysed. The empirical evidences demonstrated that informational asymmetry exists in the Indian stock market due to substantial patterns in the daily return series of the banking stocks.

Porwal (2009) I looked into whether or not the budget was to blame for stock price swings, and I found that in four of the seven budgets I looked at, volatility in the stock market was lower than average. Second, following the budget date, volatility tends to subside or increase to the level seen in a typical year.

Gupta and Kundu (2006) Evaluated the effect of Union Budgets on the Sensex in terms of both returns and volatility. They discovered that budgets have the most influence in the immediate aftermath of a budget, with average returns and volatility remaining relatively constant over longer time periods.

Verma and Agarwal (2005) Conducted a four-year analysis utilizing budget as the event window. The effect of the budget was evaluated by comparing the CNX nifty index's returns before and after the incident. According to the results of the study, the occurrence has a considerable effect on the financial markets.

Kaur (2004) Looked at how much and how regularly stock returns in India's stock market fluctuated from 1990 to 2000. She discovered that April is the most unsettling month, followed by March and then February. This may be because of the influence of the Union Budget, which is typically introduced in February.

Mohanty (2004) Analysed how announcements of new government policies in India affected stock prices. The findings demonstrate that equities typically respond rapidly to public news, but that the initial reaction is not always accurate.

Thomas and Shah (2002) Looked at how the stock market interacts with the Union Budget. Their research led them to the conclusion that the stock market is doing a decent job of processing data related to the Union Budget.

Rao (1997) Looked at the effect that major announcements of fiscal and monetary policy, such as union budgets and credit policy, had on stock prices from 1991 to 1995. Budgets, he discovered, made the market portfolio's stock values more volatile. However, it was discovered that stock market behaviour was unaffected by the credit policy pronouncements.

2.4 RESEARCH INTO THE BEARING OF FIRM-SPECIFIC VARIABLES ON STOCK RETURNS

The dividend per share, earnings per share, market cap, and book value per share of a company are all company-specific factors that are blamed for stock price fluctuations.

Gordon (1959) examined a group of regression equations to learn how various factors affect stock market values. His analysis included these equations:

$P = a_o + a_1 D + a_2 Y$……1

$P = a_o + a_1 D + a_2 (Y-D)$ ……2

$P/W = a_o + a_1 D'/W + a_2 (D/W-D'W) + a_3 g' + a_4 (g-g')$ ……3

Where,

P = price per share, D = dividend per share, Y = earnings per share, W= book value per share, g = growth measure.

Two years of research were put into the aforementioned equations for four representative samples from the business world. The study's key conclusions were

- Constant and high a1s; extremely low a2s;
- Equation a1's are substantially larger than a2's, while a3's are negligible or very little.
- Both the statistical significance and the range of volatility of the dividend coefficient have increased slightly. However, the growth rate is underwhelming.

Studied the impact of four factors on the market value of various companies' stock. Last dividend per share, undistributed profits per share, average dividend growth per share for the preceding few years, and company size were all included. The sample size was five years and five different industries. The study's primary results were

- Much of the difference in share price between firms can be attributed to differences in their most recent declared dividend per share.
- The most recent undistributed profit per share that was declared has a substantial impact on the stock price. Undistributed profits don't have much of an impact on dividends.
- The impact on dividend payments and retained earnings appears constant over time.
- The dividend growth rate in the past seems to have a small and uncertain effect on the share price.

Gill et al. (2012) Investigated the factors that contribute to the observed dispersion in U.S. stock market equity prices. For this study, we picked a random sample of 333 companies operating in the United States and listed on the New York Stock Exchange (NYSE) during the years 2009 and 2011. Co-relational and non-experimental research methods were used for this investigation. The overall results of this study reveal that the differences in American equity share prices can be attributed to differences in book value per share, earnings per share, dividends per share, price-earnings ratio, the duality of the Chief Executive Officer (CEO), and the internationalization of the firm.

Nirmala et al. (2011) Determined the factors that influence stock prices in India. The study used the completely modified ordinary least squares approach to analyse panel data from the years 2000-2009 from the automotive, healthcare, and public sector undertakings industries. Share prices across all industries examined appeared to be significantly affected by dividends, price-earnings ratio, and leverage. In addition, the auto industry is the only one in which profitability is observed to affect share prices.

Sharma (2011) Stock share prices were analysed empirically in connection to a number of potential drivers between 1993-1994 and 2008-2009, including book value per share, dividend per share, earnings per share, price-earnings ratio, dividend yield, dividend payout, size in terms of sales, and net worth. Share price was found to be significantly affected by earnings per share, dividends per share, and book value per share. Furthermore, the study concluded that dividends per share and earnings per share are the largest predictors of market price, suggesting that corporations should adhere to a flexible payout policy.

Shukla and Devani (2011) Looked at how factors including book value per share, dividend yield, dividend cover, growth, price-earnings ratio, and earnings per share relate to equity prices. The research covered the years 2005–2009. Based on the results of the correlation and regression research, it was determined that dividend yield and book value were the next most influential factors in predicting stock prices, after the price-earnings ratio, earnings per share, dividend per share, and dividend cover.

Das and Pattanayak (2007) Developed a thorough empirical understanding of the elements that drive stock prices and, by extension, the market as a whole. For the purpose of this research, the Sensex index was taken to be an all-encompassing proxy for the market from 2001 to 2005. Factor analysis simplifies the myriad of explanatory variables serving as primary predictors of stock price movements into a small number of critical components, and the importance of these factors in shaping the stock market is explored at length. The findings indicate that only a small number of factors are truly driving stock prices and, by extension, the entire market.

Sharma and Singh (2006) The post-reform period was analysed in terms of the empirical link between the market price of shares and the explanatory variables dividend per share, earnings per share, book value per share, size, cover, return on capital employed, and payout ratio. Over the course of five years, from 2001 to 2005, the correlation between independent and dependent variables at 160 companies is analysed. Share price is found to be significantly influenced by indicators of a company's financial health, such as earnings per share and book value per share. Companies should establish a generous dividend policy to stimulate both the primary and secondary markets, as dividends per share are a key determinant of share prices.

Singhania (2006) Explored the factors that affect stock prices with a focus on India's stock exchange. The averages reveal that the market price was significantly lower from 1997 to 2004 as a result of the many political, economic, and social unpredictability's that plagued the country at the time. Only the price earnings ratio was shown to have a statistically significant positive relationship with market price (1%). All fundamental indicators are favourable but negligible, including book value, dividend cover, dividend per share, earnings per share, and growth. Yield is correlated negatively and not significantly with MP at the same time. Book value, dividends per share, earnings per

share, and price earnings ratio all show statistical significance in the regression study, while dividend cover and yield show no statistical significance at all. The growth may have been negligible, but it was still valuable.

Singh (1995) Conducted a 10-year empirical analysis of 120 firms between 1983 and 1992. The earnings per share and dividends paid out had a materially favourable effect on the stock price. Share price was positively impacted by the bonus issue but was unaffected by growth or ROI. The general markers of management quality were performance and expansion.

Dhillon and Johnson (1994) The stock and bond markets' reactions to dividend adjustments were analysed. There are a number of possible causes for the stock market's positive reaction to dividend increases, but information content and wealth transfer between stockholders and bondholders are two of the most frequently addressed. Although the information content hypothesis is not disproved, the evidence offered here does lend credence to the former. When major dividend changes are announced, the reaction of bond prices is typically the reverse of stock prices.

Dixit (1986) Studied 42 businesses during a two-decade span (1961-1982). The dividend and earnings ratios proved to be the most important predictive variables, whereas the growth and leverage ratios were shown to be superfluous. The impact of ROI on the value of a company's stock was rather small.

Chandra (1981) Study of two groups of companies, the "across the broad group," which included 50 shares selected at random from a pool of 110 shares of enterprises in all industries except banking, insurance, and textile; and the "cotton -textile group," which included 30 shares, was carried out. The study's key findings indicate that returns, growth, and size positively impacted share price, but risk and leverage had no effect.

Srivastava (1968) Looked into how dividends and retained earnings affected the market value of publicly traded companies. This analysis focuses on just six sectors in 1961: cotton, tea, electricity, sugar, coal, and paper. He came to the conclusion that in India, dividends have a substantial effect on share prices but retained earnings have no such effect.

Desai (1965) Employing a linear regression model, we looked at how dividends, retained earnings, and earnings per share all affected the stock's market value. He chose 31 Indian businesses operating in 1960 as his sample. Current dividends emerged as the most important factor influencing stock prices, whereas earnings and retained earnings played a relatively little role.

2.5 EXAMINATIONS OF ADDITIONAL FACTORS AFFECTING THE STOCK MARKET

Muthukumaran and Senthamil (2011) Examined the effect of the global financial crises on the Indian economy and stock market. In addition, we analysed the connection between the Indian stock market and the American stock market and talked about the function of RBI in the current setting. They used information collected between January 1, 1999, and December 31, 2008, to learn more about the effects on the Indian stock market and the connection between the Indian stock market and the US stock market. The findings suggested that the worldwide financial turmoil had an impact on the Indian stock market.

Lazaros et al. (2010) Studied the correlation between cloud cover, temperature, and precipitation as mood indicators, and the length of the night as a proxy for investor sentiment. Overall, the data revealed that measures of historical, implied, and realized volatility are inversely associated to cloudiness and the length of night time. It appears that the strength of a connection changes depending on where an exchange occurs in relation to the equator on Earth. Explanatory power of datasets is not improved by including weather dummies or examining weather departures from seasonal norms.

Gogineni (2008) Analysed the stock market's response to shifts in oil prices and discovered that the market's reaction is proportional to the size of the price shifts. The time frame covered by the data set is April 1983 to December 2006. Same-day market returns are negatively affected by oil price fluctuations likely caused by supply shocks, and positively affected by oil price changes likely driven by movements in aggregate demand. It's not just the profits of oil-dependent businesses that are vulnerable to fluctuations in oil prices; even those of non-oil-dependent businesses can be affected.

Finally, he demonstrates that the industry's return is sensitive to variations in the price of oil for two main reasons: the cost-side dependency and the demand-side dependence.

Mohanty (2004) Analysed how announcements of new government policies in India affected stock prices. The research looked at the telecommunications industry, the banking and finance industry, and the pharmaceutical industry. He evaluated the speed and precision with which stock prices responded to public announcements using an event study methodology. The findings demonstrate that equities typically respond rapidly to public news, but that the initial reaction is not always accurate. Some traces of a learning delay can also be found.

Bushee and Noe (2000) Examined the relationship between a company's disclosure standards and the diversity of its institutional investor ownership and, by extension, the volatility of its stock return. better institutional ownership is seen for companies with better AIMR (Association for Investment Management and Research) disclosure rankings; however, the results show that the types of institutional investors drawn to these firms has no net effect on return volatility. In contrast, "transient" institutions, which are characterized by active trading base, are linked to annual improvements in transparency rankings.

Jones and Kaul (1996) According to research, the response of international stock markets to oil shocks can be rationalized by current and prospective changes in real cash flows and/or changes in expected returns. They discovered that during the post-war period, the reaction of U.S. and Canadian stock prices to oil shocks can be entirely explained by the effect of these shocks on actual cash flows. In contrast, in both the United Kingdom and Japan, changes in oil prices appear to have a larger effect on stock prices than can be explained by subsequent shifts in actual cash flows or expected returns.

Lockwood and Linn (1990) Analysed the hourly market return variance for the Dow Jones Industrial Average between 1964 and 1989. Results indicate that return volatility decreases from the opening hour until early afternoon, then increases thereafter, and is substantially higher during intraday periods than overnight periods. Market variance is also shown to have changed significantly over time, increasing after the launch of NASDAQ in 1971 and trading in stock options in 1973, falling after fixed commissions

were eliminated in 1975, increasing after trading in stock index futures was introduced in 1982, and decreasing after margin requirements for stock index futures were increased in 1988.

De Bondt and Thaler (1985) Researchers examined whether or not people tend to overreact to unexpected and dramatic events, thereby influencing stock price movements. The study used monthly stock return data from NYSE during the period from 1926 to 1982.Thus, the study highlighted the notion that investors overreact and drive stock prices to extreme ends on both sides, and that the market may be efficient in the short term but not in the long term.

Galeotti and Schiantarelli (1984) Argued that fluctuations in stock prices cannot be satisfactorily explained by fundamental changes alone. This paper is predicated on the basic premise of obtaining proxies for the fundamental and fad components of stock price movements. They discovered a significant relationship between variations in investment and movements in both components of stock price volatility. According to the point estimates, changes in fundamentals have a larger impact than changes in non-fundamentals. The statistical significance of the difference between their coefficients is contingent upon the financing system. It is demonstrated that these conclusions are resistant to model modifications and expansions.

2.6 RESEARCH INTO THE CORRELATION BETWEEN STOCK MARKET VOLATILITY AND RETURNS

The correlation between stock market returns and volatility is the subject of a large body of empirical research. Nonetheless, the following are a few of the major contributions:

Dutt and Humphery (2012) Investigated the dynamics between stock price fluctuations, company results, and stock price returns. They discovered that in both developing and developed markets outside of North America, low volatility stocks outperform high volatility stocks in terms of returns. Their analysis of operating success and stock performance underscored the need of adjusting for volatility in stock return.

Dimitrios and Theodore (2011) Studied the correlation between projected stock returns and volatility across the twelve nations of the European Monetary Union (EMU) and the five largest stock markets outside of the EMU. For the most part, they observed that predicted returns were unrelated to volatility based on parametric GARCH in mean models. Significant evidence of a negative association exists in nearly all markets, but only when employing a flexible semi-parametric specification for the conditional variance. In addition, they looked at the disproportion between the volatility response to positive and negative shocks in stock returns and found that it was negative in virtually all markets.

Athanasios and Nicholas (2006) The GARCH-M and E-GARCH models were used to investigate the correlation between stock market returns and volatility in eight developed economies (Australia, Canada, France, Japan, the United States, the United Kingdom, Germany, and Italy). When they applied the two models to the stock markets of industrialized nations, they discovered that the correlation between stock price returns and volatility was modest.

Qi et al. (2005) The authors analysed the correlation between projected stock returns and volatility from January 1980 to December 2001 across the 12 main international stock markets. Most markets during the study period showed a positive but not statistically significant association using parametric EGARCH-M models. Nonetheless, they discovered a substantial inverse link between expected returns and volatility in 6 out of the 12 markets by employing a flexible semi-parametric specification of conditional variance.

Glosten et al. (1993) Employing a GARCH-M model with some tweaks, they came to the conclusion that expected returns and volatility were negatively correlated, or not correlated at all. Also, they provided evidence that the previously held belief that monthly conditional volatility is fairly stable was incorrect. The conditional volatility appears to be revised down when unexpected returns are positive and revised higher when unexpected returns are negative.

Baillie and De Gennarro (1990) Briefly said, the majority of asset pricing models assume that higher volatility is associated with higher projected returns from a stock portfolio. To investigate the connection between mean returns and the conditional variance or standard deviation of a stock portfolio, they employed GARCH-in-mean models. They estimated several models using daily and monthly portfolio return data, and found that the correlation between mean returns and either their own variance or standard deviation was minimal. Investors, according to the data, place less emphasis on the variation of portfolio returns than they do on other risk metrics.

2.7 INDICATORS OF FUTURE STOCK MARKET VOLATILITY IN INDIA: MODELING AND FORECASTING

Researches examine the volatility of stock returns throughout time. Stock market return in the setting of emerging economies has been the subject of extensive empirical research, with the major focus being on modelling and forecasting volatility utilizing a range of applications of ARCH, GARCH, EGARCH, TGARCH, and many more models. Here are only a few of the major contributions:

Rastogi and Srivastava (2011) Examined the effects of the volatility shift on the Indian stock market using a GARCH approach that takes into account the passage of time. Additionally, during periods of economic turmoil in India, the fluctuation in volatility of the US stocks market has been compared to that of the Indian securities market. It was discovered that there is little evidence of conditional volatility co-movement between the two markets.

Srinivasan and Ibrahim (2010) Utilizing daily data starting on January 1, 1996 and ending on January 29, 2010, researchers modelled and forecasted the volatility (conditional variance) of the SENSEX Index returns of the Indian stock market. Several different types of GARCH models, from the basic GARCH (1,1) to the more complicated Exponential GARCH (1,1) and Threshold GARCH (1,1), were taken into account in this analysis. Results show that, despite the presence of the leverage effect, the symmetric GARCH model outperforms the asymmetric GARCH models in out-of-sample forecasts of the conditional variance of the SENSEX Index return.

Hung and Yen-Hsien (2009) Employing two GARCH models (GARCH-N and GARCH-SGED), we looked into the impact that return distribution specifications had on volatility forecasting accuracy. To analyse and compare the relative out-of-sample volatility prediction ability, an empirical sample of daily spot prices on the Shanghai and Shenzhen composite stock indexes is used. This is especially relevant in light of the growth potential of stock markets in China in the perspective of global investors. The empirical findings show that when model selection is based on MSE or MAE, the GARCH-SGED model outperforms the GARCH-N model for forecasting volatility in the China stock market across all horizons.

Joshi and Pandya (2008) looked at what causes price swings on India's BSE and NSE stock exchanges. Certain stylized characteristics concerning volatility, like volatility clustering and mean reverting, are suggested by several volatility estimators and diagnostic tests. This analysis is based on 16 years' worth of daily Sensex and Nifty data (July1990 - October2006). The results showed that the GARCH (1, 1) model best fits the data series under study and provides a satisfactory explanation of volatility. Volatility in both markets is highly persistent and predictable, as demonstrated by the model with a large value of the lag coefficient. Since the error coefficient of GARCH (1,1) is minimal, even huge market surprises lead to only modest changes in expected volatility going forward.

Srivastava (2008) Modelled the stock volatility of the Bombay Stock Exchange (SENSEX) and the National Stock Exchange (NIFTY) from April, 2000 to March, 2008 to get a better understanding of the underlying dynamics. He examined the presence of volatility in the Indian stock market using variants of the Autoregressive Conditional Heteroskedasticity (ARCH) model such as the Generalized ARCH, the Extremely Generalized ARCH, and the Tobin's ARCH model. According to the results, using ARCH/GARCH models to estimate the process is appropriate due to the presence of large ARCH effects in both Indian stock exchanges.

Karmakar (2006) The GARCH model was used to quantify the daily return volatility of the Indian stock market from 1961 to 2005, and the results showed that the market is both stable and prone to sudden swings in price. The first two decades of the 1960s and 1970s are characterized by low levels of volatility. Indications of a shift in market

sentiment appeared early in the 1980s. Starting in 1985, volatility begins to climb, and by 1992, it had already surpassed all previous records. This trend persisted throughout the rest of the decade. There has been less volatility over the past two years, and prices have been steadily rising over this time, thanks largely to the efforts of foreign institutional investors (FIIs).

Philip and Dick (1996) Two non-linear modifications to the GARCH model were tested to see how well they could forecast weekly stock market volatility. The GJR (Glosten, Jagannathan, and Runkle) model failed as a predictor, but the QGARCH model fared better when outliers like the 1987 stock market crash weren't included in the estimation sample.

CHAPTER - 3

A CONCEPTUAL FRAMEWORK OF STOCK MARKET VOLATILITY AND A STUDY OF SELECTED NIFTY COMPANIES

3.1 INTRODUCTION

The stock market is one of the largest venues for financial speculation, analysis, and investigation. It's the place where stocks and options and other financial instruments are bought and sold. Due to macroeconomic services like taxation, stock market prices may not signify the real substantial value. The stock market is the nerve center for major investments around the world and accounts for more money than most people realize. Many people consider the stock market to be the ideal place to make investing selections. Because of this, the industry as a whole was able to provide returns that exceeded investors' expectations. Whenever there is a significant change to the index, it becomes the front-page story of virtually every national daily and is met with several responses from experts and pieces on the economy.

Although India's stock market has been around for more than a century, its importance in the allocation of limited investment information has just been recognized in the last decade. The Indian stock exchange has undergone significant changes in recent years. These changes have had an impact on the capital market, which is widely regarded as the most transparent, clean, and efficient markets due to institutional investment, derivatives, and market intermediation. There is a widely held belief that the volatility of asset returns has increased as a result of developments in financial markets around the world. There has been an increase in volatility, but the extent to which that increase can be attributed to new information versus other variables is debatable. Everyone who has even a passing interest in the financial markets seems to agree on two points: first, that the markets are much more unpredictable than they used to be, and second, that this volatility causes a wide range of problems. Analysis of volatility is complicated because the term has different connotations to different people. When discussing volatility, almost nobody is on the mark. Moreover, there is a lot of misinformation out there about volatility.

3.1.1 VOLATILITY

The volatility of an asset or market index is a statistical measure of its return dispersion around the mean. Earnings dispersion within the same industry or security index is a common metric for analysis. The more the volatility, the riskier the security. Volatility, which measures the extent to which the return on the underlying asset changes between now and the option's expiration, can be adjusted in the option-pricing calculation. Trading behaviours are the source of volatility both as a percentage coefficient and as part of the option-pricing mechanism. The appropriate coefficient to apply depends on the precise method of measuring volatility. Volatility refers to the possibility of a sudden change occurring following a period of stability. For most financiers, risk is synonymous with the unpredictability of asset pricing. The current form of this expression is the normal annualized change in the value of an advantage.

Therefore, volatility is indicative of a person's willingness to take a gamble on exposure to a variable or an asset. The risk associated with an item increases as its price fluctuates more frequently. Price volatility occurs when the asset's standard deviation is larger than the market average. It's critical for figuring out the worth of derivative strategies like options. Therefore, prospective and historical volatility approaches influence the return and value of a wide range of financial assets with prospective interest rates. It is also a gauge of investor attitude, with high volatility indicating nervousness and low volatility indicating a willingness to take on more risk. Volatility is a simple and basic idea. The range of movement of the central tendency is examined. In other words, it measures the extent to which the current price of an item deviates from its historical norms. As stock, currency, and commodity markets across countries become more interconnected, a thorough understanding of volatility is more important than ever. Due to the presence of dominant participants, volatility now has the additional attribute of quick market transmissibility. The general public equates the word "volatility" with danger and draws the conclusion that it should be lamented because it indicates that security values are not safe and that financial markets are not operating as they should. The public seems to infer days with significant price swings, frequently downward, from the volatility. Such abrupt price decreases across the market can't always be attributed to a single news event. Shared equity, the value of which depends on

subjective estimates of future cash flows and resale prices, trades in a market where neither of these factors is a given. The general people has a more deterministic view of the asset markets; if the economy tanks, they believe there must be a specific reason. Variability in asset returns may be summarized by a normal distribution. Typically, a series of yields will have a natural distribution. Since this distribution is centered on the mean, the standard deviation measures how far the observations are from the average. These fat-tailed distributions can imply conventional financial parameters but return series cannot be distributed and sometimes exhibits excess kurtosis, making extreme values more appealing than the normal distribution. In addition, skewness is widely used, especially with return on equity, where sizable declines in performance are more common than increases.

3.1.2 VOLATILITY AND ITS IMPORTANCE

Anyone who deals with capital, equity investment, or any other type of financial instrument faces a difficulty and a major risk in the form of volatility. Issues with volatility have recently gained prominence as a topic of interest for economists, traders, institutional investors, government regulators, and academics. The more unpredictable an asset is, the riskier it is, and knowing the volatility of stock provides some indication of the possible range of values it may take at some future date. This is why volatility is of interest to market investors: to minimize risk, investors want to know how much risk they are exposed to. The entity will be able to make well-informed choices about its financial holdings.

First, it's difficult to make an accurate prediction of a stock price when it's highly volatile. In terms of their investments, most people would prefer to take as little risk as possible. Second, policymakers face a major challenge from fluctuating stock markets since the uncertainty they generate has a negative effect on the country's growth prospects. Alternately, authorities may worry that increased stock volatility threatens the stability of financial institutions and markets. Third, policymakers consider price volatility because it affects the efficiency of financial markets. Small investors flee the stock market when volatility is high. In addition, it will put a damper on trading activity and liquidity by putting a pressure on the Investor loss in stock clearance and arbitration

responsibilities trust. Finally, the timing, amount, and type of financial instrument a company chooses to issue are all affected by the fluctuation in the value of its securities.

3.1.3 THE IMPORTANCE OF STOCK MARKET VOLATILITY FOR ECONOMIC DEVELOPMENT

There are four main characteristics of developing markets that set them apart from developed ones: higher overall returns, lower similarities with emerging market returns, stable returns, and more volatility. Volatility modelling is particularly difficult in emerging markets because of how highly segmented these markets are. The volatility of fully integrated markets is largely influenced by global variables, while the volatility of segmented markets is largely influenced by local factors. Lower volatility was associated with more open markets, and understanding the impact of political risk on that volatility was made easier. Capital market liberalization led to a large decrease in volatility in emerging markets, which was a positive outcome all around (Menike, 2006). There is a significant asymmetry and positive skewness in the returns from emerging markets. The value of a company's stock is often used as a proxy for its performance. There are both economic and non-economic factors that affect the movement of stock prices. Typically, the stock market reacts strongly to news, both real and imagined. Market return volatility is, once again in large part, due to the speculative trading of International Portfolio Investors. Institutional investors in India's stock market are a major source of the market's inherent volatility. There were numerous theories that were supported by data and might explain the behaviour of international and domestic investors. As a sample size, 33 different businesses were used to assess the accuracy of volatility forecasts.

The price of a financial asset exhibits volatility when it fluctuates over time. The rate of change at which a financial asset, such as shares of stock, changes over time. For this reason, volatility is a gauge of apprehension or dispersion. It calculates the change from its previous average price. The greater the variance, the more exceptional it is. Volatility is a risk indicator used to gauge the potential for price fluctuations in a given asset or portfolio. The uncertainty of the financial markets is a concern for traders, policymakers, and regulators. Because price volatility is the basic paradigm of market information quality, the question of volatility originates from the assumption that, under

unpredictable conditions, an asset's price no longer performs its position as a 'signal' to a firm's real worth. Risk and volatility go hand in hand. There are many potential dangers and unknowns in the economy. The variance is taken as a measure of risk and volatility in many economic models. But many studies have found that the fluctuations in return activity and volatility are not continuous over time. Volatility, therefore, is predictive regardless of recent history.

3.1.4 VARIATION IN VOLATILITY

Real-World Volatility: It is the return on assets used as a measure of unpredictability at any particular time. It joins both option pricing models and is a challenging measure. Real volatility does not have a timescale that is associated with it; it is a quantity that might arise at any time, most likely changing constantly.

Previous Volatility: It is a calculation based on randomness for both a recent and distant past. The time frame is then frequently stated. For predicting future volatility, past volatility is frequently used.

Consensus Volatility: It refers to what the market believes the possible true volatility of an option will be. The market price of an option is determined by the implied volatility of the input used in the Black-Scholes pricing procedure. Expiration is a time scale connected with implied volatility.

Advance Volatility: It is applicable to real or implied volatility and can be expanded to various different types of volatility. It refers to either a time frame or a future event.

3.1.5 THE IMPACT OF IMPLIED VOLATILITY ESTIMATION

It is the latest thing to hit the Indian option market. Distribution premiums for options on future underlying securities reflect current market sentiment. A company can accurately predict future volatility if it bases its forecasts on plausible assumptions. Costs in the secondary market provide an indication of the sector's true volatility. Additionally, implied volatility may serve as a more accurate indicator of a substantial market segment. To put it another way, implied volatility included the most crucial information offered by other explanatory factors to explain probable realized volatility. There appear to be two approaches to estimating future volatility. Assuming the option

pricing model accurately reflects the behaviour of investors, within extracting the inferred fluctuations from noticed alternative costs together with other measurable variables, the variance of the future going back and the next one raising market assumptions about the long-term fluctuations from observed option prices will be the historical variance. Therefore, indicated volatility can stand in for the information included in historical volatility if the industry is deemed to be of critical importance. For this reason, predictions based on past volatility do not beat those based on implied volatility.

3.1.6 VOLATILITY'S THEORY OF FRAMEWORK

Stock market booms have increased in frequency and volume as a result of globalization, necessitating intensive research by investors, professionals, economists, and academics in order to fully understand the market. The health of a country's economy can be gauged by looking at how the stock market is doing there. More countries are opening their doors to foreign investment as a result of economic liberalization, increasing the potential for both domestic and international business opportunities. Attractive investment and trading opportunities in a wide range of asset classes can be found in the world's emerging stock markets. When considering your alternatives for international investing, it is important to keep market volatility in mind so that you can maximize your return while minimizing your exposure to loss. Investors are encouraged, thanks to globalization, to have exposure to a wider range of global economies. A single country's political and economic climate, industry and sector growth rates, and inflationary conditions all contribute to a high level of portfolio volatility.

The measure of volatility used to quantify an investment's potential for loss. Volatility is the quickest and easiest way to gauge risk statistically. Market risk for a single instrument or the entire portfolio can be computed. An asset's volatility measures how consistent its returns are. Stock markets, currency exchange rates, interest rates, portfolio value, etc., are only some of the many random financial factors that are used to calculate volatility on a regular basis. The stock market's volatility might mean different things to different people. Most empirical research have found volatility in the market, as measured by statistical calculations of price changes. These analyses are

useful because they are consistent with the commonly used risk measurements for use in selecting funds and evaluating asset pricing theories. Volatility is the percentage change in price or return rate as measured statistically. The most often used statistical measure of volatility is the variance of returns, sometimes known as the standard deviation. One month, one day, one hour, and one-minute intervals are used to calculate the standard deviation. This allows for the monitoring of return volatility on a monthly, daily, and even minute-by-minute basis.

3.1.7 VOLATILITY AND LIQUIDITY

While many models can predict the volatility of financial returns, only a small number of analytical models can shed light on its origins. The liquidity provision mechanism can explain some volatility since market microstructure affects it. As the market makers adjust their trading ranges when they anticipate unfavourable selection possibilities, the price action becomes more volatile.

3.1.8 VARIABILITY OF TIME

The ups and downs in value of various asset classes are well known occurrences. Specifically, prices rise and decrease predictably at set times of the day, while appearing to remain constant at all other times. There can be further drops or unexpected increases in price during times when prices fall abruptly (a crash). If prices have been rising rapidly (a bubble), they may continue to do so or may see large, unexpected fluctuations. The opposite behaviour, known as the "doldrums," can be debilitating and distressing. Autoregressive conditional heteroskedasticity (Dallah & Ade, 2010) argues that radical trends do not appear "out of nowhere," but rather are preceded by larger-than-usual shifts. Obviously, it is more complicated to determine whether or not these large-scale shifts are moving in the same direction. Even if volatility does increase, that may not be a precursor to subsequent increases; volatility may actually decrease again.

3.1.9 THE DIRECTION AND VOLATILITY

Volatility resists directional adjustment, which calculates dispersion while measuring standard deviation (or variance) and squares all variations, merging positive and negative trends into one quantity. The larger variance instrument may have more value variations over a particular period; both instruments offer actual estimated returns.

3.1.10 INVESTOR VOLATILITY

- Investors worry about five volatility factors
- Investors fear more when investment prices fluctuate widely.
- Higher volatility raises the risk of failed securities sales cash flows.
- Planning for retirement with higher return volatility spreads eventual portfolio prices.
- Retirement portfolio value is more affected by higher return volatility.
- Prices fluctuate, allowing investors to buy low and sell high. Today, volatility can be traded directly via options and swaps.

3.1.11 DIFFERENT CAUSES OF VOLATILITY

There is a strong correlation between high crisis occurrence and high macroeconomic volatility, both of which contribute to elevated macro-financial risks. There is strong evidence that the unsustainable economic, operational, and human capital shortfalls brought on by these crises have long-lasting effects on productivity, on top of the output forgotten during these times (which includes substantial welfare deficits). What causes stock prices to fluctuate in the market?

These are the numerous causes of their migratory patterns.

- **Up-to-Date Data on Stock Prices**

The market's valuation of a stock at a given price range is based in large part on the information that is made available to investors. All evidence presented to the public is usually the main focus of these. Depending on how the company reacts to the new data, market prices could go up or down, which would have an effect on the company's profits.

- **Stock Market Values and Inflation**

The rate of inflation is another major factor that might affect stock prices. Low inflation has historically had a negative correlation with stock prices. Therefore, low inflation encourages high multiples, while high inflation tends to drive low multiples.

- **The Influence of the Market and Comparative Economies**

Stock prices tend to follow the general economic trend and the development of a new industry or area. Many of the world's preeminent investment firms view shifts in consumer demand and business conditions as among the most influential factors in determining market prices. A negative perspective on one company can have a ripple effect on other similar stocks through the law of association, dragging down demand for the entire market.

- **Demand and Supply**

Stocks that trade fewer securities per share do not have the best price liquidity. Because of supply and demand, their prices are therefore subject to volatility. Shareholders will suffer if a large shareholder decides to sell huge quantities of stock at high prices immediately away.

- **Stock Price Effects of Psychological Factors**

These costs are frequently significantly influenced by human behaviour. Stock prices will rise more rapidly than they should due to investors' greed. Investors may choose to buy stock regardless of its fair valuation if new information triggers a frenzy in the market and causes price increases. Large dips in the stock market could occur if investors panic and sell their shares to avoid losses. Probably the single most important factor in gauging current Market volatility.

- **Quantity of Trading**

Every type of financial asset can continue to trade based on the data. Since unseen information is utilized to explain market and trade activities. The volume of trades should reveal information about the collective shifts in sentiment among market participants. Insights gained by studying the relationship between market volume and price swings could have a significant impact on the development of short-term trend projections, stock market trading, and even regulatory frameworks.

- **Uncertainty**

The direction of stock prices is frequently affected by uncertainty. In spite of market anxiety and future uncertainty, prices appear to have rebounded. Without fresh information, market price volatility is likely due to a company's possible uncertainty.

- **Communication Devices**

It Devices, which includes newspapers, magazines, and television networks, is the most reliable resource for the public when it comes to learning about the economy and getting expert advice. These insights and recommendations may influence the fund manager and investors, leading to herd behaviour and stock price fluctuations. The market could react to news reports even if it doesn't alter the broader trend.

- **Economic Situation**

It is commonly believed that market volatility increases during times of crisis because of surplus capacity and increased unemployment. Stock return volatility will increase during periods of low demand due to fixed economic costs. The state of the economy is the primary driver of both high and low volatility.

- **Investors' Typical Educational Background**

Most investors have strong biases against the homes of others. In light of these biases, the collective actions of domestic investors may prove to be the deciding factor in the direction of a country's stock market. As a result, the shared characteristics of investors that can influence their activities in the stock market cannot be disregarded in analyses of market volatility. Based on the expected number of years spent in school, we choose an average investor education level.

- **Concentration Of Market Industries**

According to the principles of modern portfolio theory, the volatility of the market should mirror the level of firm activity. Reduced diversification is a result of high levels of business concentration. Market instability can be exacerbated by the concentration of a large number of firms.

- **Trading Via Computer**

Incredible advances in IT have made it much simpler for huge numbers of people to learn about and react rapidly to information. It enables capital markets to serve as a source of liquidity for investors around the world. If news spreads rapidly, price adjustments in response to that news will accelerate.

- **Integration on a Global Scale**

As a further outcome of increased convergence, the government lifted controls on the inflow of foreign capital. The shares of major firms are now tradeable on global stock markets. When stock markets in one country rise or fall, it has an effect on markets in other countries. The stock market in one country is influenced not only by domestic and international events, but also by the actions of other countries and the president of the United States.

- **Estimated Total of Listed Companies**

The quantity of listed firms may cause a monopolization of the market. More companies indicate a more fragmented market. A larger percentage of the market is indicative of a larger number of publicly traded companies.

- **The Size of the Stock Market in Perspective**

The size of a country's equity market is measured by:

CAP/ GDP X 100

Noise trade is expected to have less of an impact on the industry as a whole in situations when CAP is the total market capitalization of all traded entities and GDP is relatively stable. There will be a correlation between market size and volatility. If the market were significantly larger, its stability would increase.

- **Extra Factor**

Major factors that affect the stock market are the interest rate, capital supply, factory output, exchange rate, foreign institutional investment, and national income, all of which are influenced by macroeconomic policies. The market price will change if any of these conditions change. The risk appetite of the investor is another factor that

contributes to volatility. The empirical research reveals that there are a variety of causes for increased market volatility.

- Discounted stock options.
- The impact of the low P/E ratio.
- Company negligence and the effects on small businesses.
- Misreading the market and overreacting.
- With the use of computerized software, massive stock transactions can take place in real time.
- Demand is being hampered by rising political unrest.
- When trading occurs around the clock, investors learn to sit back and wait for better opportunities.
- The existence of an issue characterized by uneven execution.
- The investing equivalent of a mob mentality.
- Totally baseless assumptions.
- Changes in the real interest rate.
- Changes in the exchange rate occur more frequently than are warranted by underlying economic conditions.
- What January does to you.
- What the weekend did to us.
- This is the next step in technical analysis (Apte, 2001).

3.1.12 THE ADVANTAGES OF VOLATILITY

Many people associate volatility with perceptible levels of uncertainty and danger. It's possible to make money regardless of market conditions, but selling at the market's peak when volatility is high is optimal. Day traders and other short-term market participants, in contrast to investors with a buy-and-hold mentality, are motivated by the opportunity to profit from the market's volatility. Volatility can work for or against a trader depending on which side they're 'n. Investors can now rely on their own discretion over whether or not to make a purchase or sale. Vulnerability is crucial because:

- Uncertainty in the financial markets is a reflection of broader economic and political factors. For financial institutions like banks and hedge funds, volatility is crucial as it has a major impact on their Value-at-Risk (VaR) metrics. For a certain time, horizon and trust interval, VaR determines the highest possible loss for a bank or hedge fund. In terms of risk analysis, VaR is the gold standard. A low VaR is influenced by low volatility, while a high VaR is influenced by high volatility. VaR is often used as a proxy for the degree of leverage used by banks and hedge funds. As VaR decreases, they will increase their use of leverage. The higher a company's VaR, the less leverage it has, especially at the present time.
- One of the most influential extrinsic factors in an option's pricing is volatility. All call and put options increase in extrinsic value as volatility rises. It raises the price of everything. When implied volatility drops, the value of both calls and puts falls. It causes the prices of other options to drop.
- Financial markets and economic institutions play a crucial role in the economy by mobilizing and regulating the flow of money from savers to investors and gamblers. It is inevitable that the value of financial assets would fluctuate as a result of allocating resources to meet competing needs. Stock market returns, interest rates, and currency exchange rates that are more volatile than usual can disrupt the functioning of the financial system and slow economic growth. Market owners may be able to demand higher prices for the liquidity they control as a result of the increased volatility.
- Investors should be wary of volatility when asset prices change drastically within the span of a single day and it is difficult to determine whether or not the change is due to news about the economy. For this reason, irrationality and wild speculation go hand in hand with the market. Therefore, it causes a steady decline in confidence and money pouring out of stocks.
- Market inefficiency, represented by volatility, poses a threat to the integrity of the business's operations. The growing fascination with the market has raised the stakes for market participants in accurately estimating and forecasting stock market volatility.

3.1.13 VOLATILITY INDICATOR

The standard deviation, or beta, is a statistical indicator of market volatility. The standard deviation is defined as the square root of the data's departure from the mean. It is found by taking the square root of T and multiplying it by the standard deviation. The volatility of a securities is compared to the market volatility using a measure called beta. Beta is found by regression analysis. Volatility, in the context of finance, refers to the average annual deviation of market prices. Volatility is measured by looking at stock returns, because variation around a mean requires a fixed average. The fact that the amount by which prices rise or fall is a secondary factor explaining the resurgence. Returns, calculated as the logarithmic difference in closing prices at the beginning and end of a measurement cycle, are best viewed from both sides. To facilitate comparisons of volatility across time periods and national borders, we annualize the percentage representation of volatility. We utilize trade days to annualize volatility since it grows proportionally with the square root of time. Square root of the number of trade days per year equals annualization.

3.1.14 THEORY OF STATISTICAL STOCK MARKET VOLATILITY

Volatility on the stock market is generally predicted. The management of portfolios and the pricing of assets have been significantly impacted by this remark. For instance, risk-averse investors can choose to alter their portfolios by lowering their contributions to assets with a higher expected volatility or by using more sophisticated dynamic diversification measures to offset the expected spike in volatility. In a market where such policies are in place, balanced asset prices must react to expectations of volatility and risk aversion among investors. This is especially true for markets for derivatives like options and swaps, where the value of the derivative is greatly influenced by the price of the underlying commodity.

It is clear that predicting high volatility is just that—a prediction. High variance: an accurate forecast of the size of a market moves in the future. Therefore, even complete variance predictability does not necessarily imply perfect forecasting of market activity quantity or trajectory. Trying to predict when it would rain and then not having any rain is similar to forecasting volatility. One of the earliest known functions for grouping volatility in financial data. It tells us about the predictability of volatility. In any case,

if larger-scale movements in the financial markets likely to follow, there must unavoidably be substantial volatility. In general, traders predict volatility in this way. They compute standard deviations over a range of time intervals and take into account the best suitable moving average to predict volatility. Since more information might help predict volatility, some people alter standard deviations to reflect current occurrences. On the other hand, traders who invest in long-lived assets (long-lived assets are often assets that are not used in the normal course of operation, e.g., land and buildings), may believe that uncertainty is unaffected by current information in the far future. Better projections of short- or long-term volatility can help with assessments of fundamental asset values.

The modelling and forecasting of asset return volatility are crucial in a variety of financial sectors, including the value of derivatives and risk management. Volatility can be measured and predicted in four different ways.

- **Models Of Historical Volatility**

Volatility is a widely employed historical risk metric that is based on the estimated sample standard deviation of any time series of measured asset and liability returns. It is the most popular and straightforward methodology for capturing volatility. Calculating the expected standard deviation, or volatility, of future returns is crucial. It takes into account both individual and societal hazards. Standard deviation is a statistical measure used to examine the dispersion of data from its mean. The spread is the percentage of possible outcomes separated by the mean closing value. When there is a larger gap between the closing and average rates, there is also more volatility. A smaller standard deviation and volatility both indicate that prices are more stable. By comparing the current period's standard deviation of stock returns to that of a different time period, we might infer that the current period is more volatile. This strategy can then be used to forecast the volatility of subsequent periods (Srivastava & Jain, 2006).

- **Models Of Implied Volatility**

The implied volatility is an underappreciated but valuable indicator. Based on the option's asking price, we can infer its implied volatility. This calculation is centered on a fictitious reality including derivatives, wherein two observations of the price of the

underlying security are obtained from the value of the derivative and the price of the security itself. The market's perception of stock price swings or the uncertainty of the contract's future were implied. High volatility characterizes a stock that trades throughout a wide range (is widely circulated). Low volatility is a characteristic of stocks that are traded infrequently and so do not experience large price swings. Arbitrators considered this evidence in deciding whether the asset was mispriced relative to its derivatives. Students of the financial markets can utilize the data on securities prices and derivative values that have been collected to draw important conclusions. Information from security derivatives is used in this calculation to determine the value of the underlying asset. The implied volatility of a security increases as market differences widens. Another way to look at it is that real volatility represents what actually happened, while implied volatility represents what the markets think will happen based on the options being traded.

- **The Conditional Volatility Model**

While standard and extreme value estimators ignore the existence of time-varying volatility, conditional volatility models (ARCH/GARCH) account for it. Both the ARCH and GARCH models assume unconditional homoscedasticity for the error variance. To rephrase, deviations from a continuous and unconditional variance based on prior errors depend on the recognition that such changes are transitory and unexpected. An advantage of GARCH is that it may detect the clustering of volatility in financial data. Since market volatility is closely related to the rate at which new information enters the market, this concept is useful for making the connection between information and volatility (Ajay Pandey, 2005).

3.2 AN OVERVIEW OF THE NIFTY 50

3.2.1 NIFTY 50

The NIFTY 50 is a broad and balanced index of 50 stocks representing 14 different industries. It is used for benchmarking fund portfolios, index fund portfolios, and derivatives based on indices. NIFTY 50 is managed and updated by India Index Services and Products Limited. The Industrial Index Services Limited (IISL) is the first company in India to specialize in the core product index (CPI).

The NIFTY 50 is a market capitalization-weighted index comprising 50 Indian stocks. It has its roots in economics and was developed for use by Indian stock investors and traders.

3.2.2 FLOATING STOCK

Ten percent of floating stock is required for NIFTY 50 businesses. In this context, "floating stock" refers to shares that aren't held by the company's founders or other official bodies.

3.2.3 INITIAL DATE AND VALUE

Since this date marks the end of the first year of trading on the NSE's Capital Market Segment, it was chosen as the base period for the NIFTY 50 index. The initial value of the index was set at 1000, and the initial capital was 2.06 trillion.

3.2.4 TRADING NIFTY 50 DERIVATIVES

On June 12, 2000, NSE began trading index futures. The NSE focuses its futures contracts on the NFTY 50 index. In June 2001, the bourse began offering index options based on the NIFTY 50.

CHAPTER - 4

DATA ANALYSIS

4.1 VOLATILITY TRENDS IN THE STOCK MARKET

Although the Indian stock market has been around for more than a century, only in the last decade has its significance in the mobilization, allocation, and efficient use of limited investment resources been acknowledged. The Indian capital market has witnessed radical changes in recent years. These shifts have had an effect on every facet of the Indian capital market, including the main and secondary markets, derivatives, institutional investment, and market intermediation. One of the most open, efficient, and pristine marketplaces is the capital market, according to research by Raju and Ghosh (2004). There is a widespread belief, spurred by recent changes in global financial markets, that asset return volatility has increased. There has been an increase in volatility, but how much and whether or not it is supported by information arrivals versus other factors is debatable.

Volatility is a measure of risk and, as such, should give investors and others a reason to be wary of the stock market and other financial instruments. As a result, concerns about volatility have risen in prominence in recent years among financial professionals, market players, individual investors, regulators, and academics (Kaur, 2004 a).

Stock price volatility is caused by factors such as rising interest rates, high inflation, economic slowdown, currency fluctuations, slow economic reforms, political instability, asset price crashes, political tension, and potential terrorist attacks. Political, economic, social, and most crucially psychological variables affect market movements. Binder and Merges (2000) identified four stock market volatility factors: uncertainty about the price level, the riskless rate of interest, the risk premium on equities, and the predicted profit-to-revenue ratio. Shiller (1987) found that dividends, real interest rates, and a direct measure of intertemporal marginal rates of substitution affect the aggregate stock market's true investment value. Kaur (2004 b) suggests that long-term volatility is influenced by firm market capitalization, corporate leverage (financial and operations), personal leverage, and economic conditions. Short-term factors include

traded volume, news, and noise trading, and lower-capitalization firm stocks are more volatile. They trade at lower prices and less often than high-capitalization corporations. Rao (1997) observed that budgets enhanced market portfolio stock price volatility. Industrial production, the disparity between long and short interest rates, and expected and unexpected inflation affect the stock market, according to Chen et al. (1986).

4.1.1 DISCUSSING AND ANALYZING

Volatilities of BSE Sensex and S&P CNX Nifty market indices were estimated over various observation periods:

a) Annual Monthly Return Volatility
b) Annual Daily Return Volatility
c) Monthly Daily Return Volatility
d) Spike Volatility

Measurements of stock market volatility during the study are provided below:

a) Annual Monthly Return Volatility

From January 1996 through December 2011, the monthly return volatility for the BSE Sensex and the S&P CNX Nifty is shown in Tables 4.1 and 4.2, respectively. The tables show the annualized return and volatility of Sensex and Nifty for each year, as well as the average monthly return and volatility of Sensex and Nifty for each month. Natural logarithmic discrepancies between the monthly opening and closing prices of the BSE Sensex and S&P CNX Nifty have been used to compute the monthly returns. Multiplying the monthly returns and volatilities by the total number of trading days and the square root of the total number of trading days in a year, respectively, yields the corresponding annualized returns and volatilities.

Table 4.1: The Annual Volatility of BSE Sensex Monthly Returns (January 1996 - December 2011)

Year	Duration In Months	Monthly Average Return (%)	Volatility Per Month (%)	Return Annualized (%)	Volatility Annualized (%)
(1)	(2)	(3)	(4)	(5)=(3)*(2)	(6)=(4)*sqrt.(2)
1996	12	-0.49	7.39	-5.85	25.59
1997	12	0.42	8.11	5.10	28.10
1998	12	-1.42	7.82	-16.99	27.07
1999	12	4.69	7.17	56.26	24.84
2000	12	-2.86	7.97	-34.36	27.62
2001	12	-1.21	7.81	-14.52	27.06
2002	12	-0.36	6.30	-4.32	21.82
2003	12	3.64	6.80	43.68	23.56
2004	12	0.16	6.64	1.92	23.00
2005	12	2.32	6.41	27.84	22.21
2006	12	2.90	6.41	34.80	22.21
2007	12	3.34	6.46	40.08	22.38
2008	12	-6.16	11.97	-73.92	41.47
2009	12	0.08	9.48	0.96	32.84
2010	12	0.83	4.92	9.99	17.06
2011	12	-2.51	5.95	-30.16	20.61
Overall	192	0.21	7.35	2.53	25.43

Source: Calculated using data from the BSE website for the specified time.

Market volatility peaked in 2008, and as shown in Tables 4.1 and 4.2, continued to rise through 2009. It then levelled off until 2000. Stock prices fluctuated wildly in 2008 for a number of reasons, including

- investor dissatisfaction after Reliance Power shares debuted at a price lower than their application price (these investors had applied for Reliance Power shares expecting to profit from the stock's listing, but instead saw even their grey market premium erode between the time of application and the stock's listing);
- On Sunday, the Chinese government announced a $586 billion spending package for public welfare and infrastructure to bolster the economy. This raised expectations that other nations will take more measures to free their economies from the grip of the global financial crisis.
- The Bear Stearns crisis caused the US market to plunge sharply, which was also felt in Asian markets;
- Political ambiguity surrounding the nuclear agreement;

- Businesses reveal their mark-to-market losses in derivatives trades on the FOREX market;
- The Manmohan Singh administration winning the votes of confidence.
- The Finance Minister's assurances on the nation's financial stability and his declaration that the Government would take action to increase liquidity;
- Mr. P. Chidambaram, the Union Finance Minister, stated in front of the Lok Sabha that the Government would continue to try to stimulate the economy while keeping an eye on inflation; and
- SEBI tightened the derivatives sector's exposure margin standards.

Table 4.2: Yearly Volatility of Monthly Returns For S&P CNX Nifty (January 1996 - December 2011)

Year	Duration In Months	Monthly Average Return (%)	Volatility Per Month (%)	Return Annualized (%)	Volatility Annualized (%)
(1)	(2)	(3)	(4)	(5)=(3)*(2)	(6)=(4)*sqrt.(2)
1996	12	-0.47	7.78	-5.60	26.96
1997	12	0.73	7.94	8.79	27.51
1998	12	-1.39	7.37	-16.72	25.53
1999	12	4.92	6.68	59.08	23.13
2000	12	-2.24	7.89	-26.89	27.35
2001	12	-1.21	7.71	-14.52	26.71
2002	12	-0.41	5.94	-4.92	20.58
2003	12	3.59	7.20	43.08	24.94
2004	12	0.002	7.05	0.024	24.42
2005	12	1.97	6.63	23.64	22.97
2006	12	2.54	6.50	30.48	22.52
2007	12	3.74	6.77	44.88	23.45
2008	12	-5.93	12.45	-71.16	43.13
2009	12	-0.12	9.74	-1.41	33.74
2010	12	0.81	4.69	9.74	16.25
2011	12	-2.51	6.03	-30.08	20.90
Overall	192	0.25	7.40	3.01	25.60

Source: Estimated using information retrieved from the NSE website within the specified time frame.

Increased volatility was also observed in 2009. The primary causes were

- The admission of the wildly inflated balance sheet by Satyam Computer Services Chairman B. Ramalinga Raju;
- The United States' rumoured plans to assist financial institutions in getting rid of their toxic assets;

- The stock market celebrated the coalitions led by the Congress after their win; and
- The market has responded negatively to the budget announcement (no mention of significant policy changes, a rise in the Minimum Alternative Tax (MAT), and higher projected revenues and expenditures).

The main causes of 1997's stock market volatility were

- The President of Congress has said that his party will no longer be supporting the United Front Government. The President has requested that the PM demonstrate a majority by April 7th.
- Collapse of stock markets around the world. Worst drop in the history of the Hang Seng and the Dow; and
- P. Chidambaram's second budget saw significant reductions in the rates paid by corporations and individuals. amended the minimum alternative tax structure, unveiled a plan for anonymous reporting.

In addition, 2000 saw the most market volatility ever recorded. These were the primary causes:

- Disappointment in the Union Budget is caused by the fact that it fails to address macroeconomic issues including the fiscal imbalance, government expenditure, and public sector disinvestment, and it increases the dividend tax by 100 percent.
- There have been rumours that the Income Tax Department is sending out warnings to FIIs who use Mauritius as a tax haven.
- Increased net sales margins, a ban on carrying forward changes to naked short sellers, and a lowered daily circuit filter limit all came from SEBI.
- Companies including Satyam Computers, Zee Telefilm, Dr. Reddy's Laboratories, and Reliance Petroleum were added to the SENSEX as part of the revamp, while those like Indian Hotels, IDBI, Tata Chemicals, and Tata Power were dumped.
- Negative signals were conveyed to the market when the head of Infosys said that Indian software companies could face competition from software companies in South East Asia.

The average monthly volatility of the Sensex and the Nifty for the time period under review was 7.35 and 7.40 percent, respectively. Both percentages are expressed as annualized rates of 25.43 and 25.60 percent. While monthly fluctuations for Sensex have averaged 4-12% and Nifty 5-13%. Sensex and Nifty annualized volatility have been between 17% and 42%, respectively.

b) Annual Daily Return Volatility

The daily return volatility for the BSE Sensex and the S& P CNX Nifty from January 1996 to December 2011 is shown in Tables 4.3 and 4.4, respectively. Tables are provided for both Sensex and Nifty, displaying average daily returns, volatility of daily returns, and annualized values (annualized return and annualized volatility) for each year.

Table 4.3: Daily Return Volatility Over a Full Year for The BSE Sensex (January 1996 - December 2011)

Year	Duration In Months	Daily Average Return (%)	Volatility Daily (%)	Return Annualized (%)	Volatility Annualized (%)
(1)	(2)	(3)	(4)	(5)=(3)*(2)	(6)=(4)*sqrt.(2)
1996	238	-0.003	1.53	-0.82	23.51
1997	246	0.07	1.64	17.06	25.72
1998	244	-0.07	1.90	-18.03	29.56
1999	248	0.20	1.82	49.37	28.60
2000	250	-0.09	2.10	-23.13	33.20
2001	248	-0.08	1.71	-19.69	27.00
2002	251	0.01	1.10	3.46	17.46
2003	253	0.22	1.18	54.75	18.83
2004	254	0.05	1.61	12.29	25.66
2005	251	0.14	1.08	35.30	17.12
2006	250	0.15	1.63	38.32	25.73
2007	249	0.16	1.54	38.62	24.37
2008	246	-0.30	2.85	-74.33	44.75
2009	239	0.25	2.21	59.35	34.19
2010	251	0.06	1.01	16.07	15.98
2011	247	-0.11	1.32	-28.29	20.75
Overall	3965	0.04	1.64	10.24	25.91

Source: Estimated using information gathered from the BSE website throughout the specified time frame.

The daily returns are the difference in natural logarithms of the stock market closes on each trading day. Annualized returns and volatilities are calculated by multiplying the daily figures by the total number of trading days and the square root of that figure, respectively.

An examination of the aforementioned tables reveals that 2008 was the most volatile year, followed by 2009.

Table 4.4: Daily Volatility of the S&P CNX Nifty Stock Index Year-Over-Year (January 1996 - December 2011)

Year	Duration In Months	Daily Average Return (%)	Volatility Daily (%)	Return Annualized (%)	Volatility Annualized (%)
(1)	(2)	(3)	(4)	(5)=(3)*(2)	(6)=(4)*sqrt.(2)
1996	250	-0.004	1.52	-1.04	24.12
1997	244	0.075	1.78	18.28	27.78
1998	249	-0.08	1.79	-19.94	28.22
1999	254	0.2	1.84	51.54	29.28
2000	250	-0.06	2.00	-15.84	31.65
2001	248	-0.07	1.63	-17.66	25.67
2002	251	0.013	1.06	3.20	16.81
2003	254	0.21	1.23	54.18	19.64
2004	254	0.04	1.76	10.15	28.09
2005	251	0.12	1.11	31.00	17.64
2006	250	0.13	1.65	33.53	26.10
2007	249	0.18	1.60	43.67	25.27
2008	246	-0.30	2.80	-72.97	44.05
2009	243	0.23	2.14	56.40	33.40
2010	252	0.07	1.02	16.51	16.26
2011	247	-0.11	1.32	-28.26	20.77
Overall	3992	0.04	1.64	10.04	25.91

Source: Estimated using information gathered from the NSE website within the specified time frame.

Volatility was lower from 1996 through 1999, but increased in 2000, according to a breakdown by year.

When compared to the years 2001–2007, when it was relatively quiet, the years 2008 and 2009 saw a sharp increase to a record high.

For the whole-time frame under consideration, the daily volatility of both the Sensex and the Nifty averaged 1.64%. Each value is equivalent to an annualized rate of 25.91%. While daily fluctuations for the Sensex and Nifty have been between 1% and 3%. Both the Sensex and the Nifty have experienced yearly volatility between 16% and 45%.

c) Monthly Daily Return Volatility

The monthly volatility of daily returns over the study period is summarized in Tables 4.5 and 4.6. It is clear from both tables that volatility has fluctuated throughout time, both within a year and between years, with 2008 showing the highest volatility.

When compared to other years' corresponding months, almost every month in 2008 was judged to be the most volatile. May, followed by March and April, has been identified as the period of most volatility for Sensex throughout the time frame under consideration.

This may have happened since the Union budget is traditionally unveiled at the very end of the month of February. There is much conjecture about the contents of the upcoming budget. After the Budget is presented, market participants evaluate the substance of the budget's pronouncements. For whatever reason, most businesses announced their financial status in the first week of April. Investors will decide whether or not to buy the scrips of a firm based on the health of its finances.

For Nifty, the time under consideration revealed that October is the most volatile month, followed by April and May. It's possible that this is because of the timing of the Diwali celebration. Most corporations announced their financial status in the first week of September, which may have contributed to the increased volatility. Investors consider a company's financial standing before deciding whether or not to purchase its scrips.

Table 4.5: Average Monthly Volatility of BSE Sensex Daily Returns (January 1996 - December 2011)

Months	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
January	0.93	2.44	1.52	1.87	2.47	1.31	0.92	0.71	2.05	1.54	1.01	1.16	2.89	2.97	0.98	1.13	1.61
February	2.24	1.88	1.44	1.57	2.44	1.64	1.51	0.79	1.5	0.8	0.9	1.54	2.32	1.88	1.18	1.48	1.57
March	1.29	2.66	1.74	1.88	1.91	2.85	1.31	1.12	1.45	1.02	0.88	1.95	3.21	2.61	0.68	1.27	1.74
April	1.38	1.44	1.67	3.09	3.83	2.42	0.99	1.22	1.3	1.3	1.64	1.68	1.4	2.12	0.85	1.05	1.71
May	1.39	0.72	1.85	2.12	3.14	0.94	1.54	0.72	3.88	0.63	2.55	0.8	1.3	4.2	1.52	1.13	1.78
June	1.23	0.88	3.08	1.44	1.59	1.28	1.16	1.01	1.36	0.76	3.24	0.82	1.93	1.75	1.16	0.98	1.48
July	1.67	1.09	2.07	1.56	2.16	1.18	1.07	1.04	1.05	0.91	1.96	1.07	3.3	2.32	0.62	0.97	1.5
August	1.28	1.92	1.59	1.34	1.15	0.71	0.91	1.57	0.92	0.95	0.67	2	1.73	1.95	0.66	1.54	1.31
September	1.14	1.1	1.45	1.18	2.28	2.76	0.82	1.69	0.73	1.1	1.06	1.04	2.5	1.07	0.76	1.63	1.39
October	1.86	1.13	2.63	2.06	1.62	1.44	0.97	1.44	0.9	1.42	0.94	2.34	5.19	1.08	1.07	1.58	1.73
November	1.32	1.78	1.31	0.47	1.08	1.2	0.67	1.31	0.69	0.98	0.58	1.73	3.85	1.57	1.29	1.28	1.32
December	1.9	1.31	1.51	1.42	2.2	1.33	0.84	0.9	0.77	1.09	1.48	1.49	2.53	1.01	0.9	1.54	1.39

Source: Estimated using information gathered from the BSE website throughout the specified time frame.

Table 4.6: Volatility Of The S&P CNX Nifty's Daily Price Over a Full Year (January 1996-December 2011)

Months	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
January	0.97	2.2	1.5	2.01	2.52	1.2	0.99	0.8	2.18	1.67	0.92	1.15	3.29	2.73	1.03	1.17	1.65
February	2.56	1.86	0.97	1.81	1.85	1.57	1.49	0.9	1.7	0.78	0.81	1.56	2.46	1.81	1.18	1.5	1.55
March	0.26	2.71	1.61	1.52	1.98	2.91	1.18	1.1	1.48	1.08	0.93	2	3.06	2.34	0.7	1.25	1.63
April	1.62	1.59	1.83	3.27	3.51	2.23	1.11	1.37	1.41	1.23	1.67	1.75	1.28	2.18	0.82	1.04	1.74
May	1.53	0.85	1.49	2.16	2.65	0.89	1.34	0.74	4.32	0.67	2.77	0.85	1.21	4.15	1.56	1.13	1.77
June	1.1	0.86	3.05	1.34	1.48	1.27	1.13	0.93	1.46	0.73	3.22	0.84	1.91	1.92	1.8	0.97	1.5
July	1.38	1.34	1.84	1.57	1.78	1.01	1.01	1.04	1.3	0.94	1.93	1.15	2.97	2.22	0.64	0.98	1.44
August	1.05	1.95	1.63	1.38	1.07	0.57	0.85	1.51	0.99	0.98	0.71	2.06	1.61	1.78	0.68	1.55	1.27
September	1.09	0.93	1.39	1.3	2.07	2.56	0.72	1.81	0.83	1.2	1.06	1.06	2.32	0.92	0.77	1.61	1.35
October	1.75	3.01	2.43	2.04	1.6	1.2	0.84	1.52	0.97	1.51	0.93	2.46	5.03	1.08	1.09	1.57	1.81
November	1.27	1.66	1.18	1.68	1.44	1.24	0.68	1.3	0.68	0.95	0.61	1.72	3.83	1.58	1.29	1.28	1.4
December	1.79	1.37	1.46	1.42	1.42	1.21	0.96	0.96	0.74	1.09	1.51	1.67	2.46	1.05	0.93	1.52	1.35

Source: Estimated using information gathered from the NSE website within the specified time frame.

The 25 months with the biggest swings in the Sensex and Nifty are shown in Table 4.7. The table shows that October 2008 was the most volatile month for the Sensex, followed by May 2009. The months of October 2008 and May 2004 saw the highest fluctuation in the Nifty. It is interesting to note that the two most volatile months for Sensex and one most volatile month for Nifty both occurred in 2008 and 2009.

In the case of the Sensex, 9 of the 25 most volatile months occurred in 2008, while in the case of the Nifty, 7 of the most volatile months occurred in 2008. It demonstrates that 2008 was the most unstable year on record.

Table 4.7: Top 25 Most Volatile Months on The BSE Sensex And S&P CNX Nifty (January 1996–December 2011)

Rank	Month & Year (BSE)	Monthly Volatility (BSE)	Month & Year (NSE)	Monthly Volatility (NSE)
1	October-08	5.19	October-08	5.03
2	May-09	4.20	May-04	4.32
3	May-04	3.88	May-09	4.15
4	November-08	3.85	November-08	3.83
5	April-00	3.83	April-00	3.51
6	July-08	3.30	January-08	3.29
7	June-06	3.25	April-99	3.27
8	March-08	3.21	June-06	3.22
9	May-00	3.14	March-08	3.06
10	April-99	3.09	June-98	3.05
11	June-98	3.08	October-97	3.01
12	January-08	2.89	July-08	2.97
13	March-01	2.85	March-01	2.91
14	September-01	2.76	May-06	2.77
15	March-97	2.66	January-09	2.73
16	October-98	2.63	March-97	2.71
17	May-06	2.55	May-00	2.65
18	December-08	2.53	February-96	2.56
19	September-08	2.50	September-01	2.56
20	January-00	2.47	January-00	2.52
21	January-97	2.44	February-08	2.46
22	February-00	2.44	December-08	2.46
23	April-01	2.42	October-07	2.46
24	October-07	2.34	October-98	2.43
25	February-08	2.32	March-09	2.34

Source: Information gathered from Tables 4.5 and 4.6.

The total findings show that 15 of the most volatile months for both the Sensex and the Nifty occurred in 2008, 2009, 2000, and 1997, 2 months occurred in 1998 and 2006, and 1 month occurred in 1999, 2004, and 2007. Three of the most volatile months for Sensex occurred in 2001, whereas two of the most volatile months for Nifty occurred in 2001 and one occurred in 1996.

d) Spike Volatility

Differentiating between "normal" volatility and "spike" volatility is essential. The latter metric is designed to capture those days with very large swings.

As logarithmic price changes are roughly symmetrically distributed like a normal curve, only 'moves' that fall outside the plus or minus 3 standard deviation boundaries can be considered 'spikes' in theory. Plus, or minus three standard deviations characterizes the normal distribution's tails (Karmakar and Roy, 1996).

The average daily return for the Sensex and Nifty during the entire period was roughly 0.04%, with a standard deviation of about 1.64%, as shown in Tables 4.3 and 4.4. For the Sensex and the Nifty, this means that you can't go higher than 4.92% (3*1.64). The Sensex and Nifty's spike occurrence rates are displayed in Table 4.8.

The figure shows that out of a total of 3965 trading days, there were 70 days where the Sensex's daily return fell outside of the plus or minus 4.92% range. Similarly, out of a total of 3992 trading days, 64 saw rises for Nifty. The table clearly shows that 2008 was the year with the most spikes.

To see why the years with more frequent spikes also showed overall volatility, we can compare the following table with Tables 4.1 to 4.4. Sensex and Nifty both remained relatively flat in 2002, 2003, 2005, 2007, and 2010, with the exception of two spike entries in 2007. It's fair to say that 1996, 1998, 2001, 2004, and 2006 were all calm years.

Table 4.8: Number Of Days with Returns of More Than (±) 4.92% On the BSE Sensex And S&P CNX Nifty

Year	Positive (BSE)	Negative (BSE)	Total (BSE)	Positive (NSE)	Negative (NSE)	Total (NSE)
1996	3	0	3	3	0	3
1997	3	2	5	3	2	5
1998	1	2	3	1	2	3
1999	6	1	7	2	2	4
2000	4	6	10	3	4	7
2001	1	2	3	1	3	4
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	1	2	3	1	2	3
2005	0	0	0	0	0	0
2006	2	1	3	2	2	4
2007	0	0	0	1	1	2
2008	14	13	27	12	13	25
2009	4	2	6	2	2	4
2010	0	0	0	0	0	0
2011	0	0	0	0	0	0
All Years	39	31	70	31	33	64

Source: Estimated using information gathered from the BSE and NSE websites during the specified time frame.

Information on the days when both the Sensex and the Nifty posted daily returns of greater than ±4 is listed in Table 4.9. In addition to the "spikes" we just defined, other days saw considerably higher returns as well.

Table 4.9: Extreme Daily Returns on BSE Sensex, S&P CNX Nifty

S. No	Date	Daily Returns in % (BSE Sensex)	Daily Returns in % (S&P CNX Nifty)	Events Reported
1	2 February, 1996	+5.55	+5.46	Not Available
2	8 February, 1996	+5.39	+5.05	Not Available
3	9 February, 1996	-----	+5.24	Not Available
4	24 April, 1996	-----	+4.40	Not Available
5	11 December, 1996	+4.98	+4.13	Not Available
6	1 January, 1997	+5.53	-----	The government has promised to take action to revive the stock markets within the next two weeks.
7	15 January, 1997	+4.33	+5.17	Not Available

8	16 January, 1997	-5.37	-----	Not Available
9	28 February, 1997	+6.33	-----	▪ P. Chidambaram has just delivered the second budget for the Union. ▪ Slashed rates of both corporate and individual income taxation. ▪ Modified the alternative minimum tax system. ▪ Revealed a plan for anonymous reporting.
10	1 March, 1997	+5.48	+9.93	▪ Union Budget Presentation (1997–1998). ▪ The previous limit on FII investment climbed to 30% from 24%.
11	31 March, 1997	-8.62	-8.84	The President of the Congress Party has said that his party will no longer be supporting the United Front Government. The President has requested that the Prime Minister demonstrate majority rule by April 7th.
12	28 October, 1997	-----	-8.20	The stock markets around the world have collapsed. A record drop in both the Hang Seng and the Dow Jones.
13	29 October, 1997	-----	+6.96	Revival of Equity Markets Around the World. Global markets relax as the Dow Jones index recovers.
14	15 June, 1998	-----	+6.96	▪ There is talk of economic upheaval in Southeast Asia. ▪ The Dow and the yen both took a big hit.
15	17 June, 1998	+7.31	+7.04	▪ To prevent a further decline in stock prices, SEBI has banned short sales. ▪ The Southeastern Asian region is on the mend.
16	5 October 1998	-7.50	-7.36	Holding US-64 equities in the upcoming weeks.
17	21 January, 1999	-----	+4.56	▪ Expectations were raised for the upcoming announcement of the Union Budget. ▪ Due to strong buying support from both domestic and foreign institutional investors, the stock market turned bullish.
18	27 February, 1999	+4.99	+4.17	▪ Yashwant Sinha delivered the second Union Budget. ▪ Mutual fund and Unit Trust of India dividends received by Sinha will be exempt from taxation. ▪ Shares with long-term capital gains now only incur a 10% tax, down from 20%.

19	5 April, 1999	-----	-5.01	The AIADMK has threatened to cut ties with the current BJP-led coalition.
20	16 April, 1999	+6.22	+7.54	The National Lok Dal and the DMK parties have reached an agreement to back the governing BJP-led coalition in the upcoming vote of confidence.
21	17 April, 1999	-7.13	-7.71	The Parliament voted no confidence in the coalition formed by the BJP.
22	26 April, 1999	-----	-5.29	The President has decided to abolish the Lok Sabha.
23	31 May, 1999	+4.92	+4.59	▪ A reduction in Badla Interest Rates. ▪ Some encouraging news from the Kargil front. ▪ There have been rumblings that the foreign ministers of India and Pakistan may meet to address the recent developments on the border.
24	12 July, 1999	+4.98	+4.78	Bring the Kargil War to a quick close.
25	7 October, 1999	+5.50	+5.38	In the General Elections, the BJP-led alliance (NDA) is making progress toward a majority.
26	1 November, 1999	-----	-4.27	▪ Concerns about the Y2K bug. ▪ Lack of institutional demand locally and selective sale of foreign funds.
27	2 November, 1999	+5.04	+4.78	UTI and LIC each invested Rs. 200 crores in the market.
28	22 December, 1999	-----	+4.13	Strong overnight advances on the US Nasdaq, which is heavily weighted toward technology, and frenzied corporate reorganization efforts in the Indian corporate sector.
29	3 January, 2000	+7.12	+7.28	The largest single-day increase in the BSE Sensex since 1992 marked the beginning of the "Y2K bug free millennium" in the Indian stock market.
30	29 February, 2000	-5.25	-----	▪ Due to the doubling of the dividend tax, the presentation of the Union Budget is disappointing. ▪ Imposition of a progressive tax on export revenue. ▪ Macroeconomic problems including the budget deficit, government expenditure, and public sector disinvestment are not addressed.
31	4 April, 2000	-7.42	-7.20	▪ FIIs that made investments through Mauritius have reportedly received letters from the income tax department.

				▪ NASDAQ Composite Index also experienced a significant decline the day before.
32	7 April, 2000	+6.99	+6.93	▪ The government makes the decision to revoke Income Tax notices already delivered to FIIs. ▪ NASDAQ also experienced a significant recovery the day before.
33	10 April, 2000	+4.19	-----	The Revamp initiative, which involved Satyam Computers, Zee Telefilm, Dr. Reddy Laboratory, and Reliance Petroleum, gave SENSEX more momentum. Indian Hotels, IDBI, Tata Chemicals, and Tata Power were among the equities that were sold off.
34	13 April, 2000	-4.80	-4.76	▪ Persistent NASDAQ Composite Index weakening. ▪ Reliance scrip as a result of a buyback offer that fell far short of expectations.
35	17 April, 2000	-5.79	-5.07	The previous trading day saw the largest-ever declines in the DJIA and NASDAQ Composite Index, signaling a global stock market disaster.
36	26 April, 2000	+5.55	+5.48	▪ Increased net sales margins, a ban on paying carryover changes to naked short sellers, and a 12% reduction in the daily circuit filter limit are all implemented by SEBI. ▪ NASDAQ and DOW both saw gains. ▪ Additionally, a rise in U.S. interest rates is anticipated, which suggests that money may move into emerging markets.
37	2 May, 2000	-6.32	-5.34	▪ A bank liquidating its stock holdings because it has not received the margin payment. ▪ Investigations of the marketing practices of 30 IT businesses were reported in the news.
38	4 May, 2000	-----	+4.78	The financial incentives made available to the pharmaceutical and information technology industries.
39	8 May, 2000	-5.03	-4.12	▪ The market reacted negatively to news of Infosys chief's comment that Southeast Asian software companies might compete with Indian software giants.

				▪ Additionally, reports of a weak monsoon had a bad overall effect on FMCG companies.
40	11 May, 2000	-4.75	-4.39	Market mood was lowered by the scramble of FIIs and brokers to reduce their exposure to equities.
41	24 July, 2000	-6.37	-5.86	▪ RBI increases the bank rate by 1%. ▪ Political instability at the center is evident.
42	18 September, 2000	-----	-4.53	▪ persistent increase in oil costs. ▪ There have been rumours of rising tension between Iran and Iraq, two west Asian neighbours at war.
43	22 September, 2000	-5.43	-4.88	▪ Following a strong decline in the US market due to a profit warning by Intel, the major chip maker, the Asian market was dominated by a sharp decline in technology companies. ▪ Rumours of significant NSE broker margin payment defaults.
44	28 February, 2001	+4.26	+4.22	Union that favours the market spending plan as it was ▪ corporation dividend tax rates are decreased from 20% to 10%. ▪ the repeal of the business tax surcharge. ▪ The FII investment cap in Indian enterprises has increased from 40% to 49%. ▪ 150 basis point reduction in modest savings rate. ▪ The exclusion of capital gains if they were used by businesses to invest in primary issues came as a surprise.
45	2 March, 2001	-4.22	-----	▪ Unverified rumours (that Nortel, a significant client of Infosys, has scaled back orders with the business). ▪ Fear of a US economy slowdown.
46	9 March, 2001	-4.41	-----	Falling stock prices on Dalal Street as a result of a payment crisis at the Calcutta Stock Exchange brought on by pay-in defaults by several brokers, including Mr. Dinesh Kumar Singhania, a director of the exchange.
47	12 March, 2001	-----	-4.63	▪ The NASDAQ Composite Index dropped significantly the day before. ▪ Observing short sale restrictions.
48	13 March, 2001	-6.22	-6.31	The Sensex fell after shocking media revelations regarding corruption in defence

				agreements (BJP President Bangaru Laxman was seen accepting bribes on Tehalka.com's camera).
49	14 March, 2001	+5.08	+6.00	Strong hitters in technology and the traditional economy.
50	30 March, 2001	-4.00	-4.00	▪ As a result of rumours that the top technology bull operator, Mr. Ketan Parekh, had neglected to make payments to banks (and that the Bank of India had filed a case with the government agencies for his arrest and that the bull operator had been called by the Central Bureau of Investigation (CBI) for questioning), the bull operator was reportedly arrested. ▪ Resignation of the Calcutta Stock Exchange's (CSE) elected directors.
51	12 April, 2001	-4.35	-4.01	▪ Reports claiming that a number of federal investigative organizations are looking into stockbrokers' alleged involvement in share price manipulation and their unofficial connections to other countries. ▪ There are no encouraging developments to boost investor confidence. ▪ Concerns over the budget's passing in its current shape continue, especially as the main coalition partners try to capitalize on the problem politically.
52	12 September, 2001	-----	-4.11	▪ SEBI reduced the dummy circuit filters (used for order verification) and strengthened the market-wide index circuit-breakers on 53 specific stocks. ▪ The World Trade Center's twin towers in New York were struck by commercial aircraft driven by terrorists.
53	14 September, 2001	-----	-5.50	Shares drop as investors fear that the US would strike Afghanistan right away.
54	21 September, 2001	-6.03	-5.09	▪ Major Asian stock indices suffered from a sharp decline in the NASDAQ and Dow Jones Industrial Average. ▪ The destruction caused by terrorists triggered plans for US military retribution, many layoffs, worries of a recession, and national grief.

55	28 February, 2002	-----	-4.05	▪ Due to the increase in the surcharge from two to five percent, the presentation of the Union Budget is disappointing. ▪ The repeal of the 10% distribution tax on corporations and mutual funds' dividend incomes, which is then passed on to recipients. ▪ Small deposits are decreased by 5%. ▪ Gujarat continues to be tense. ▪ The derivatives contract for February 2002 had to be sold, which was another reason for selling.
56	10 April, 2002	-----	-4.34	Infosys, a pioneer in technology, performed worse than anticipated.
57	27 August, 2003	+4.90	-----	The BSE wants to launch a trading platform that is just for small-cap businesses that are listed on both the BSE and regional stock exchanges (RSEs) and have paid-up capital of up to Rs. 20 crores.
58	23 January, 2004	-----	+4.26	▪ The Securities and Exchange Board of India (SEBI) has updated and clarified certain technical information about Participatory Notes (PNs). ▪ India's foreign currency rating was raised to investment grade by the international rating agency Moody's.
59	27 April, 2004	-----	-4.05	▪ The Reserve Bank of India is restricting bankers' ability to pay dividends (according to a circular the RBI released, banks with NPAs of more than 3% must request RBI clearance before announcing the dividend). ▪ Exit polls and opinion surveys suggested that the Center would experience political unrest.
60	11 May, 2004	-4.23	-4.01	Elections in Andhra Pradesh saw a BJP-TDP rout. Congress triumphs. The decisive element was the magnitude of the TDP loss. Nobody anticipated that it would be by such a wide margin. The market is concerned because this clearly points to a hung Parliament at the Center.
61	14 May, 2004	-6.23	-8.19	Uncertainty regarding reforms and underinvestment by the next administration.

62	17 May, 2004	-11.80	-13.05	▪ "Market-unfriendly" The Center's economic policymaking is overwhelmingly influenced by leftist ideology. ▪ A slowdown in the Chinese economy, rising oil prices, and fears of a rise in US interest rates.
63	18 May, 2004	+7.93	+7.97	▪ Manmohan Singh, a former finance minister, was expected to succeed Sonia Gandhi as prime minister but she declined. ▪ Another help came from the Reserve Bank of India when it lowered the margin requirements for bank loans secured by shares. ▪ Investors have opted to have a long-term perspective and avoid being swept away by short-term anomalies because the economy's fundamentals are robust.
64	19 May, 2004	-----	+4.16	The "original reformer," Dr. Manmohan Singh, has been appointed prime minister.
65	28 May, 2004	-4.51	-5.02	The stock market rejected the United Progressive Alliance (UPA) government's Common Minimum Programme (CMP) because it provided no clear guidance for the new administration's approach to the economy.
66	15 May, 2006	-----	-4.11	▪ Weak indications from international bourses. ▪ Falling metal prices on global markets (as speculators withdrew out of concern for a drop in demand brought on by rising interest rates).
67	18 May, 2006	-7.00	-7.01	▪ Foreign funds began to report profits as a result of a government circular on taxing investment gains, which calmed the nervous stock market. ▪ Weak international markets and reports of rising interest rates in the US. ▪ Large-scale client sales by brokerage firms as a result of margin calls or a shortage of margin.
68	19 May, 2006	-4.06	-4.28	▪ Left leaders' market-unfriendly remarks on reforms and taxing foreign funds. ▪ Margin calls and position reductions on leveraged trades.
69	22 May, 2006	-4.27	-5.23	▪ Global cues are weak. ▪ Freefall is triggered by margin pressure.

70	2 June, 2006	-----	+4.26	Foreign fund purchases ended a three-day losing streak in the stock market.
71	8 June 2006	-4.84	-----	▪ The RBI increased the reverse repo rate under the Liquidity Adjustment Facility (LAF) by 25 basis points to 5.75 percent from 5.50 percent. ▪ The repo rate rose 25 basis points to 6.75 percent.
72	9 June, 2006	+5.39	+5.08	The overnight rally in US stocks and rebound in Asian markets coincided with a drop in fuel costs.
73	13 June, 2006	-4.46	-4.17	Global indexes weak.
74	15 June, 2006	+6.67	+ 6.11	▪ Profit from global indications like the Bank of Japan's decision to maintain low interest rates. ▪ Corporate tax statistics were better than expected, indicating solid April-June earnings.
75	30 June, 2006	+ 4.30	+ 4.25	Investors praised the US FOMC's rate hike decision (0.25% to 5.25%) and the Fed Reserve's statement signaling a possible delay in a subsequent rate increase in August.
76	28 February, 2007	-4.09	-----	A market-unfriendly Union Budget is presented. ▪ Tax on dividend distributions rose from 12.5% to 15%. ▪ Fringe Benefit Tax continues to exist. ▪ Excise duty on cement pricing has increased. ▪ The extension of the minimal alternate tax (MAT) to the information technology industry and the application of the MAT to all corporate incomes. ▪ STT and capital gains tax rates remain unchanged.
77	5 March, 2007	-----	-4.11	▪ According to brokers, the Indian corporate sector's post-Budget unhappiness has persisted. ▪ Weak market worldwide
78	2 April, 2007	- 4.83	- 5.04	The Cash Reserve Ratio (CRR) and repo rates are increased by the Reserve Bank of India.
79	1 August, 2007	- 4.03	- 4.12	▪ The increase in crude oil prices, which just crossed the $78 per barrel mark. ▪ The enormous losses Macquarie Bank reported in the US market caused alarm

				among overseas investors all around the world. ▪ The threat of subprime lending defaults in the US housing loan sector.
80	16 August, 2007	- 4.38	- 4.48	US market effects of subprime lending. (Unconfirmed reports that two other American mortgage companies have been hit by the sub-prime crisis haunted bourses).
81	19 September, 2007	+ 4.09	+ 4.01	▪ A 50-basis point reduction in the US Federal Reserve's interest rate (the Fed rate decrease would result in increased liquidity, which would attract more investment into emerging countries like India). ▪ Hope that India will follow suit and lower interest rates or at the very least hold them steady.
82	9 October, 2007	+4.41	+4.65	The potential for a compromise over the Indo-US nuclear agreement between Left-leaning parties and the Congress.
83	15 October, 2007	-----	+4.36	▪ Corporate profits have increased by an average of 40–50%, according to the statistics. ▪ liquidity from overseas sources (Many fund companies increased their exposure in emerging markets while decreasing it in industrialized nations).
84	23 October, 2007	+4.87	+5.44	▪ SEBI's clarification that there is no cap on the number of subaccounts that can register as FIIs. ▪ Since the existing P-note policy will end on October 25, FIIs bought heavily.
85	14 November, 2007	+4.59	+4.17	▪ Favorable global cues. ▪ Wal-Mart's results were better than anticipated, which led to a rise in US markets that spread fast to other markets across the world. ▪ Signs that a resolution on the Indo-US nuclear dispute was close between the Left and Congress parties.
86	17 December, 2007	-----	-4.58	▪ The RBI's clarification that banks are not permitted to guarantee stock exchanges on behalf of FIIs. ▪ Fear that US authorities may raise interest rates in response to inflation concerns. ▪ The US holiday season (which was an additional trigger because there is

				significant redemption pressure on FIIs due to seasonal spending by investors abroad).
87	21 January, 2008	-7.70	-9.10	▪ Weaker prognosis for the world economy. ▪ The two IPOs of Future Capital and Reliance Power drained money. ▪ Margin Selling, often known as the forced sale of stocks that investors had pledged as collateral for loans on which they could not make the required margin payments.
88	22 January, 2008	-5.10	-6.12	Ongoing crises such as margin selling and IPO The markets got off to the worst possible start as they immediately hit the lower circuit with a 10% decline in the first minute of trade in the morning, stopping trading for an hour till 10.55 a.m.
89	23 January, 2008	+5.04	+6.02	The company has achieved solid and consistent success.
90	25 January, 2008	-----	+6.72	▪ The expectation of a rate cut boosted equities in real estate, banks, and cars. ▪ Optimism on the budget and improved company performance.
91	11 February, 2008	-4.89	-5.28	▪ Weak global market signals. ▪ Indian corporations' profitability are being hurt by the global economic downturn. ▪ Investors are dissatisfied since Reliance Power's stock initially trades below its offering price.
92	14 February, 2008	+4.71	+5.38	Favourable indications from international markets, such as reports of increased US retail sales figures and Japanese GDP growth, have given the economy a boost.
93	3 March, 2008	-5.26	-5.32	▪ A major blow was handed to domestic markets by a sharp decline in US equities. ▪ Many FIIs and arbitrageurs have been alarmed by the budget proposals (The farmers' loan waiver proposal for Rs 60,000 crore without making any provision in the budget raises doubts about the source of the cash).
94	13 March, 2008	-----	-5.23	▪ News of unfavourable changes in the world's currencies (the dollar's decline to a 12-year low against the yen).

				▪ Weak January industrial output numbers for the country.
95	17 March, 2008	-6.22	-5.25	The US market fell precipitously as a result of the Bear Stearns crisis, and Asian markets experienced a similar decline.
96	25 March, 2008	+5.89	+5.64	▪ The US Federal Reserve's 75 basis point rate decrease causes the Sensex to jump. ▪ Bear Stearns was saved from bankruptcy thanks to the reduction in the discount rate.)
97	31 March, 2008	-4.54	-4.29	▪ Businesses that engage in derivatives transactions on the FX market reveal their mark-to-market losses. ▪ High inflation rate and two days in a row where US stock markets closed negatively. ▪ There are rumours that the US IT sector is slowing down.
98	21 June, 2008	-4.39	-----	▪ New record highs for inflation. ▪ Politics are now uncertain.
99	27 June, 2008	-----	-4.24	▪ The 11.42 percent high inflation rate (high inflation is defined as a combination of high interest rates and high input costs). ▪ A record-breaking $142 per barrel was paid for oil. ▪ Worldwide signal that is negative. ▪ Political ambiguity over the nuclear agreement.
100	2 July, 2008	+5.28	+4.92	▪ News that is good on the political front. ▪ Strong market opening in Europe. ▪ The repurchase announcement made by DLF; a developer based in Delhi.
101	3 July, 2008	-4.26	-4.18	▪ Price increase for crude oil ($146 per barrel). ▪ Because of the tremendous doom and gloom that encourages aggressive short selling, there is no element of confidence.
102	9 July, 2008	+4.50	+4.14	Market gains were attributed to anticipation that the government would advance some of the economic changes that Left-wing parties had been blocking for the previous four years.
103	15 July, 2008	-5.03	-4.52	▪ Major global market collapse. ▪ Due to Fitch, a global rating agency, the rupee lost 30 paise against the dollar.

104	17 July, 2008	+4.17	-----	▪ Falling crude oil prices. ▪ Note of optimism on the global market.
105	23 July, 2008	+5.77	+5.43	▪ The confidence votes were won by the Manmohan Singh government. ▪ favourable global cues. ▪ Crude oil drops in price to $125 per barrel.
106	19 September, 2008	+5.31	+5.00	▪ Following a week of intense selling, foreign institutional investors switched to net buying. ▪ New Delhi provided assurances that the US turmoil would not significantly affect the Indian economy. ▪ Likewise, observing the strong starts of Asian markets.
107	3 October, 2008	-4.14	-----	▪ Worldwide sentiment is down. ▪ Gains were eliminated by a lack of buying support. ▪ Investors are concerned that the financial crisis may persist even after the US rescue plan is approved.
108	6 October, 2008	-5.31	-5.82	Following global cues, especially the European markets, which began sharply down on the announcement that the UK Government was bailing out Fortis.
109	10 October, 2008	-7.33	-6.88	Industrial growth slows to 1.3%.
110	13 October, 2008	+7.16	+6.23	Confirmation of the nation's financial soundness from the finance minister, along with his guarantee that the government would take action to increase liquidity.
111	15 October, 2008	-6.05	-5.23	▪ The exposure margin standards in the derivatives sector were tightened by SEBI. ▪ Weak market globally.
112	17 October, 2008	-5.96	-6.15	▪ Fears of a protracted downturn. ▪ Further global unrest (weak European Market).
113	21 October, 2008	+4.40	-----	P. Chidambaram, the Union Finance Minister, said in a statement to the Lok Sabha that the government would continue to search for ways to boost the economy while keeping an eye on inflation.
114	22 October, 2008	-4.92	-5.39	▪ Deflation in US stocks as a result of a wave of disappointing corporate earnings from big US corporations. Weakness in the worldwide markets.

				▪ The rate of profit growth has been constrained to a single digit by high input costs and interest costs.
115	23 October, 2008	-----	-4.06	▪ Weak global cues (the world economy entering a recession and the financial crisis getting worse). ▪ After the RBI maintained all of the major rates unchanged, markets further declined.
116	24 October, 2008	-11.60	-13.01	▪ The main interest rates were left unchanged by the central bank. ▪ The estimated growth of the GDP was reduced from 8% to 7.5%.
117	28 October, 2008	+5.69	+6.16	▪ Greetings from Diwali filled the marketplace. ▪ Investors anticipate a US Fed interest rate reduction.
118	31 October, 2008	+7.90	+6.76	▪ Domestic inflation decreases to 10.68%. ▪ The rate reduction worldwide caused the RBI to anticipate cutting rates as well.
119	3 November, 2008	+5.46	+5.34	Market recovery as a result of RBI action (on Saturday, it lowered the repo and CRR rates, ending the excessive interest rate regime).
120	5 November, 2008	-4.93	-4.80	▪ After the five-day winning streak, profit booking. ▪ Five petrochemical and polyester facilities owned by Reliance are closing in Patalganga.
121	10 November, 2008	+5.58	+5.73	To strengthen the economy, the Chinese government on Sunday unveiled a $586 billion spending plan for infrastructure and social welfare. This raised hopes that more nations would act to free their economies from the grip of the financial crisis.
122	11 November, 2008	-6.84	-6.89	▪ The big $586 billion stimulus package from China only offered a brief reprieve. ▪ India's October export results and concerns of a protracted slowdown in global economic activity.
123	18 November, 2008	-----	-4.25	▪ The statement by Citigroup that it would lay off 50,000 workers ▪ Global cues are weak.
124	21 November, 2008	+5.35	+5.35	▪ Decreasing to 8.9%, the inflation rate. ▪ And the hope that the government's central bank will lower interest rates in the upcoming weeks.

125	4 December, 2008	+5.34	+4.83	▪ Decrease in the national inflation rate ▪ The anticipation of a government stimulus program to stimulate the economy.
126	10 December, 2008	+5.23	+5.05	▪ Since they will be away in December, many of the larger FIIs—many of which have been sellers in the market—have scaled back their operations. ▪ Stock prices have increased as a result of the fiscal and monetary package released last week.
127	7 January, 2009	-7.52	-6.38	The admission of the enormously inflated financial sheet by Mr. B. Ramalinga Raju, chairman of Satyam Computer Services.
128	23 March, 2009	+4.97	4.62	▪ Market gains in Asia and Europe ▪ US plans to assist banks and other financial institutions in getting rid of their toxic assets are reported.
129	30 March, 2009	-4.90	-4.29	▪ Weak global cues and profit taking by investors after last week's spectacular gains. ▪ The 'drag-down' impact of investors purposefully posting losses before the fiscal year end (March 31) for tax reasons also existed.
130	2 April, 2009	-----	4.81	▪ Gains in the international stock markets. ▪ Expects the RBI to lower rates further. ▪ The inflation rate is falling almost to zero.
131	29 April, 2009	6.22	-----	▪ At the April Futures and Options (F&O) series expiration, traders closed off their short positions. ▪ The prosperous markets of Europe.
132	18 May, 2009	15.99	16.33	The success of the Congress-led alliances was celebrated on the stock market.
133	6 July, 2009	-6.01	-6.02	Market response to the budget announcement was very positive (no major policy adjustments, higher minimum alternate tax (MAT), higher budgeted fiscal and revenue).
134	17 August, 2009	-4.15	-4.29	Even while the monsoon continues to have a negative impact on investor confidence, the global economic recovery will go more slowly than anticipated.

Source: Information gathered for various dates from several newspapers, including The Hindu, The Economic Times, Business Line, and The Tribune.

A number of intriguing observations can be made from the data in Table 4.9. The year 2008, which features 17 positive and 18 negative excessive return entries for the Sensex and 16 positive and 20 negative entries for the Nifty, dominates the list of days. Following that, the year 2000 with 13 entries for the Sensex and 12 for the Nifty is displayed. Over the past two years, volatility has increased.

The Stock Market celebrated the triumph of the Congress-led alliance on May 18, 2009, with the highest one-day price change and a positive change in both the Sensex (+15.99%) and the Nifty (+16.33%). This was in stark contrast to what occurred on May 17, 2004, when the same Congress-led UPA was elected in national elections. On May 17th, 2004, the Sensex dropped by (-11.8%) and the Nifty by (-13.05%), both all-time lows. This was because the NDA administration suffered an unexpected loss in the parliamentary elections.

4.2 CONSEQUENCES OF VOLATILITY

Volatility is a measure of risk and, as such, should give investors and others a reason to be wary of the stock market and other financial instruments. Thus, in recent years, concerns about volatility have gained prominence amongst financial professionals, market participants, individual investors, regulators, and academics.

But the moot question is whether variation or fluctuation in the price of an asset or volatility is bad?

Essentially, there are two types of volatility. There is no denying that volatility has both positive and negative aspects, each of which might have an impact on a different group of stakeholders in the sector, such as shareholders, bankers, traders, or analysts. What is needed in the market is open to several interpretations. Regarding volatility, there are clearly divergent viewpoints.

4.2.1 THE DRAWBACKS OF VOLATILITY

- **Volatility in Stock Returns Hurts the Economy by Making People Spend Less**

As soon as stock prices keep going down, economic predictions usually call for much slower growth in the economy. They think that people will spend less because stock prices are going down (Garner, 1988). Consumer spending is likely to go down because people's income has dropped a lot because of the drop in stock prices. A drop in shopper confidence could also cause people to spend less. One of the most thrilling times in U.S. financial history was the stock market crash of October 1987. On October 19, stock prices fell more than on any other day, even the famous stock market crash of 1929. The sharp drop in stock prices made most economists think that the economy would grow less quickly in 1988. People were more pessimistic because they thought that the crash of the stock market and the resulting drop in family wealth would make people spend less.

- **Changing Stock Returns May Also Affect How Much a Business Spends on Investments**

The increased risk in equity investments may be perceived by investors as a rise in stock market volatility. Speculators could then rebalance their portfolios toward safer investments. Since investors are more likely to buy stock in larger, more established companies as a result of this reaction, newer companies may be hit particularly hard (Gertler & Hubbard, 1989).

- **Volatility in Stock Returns Could Make the Financial System Less Stable and Lead to Changes in Structure or Rules**

Systems that work well when returns aren't very volatile might not be able to handle the big price changes. It's possible that the market rules and laws need to be changed to make it more stable when there is more volatility (Sean and Gordon, 1989).

- **How the Capital Markets Work Is Affected**

The way the financial markets work is affected by how volatile the market is. Some small buyers stay away from the market because it is too volatile. Some buyers got rid of their stocks and put the money they got into other, risk-free securities. It may also make it harder for the market to clear and pay, which could make investors lose faith, which would lower market participation and liquidity (Geert and Campbell, 2002).

- **Bringing Down the Net Worth of The Family Sector**

The net worth of households goes down when there is volatility. Even though higher prices for government bonds helped keep family wealth stable, consumers were hurt by investing in stocks directly and in mutual funds and pension funds.

- **The Real Economy Is Also Affected by Volatility**

Businesses can talk about what projects are likely to succeed, what technologies are likely to grow, and what goods people are likely to buy in capital markets. If the prices of securities correctly reflect these views, then they send useful signals to business leaders and companies that want to make their companies as valuable as possible. If, on the other hand, the prices really do have big systematic errors, then business managers who use price signs to make decisions are only reacting to noise. So, too much instability, or "noise," that doesn't seem to be linked to any important news about the company or the market as a whole makes stock prices less useful as a "signal" about how much a company is really worth (Fabio and Antonio, 2005).

- **Volatility Affects Both the Local and International Markets**

Volatility effects both the local and international markets. The main reason the Sensex fell by 6.03% on September 21, 2001, was a big drop in the Dow Jones Industrial Average and the NASDAQ. Sensex was down 5.96% again on October 17, 2008, because the European Market was weak.

4.2.2 POSITIVE EFFECTS OF VOLATILITY

- **Volatility Is a Sign of a Market That Is Working Well and Getting Enough Information to Buyers**

Most economists think that changes in the market are caused by new knowledge. People who trade on the market are always getting new information that makes them reevaluate the true value of the assets they are trading. When there is an efficient market, the price of the traded object changes quickly to reflect the new information. This means that the instability that comes from it is good, not bad (Grossman and Stiglitz, 1980).

- **The Trader Has the Chance to Enter the Market Short and Get a Quick Result**

From the traders' point of view, instability gives them a chance to cut their losses quickly. If the market goes the way they think it will, they can make more money. Imagine a world where investments in stocks always did the same thing. In this case, a stock would be like a CD. As long as inflation is taken into account, it would be stable, but it wouldn't give you much money either. Because they are risky, stocks have given back more than 10% a year on average over the last 80 years. To put it another way, a bigger return is what you get for investing in something riskier.

Then again, picture a world where Reliance's stock price remained relatively stable for months on end, adding only a little amount each year. An investor would have a pleasant experience in such a scenario, but they would never get a chance to save money. Shares of even this generally steady corporation have risen during the previous four years. There has been no change at all at Reliance during that time, and the company has continued to operate in the same global economy. The stock price has risen and fallen depending on the moods of investors, which have been affected by both optimism and pessimism (RightLine, 2003).

As a result, making money in the stock market requires effort. Choosing solid corporations or mutual funds is involved, however indirectly. Most of the effort, though, comes from fighting off the worry and concern that come with knowing that tomorrow your investment could be worth significantly less than it is today. The difficulty lies in maintaining stable relationships with reliable companies.

- **Earnings from Trading Options**

The only time an option trader makes money is when the underlying asset is extremely volatile. In that case, the out-of-the-money option has a chance of becoming in-the-money (a situation in which the strike price of a call option is below the current market price of the underlying security, or the strike price of a put option is higher than the current market price of the underlying security, respectively). There is value in the option itself. But if the market doesn't behave as expected, you could end up losing money. Therefore, volatility is crucial since it is the single most important factor in determining how much extrinsic value there is in an option's pricing. There is an increase in the extrinsic value of both calls and puts as volatility rises. (Chuck, 2007).

- **Stocks Benefit from Increased Volatility**

When the stock market drops, many investors are at a loss for what to do. They either sell or take no action, waiting for the downward trend to reverse. It's ironic that they only start investing when stock prices are high. It's unusual since it's the opposite of what one would expect. In general, consumers prefer to make purchases when prices are low, whereas investors choose to buy equities when the market is high. The term "herd mentality" describes the widespread belief that further price increases are inevitable as a result of the market's current upward trend. In what is known as "contrarian theory," a savvy investor will make purchases when the market is falling. A long-term investor need not worry about today's stock market drop because he is building a portfolio for the future. He will likely buy the stock at the first sign of a downward trend. When the stock price drops, investors tend to buy more shares since their "holding cost" decreases. This is the benefit of the volatility that so many people hate in the stock market. When taking advantage of the

volatility of the stock market, the most important thing for an investor to do is to conduct extensive research about a stock before buying any shares. If someone wants to make money in ten years, he should invest in a stock that is excellent enough to hold for at least that long (Singh, 2009).

All parties involved must deal with volatility, which has positive and negative effects. Therefore, the question of whether volatility is good or bad depends not on the market as a whole, but on the individual traders' risk tolerance and the rewards they are willing to forego. There can be no unexpected gains if there is no risk, and there is no risk if there is no volatility.

Participants can, therefore, invest their money safely in a variety of vehicles such as money market funds, short-term notes, and Treasury bills. But if they want bigger profits, they have to put up with the risks. Until you've had a chance to learn why "risk" isn't always a negative thing, you should store your money in safer investments if the market's volatility scares you. Since volatility is inevitable, it's best to lessen its impact as much as possible.

4.3 STOCK MARKET VOLATILITY DETERMINANTS

There are micro and macro elements that contribute to volatility. Earnings per share, company size, and book value per share all have considerable effects on the value of a firm's stock, but micro factors, such as dividend decisions, major expansion plans, and the receipt of large contracts, are narrower in scope. The stock market's behaviour is influenced by the economy as a whole, which in turn is affected by macro level variables. Clearly, the impact of these factors is reflected in the volatility of the stock market. The tax rate, interest rate, inflation rate, agricultural and industrial production, bank, GDP, government expenditure, foreign institutional investment, exchange rate, union budget, import growth rate, current account deficit, money supply, and foreign currency reserves are all examples of such variables. Stock market volatility can be caused by a variety of different things. However, the scope of the present investigation will only include the following elements.

1) Investment by Foreign Institutions
2) The Union Budget
3) The Rate of Inflation
4) Rate of Interest
5) The Basics of Business

4.3.1 INVESTMENT BY FOREIGN INSTITUTIONS

Investors from one country acquire a stake in the economy and means of production in another country; this is known as a foreign investment (Surumpudi, 2006). Foreign institutional investors are those that are based outside of India yet make investments within the country (Upadhyay, 2006). These investments have increased dramatically since borders were opened to the free flow of capital. However, the impact of FDI varies widely from nation to nation. The recipient country's factor productivity and trade balance may be impacted. There is a pressing requirement for foreign investment in emerging countries like India, where it is used to boost worker productivity and currency reserves to cover trade deficits. Developing nations can get access to global financial markets through foreign direct investment. There are two categories of such investments: FDI and FII, or foreign direct investment and foreign institutional investment. Direct manufacturing and a medium- to long-term time horizon characterise foreign direct investment. However, most financial market investments made by foreign institutions are only made for the short term. Because FII is transient, it can cause and be caused by movements in other local financial markets including stocks, bonds, and currencies (Ray, 2009).

Since the start of reforms in 1991, India has tried several steps to entice investors from abroad. As a result, between 2010 and 2011, India was able to get investments from overseas institutions totalling over $12,1559 million. An investment of this magnitude from an overseas institution has the potential to greatly impact a nation's progress. India is currently in the midst of capital account liberalisation, which will have far-reaching effects on foreign investment and, in particular, FII, and hence on the short-term stability of the financial markets.

Foreign institutional investors (FIIs) now play a significant role in India's stock market. The Indian stock market is just one of many economic variables that are impacted by the massive influx of foreign capital. Other variables include exchange rates, interest rates, foreign exchange reserves, and domestic monetary circumstances. Institutional investors, especially Foreign Institutional Investors (FIIs), are widely believed to play a significant effect in the fluctuations of the top Indian stock indices (Bodla and Garg, 2007).

When it comes to the stock market, FIIs can have both beneficial and detrimental effects. In a positive light, FII investment can improve the functioning of the stock market as it is believed to invest after a thorough analysis of stock valuation (Panda, 2005), increase the inflow of foreign reserve, which can help improve the balance of payment situation of the country, lower the cost of borrowing, and thus promote investment activities, and increase liquidity in the system. On the flip side, foreign institutional investors (FIIs) can cause large swings in the stock market with only a moderate change in market conditions; speculators can artificially drive up and down stock prices for short-term gains, and at the slightest hint they can withdraw from the stock market entirely, leading to massive swings in stock prices; in this process, some people profit greatly by booking when the index is high, while others lose money because they are unable to sell during the high point. A high stock price typically suggests that shareholders have made money from their investment. Investors hoping to profit from a stock's projected growth should avoid making any sudden withdrawals from their accounts. This means that investors need to have an understanding of when to get in and when to get out of a market (Sujit, 2010).

- **Theoretical and Experiment on Capital Flows and Stock Market Volatility**

Many people think that large investment firms are to blame for stock market volatility. Institutions, due to their unique investment strategies, are widely believed to increase the correlation and volatility of stock returns while also shifting stock prices away from fundamentals. Institutional investors have been blamed for having a destabilising effect on stock prices due to herding, positive feedback trading, and contagion (Mazumdar, 2004).

Therefore, 'Positive feedback trading' is the primary route by which capital inflows affect stock market volatility. Fund managers often engage in positive feedback trading, often known as "trend behaviour," in which they prefer to acquire "winner" stocks while selling "loser" stocks. Strategy of investing heavily during bull markets and selling off holdings during bear markets is described. Batra (2003) provides compelling evidence that, on average, FIIs have been constructive feedback investors. Positive feedback traders may do so for logical or irrational reasons, depending on the investor. Such investors are seen as disruptive to the market since their sales drive the price down further and their buying drive the price up further. It has been argued that this kind of trading leads to unstable capital flows in addition to increasing the volatility of stock returns. This occurs when equity investors flock to nations with rising stock markets and avoid those with sinking ones (Bohl and Brzeszczynski, 2005).

Herd behaviour is the second way that money inflow contributes to market volatility. Fund managers and investors engage in herd behaviour when they mimic the trading strategies of other managers without considering their own unique circumstances. According to research by Batra (2003).

Contagion is the third mechanism by which capital inflows affect stock market volatility. The ideal definition of contagion, then, is a rise in cross-linkages following a shock to a country or a group of countries. When a crisis strikes in one country in the same region, fund managers often employ contagion methods, such as selling assets in that country. The contagion channel is an escalation of the herd mentality displayed by many financial advisors. While herding can draw money into a particular region, contagion can cause fund managers to flee that region during a crisis (Dornbusch et al., 2000).

- **Investment Trends by FIIs**

One of the primary ways in which foreign investment enters India is through foreign institutional investment (FII). To increase the depth and breadth of the Indian capital market, it was opened to FIIs (foreign institutional investors) in 1992. Here is a table

displaying the dynamics of FII investment in India from fiscal year 1992–93 to fiscal year 2010–11.

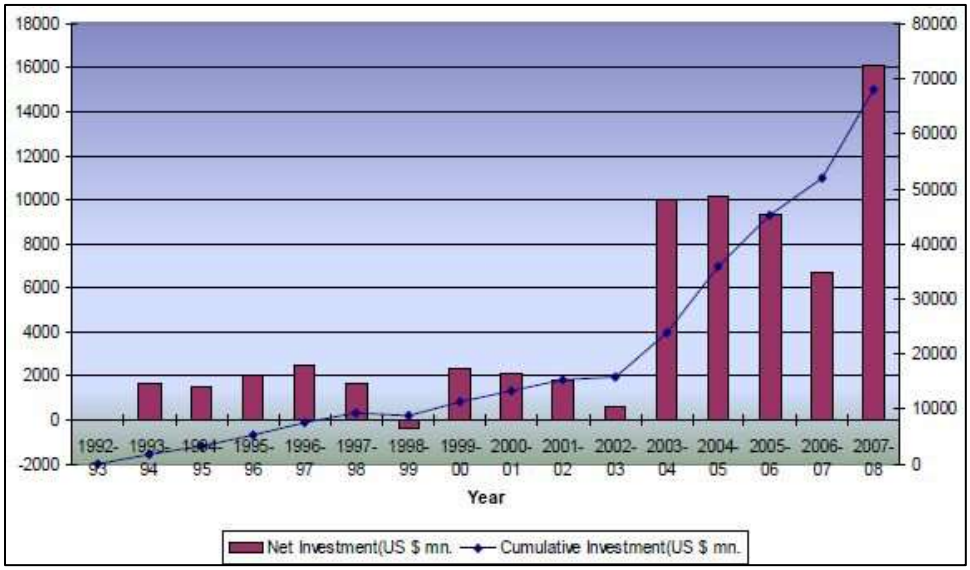
According to Table 4.10, FIIs' total net investment grew from US$4 mn. In 1992–1993 to US$12,155,59 in 2010–2011. Since then, only two years (1998–1999) and 2008–2009 (Figure 4.1) had a negative net investment by FIIs in India. A major contributor to the ongoing outflow of capital in the second half of 1998 was the deteriorating prognosis for emerging markets. The crisis that began in July 1997 dealt a significant blow to the creditworthiness of nearly all South-east Asian governments. Therefore, there was intense pressure on the FIIs to redeem their holdings in the Emerging Markets Funds. From March of 1998 until September of 1998, stock markets across these countries consistently dropped.

Table 4.10: Investment Trends by FIIs in India

Year	Gross Purchase (Rs. Crore)	Gross Sales (Rs. Crore)	Net Investment (Rs. Crore)	Net Investment (US $ mn.)	Cumulative Investment (US $ mn.)
1992-93	18	4	13	4	4
1993-94	5593	467	5127	1634	1638
1994-95	7631	2835	4796	1528	3167
1995-96	9694	2752	6942	2036	5202
1996-97	15554	6980	8575	2432	7635
1997-98	18695	12737	5958	1650	9285
1998-99	16116	17699	-1584	-386	8898
1999-00	56857	46735	10122	2474	11372
2000-01	74051	64118	9933	2160	13531
2001-02	50071	411308	8763	1839	15371
2002-03	47062	44372	2689	566	15936
2003-04	144855	99091	45764	10005	25942
2004-05	216951	171071	45880	10352	36293
2005-06	346976	305509	41467	9363	45657
2006-07	520506	489665	30841	6821	52477
2007-08	948010	881839	66179	16442	68919
2008-09	614576	660386	45811	9837	59082
2009-10	846438	703780	142658	30252	89333
2010-11	992599	846161	146438	32226	121559

Source: The SEBI published a handbook on the Indian securities market's statistics in 2011.

As a result, the globalisation of the capital markets has permeated the Indian market as well. However, foreign institutional investors' (FIIs') ongoing faith in the Indian capital market can be attributed in part to the market's low volatility as compared to other emerging market nations and an efficient market structure. Portfolio investment by FIIs in the Indian market has increased dramatically in recent years (Figure 4.1).



Source: Based on data in Table 4.10

Figure 4.1: Investment Patterns by Foreign Institutions

4.3.1.1 Discussion and Analysis

Granger causality test was used to examine the link between net FII investment and stock market volatility, namely BSE Sensex and NSE Nifty. All data series must be stationary before a time-series analysis can be performed. The Augmented Dicker-Fuller (ADF) test has been used to investigate whether or not a given data series is stationary. The results of the ADF tests performed on the FII investments are shown in Table 4.10. According to the data, FII has an ADF of -4.408207. The FII ADF value is lower than the critical values, suggesting that the unit root hypothesis can be rejected at the 1%, 5%, and 10% levels of significance shown in Table 4.11. This demonstrates that the data on net FII investments over time are stationary.

Table 4.11: Statistical Analysis of The ADF For Investing By FII

	t-Statistic	Probability
Statistic for the modified Dickey-Fuller test	-4.408207	0.0004
Value criticality testing	1% level	-3.465014
	5% level	-2.876677
	10% level	-2.574917

Tables 4.12 and 4.13 display the results of an ADF test for the volatility of the stock market, specifically the BSE Sensex and the NSE Nifty. The results show that the ADF statistic for the volatility of the BSE Sensex return is -4.588579, while the ADF statistic for the volatility of the NSE Nifty return is -5.136850. At the 1%, 5%, and 10% levels of significance, the ADF values for volatility of stock market return of BSE Sensex and NSE Nifty are lower than critical values, suggesting rejection of the unit root hypothesis. This demonstrates that the BSE Sensex and NSE Nifty stock market volatility time series data are stationary.

Table 4.12: Analysis Of Dispersion Function Test Data for The BSE Sensex

	t-Statistic	Probability
Statistic for the modified Dickey-Fuller test	-4.588579	0.0002
Value criticality testing	1% level	-3.465014
	5% level	-2.876677
	10% level	-2.574917

Table 4.13: Test Data Analysis Framework for Stock Market Volatility (NSE Nifty)

	t-Statistic	Probability
Statistic for the modified Dickey-Fuller test	-5.136850	0.0000
Value criticality testing	1% level	-3.465014
	5% level	-2.876677
	10% level	-2.574917

The Granger-Causality test was applied to confirm the direction of the causal association between the stationary data series representing FII investment and stock market volatility (BSE Sensex and NSE Nifty). Table 4.14 displays the outcomes of the Granger-Causality analysis.

Table 4.14: Statistical Analysis of The Granger-Causality Test

Null Hypothesis	Observation	F-statistics	Probability
FII does not promote volatility (BSE Sensex).	190	1.38943	0.25180
FII is not affected by BSE Sensex volatility.	190	0.50388	0.60501
FII does not increase volatility affecting NSE Nifty.	190	1.18699	0.30745
NSE Nifty volatility may not necessarily impact FII.	190	0.35368	0.70257

Granger Causality results imply that FII and stock market volatility (as measured by the BSE Sensex and NSE Nifty) are unrelated. The probabilities of both the first and second hypotheses, at 0.25180 and 0.60501, respectively, are greater than the 0.05 threshold. Therefore, we accept the null hypothesis, which shows that neither foreign institutional investments nor stock market volatility (as measured by the BSE Sensex) are causally related to one another. Results for the third and fourth hypotheses are also consistent with the null hypothesis, thus these two are also accepted.

4.3.1.2 Results

The estimated ADF statistics for all the series are fewer than the critical levels, indicating that the series are all stationary. While there is some theoretical support for a connection between stock market volatility and FII equity flows in India over the long term, empirical evidence does not support this finding. This finding suggests that FII and stock market volatility (as measured by the BSE Sensex and NSE Nifty) do not have a causal relationship with one another. It follows that FII equity flows have had no effect on the volatility of stock market returns in India, either increasing or decreasing them. There could be a number of causes for a relationship to be so superficial. The fact that FIIs are restricted to engaging in solely delivery-based trading and cannot engage in short selling may be a contributing factor. Trading is severely hampered as a result of this. Furthermore, Foreign Institutional Investors (FIIs) were required to open a trading account with an Indian broker (Mazumdar, 2004). They had to pay more for trading commissions than domestic institutional investors did. This meant the cost of their transactions would be higher than those of domestic banks. Third, FIIs are proactive with their investment and withdrawal

decisions because they have access to specialist knowledge and can make accurate predictions regarding the development of emerging markets in advance (Dhillon and Kaur, 2007). There is no substantial statistical association between FII equity flows and the volatility of stock market returns in India, notwithstanding the large percentage that is granted to foreign institutional investors in India.

4.3.2 THE UNION BUDGET

Even the most powerful economies throughout the world were not immune to the worldwide financial crisis. Government budgetary measures were implemented to restore confidence in the financial sector of the economy at a time of great unpredictability. Since the growth of stock exchanges depends on the prospects for the economy, they serve as a reliable indicator of its fundamental health. Stock market rationality may therefore be profoundly affected by government spending policies of any kind. According to Sharma and Mehta (2010).

According to Article 112 of the Constitution of India, the budget is an annual financial statement that includes the expected receipts and expenditures of the Government of India for the upcoming fiscal year, which begins on April 1 and ends on March 31. A national budget allows the government greater influence over the country's financial resources. Possible positive or negative effects on the stock market are proposed changes in direct and indirect taxes, industrial policy, trade policy, currency rate policy, and banking sector reforms (Gupta and Kundu, 2006). Based on the characteristics of the costs involved, a budget can be broken down into two categories: operating and capital. Budgets are the primary tool the government uses to enact its budgetary policy. Direct and indirect tax rates that apply to individuals and businesses of all sizes are established in the finance bill. As a result, the budget is a universal macroeconomic phenomenon (Verma and Agarwal, 2005).

When it comes to economic policymaking in India, the Union Budget is among the most anticipated events. It goes without saying that macroeconomics relies heavily on taxation, spending, and the fiscal deficit — the three pillars of fiscal policy. Budget speeches are also frequently used by governments as a platform from which to announce significant new

policy initiatives and to lay out some plans for economic policy in the months ahead (Thomas and Shah, 2002).

Investors anticipate significant shifts in the budget and adjust their outlooks accordingly. When policy shifts are expected, the market begins responding early on. It's possible that proposed budget cuts or increases will be necessary. There could be some twists and turns. Stock prices are adjusted by investors when actual results differ from expectations or when shocks occur. There is a strong connection between the Union Budget and the stock market. Everyone on Dalal Street gathers around TVs whenever the Finance Minister speaks in Parliament. And the cursor moves to the beat of the music. The stock market is often highly sensitive to government spending plans. The reaction of the stock market indicates the quality of the budget. The stock market as a whole reacts positively or negatively depending on whether or not individual industries benefit from government subsidies, tax rebates, or policy changes (Patra, 2012).

4.3.2.1 Discussion and Analysis

In tables 4.15 and 4.16, we see the average daily returns and budget day returns for Sensex and Nifty during the preceding, next 3, 15, and 30 days around the budget day.

The Sensex and the Nifty After Budget Day:

The first group of paired t-tests examines the impact of the budget on the Sensex and the Nifty on the same day (Z) vs the 3, 15, and 30 trading days prior. In both tables, the returns on budget day (ignoring the sign) are generally higher than the returns on the preceding 30, 15, and 3 trading days. Therefore, when comparing the returns on budget day (Z) to the long-term pre-budget return in the case of Sensex, budget day returns are shown to be higher in all years, i.e., (19 out of 19 budgets), compared to medium-term (19 out of 19 budgets) and short-term (13 out of 19 budgets).

Table 4.15: The Sensex's Daily Avg. Returns

Year	X_1(Last 30 days)	X_2(Last 15 days)	X_3(Last 3 days)	Z(Budget day)	Y_1(Next 3 days)	Y_2(Next 15 days)	Y_3(Next 30 days)
1996 (interim)	0.52	0.56	0.18	-0.72	-0.89	-0.51	0.09
1996	-0.09	-0.09	1.06	1.17	-2.25	-0.64	-0.27
1997	-0.21	0.05	0.68	6.33	2.57	0.14	-0.01
1998	-0.37	-0.66	-1.66	-1.19	-0.89	-1.12	-0.31
1999	-0.08	0.04	-0.51	4.99	1.93	0.67	-0.07
2000	0.16	0.32	0.58	-5.25	-0.42	-0.42	-0.17
2001	0.02	-0.48	-1.54	4.26	-2.01	-0.89	-0.89
2002	0.34	0.52	0.93	-3.94	0.73	-0.05	-0.10
2003	-0.08	0.04	-0.45	0.19	-0.59	-0.30	-0.30
2004 (interim)	0.17	-0.47	-1.70	-1.32	0.97	0.13	-0.05
2004	-0.08	0.23	0.58	-2.29	0.38	0.37	0.19
2005	0.25	-0.05	-0.10	2.17	0.35	-0.06	-0.13
2006	0.31	0.36	0.19	0.85	0.72	0.30	0.36
2007	-0.04	-0.49	-1.32	-4.09	-1.38	0.004	0.11
2008	-0.33	0.11	0.33	-1.39	-2.03	-0.59	-0.21
2009 (interim)	-0.01	0.59	-0.04	-3.48	-0.73	0.35	-0.96
2009	0.24	-0.14	0.95	-6.01	0.60	0.22	-0.69
2010	-0.23	-0.10	0.04	1.07	0.39	0.24	1.08
2011	-0.27	-0.11	-1.10	0.69	0.06	0.33	1.22

Source: calculated using information obtained from the BSE website for the specified time.

Note: Percentages are used for all returns.

The returns on budget day have exceeded those of 18 out of the total of 19 budgets. When examining the long-term pre-budget returns, it is observed that the budget day returns (Z) surpass the medium-term pre-budget returns in 18 out of 19 budgets. Similarly, when comparing the budget day returns (Z) with the short-term pre-budget returns, it is found that budget day returns exceed those of 14 out of 19 budgets.

Table 4.16: Nifty's Daily Avg. Returns

Year	X_1(Last 30 days)	X_2(Last 15 days)	X_3(Last 3 days)	Z(Budget day)	Y_1(Next 3 days)	Y_2(Next 15 days)	Y_3(Next 30 days)
1996 (interim)	0.53	0.57	0.08	-0.01	-0.94	-0.48	0.06
1996	-0.03	-0.05	0.78	0.57	-1.92	-0.58	-0.32
1997	-0.16	0.17	0.95	0.59	3.74	0.41	0.12
1998	-0.42	-0.59	-1.27	-0.89	-0.86	-1.20	-0.30
1999	-0.07	0.03	-0.30	4.17	1.98	0.52	0.04
2000	0.20	0.34	0.51	-4.01	0.02	-0.42	-0.29
2001	0.02	-0.46	-1.50	4.22	-2.03	-0.86	-0.86
2002	0.29	0.44	0.73	-4.05	1.05	0.01	-0.02
2003	-0.1	0.04	-0.54	0.99	-0.72	-0.32	-0.37
2004 (interim)	0.14	-0.56	-1.70	-2.28	1.20	0.19	-0.04
2004	-0.07	0.31	0.63	-3.15	0.46	0.43	0.19
2005	0.25	-0.05	0.04	2.03	0.40	-0.02	-0.13
2006	0.24	0.24	0.18	0.24	0.78	0.35	0.36
2007	-0.04	-0.53	-1.23	-3.89	-1.54	0.03	0.15
2008	-0.37	0.19	0.54	-1.17	-1.99	-0.52	-0.17
2009 (interim)	-0.01	0.55	0.16	-3.45	-0.7	-0.56	0.40
2009	0.14	-0.02	1.02	-6.02	-0.69	0.62	0.17
2010	-0.25	0.02	0.02	1.28	1.05	0.37	0.23
2011	-0.27	-0.11	-1.03	0.56	1.26	0.10	0.34

Source: calculated using information obtained from the NSE website for the specified time.

Note: Percentages are used for all returns.

The findings from the Paired t-test used to further statistically test the observations stated in Tables 4.15 and 4.16 are shown in Tables 4.17 and 4.18. The budgets are known to always catch the markets off guard. The results of all tests show that the real numbers are higher than those in the table, supporting the alternative hypothesis.

T-VALUES FROM THE PAIRED T-TEST

Table 4.17: Sensex's Reaction to Budget Day Returns

	X_1 and Z	X_2 and Z	X_3 and Z
Actual Value (5%)	-5.35*	-5.25*	-4.29*
Table Value (5%)	-1.76	-1.76	-1.76

Source: Calculated using the information in Table 4.15.

Note: *Signifies the rejection of the Null Hypothesis (H_o).

Table 4.18: Budget Day Returns' Impact on the Nifty

	X_1 and Z	X_2 and Z	X_3 and Z
Actual Value (5%)	-4.98*	-4.99*	-4.04*
Table Value (5%)	-1.76	-1.76	-1.76

Source: Calculated using the information in Table 4.16.

Note: *Signifies the rejection of the Null Hypothesis (H_o).

T- VALUES FROM THE PAIRED T-TEST

Table 4.19: Budget Effects on The Sensex

Period	Short-Term Period			Medium-Term Period			Long-Term Period		
	X_1 and Y_1	X_2 and Y_1	X_3 and Y_1	X_1 and Y_2	X_2 and Y_2	X_3 and Y_2	X_1 and Y_3	X_2 and Y_3	X_3 and Y_3
Actual Value (5%)	-5.83*	-5.01*	-2.41*	-2.76*	-1.78*	2.30	-0.51	0.89	4.05
Table Value (5%)	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76

Source: Calculated using the information in Table 4.15.

Note: *Signifies the rejection of the Null Hypothesis (H_o).

Since alternative hypotheses were accepted in all three cases, Tables 4.19 and 4.20 give further evidence that budgets have their greatest effect in the short-term. Only one alternative theory has been accepted over the long term, but two out of three have been accepted over the medium term.

Table 4.20: Budgets' Effect on The Nifty

Period	Short-Term Period			Medium-Term Period			Long-Term Period		
	X_1 and Y_1	X_2 and Y_1	X_3 and Y_1	X_1 and Y_2	X_2 and Y_2	X_3 and Y_2	X_1 and Y_3	X_2 and Y_3	X_3 and Y_3
Actual Value (5%)	-5.17*	-4.62*	-2.78*	-3.15*	-1.87*	2.23	-0.79	0.58	3.94
Table Value (5%)	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76

Source: Calculated from the data provided in Table 4.15.

Note: *Signifies the rejection of the Null Hypothesis (H_o).

Five out of nine cases (3+2+0) at the left tail have actual values that are greater than the tabular values. This proves that budgets as a whole have the most effect in the immediate time period following the budget, have some effect in the intermediate time period, and have no effect at all on long-term average returns.

Table 4.21: Variation In Sensex Returns

Year	X_1(Last 30 days)	X_2(Last 15 days)	X_3(Last 3 days)	Y_1(Next 3 days)	Y_2(Next 15 days)	Y_3(Next 30 days)
1996 (interim)	0.036	0.037	0.009	0.036	0.018	0.016
1996	0.019	0.022	0.016	0.026	0.023	0.024
1997	0.033	0.016	0.010	0.069	0.041	0.060
1998	0.032	0.030	0.007	0.019	0.108	0.083
1999	0.020	0.013	0.007	0.067	0.031	0.070
2000	0.038	0.056	0.113	0.118	0.050	0.081
2001	0.020	0.019	0.026	0.059	0.095	0.069
2002	0.011	0.010	0.024	0.049	0.021	0.013
2003	0.006	0.007	0.007	0.002	0.014	0.016
2004 (interim)	0.032	0.048	0.001	0.023	0.022	0.023
2004	0.024	0.014	0.013	0.024	0.008	0.009
2005	0.009	0.004	0.000	0.015	0.006	0.011
2006	0.009	0.008	0.004	0.012	0.010	0.014
2007	0.015	0.017	0.022	0.077	0.045	0.039
2008	0.095	0.050	0.002	0.105	0.108	0.072
2009 (interim)	0.071	0.044	0.029	0.031	0.031	0.058
2009	0.032	0.028	0.007	0.038	0.041	0.043
2010	0.014	0.013	0.001	0.013	0.005	0.006
2011	0.017	0.021	0.031	0.037	0.019	0.015

Source: Calculated using BSE website data during the period.

Table 4.22: Return Variation in The Nifty

Year	X_1(Last 30 days)	X_2(Last 15 days)	X_3(Last 3 days)	Y_1(Next 3 days)	Y_2(Next 15 days)	Y_3(Next 30 days)
1996 (interim)	0.045	0.055	0.005	0.049	0.019	0.017
1996	0.013	0.015	0.046	0.015	0.019	0.017
1997	0.027	0.018	0.017	0.288	0.095	0.087
1998	0.017	0.022	0.0001	0.055	0.108	0.078
1999	0.031	0.023	0.012	0.067	0.027	0.031
2000	0.027	0.029	0.028	0.093	0.054	0.076
2001	0.017	0.016	0.010	0.051	0.101	0.069
2002	0.011	0.008	0.013	0.032	0.016	0.012
2003	0.008	0.008	0.007	0.002	0.013	0.018
2004 (interim)	0.037	0.054	0.004	0.040	0.026	0.025
2004	0.028	0.017	0.019	0.030	0.011	0.012
2005	0.010	0.004	0.0004	0.017	0.006	0.011
2006	0.008	0.006	0.003	0.007	0.010	0.014
2007	0.016	0.018	0.017	0.090	0.048	0.042
2008	0.121	0.055	0.005	0.105	0.098	0.064
2009 (interim)	0.060	0.039	0.024	0.033	0.029	0.049
2009	0.039	0.037	0.006	0.041	0.042	0.039
2010	0.014	0.011	0.001	0.012	0.006	0.006
2011	0.018	0.022	0.042	0.037	0.019	0.014

Source: Calculated using NSE website data during the period.

The F-test values for the comparisons of the variances among the returns in Sensex (provided in Table 4.21) and Nifty (supplied in Table 4.22) across the short-term, medium-term, and long-term periods after the budget are shown in Tables 4.23 and 4.24, respectively. Except for 2002, the Sensex's actual value has never topped its tabulated value. Nifty, on the other hand, never had an instance when the actual value was higher than the tabular number. This means that there is typically no rise in volatility in a post-budget scenario as time passes.

Table 4.23: F-Test Results Comparison of Post-Budget Return Variance (BSE Sensex)

Year	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)
	Y_1 and Y_2	df = 14/2	Y_2 and Y_3	df= 29/14	Y_3 and Y_1	df= 29/2
1996 (interim)	2.00	3.74	1.13	2.03	2.25	3.33
1996	1.13	3.74	1.04	2.03	1.08	3.33
1997	1.68	3.74	1.46	2.31	1.15	3.33
1998	5.68	19.43	1.30	2.03	4.37	19.46
1999	2.16	3.74	2.26	2.31	1.05	19.46
2000	2.36	3.74	1.62	2.31	1.46	3.33
2001	1.61	19.43	1.38	2.03	1.17	19.46
2002	2.33	3.74	1.62	2.03	3.77*	3.33
2003	7.00	19.43	1.14	2.31	8.00	19.46
2004 (interim)	1.05	3.74	1.05	2.31	1.00	3.33
2004	3.00	3.74	1.13	2.31	2.67	3.33
2005	2.50	3.74	1.83	2.31	1.36	3.33
2006	1.20	3.74	1.40	2.31	1.17	19.46
2007	1.71	3.74	1.15	2.03	1.97	3.33
2008	1.03	19.43	1.50	2.03	1.46	3.33
2009 (interim)	1.00	3.74	1.88	2.31	1.87	19.46
2009	1.08	19.43	1.05	2.31	1.13	19.46
2010	2.60	3.74	1.20	2.31	2.17	3.33
2011	1.95	3.74	1.27	2.03	2.47	3.33

Source: Calculated using Table 4.21 Data.

Note: *Signifies the rejection of the Null Hypothesis (H_o).

Table 4.24: F-Test Results Comparison of Post-Budget Return Variance (NSE Nifty)

Year	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)
	Y_1 and Y_2	df = 14/2	Y_2 and Y_3	df= 29/14	Y_3 and Y_1	df= 29/2
1996 (interim)	2.58	3.74	1.12	2.03	2.88	3.33
1996	1.27	19.43	1.12	2.03	1.13	19.46
1997	3.03	3.74	1.09	2.03	3.31	3.33
1998	1.96	19.43	1.38	2.03	1.42	19.46
1999	2.48	3.74	1.15	2.31	2.16	3.33
2000	1.72	3.74	1.41	2.31	1.22	3.33
2001	1.98	19.43	1.46	2.03	1.35	19.46
2002	2.00	3.74	1.33	2.03	2.67	3.33
2003	6.50	19.43	1.38	2.31	9.00	19.46
2004 (interim)	1.54	3.74	1.04	2.03	1.60	3.33
2004	2.73	3.74	1.09	2.31	2.50	3.33
2005	2.83	3.74	1.83	2.31	1.55	3.33
2006	1.43	19.43	1.40	2.31	2.00	19.46
2007	1.88	3.74	1.14	2.03	2.14	3.33
2008	1.07	3.74	1.53	2.03	1.64	3.33
2009 (interim)	1.14	3.74	1.69	2.31	1.48	19.46
2009	1.02	19.43	1.08	2.03	1.05	3.33
2010	2.00	3.74	1.00	2.03	2.00	3.33
2011	1.95	3.74	1.36	2.03	2.64	3.33

Source: Calculated using the information in Table 4.22.

Table 4.25: F-Test Findings Analysis of Post-Budget Period Return Variance in Relation to Long-Term Pre-Budget Period Returns (BSE Sensex)

Year	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)
	X_1 and Y_1	df=29/2	X_1 and Y_2	df=29/14	$X_1$and Y_3	df=29/29
1996 (interim)	1.00	3.33	2.00	2.31	2.25*	1.85
1996	1.37	3.33	1.21	2.03	1.26	1.84
1997	2.09	3.33	1.24	2.03	1.81	1.84
1998	1.68	3.33	3.38*	2.03	2.59*	1.84
1999	3.35	3.33	1.55	2.31	3.50*	1.84
2000	3.11	3.33	1.32	2.03	2.13*	1.84
2001	2.95	3.33	4.75*	2.03	3.45*	1.84
2002	4.45*	3.33	1.91	2.03	1.18	1.84
2003	3.00	19.46	2.33*	2.03	2.67*	1.84
2004 (interim)	1.39	3.33	1.45	2.31	1.39	1.85
2004	1.00	3.33	3.00*	2.31	2.67*	1.85
2005	1.67	3.33	1.5	2.03	1.22	1.84
2006	1.34	19.46	1.11	2.03	1.56	1.84
2007	5.13*	3.33	3.00*	2.03	2.60*	1.84
2008	1.11	19.46	1.14	2.31	1.32	1.85
2009 (interim)	2.29	19.46	2.29	2.31	1.22	1.85
2009	1.19	3.33	1.28	2.03	1.34	1.84
2010	1.08	19.46	2.80*	2.31	2.33	1.85
2011	2.18	3.33	1.12	2.03	1.14	1.85

Source: Calculated using the information in Table 4.21.

Note: *Signifies the rejection of the Null Hypothesis (H_o).

Table 4.26: F-Test Findings Comparing the Difference in Returns Between Long-Term Pre-Budget and Post-Budget Periods (NSE Nifty)

Year	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)
	X_1 and Y_1	df=29/2	X_1 and Y_2	df=29/14	$X_1$and Y_3	df=29/29
1996 (interim)	1.09	3.33	2.37*	2.31	2.65*	1.85
1996	1.15	3.33	1.46	2.03	1.31	1.84
1997	10.67*	3.33	3.52*	2.03	3.22*	1.84
1998	3.23	3.33	6.35*	2.03	4.59*	1.84
1999	2.16	3.33	1.15	2.31	1.00	1.84
2000	3.44	3.33	2.00	2.03	2.81*	1.84
2001	3.00	3.33	5.94*	2.03	4.06*	1.84
2002	2.90	3.33	1.45	2.03	1.09	1.84
2003	4.00	19.46	1.63	2.03	2.25*	1.84
2004 (interim)	1.08	3.33	1.42	2.31	1.48	1.85
2004	1.07	3.33	2.55*	2.31	2.33*	1.85
2005	1.70	3.33	1.67	2.03	1.10	1.84
2006	1.14	19.46	1.25	2.03	1.75	1.84
2007	5.63*	3.33	3.00*	2.03	2.63*	1.84
2008	1.15	19.46	1.23	2.31	1.89*	1.85
2009 (interim)	1.81	19.46	2.07	2.31	1.22	1.85
2009	1.05	3.33	1.07	2.03	1.00	1.84
2010	1.17	19.46	2.33	2.31	2.34	1.85
2011	2.06	3.33	1.06	2.03	1.29	1.85

Source: Calculated using the information in Table 4.22.

Note: *Signifies the rejection of the Null Hypothesis (H_o).

The variation of Sensex and Nifty returns throughout the short-, medium-, and long-term post-budget periods are compared to the long-term pre-budget period, and the F-test values for this comparison are displayed in Tables 4.25 and 4.26. Sensex saw the most noteworthy events during the long-term time frame (9 out of 19 budgets), followed by the medium-term (6 out of 19 budgets), and the short-term (2 out of 19 budgets). But for Nifty, the most significant events occurred over the long-term time frame (10 out of 19 budgets), followed by the medium-term time frame (7 out of 19 budgets), and finally the short-term time frame (2 out of 19 budgets). According to the data, compared to a comparable long-term period

before the budget, the long-term period following the budget is often more variable than the medium-term and short-term periods.

The test values do not establish that the market index will grow or fall after the presentation of budgets, however, because the index values have historically risen after budget presentations.

If one looks at the historical performance of the Sensex and the Nifty on budget day since 1996 (Table 4.15 and Table 4.16), the largest drop occurred in 2009. A number of issues contributed to the slide, including a lack of communication about necessary policy adjustments, a rise in MAT, and ballooning deficits. Both the Sensex and the Nifty fell by more than 5% in 2000. Investors were dissatisfied because the budget fell short of the 'hype' that had been built up in anticipation of it. The market did not take kindly to the Budget because it failed to address macroeconomic issues like fiscal deficit, Government spending, and public sector disinvestment, and because it increased the tax on dividend outgo for companies and subjected export earnings to a 20% tax per year over the next five years.

The stock market dropped 3% in 2002 despite a mild budget decrease. The stock market lost 4% of its value in 2007. In recent memory, this represents the worst drop on a Budget Day. Union budget measures that were unfavourable to the market contributed to the decline. The minimum alternative tax (MAT) for the IT industry was extended, while the excise duty on cement prices was raised from 12.5 percent to 15 percent.

Budget, on the other side, has occasionally aided the rapid ascent of the market. The Sensex and Nifty rose strongly in 1997, 1999, 2001, and 2005 as a result of popular initiatives made by the finance minister, like as tax relaxations.

Therefore, for an investor to profit from budget fluctuations, he must anticipate which budget pronouncements will lead to an increase or fall in share prices following the budget.

4.3.2.2 Results

The impact of various budgets on the stock market was examined by looking at 17 years of stock market returns and volatility data. The results of the hypothesis tests at different

levels of significance are fascinating from the viewpoints of investors, regulators, and the government.

When thinking about returns, the time surrounding the budget (up to 15 trading days) is when an investor has the most chance to make substantial gains. If his budgetary projections are not realised, however, there is a chance of extraordinary losses. This is likewise true for business conducted on budget day. Average returns do not significantly alter as one gets further and further away from the budget day (up to 30 trading days). As a result, budgets are considered to have an impact on returns for no more than 15 trading days after the budget day.

However, volatility does not seem to rise in a post-budget scenario as the time period lengthens. However, compared to a similar long-term period before the budget, the long-term period following the budget is typically more variable than the medium-term and short-term periods. In the case of the Sensex, post-budget short-term volatility increases in only 11% of cases (2 out of 19 budgets), post-budget medium-term volatility increases in 32% of cases (6 out of 19 budgets), and post-budget long-term volatility increases in 47% of cases (9 out of 19 budgets). Ten percent of the time (two out of nineteen budgets), Nifty's short-term volatility increases after the budget is passed; thirty-seven percent of the time (seven out of nineteen budgets) Nifty's medium-term volatility increases after the budget passes; and fifty-three percent of the time (ten out of nineteen budgets) Nifty's long-term volatility increases after the budget passes. Therefore, when both volatility and return are taken into account, the budget has a larger impact on return than volatility in the short-term, while the opposite is true in the long-term.

4.3.3 THE RATE OF INFLATION

For the average person, this means that necessities like food and clothing will become more expensive. However, analysts view this as a long-term increase in consumer prices. Two things stand out in this context: the steady ascent, and the overall price level. To be considered inflation, price increases must be sustained for a significant period of time, not just a single event. Additionally, commodity basket inflation often increases over time (Rao

et al., 2008) unless otherwise specified. The real worth of money decreases due to inflation, meaning people have less buying power. It is commonly referred to as "wasteful spending on a small return." It's often described as "a necessary evil" for any functioning economy. Like an elephant, inflation can be seen from a distance but is difficult to quantify (Agarwal and Barua, 1999). However, when inflation is present, the purchasing power of money decreases since more things cost more. In this way, inflation shows the decline in value of money.

There are two primary price indices in India: The Consumer Price Index (CPI) and the Wholesale Price Index. Different from the CPI's focus on the final consumer, the WPI tracks prices at the wholesale level. In addition, whereas the Consumer Price Index tracks changes in retail prices, the Wholesale Price Index tracks similar shifts in the wholesale price of items.

According to the work of Rao and Bhole (1990), inflation is defined as the annualised rate of change in a price index. Therefore, if the inflation rate for a given week is 10%, then the index is 10% greater than it was in the same week one year prior.

The Following Factors Contribute to Inflation:

- **Inflation Caused by Rising Demand**

More cash is being spent on fewer products. Because of the strong demand, the prices of these items have increased. Consumer and government expenditure increases typically drive the rising demand. Higher demand-driven inflation is often viewed favourably in a rising economy like India's since it helps sustain growth and can be more easily regulated by the government.

- **Inflation Caused by Decreased Supply**

There are periodic reports that bad monsoons have caused decreased crop yields across a variety of agricultural products. As a result, when there is less available in the market, prices go up. Due to supply constraints, prices may continue to rise even if demand remains same. For a developing economy like India's, this kind of inflation may be especially

damaging and is notoriously difficult to control. Inflation can range from "creeping" to "galloping" to "hyperinflation" to "stagflation" to "deflation" (Agarwal and Barua, 1999).

- **Unchecked Inflation**

This is what economists refer to as "mild" or "moderate" inflation. When prices continue to rise slowly but steadily over time, we see a mild inflation. When inflation is less than ten percent per year, or in the single digits, the rate is called moderate.

- **Extremely High Inflation**

Mild inflation, if left unchecked and uncontrollable, can quickly take on the characteristics of galloping inflation. The term "galloping inflation" is used to describe annual inflation rates of 20%, 100%, or even 200%. Inflation rates of 50 to 700 percent per year were common in many Latin American countries in the 1970s and 1980s.

- **Hyperinflation**

It's the point where inflation rates skyrocket. While economies may appear to be resilient in the face of soaring inflation, hyperinflation introduces a third, fatal strain. A market economy in which prices are increasing by a million or a trillion percent per year is not a good thing. When the central bank is powerless to prevent prices from rising dramatically, hyperinflation results. In the 1920s, Germany experienced similar inflation.

- **Stagflation**

It is a state of the economy characterised by the coexistence of inflation and prolonged economic stagnation or recession. In the 1970s, when global oil prices spiked, industrialised countries experienced stagflation.

- **Deflation**

When inflation goes up, deflation follows. The term is used to describe a prolonged drop in the general cost of living. The actual value of money rises when inflation rates fall below zero percent on an annual basis (a negative inflation rate). For nearly a decade in the 1990s, Japan experienced deflation.

Extremely low inflation rates are problematic for all economies, but expanding ones in particular. a) Demand Declines and/or, b) Oversupply.

As a result, neither of these scenarios is ideal (Henry, 2002) because they hinder the economic growth process.

Inflation rates are often cited as justification for wage increases requested from employers. But when inflation rates fall, we don't immediately demand pay cutbacks. Reducing wage rates in an economy is a difficult task. As a result, layoffs are a common response from the organisation. The overall effect is an increase in unemployment rates. The Reserve Bank of India (RBI) takes action by reducing interest rates in an effort to increase domestic investment, but this has the unintended consequence of reducing net inflows. Thus, low or no inflation is counterproductive to economic expansion (Tribedy, 1991).

So, a compromise is what's recommended. For a developing economy like India's, an inflation rate between 4% and 6% is considered moderate. Inflation of a moderate degree is required to grease the economic wheels. It's an indication of robust economic demand and a means of warding off Reserve Bank of India (RBI) intervention, which can dampen discretionary and capital expenditures (Knif et al., 2003).

What Impact Does Inflation Have on The Stock Market?

Inflation is widely regarded to have a countervailing effect on stock prices. When inflation rises, the price of raw materials rises along with it, driving up manufacturing costs for enterprises. Companies typically pass on some of the price increase to their customers, but they also have to eat some of it themselves. Companies' bottom lines are inevitably impacted negatively as a result. Companies with lower earnings may be less appealing to investors, which could lead to a decline in stock price (Cohn and Lessard, 1981).

In addition, investors seek a higher rate of return on their assets during times of high inflation to help them keep or even increase their standard of living. Better returns can only be found by investors when P/E ratios are lower. Therefore, the P/E ratio should ideally be lower during times of high inflation and greater during times of low inflation. Inflation, according to Summers's (1981) research, boosts the expected return on real physical assets (such owner-occupied houses). Investors rebalance their holdings by selling shares of stock and reinvesting the proceeds in other assets. As a result of these portfolio changes, share prices fall. Stock prices, which are the present discounted values (PDVs) of a company's future after-tax earnings, fall when inflation rises (Feldstein,1980). If inflation suddenly spikes, the government or the central bank may respond by shifting fiscal policy, monetary policy, or both. Companies' bottom lines may be hurt if the government enacted measures like price restrictions or altered tariff rates. If the money supply grows too quickly, the central bank may raise interest rates through open market operations. Rising interest rates can have a negative impact on cash flow for businesses because they force them to reduce investments in areas where returns on capital are particularly sensitive. The information effect (Jaffe and Mandelker, 1976) refers to the possible impact on stock prices due to investors' anticipation of a response from the government or central bank.

4.3.3.1 Discussion and Analysis

The Granger Causality Test was used to examine the potential cause-and-effect link between inflation and stock market volatility, specifically the BSE Sensex and the NSE Nifty. All data series must be stationary before a time-series analysis can be performed. To investigate whether or not a data series is stationary, the Augmented Dicker Fuller (ADF) test has been used. Table 4.27 details the results of the ADF inflation test. The data show that the ADF figure for price inflation is -4.956150. At the 1%, 5%, and 10% levels of significance, the inflation ADF value is below the critical values, suggesting that the unit root hypothesis should be rejected. This demonstrates that the inflation time series data is stationary.

Table 4.27: Statistics On Inflation Based on The ADF Test

	T-Statistic	Probability
Statistic for the modified Dickey-Fuller test	-4.956150	0.0000
The Value of Critical Test	1% level	-3.465014
	5% level	-2.876677
	10% level	-2.574917

Tables 4.28 and 4.29 show the results of an ADF test comparing the volatility of the stock market indices BSE Sensex and NSE Nifty. According to the data, the ADF statistic for the volatility of the BSE Sensex return is -4.588579, while the ADF statistic for the volatility of the NSE Nifty return is -5.136850. At the 1%, 5%, and 10% levels of significance, the ADF values for volatility of stock market return of BSE Sensex and NSE Nifty are lower than critical values, suggesting rejection of the unit root hypothesis. This demonstrates that the stock market volatility time series data for both the BSE Sensex and NSE Nifty are stationary.

Table 4.28: ADF Test BSE Sensex Stock Market Volatility Statistics

	T-Statistic	Probability
Statistic for the modified Dickey-Fuller test	-4.588579	0.0002
The Value of Critical Test	1% level	-3.465014
	5% level	-2.876677
	10% level	-2.574917

Table 4.29: Statistics From the ADF Test for NSE Nifty Stock Market Volatility

	T-Statistic	Probability
Statistic for the modified Dickey-Fuller test	-4.588579	0.0002
The Value of Critical Test	1% level	-3.465014
	5% level	-2.876677
	10% level	-2.574917

Granger-causality testing was performed to determine the direction of causality between the inflation and stock market volatility of BSE Sensex and NSE Nifty, both of which were found to be stationary in the test. Table 4.30 displays the outcomes of the Granger-Causality analysis.

Inflation and stock market volatility (as measured by the BSE Sensex and NSE Nifty) appear to be unrelated, according to the Granger-Causality results. Since the probability values of the null hypothesis (0.91553) and the alternative (0.212785) are both higher than the crucial value (0.05), the latter is accepted.

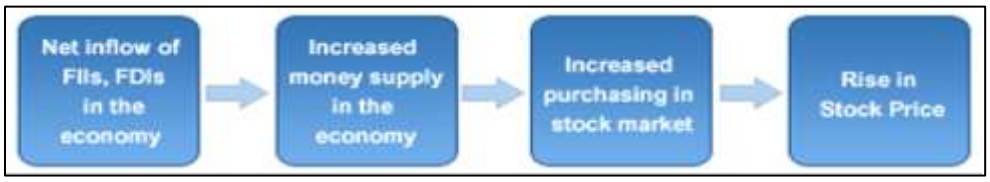
Table 4.30: Statistics For the Granger Causality Test

Null Hypothesis	Observation	F-Statistics	Probability
BSE Sensex Volatility is not a Granger Cause of Inflation	190	0.08830	0.91553
BSE Sensex Volatility Granger Causality Analysis Dismisses Inflation.	190	2.07997	0.12785
The NSE Nifty Index Volatility Index is not a Granger Cause of Inflation.	190	0.01326	0.98683
The NSE Nifty's Volatility Does Not Granger Cause Price Increases	190	1.72908	0.18030

It demonstrates that the volatility of the stock market (as measured by the BSE Sensex) does not produce inflation and that inflation does not drive the volatility of the stock market. The same logic applies to the third and fourth hypotheses, therefore we'll likewise accept the null hypothesis there.

4.3.3.2 Results

Since the computed ADF statistics are smaller than critical values, it has been determined that all the series are stationary. Even while there is a long-run association between stock market volatility and inflation in theory, there is no statistical evidence to support this. There appears to be no causal link between inflation and the volatility of the stock market, as measured by the BSE Sensex and the NSE Nifty. Stock market returns in India are unaffected by inflation, and it does not make them more volatile. There could be a number of factors at play in explaining why this connection is so weak. However, it can be because to the FII and FDI net inflows.



Therefore, even with double-digit inflation rates, investors may find it profitable to participate in the stock market in a developing nation like India. A stock market investor must therefore take into account the movement of broad economic indicators like inflation while making stock market investments.

4.3.4 RATE OF INTEREST

The stock market's rise and fall over the years has come to be seen as a reflection of the health of India's economy. Because of this, understanding how the stock market functions is essential for economists, traders, and central bankers. As a result of its reliance on the emotions of its players, the stock market is a highly volatile and unpredictable element of the economy. Increased sensitivity might be attributed to the multiplicity of factors that affect the stock market. Interest rates are one of several crucial factors, and they are the only ones that have any bearing on the stock market.

The interest rate is the price at which money is borrowed. It's the cost of borrowing money, expressed as a percentage of the loaned amount. The interest rate is the cost of capital, or the expense incurred to borrow money for a specific time period. The cost of borrowing money (interest rate) is the focus of attention from the perspective of the borrower. According to Amedeo (2012), a lender's interest rate is the cost of providing credit to borrowers.

Instead of interest rates being set by the market, the Reserve Bank of India (RBI) sets them through its monetary policy. There are two primary drivers of interest rate changes:

- Investments Are Impacted by The Government's Interest Rate Changes: A recession does not magically reverse itself and restore economic growth. In order to encourage private investment and consumer borrowing and spending during the recent slump of 2008-2009, the US government decreased its interest rate to roughly 1-2%.
- Effects Of Inflation on Interest Rates: In response to growing inflation, the Reserve Bank of India (RBI) raises interest rates to restrict the flow of currency into the economy.

The interest rate, which is the cost of borrowing money, is the driving force behind the money and capital markets just as the price of a commodity is at the centre of the commodities market. Just as there isn't a single price for any given commodity (there is instead a complex of prices for many forms of the item), the same may be said of interest rates. However, this does not mean that the different rates have no connection with one another; rather, they are typically woven together in a balanced fashion.

Interest rates are generally determined by three factors: the degree of risk involved, the length of time until repayment is due, and the marketability or liquidity of the security. If the risk was larger and more likely to occur, the premium would increase accordingly. Similar to how the risk of default increases with loan duration, the risk of capital value depreciation due to an increase in the interest rate over the loan's term also increases with loan duration (Tessaromatis, 1989). If it were more marketable, the interest rate would be lower. Legislative provisions and practises regarding the transferability of assets and the investing pattern of institutional investors in particular also impact marketability. For example, if the long-term rate is constantly increasing, the short-term rate should also increase because borrowers will likely convert from long-term to short-term loans and lenders will likely move funds into the long-term market. Interbank call rates, Treasury bill rates, commercial bill rates, deposit and lending rates of commercial and co-operative banks, and the bank rate, the lending rate of the central bank, are all examples of short-term rates proper that dominate the money market. Government and corporate bond yields, ordinary and preference share yields, etc., are all examples of long-term rates or capital market rates (Apergis and Eleftheriou, 2002).

The Bank Rate is the interest rate at which a country's central bank lends money to commercial banks. It's a tactic used by central banks for temporary goals. If the central bank raises the Bank Rate, the Base Rate and the Benchmark Prime Lending Rate will need to go up as well. As a result, any change to the Bank Rate can mean an increase or decrease in our EMI and, consequently, a change to the interest rate on our savings.

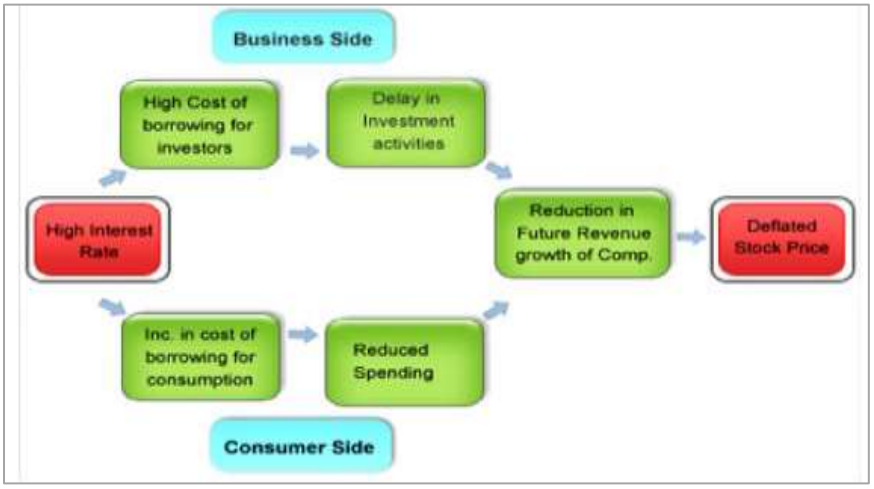
Interest rates are generally believed to have a negative effect on stock prices. This is because, in the cash flow discounting model, future cash flows are discounted at a discount rate to arrive at the current value of a stock. Stocks' present values go down if the discount rate goes up and up if the discount rate goes up. This discount rate is equivalent to the market interest rate and represents a risk-adjusted needed rate of return. As a result, when interest rates rise, the present value of stocks falls. A slight increase in interest rates over a long period of time can have a large impact on present prices (Durre and Giot, 2005). In addition, falling profits from increased borrowing costs dampen companies' cash flow. Stocks' present worth and current prices fall as a result of these two factors. The converse is also true. The aforementioned theoretical explanations aren't the only ones that can be used to explain the inverse correlation between interest rates and stock prices. First, interest rates are risk-free returns on bonds, so as they rise, bond prices rise and stock prices fall. The asset allocation shifts to favour bonds over equities as a result. The result is a rise in bond prices and a fall in stock prices since money is transferred from the stock market to the bond market. This causes a decline in stock values. When bond prices rise and stock prices fall, investors move money out of bonds and into stocks (Shiller, 1987).

The second negative effect of a rate hike is on business profitability. There are two ways in which interest rates impact earnings. To begin, the cost of money, that is, the interest rates a company pays to borrow money to finance capital equipment and inventory, is of considerable importance. Second, a large portion of such transactions are ultimately financed by debt. As a result, consumers' purchasing power and propensity are very sensitive to interest rate conditions. The automobile business is a perfect illustration because it features two financially powerful groups: manufacturers and buyers. The highly indebted utilities and transportation sectors, as well as the building and housing sectors, are also significant borrowers (Flannery and James, 1984).

The fact that rising rates indicate tighter monetary policy, which is bad for business, and decreasing rates, which boost the economy, is perhaps the most significant impact of interest rate changes on stock values. Most companies can adapt to increased rates over time, but when rates fluctuate suddenly, it often forces them to halt expansion plans, reduce

inventory, etc. The economy and, by extension, business earnings, suffer as a result of this. Stock prices fall as a result of lower price/earnings multiples as a result of higher interest rates and smaller profits. When policymakers are worried about the economy, they reduce short-term interest rates, which has the opposite impact (Bordo et al., 2008).

Finally, broker-issued margin debt is a loan made against the value of assets as collateral. Margin debt is typically used to buy stocks, although it is also occasionally used to buy cars and other consumer goods. Both types of margin debt see an increase in their carrying costs as interest rates rise. As a result, investors are hesitant to take on more debt as the associated costs increase. Stocks are liquidated and debt is repaid when service fees rise to unsustainable levels. Increasing stock supply in response to rising interest rates puts downward pressure on stock prices (Binder and Merges, 2000). The next chart also shows how interest rates and the stock market are connected.



The diagram represents the two major components of any economy: the business sector and the consumer market. Both investors and consumers are impacted by rising interest rates, which has a negative effect on the stock market. When the repercussions of both sides are added together, they portend a dismal future for the economy. Stock prices would fall as investors worried about the companies' ability to generate future income were discouraged. People also tend to put more money into low-risk investments like bonds and savings accounts as interest rates rise. As a result, money leaves the stock market, which has a negative effect on stock prices (Ray and Vani, 2007).

Effects of Interest Rates on Various Industries

- Companies with a lot of debt will feel the effects of a hike in interest rates first and fastest. They have to pay more in interest, which cuts against their earnings per share. As a result, investors would have a poor opinion of the stock, which would drive down its price.
- The effects of high interest rates on individual industries would be more pronounced over the longer run. Real estate, automobiles, and other capital-intensive businesses feel the effects of high interest rates first and foremost. Consequently, an investor who ventures into these fields when interest rates are high runs the risk of suffering a catastrophic loss.
- The banking industry stands to gain the most from current interest rate levels. Profits and share prices are projected to rise as a result of a rise in banks' net interest margins (the difference between the interest banks make on loans and the interest they pay on deposits).
- Investments in industries like pharmaceuticals, fast moving consumer goods (FMCG), information technology (IT), etc., are relatively immune to changes in interest rates.

Long-term increases in interest rates have a chilling effect on businesses and consumers, often resulting in a recession. There are other economic variables that interact with interest rates to determine a stock's value, making the effects of interest rate changes on a stock's intrinsic value more complex than previously described. When real interest rates do not exist and the inflation rate is high, investors are less likely to shift their money from the stock market to the bond market in reaction to a rise in interest rates (Chakradhara, 2008). As a result, it is not always the case that a rise in interest rates would lead to falling stock prices. The following are additional reasons why this pairing has the potential to be fruitful. First, if interest rates are rising because the economy is expanding too quickly, then both corporate profits and stock prices should be rising at a rapid pace. Second, if inflation is expected to be high, then interest rates should be high. As a result, corporations are expected to see faster earnings-per-share growth as a result of their increased pricing

power. Therefore, the stock valuation formula is adjusted upwards in terms of earnings per share when the discount factor is raised. In light of this, reduced stock prices may be unwarranted (Durre and Giot, 2005). Finally, a positive correlation might be understood in terms of the dynamic nature of the risk premium. For instance, investors shifting their money from equities and other riskier assets to bonds and other safer investments may cause interest rates to fall (Barsky, 1989). Although the negative correlation between interest rates and stock prices is not immediate or perfect, it is inevitable in the long run. Interest rates and stock prices can have either a positive or negative relationship, as we have shown above. Therefore, the purpose of this research is to investigate the connection between interest rates and stock prices in India.

4.3.4.1 Discussion and Analysis

Tables 4.31 and 4.32 show the average daily returns and returns on the day of interest rate announcement for Sensex and Nifty, respectively, for the three days prior, the three days after, and the thirty days after the day of interest rate announcement.

Immediate Reaction of Sensex and Nifty to Interest Rate Announcement:

The first group of studies uses paired t-sample sizes to determine the impact of interest rate announcements on the Sensex and Nifty on the announcement day (Z) relative to the prior 3, 15, and 30 trading days. Glancing at Tables 4.31 and 4.32, it is clear that in most situations the returns on the day of an interest rate announcement (ignoring sign) are higher than the returns on the 30, 15, and 3 trading days prior. Therefore, when the announcement of interest rate day returns (Z) are compared with the long-term pre-announcement of interest rate return in the case of Sensex, it demonstrates that announcement of interest rate day returns exceed in all years (i.e., 15 out of 15), in contrast to the medium-term (12 out of 15) and short-term (11 out of 15).

Table 4.31: Average Daily Returns in The Sensex

Year	X_1(Last 30 days)	X_2(Last 15 days)	X_3(Last 3 days)	Z(Int. rate)	Y_1(Next 3 days)	Y_2(Next 15 days)	Y_3(Next 30 days)
15 April, 97	0.15	-0.26	-0.48	1.60	1.37	0.16	0.14
25 June, 97	0.36	0.47	0.25	-0.63	1.30	0.14	0.33
21 October, 97	0.10	0.38	0.98	-0.92	-1.32	-0.95	-0.57
16 January, 98	-0.19	-0.46	-0.29	0.49	0.35	-0.13	0.31
18 March, 98	0.56	0.65	0.35	0.89	1.19	0.49	0.27
2 April, 98	0.54	0.29	0.52	0.58	1.64	0.15	-0.08
29 April, 98	0.28	0.15	-0.08	-2.80	1.45	-0.11	-0.77
1 March, 99	-0.08	0.04	-0.51	8.60	0.73	0.29	-0.08
1 April, 00	-0.45	-0.65	-1.02	1.03	-1.25	-0.59	-0.62
21 July, 00	-0.02	-0.30	-1.23	-2.48	-2.10	-0.42	0.12
16 February, 01	0.30	0.17	0.24	-2.46	-0.22	-0.93	-0.65
1 March, 01	0.14	0.10	0.99	0.58	-1.80	-1.08	-0.85
22 October, 01	-0.20	0.70	0.27	-0.50	-0.20	0.17	0.45
29 October, 02	-0.33	-0.22	-1.32	1.78	0.75	0.48	0.47
29 April, 03	-0.24	-0.47	-0.12	0.46	0.28	0.24	0.39

Source: Calculated using information obtained from the BSE website for the specified time.

Note: The percentages are used for all results.

Table 4.32: Average Daily Returns in The Nifty

Year	X_1(Last 30 days)	X_2(Last 15 days)	X_3(Last 3 days)	Z(Int. Rate)	Y_1(Next 3 days)	Y_2(Next 15 days)	Y_3(Next 30 days)
15 April, 97	0.12	-0.32	-0.89	1.55	1.44	0.25	0.12
25 June, 97	0.38	0.49	-0.13	0.57	0.86	0.12	0.30
21 October, 97	0.24	0.61	1.08	-1.12	-1.10	-0.78	-0.50
16 January, 98	-0.14	-0.42	-0.21	0.82	0.48	-0.15	0.21
18 March, 98	0.39	0.47	0.01	1.83	0.62	0.61	0.24
2 April, 98	0.49	0.38	0.28	0.63	0.86	0.04	-0.05
29 April, 98	0.21	-0.15	-1.01	0.37	1.05	-0.14	-0.57
1 March, 99	0.09	0.46	0.81	3.46	1.25	0.30	-0.16
1 April, 00	-0.38	-0.58	-0.86	0.41	-1.83	-0.44	-0.57
21 July, 00	-0.09	-0.31	-1.27	-1.91	-1.94	-0.43	0.07
16 February, 01	0.31	0.24	0.34	-2.53	-0.27	-0.95	-0.65
1 March, 01	0.24	0.34	-0.77	0.49	-1.70	-1.04	-0.80
22 October, 01	-0.20	0.62	0.18	-0.03	0.23	0.20	0.43
29 October, 02	-0.27	-0.18	-1.23	1.53	0.51	0.49	0.46
29 April, 03	-0.25	-0.55	-0.17	0.30	0.47	0.25	0.38

Source: Calculated using NSE website data during the time.

Note: All percentage returns.

T-VALUES FROM PAIRED T-TEST

Table 4.33: Impact Of Interest Rate Day Returns Announcement on The Sensex

	X_1 and Z	X_2 and Z	X_3 and Z
Actual Value (5%)	-2.65*	-2.41*	-2.10*
Table Value (5%)	-1.76	-1.76	-1.76

Source: Calculated using the information from Table 4.31

Note: *Signifies the rejection of the Null Hypothesis (H_o).

Paired t-tests (Tables 4.33 and 4.34) were used to further verify the aforementioned conclusions (Tables 4.31 and 4.32).

Table 4.34: Effect of Interest Rate Day Returns Announcement on the Nifty

	X_1 and Z	X_2 and Z	X_3 and Z
Actual Value (5%)	-3.54*	-2.92*	-2.24*
Table Value (5%)	-1.76	-1.76	-1.76

Source: Calculated using the information from Table 4.32

Note: *Signifies the rejection of the Null Hypothesis (H_o).

T-VALUES FROM PAIRED T-TEST

Table 4.35: Effect Of Interest Rate Announcement on The Sensex

Period	Short-Term Period			Medium-Term Period			Long-Term Period		
	X_1 and Y_1	X_2 and Y_1	X_3 and Y_1	X_1 and Y_2	X_2 and Y_2	X_3 and Y_2	X_1 and Y_3	X_2 and Y_3	X_3 and Y_3
Actual Value (5%)	-4.91*	-4.00*	-3.45*	-1.79*	-.617	1.57	-1.88*	-.607	1.39
Table Value (5%)	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76

Source: Calculated using the information from Table 4.31

Note: *Signifies the rejection of the Null Hypothesis (H_o).

Table 4.36: Effect of Interest Rate Announcement on the Nifty

Period	Short-Term Period			Medium-Term Period			Long-Term Period		
	X_1 and Y_1	X_2 and Y_1	X_3 and Y_1	X_1 and Y_2	X_2 and Y_2	X_3 and Y_2	X_1 and Y_3	X_2 and Y_3	X_3 and Y_3
Actual Value (5%)	-4.65*	-3.72*	-3.12*	-1.88*	-0.05	1.65	-1.84*	-0.56	2.06
Table Value (5%)	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76

Source: Calculated using the information from Table 4.32

Note: *Signifies the rejection of the Null Hypothesis (H_o).

The results of the second series of tests are summarised in Table 4.33; these show that the announcement of interest rates has the most effect in the short-term (alternative hypotheses are accepted in all three circumstances). However, the alternative hypotheses have been accepted in one-third of the cases during the medium- and long-terms. Out of the nine cases at the left tail, the actual values are greater than the tabular values in five (3+1+1) of them. The results show that the average return over the short-, medium-, and long-terms is most affected by interest rate announcements immediately following the announcements themselves.

Table 4.37: Return Variation on the Sensex

Year	X_1(Last 30 days)	X_2(Last 15 days)	X_3(Last 3 days)	Y_1(Next 3 days)	Y_2(Next 15 days)	Y_3(Next 30 days)
15 April, 97	0.072	0.080	0.018	0.019	0.011	0.008
25 June, 97	0.005	0.006	0.002	0.020	0.017	0.015
21 October, 97	0.012	0.009	0.001	0.002	0.012	0.022
16 January, 98	0.023	0.025	0.014	0.048	0.029	0.028
18 March, 98	0.023	0.025	0.02	0.030	0.020	0.025
2 April, 98	0.020	0.016	0.016	0.009	0.028	0.034
29 April, 98	0.021	0.028	0.008	0.023	0.037	0.044
1 March, 99	0.020	0.013	0.007	0.047	0.290	0.052
1 April, 00	0.053	0.025	0.001	0.288	0.152	0.125
21 July, 00	0.022	0.018	0.014	0.255	0.057	0.036
16 February, 01	0.016	0.020	0.018	0.009	0.053	0.080
1 March, 01	0.026	0.082	0.995	0.076	0.094	0.071
22 October, 01	0.064	0.027	0.042	0.023	0.015	0.017
29 October, 02	0.005	0.006	0.000	0.013	0.006	0.008
29 April, 03	0.016	0.015	0.002	0.001	0.004	0.006

Source: Calculated using information obtained from the BSE website for the specified time.

Table 4.38: Return Variation in the Nifty

Year	X_1(Last 30 days)	X_2(Last 15 days)	X_3(Last 3 days)	Y_1(Next 3 days)	Y_2(Next 15 days)	Y_3(Next 30 days)
15 April, 97	0.087	0.080	0.018	0.018	0.016	0.011
25 June, 97	0.007	0.008	0.001	0.009	0.021	0.018
21 October, 97	0.012	0.011	0.002	0.004	0.090	0.060
16 January, 98	0.023	0.025	0.003	0.017	0.019	0.023
18 March, 98	0.019	0.029	0.011	0.003	0.016	0.024
2 April, 98	0.023	0.018	0.053	0.005	0.029	0.027
29 April, 98	0.024	0.029	0.002	0.010	0.026	0.029
1 March, 99	0.037	0.030	0.087	0.050	0.020	0.029
1 April, 00	0.040	0.035	0.002	0.218	0.148	0.107
21 July, 00	0.015	0.013	0.003	0.169	0.040	0.027
16 February, 01	0.013	0.017	0.015	0.080	0.050	0.069
1 March, 01	0.016	0.015	0.09	0.080	0.101	0.710
22 October, 01	0.054	0.018	0.023	0.017	0.013	0.015
29 October, 02	0.005	0.006	0.001	0.006	0.004	0.009
29 April, 03	0.018	0.021	0.004	0.001	0.004	0.006

Source: calculated using information obtained from the NSE website for the specified time.

Tables 4.39 and 4.40 display F-test values for comparisons of the variance between Sensex (Table 4.37) and Nifty (Table 4.38) returns in the immediate, intermediate, and extended time periods following the announcement of interest rate changes. Except for those two years, the Sensex and Nifty have never had actual values higher than those shown in the table. This indicates that volatility following the announcement of an interest rate scenario does not typically grow as time elapses.

Table 4.39: F-Test Outcomes Comparing the Variance of The Returns (Post-Interest Rate Announcement) (BSE)

Year	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)
	Y_1 and Y_2	df = 14/2	Y_2 and Y_3	df= 29/14	Y_3 and Y_1	df= 29/2
15 April, 97	1.73	3.74	1.38	2.03	2.38	3.33
25 June, 97	1.18	3.74	1.13	2.03	1.33	3.33
21 October, 97	6.00	19.43	1.83	2.31	11.00	19.46
16 January, 98	1.66	3.74	1.04	2.03	1.71	3.33
18 March, 98	1.50	3.74	1.25	2.31	1.20	3.33
2 April, 98	3.11	19.43	1.21	2.31	3.78	19.46
29 April, 98	1.61	19.43	1.19	2.31	1.91	19.46
1 March, 99	6.17	19.43	5.58*	2.03	1.11	19.46
1 April, 00	1.89	3.74	1.22	2.03	2.30	3.33
21 July, 00	4.48*	3.74	1.58	2.03	7.08*	3.33
16 February, 01	5.89	19.43	1.51	2.31	8.89	19.46
1 March, 01	1.24	19.43	1.32	2.03	1.07	3.33
22 October, 01	1.53	3.74	1.13	2.31	1.35	3.33
29 October, 02	2.17	3.74	1.33	2.31	1.63	3.33
29 April, 03	4.00	19.43	1.50	2.31	6.00	19.46

Source: Calculated using the information from Table 4.37

Note: *Signifies the rejection of the Null Hypothesis (H_o).

Table 4.40: F-Test Findings Comparing Return Variance (Post-Interest Rate Announcement) (NSE)

Year	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)
	Y_1 and Y_2	df = 14/2	Y_2 and Y_3	df= 29/14	Y_3 and Y_1	df= 29/2
15 April, 97	1.13	3.74	1.45	2.03	1.64	3.33
25 June, 97	2.33	19.43	1.17	2.03	2.00	19.46
21 October, 97	22.5*	19.43	1.50	2.03	15.00	19.46
16 January, 98	1.12	19.43	1.21	2.31	1.35	19.46
18 March, 98	5.33	19.43	1.5	2.31	8.00	19.46
2 April, 98	5.8	19.43	1.07	2.03	5.40	19.46
29 April, 98	2.6	19.43	1.12	2.31	2.90	19.46
1 March, 99	2.5	3.74	1.45	2.31	1.72	3.33
1 April, 00	1.47	3.74	1.38	2.03	2.04	3.33
21 July, 00	4.23*	3.74	1.48	2.03	6.23*	3.33
16 February, 01	1.60	3.74	1.38	2.31	1.16	3.33
1 March, 01	1.26	19.43	1.42	2.03	1.13	3.33
22 October, 01	1.31	3.74	1.15	2.31	1.13	3.33
29 October, 02	1.50	3.74	2.25	2.31	1.50	19.46
29 April, 03	4.00	19.43	1.50	2.31	6.00	19.46

Source: Calculated using the information from Table 4.38

Note: *Signifies the rejection of the Null Hypothesis (H_o).

Table 4.41: Results Of F-Test Comparison of Return Variance Between Post Announcement and Long-Term Preannouncement Interest Rate Periods (BSE)

Year	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)
	X_1 and Y_1	df=29/2	X_1 and Y_2	df= 29/14	$X_1$and Y_3	df= 29/29
15 April, 97	3.79	19.46	6.55*	2.31	9.00*	1.85
25 June, 97	4.00*	3.33	3.40*	2.03	3.00*	1.84
21 October, 97	6.00	19.46	1.00	2.31	1.83	1.84
16 January, 98	3.39*	3.33	1.26	2.03	1.22	1.84
18 March, 98	1.30	3.33	1.15	2.31	1.09	1.84
2 April, 98	2.22	19.46	1.40	2.03	1.70	1.84
29 April, 98	1.09	3.33	1.76	2.03	2.09*	1.84
1 March, 99	2.35	3.33	14.5*	2.03	14.5*	1.84
1 April, 00	5.43*	3.33	2.87*	2.03	2.36*	1.84
21 July, 00	11.59*	3.33	2.00*	2.03	1.64	1.84
16 February, 01	1.78	19.46	3.31*	2.03	5.00*	1.84
1 March, 01	2.92	3.33	3.61*	2.03	2.73*	1.84
22 October, 01	2.78	19.46	4.27*	2.31	3.76*	1.85
29 October, 02	2.60	3.33	1.20	2.03	1.60	1.84
29 April, 03	16.00	19.46	4.00*	2.31	2.67*	1.85

Source: Calculated using the information from Table 4.37

Note: *Signifies the rejection of the Null Hypothesis (H_o).

The F-values for tests comparing the variance of returns in the Sensex and Nifty across the short-, medium-, and long-terms after the announcement of interest rates to the long-terms before the announcement are shown in Tables 4.41 and 4.42, respectively. The long-term timeframe for both Sensex and Nifty has seen 9 of the 15 notable cases, while the medium-term period has seen 8 of the 15 and the short-term period has seen 4 of the 15 cases. If we compare a similar long-term period before the interest rate announcement to a similar long-term period after the rate announcement, we see that the latter is more volatile than the former.

Table 4.42: F-Test Results Comparison of Return Variance Between Post announcement and Long-Term Preannouncement Interest Rate Periods (NSE)

Year	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)	Actual Value	Table Value (5%)
	X_1 and Y_1	df=29/2	X_1 and Y_2	df= 29/14	$X_1$and Y_3	df= 29/29
15 April, 97	4.83	19.46	5.44*	2.31	7.90*	1.85
25 June, 97	1.28	3.33	3.00*	2.03	2.57*	1.84
21 October, 97	3.00	19.46	7.50*	2.03	5.00*	1.84
16 January, 98	1.35	19.46	1.21	2.31	1.00	1.85
18 March, 98	6.33	19.46	1.19	2.31	1.26	1.84
2 April, 98	4.60	19.46	1.26	2.03	1.17	1.84
29 April, 98	2.40	19.46	1.08	2.03	1.21	1.84
1 March, 99	1.35	3.33	1.85	2.31	1.28	1.85
1 April, 00	5.45*	3.33	3.70*	2.03	2.68*	1.84
21 July, 00	11.27*	3.33	2.67*	2.03	1.89*	1.84
16 February, 01	6.15*	3.33	3.85*	2.03	5.31*	1.84
1 March, 01	5.00*	3.33	0.16	2.03	4.43*	1.84
22 October, 01	3.18	19.46	4.15*	2.03	3.60*	1.84
29 October, 02	1.20	3.33	1.25	2.31	1.80	1.84
29 April, 03	18.00	19.46	4.50*	2.31	3.00*	1.85

Source: Calculated using the information from Table 4.38

Note: *Signifies the rejection of the Null Hypothesis (H_o).

4.3.4.2 Results

There was an attempt to quantify the effect of 15 interest rate announcements over 17 years on the stock market by analysing the returns and volatility of the Sensex and the Nifty. Investors, regulators, and the government all have found some fascinating findings in the hypothesis tests undertaken at varying levels of significance.

An investor stands a better chance of seeing a return on their money if they put it to work in the short- and medium-term (up to 15 trading days). But if the announcements don't pan out as he hopes, he runs the danger of exceptional losses. Trading on the day of the announcement is similarly affected. Average returns do not significantly alter as time away from the announcement day increases (up to 30 trading days, according to paired t-tests). As a result, statements of this nature only affect returns for a period of 15 trading days following the budget day.

However, in a post-announcement context, volatility does not seem to rise with passing time. However, compared to a comparable long-term period before the announcement, the long-term period after tends to be more volatile than the medium-term and short-term. Only 26% (4/15) of post-interest rate announcements caused volatility in the Sensex and Nifty during the short-term period, 53% (8/15) caused volatility during the medium-term period, and 60% (9/15) caused volatility in the long-term period compared to volatility during the long-term period before such announcements. Therefore, when volatility and return are studied combined, it is observed that an announcement of interest rate has a bigger impact on return than volatility in the short-term period, but that in the long-term period, such an announcement of interest rate has a greater impact on the volatility than the return.

4.3.5 THE BASICS OF BUSINESS

The price of a share of stock is the single most crucial piece of information available to investors when deciding whether or not to buy that stock. The stock market's share price is highly volatile. It could skyrocket to unprecedented heights or plummet to catastrophic lows. There is no way to know for sure what the share price will do in the future. There are various methods available for forecasting stock prices. The fundamental technique uses financial, environmental, and managerial elements to forecast share price, whereas the technical approach uses historical patterns to do the same. The demand and supply of shares determine the price. Share prices tend to climb when there are more buyers than sellers, and fall when there are more sellers. The mechanism by which the share price is set is known as the "demand and supply" mechanism. The Efficient Market Hypothesis recognises the importance of information about any given organisation. The opposite is also true; if there is positive news about the company, the stock price will rise. Investors, managers, governments, and anybody else with a stake in the company can benefit greatly from knowing how different fundamental elements affect the stock price. These facts are not unknown to investors, but they do not explain the high demand for the shares. When a stock price goes up or down, what kind of news is responsible? What aspects of the economy, if any, influence stock prices? In other words, what factors lead to fluctuations in stock prices? Among the many considerations in doing the research are:

- **The Market Price (MP)**

Zahir and Khanna (1982), Malhotra (1987), and Piatroski (2004) all agree that supply and demand in the market are the primary drivers of a security's market price. The market price reflects the expertise and insight of traders everywhere. Price shifts occur daily as a result of shifts in the demand and supply. As a result of these shifts, it becomes unclear which market price should be used in a regression analysis. It can be derived mathematically as:

$$\text{MP} = \frac{\text{PH} + \text{PL}}{2}$$

Where PH is the highest market price recorded during the t' time, and PL is the lowest.

- **Earnings Per Share (EPS)**

Preference dividends are often subtracted from the net profits before calculating EPS because equity holders are the residual claimants to the earnings of the firm. The relevance of this ratio stems from the fact that a higher rate of dividend and retained earnings can be paid out of a larger portion of the firm's profits, so bolstering the company from the inside out. That's why a rising EPS would boost the stock price and a falling one would do the opposite.

$$\text{EPS} = \frac{\text{Net income after tax} - \text{Preference dividend}}{\text{No. of Equity Shares Outstanding}}$$

- **"Book Value"**

Since it quantifies the total worth of the company's assets allotted to each equity share, it goes by the name "net asset value per share." The amount of money per share that shareholders have put into the company is reflected in the book value. Having a high book value, or large reserves, usually means that a company has done well in the past, which in turn leads to a high market price (Grewal,1986).

$$\text{Book value per share} = \frac{\text{Equily Share cepilal} + \text{Shareholders Reserves}}{\text{Total no. of equity shares outstanding}}$$

- **P/E Ratio (Price to Earnings)**

The price-to-earnings ratio (P/E ratio) describes the relationship between a company's share price and its earnings per share. It reveals how much of a share's earnings are reflected in its current price. Using this ratio, a shareholder can roughly estimate how long it will take to recoup his initial investment in the company. There is a positive correlation between market value and the price-earnings ratio.

$$\mathrm{P/E} = \frac{\text{Market price per share}}{\text{Earning per share}}$$

- **Yield of Dividends**

This is the profit that a stockholder realises via dividends. To calculate dividend yield, one must:

$$\text{Dividend yield} = \frac{\text{Dividend per share}}{\text{Market Price}} * 100$$

4.3.5.1 Discussion and Analysis

Market Price (MP) was used as the dependent variable, while Earnings Per Share (EPS), Dividends Per Share (DPS), Book Value (BV), Price Earnings Ratio (P/E), and Dividend Yield (DY) were used as the independent variables in the multivariate regression study.

4.3.5.2 Results

The test's results show that the F-values are statistically significant below the 0.05 threshold for both the BSE and the NSE, and for each of the five companies (HDFC Bank, State Bank of India, Tata Motors, Mahindra & Mahindra, and Hero Motors). So, in both the BSE (H_{oq}) and NSE (H_{or}) cases, we may conclude that the no-relationship-between-market-price-and-independent-variables null hypothesis is false. All of the selected firms have Durbin-Watson test values that are less than 2, indicating there is no autocorrelation.

All companies in the sample, as well as the BSE and NSE, have R and R^2 values above 0.90, indicating a significant relationship between Market Price and independent variables, and that 90.0% of the variation in Market Price can be attributed to changes in the independent variables.

Regression analysis also shows that EPS, P/E, and DY have been significant in determining share prices across all companies in the sample and on both the BSE and NSE. In the banking industry, earnings per share (EPS) and price to earnings (P/E) have been proven to be the most influential factors in determining share price, while in the automotive industry, DY, P/E, and EPS have been found to be the most critical factors.

❖ THE HDFC BANK: AN ANALYSIS

The F-test was used to see if the entire multiple regression model was statistically significant. This analysis reveals whether or not the dependent variable can be explained by a linear regression of the independent variables. According to Table 4.34, the F-values for both BSE and NSE are statistically significant, meaning that they are lower than the 0.05 threshold. Since market prices in both the BSE (H_{oq}) and NSE (H_{or}) do correlate with the independent variables, we reject the null hypothesis that there is no correlation between the two. The Durbin-Watson test has been utilised because it is valid for time series analysis of economic variables when there is no autocorrelation. Assuming the Durbin-Watson statistic is near to 2, this prediction is highly probable. Durbin-Watson statistics yielded values of 1.78 and 1.75 for BSE and NSE, respectively.

Multiple predictors and an outcome are linked through the coefficient of correlation (R). In all examples, R = 0.985, indicating a robust correlation between the two variables. Like R^1, the coefficient of determination quantifies the proportion of the total variation in the dependent variable that can be attributed to the total variation in the independent variables. Both situations have an R^2 of 0.970 for the regression equation, suggesting that 97.00% of the fluctuation in market price can be attributed to shifts in the Earnings Price Share and the Price/Earnings Ratio, respectively.

Table 4.43: ANOVA And the HDFC Bank's Regression Model Summary

Model	R	R^2	F- Change	Sig. F-Change	Durbin-Watson
BSE(Sensex)	0.985	0.970	70.221	0.000	1.78
NSE(Nifty)	0.985	0.970	72.210	0.000	1.75

Equation of Regression:

For the BSE Sensex

Market Price (MP) = b_0 + b_1 Earning Per Share (EPS) +b_4 Price/Earnings Ratio (P/E)

= -296.345+27.38EPS+10.12P/E

For S&P CNX Nifty

Market Price (MP) = b_0 + b_1 Earning Per Share (EPS) +b_4 Price/Earnings Ratio (P/E)

= -294.45 + 27.35EPS+10.09P/E

Relationships between the dependent variable and each predictor are indicated by the b-values. Coefficients can be positive or negative; a positive value indicates a positive association between the predictor and the result, while a negative value indicates a negative relationship. Two of the predictors in both regression equations have b-values that are positive, indicating that they are positively correlated. Therefore, in both scenarios, a higher Earnings Per Share and Price Earnings Ratio would result in a higher market price. If the effects of all other predictors are maintained constant, the b-values also explain how much of an effect each predictor has on the result.

Table 4.44: BSE Sensex HDFC Bank Coefficients

Model	B -Value	T-Value	Sig.
(Constant)	-296.345	-2.588	0.023
EPS	27.376	20.440	0.000
P/E	10.117	2.570	0.023

Earnings Per Share (EPS) (b = 27.37): This ratio shows that for every 1 Rupee gain in EPS, there is a 27.37 Rupee increase in MP. Only if the P/E effect is ignored can this interpretation be correct.

Price/Earnings Ratio (P/E) (b =10.11): This ratio suggests that for every 1 rupee increase in P/E, there is a 10.11 rupee increase in MP. This explanation holds water only if EPS's influence is ignored.

Table 4.45: HDFC Bank (S&P CNX Nifty) Coefficients

Model	B -Value	T-Value	Sig.
(Constant)	-294.450	-2.588	0.023
EPS	27.351	20.418	0.000
P/E	10.090	2.563	0.024

Earnings Per Share (EPS) (b = 27.35): This ratio shows that for every 1 Rupee gain in EPS, there is a 27.35 Rupee increase in MP. Only if the P/E effect is ignored can this interpretation be correct.

Price/Earnings Ratio (P/E) (b =10.09): This ratio shows that for every 1 rupee increase in P/E, there is a 10.09 rupee increase in MP. Unless the influence of EPS is ignored, this view is false.

The significance of t indicates that the slope of the regression line is considerably different from horizontal in simple regression, but in multiple regression, this is not so intuitive. You can think of t-tests as tools for determining whether or not the predictor is significantly influencing the model. In other words, a predictor is significantly contributing to the model if the t-test linked with a b-value is statistically significant (if the value in the column labelled significant is less than the significance level of 0.05). The bigger the predictor's contribution, the smaller the value of significant and the larger the value of t. EPS and P/E are significant predictors of market price for both models, with values for both over 0.05. The size of the t-statistics indicates that EPS is more significant than P/E in both circumstances.

❖ STATE BANK OF INDIA: AN ANALYSIS

The F-test was used to determine the statistical significance of the entire multiple regression model. According to Table 4.46, the F-values are statistically significant because they are lower than the 0.05 threshold. Therefore, in both the instance of BSE (H_{oq}) and NSE (H_{or}), the null hypothesis that there is no association between the market price and independent variables is rejected. Durbin-Watson tests for BSE and NSE yielded values of 1.77 and 1.19, respectively. Therefore, there is no autocorrelation.

Both the BSE and NSE readings of 'R', 0.983 and 0.977, indicate a highly significant correlation. According to the regression equation, the fluctuations in Earnings Per Share, Book Value, and Price/Earnings Ratio account for 96.6 percent (BSE) and 95.4% (NSE) of the variation in market price.

Table 4.46: State Bank of India: Analytical Summary and Regression Model

Model	R	R^2	F- Change	Sig. F-Change	Durbin-Watson
BSE (Sensex)	0.983	0.966	58.185	0.000	1.77
NSE (Nifty)	0.977	0.954	48.592	0.000	1.19

Regression Equation:

For BSE Sensex

$$\text{Market Price (MP)} = b_0 + b_1\text{Earning Per Share (EPS)} + b_3\text{ Book Value (BV)} + b_4\text{ Price/Earnings Ratio (P/E)}$$
$$= -744.74 - 2.21\text{EPS} + 1.64\text{BV} + 36.54\text{P/E}$$

For S&P CNX Nifty

$$\text{Market Price (MP)} = b_0 + b_1\text{Earning Per Share (EPS)} + b_3\text{ Book Value (BV)} + b_4\text{ Price/Earnings Ratio (P/E)}$$
$$= -931.92 - 10.60\text{ EPS} + 1.84\text{BV} + 97.49\text{P/E}$$

Relationships between the dependent variable and each predictor are indicated by the b-values. There are two predictors with positive b-values, indicating positive associations, and one predictor with a negative b-value, indicating a negative link, in each regression equation. As a result, a rise in both the Price Earnings Ratio and the Book value leads to a higher market price. In contrast, a rise in share price occurs when EPS falls. If the effects of all other predictors are maintained constant, the b-values also explain how much of an effect each predictor has on the result.

Earnings Per Share (EPS) (b =-2.21): The ratio of this value to the change in EPS shows that the market price rises by Rs. 2.21 for every Re. 1 drop in EPS. This understanding holds only if the impacts of BV and P/E are ignored.

Table 4.47: State Bank of India (BSE Sensex) Index Coefficients

Model	B -Value	T-Value	Sig.
(Constant)	-744.743	-7.477	0.000
EPS	-2.213	-.359	0.000
BV	1.643	10.215	0.000
P/E	36.538	11.756	0.000

Book Value (BV) (b =1.64): According to this result, MP rises by 1.64 as BV rises by Re. 1. Only when the impacts of EPS and P/E are held constant does this interpretation hold true.

Price/Earnings Ratio (P/E) (b = 36.53): This result shows that MP rises by Rs. 36.53 for every Rs. 1 increase in P/E. Only when the effects of EPS and BV are held constant does this interpretation hold true.

Table 4.48: State Bank of India (S&P CNX Nifty) Coefficients

Model	B -Value	T-Value	Sig.
(Constant)	-931.923	-7.823	0.000
EPS	-10.602	-8.575	0.000
BV	1.843	11.220	0.000
P/E	97.494	68.121	0.000

Earnings Per Share (EPS) (b = -10.60): According to this value, the market capitalization of a company rises by Rs. 10.60 for every reduction of Rs. 1 in earnings per share. This understanding holds only if the impacts of BV and P/E are ignored.

Book Value (BV) (b =1.84): According to this value, there is a 1.84-fold rise in MP for every 1 Re. 1 increase in BV. If EPS and P/E impacts are ignored, then this interpretation holds.

Price/Earnings Ratio (P/E) (b = 97.49): This ratio suggests that for every 1 rupee increase in P/E, there is a 97.49 rupee increase in MP. If the impacts of EPS and BV are ignored, then this interpretation holds.

The significance of a predictor's role in the model is determined by the t-test. This means that a predictor is significantly contributing to the model if the t-test associated with that b-value is statistically significant (i.e., the value in the column labelled significant is less than the significance level of 0.05). The larger the value of t and the smaller the value of

significant, the larger the contribution of the predictor. With P/E, BV, and EPS all falling below the 0.05 threshold, the two models agree that they are significant predictors of market price. P/E has a larger impact than BV and EPS in both scenarios, as seen by the size of the corresponding t-statistics.

❖ TATA MOTORS: AN EVALUATION

The F-test was used to determine the statistical significance of the entire multiple regression model. Table 4.49 displays the results of the test, which show that in both instances, the F-values are statistically significant because they are lower than the 0.05 threshold. Therefore, in both the instance of BSE (H_{oq}) and NSE (H_{or}), the null hypothesis that there is no association between the market price and independent variables is rejected. Durbin-Watson tests for BSE and NSE yielded values of 1.57 and 1.92, respectively. Therefore, there is no autocorrelation.

Both the BSE and NSE values of 'R' are very significant, showing a strong correlation. R^2 values of 0.897 (BSE) and 0.964 (NSE) for the corresponding regression equation indicate that 89.7% and 96.47% of the fluctuation in market price is explained by variations in Dividend Per Share, Book Value, and Dividend Yield, respectively.

Table 4.49: Tata Motors: Analysis of Variance and Regression

Model	R	R^2	F- Change	Sig. F-Change	Durbin-Watson
BSE (Sensex)	0.947	0.897	14.253	0.001	1.575
NSE (Nifty)	0.982	0.964	38.950	0.000	1.925

Regression Equation:

For BSE Sensex

$$\text{Market Price (MP)} = b_0 + b_2\text{Dividend Per Share (DPS)} + b_3\text{ Book Value (BV)} + b_5\text{ Dividend Yield (DY)}$$

$$= 133.52 + 50.76\text{DPS} + 1.26\text{BV} - 127.8\text{DY}$$

For S&P CNX Nifty

$$\text{Market Price (MP)} = b_0 + b_2\text{Dividend Per Share (DPS)} + b_3\text{ Book Value (BV)} + b_5\text{ Dividend Yield (DY)}$$

$$= 169.81 + 58.12\text{ DPS} + .97\text{ BV} - 145.46\text{ DY}$$

Relationships between the dependent variable and each predictor are indicated by the b-values. There are two predictors with positive b-values, indicating positive associations, and one predictor with a negative b-value, indicating a negative link, in each regression equation. Assuming that Book value and Dividend Yield remain unchanged, the rising dividend per share drives up the stock price. A similar result occurs when Book Value rises and Dividend Yield falls (assuming all other factors remain constant). If the effects of all other predictors are maintained constant, the b-values also explain how much of an effect each predictor has on the result.

Table 4.50: Tata Motors (BSE Sensex) Price Index Coefficients

Model	B -Value	T-Value	Sig.
(Constant)	133.101	1.793	0.103
DPS	50.779	6.458	0.000
BV	1.2550	2.611	0.026
DY	-127.851	-6.517	0.000

Dividend Per Share (DPS) (b = 50.77): According to this ratio, for every 1 Rupee added to DPS, 50.77 Rupees are added to MP. In order for this view to hold water, the impacts of BV and DY must be ignored.

Book Value (BV) (b=1.25): This value shows that for every 1 Rupee added to BV, there will be a 1.25 Rupee increase to MP. Keeping the effects of DPS and DY constant is a must for this interpretation to hold water.

Dividend Yield (DY) (b = -127.85): According to this value, the MP falls by Rs. 127.85 for every 1 Re. increase in DY. Keeping the effects of DPS and BV constant is a precondition for this interpretation to hold water.

Table 4.51: Tata Motors (S&P CNX Nifty) Price Index Coefficients

Model	B -Value	T-Value	Sig.
(Constant)	169.813	1.763	0.112
DPS	58.121	14.853	0.000
BV	0.974	1.981	0.079
DY	-145.468	-7.123	0.000

Dividend Per Share (DPS) (b = 58.12): Based on this value, we can deduce that for every 1 Rupee added to DPS, MP rises by Rs. 58.12. Keeping the effects of BV and DY constant is a must for this interpretation to hold water.

Book Value (BV) (b =0.97): This indicates that for every 1 Rupee added to BV, only 97 paise are added to MP. If the effects of DPS and DY are held constant, then this interpretation holds.

Dividend Yield (DY) (b= -145.46): This value reflects that as DY increases by Re. 1, MP decreases by Rs. 145.46. This interpretation stands true only if the effects of DPS and BV are held constant.

The significance of the predictor's role in the model is determined by the t-test. Therefore, a predictor is significantly contributing to the model if the t-test linked with a b-value is significant (if the value in the column labelled significant is less than the significance level of 0.05). The stronger the contribution of the predictor, the smaller significant and the larger t. Below the 0.05 threshold, the DPS, BV, and DY in both models are all significant predictors of market price. DPS has a more significant effect than DY and BV, as shown by the larger size of their respective t-statistics.

❖ ANALYSIS OF MAHINDRA AND MAHINDRA

The F-test was used to determine the statistical significance of the entire multiple regression model. According to Table 4.43, the F-values for both BSE and NSE are statistically significant because they are lower than the 0.05 threshold. Therefore, in both the instance of BSE (H_{oq}) and NSE (H_{or}), the null hypothesis that there is no association between the market price and independent variables is rejected. The calculated Durbin-Watson test values for BSE and NSE are 1.28 and 1.46, respectively. Therefore, there is no autocorrelation. Higher 'R' values (0.991 for BSE and 0.959 for NSE) indicate a more significant correlation. Values of R^2 for the regression equation are 0.983 (BSE) and 0.920 (NSE), showing that changes in Earnings Price Share, Price/Earnings Ratio, and Dividend Yield account for 98.3% and 92%, respectively, of the variation in market price.

Table 4.52: Summary and Analysis of Variance for Mahindra & Mahindra Regression Models

Model	R	R^2	F- Change	Sig. F-Change	Durbin-Watson
BSE (Sensex)	0.991	0.983	90.428	0.000	1.289
NSE (Nifty)	0.959	0.920	25.008	0.000	1.460

Regression Equation is:

For BSE Sensex

Market Price (MP) = b_0 + b_1 Earning Per Share (EPS) +b_4 Price/Earnings Ratio (P/E) +b_5 Dividend Yield (DY)

= -379.35 + 13.99 EPS + 28.03P/E + 3.94DY

For S&P CNX Nifty

Market Price (MP) = b_0 + b_1 Earning Per Share (EPS) +b_4 Price/Earnings Ratio (P/E) +b_5 Dividend Yield (DY)

= -266.43 + 15.12 EPS + 19.29 P/E + 5.65DY

Relationships between the dependent variable and each predictor are indicated by the b-values. Three of the predictors have positive b-values in both regression models, showing there is a positive association between the variables. Market value rises as a result of an increase in earnings per share, assuming the price-earnings ratio and dividend yield remain same. Market value also rises as P/E and DY ratios rise (in isolation) (assuming all else is equal). Each predictor's impact on the result, when other predictors' effects are held constant, is described by its b-value.

Table 4.53: BSE Sensex Mahindra & Mahindra Index Coefficients

Model	B -Value	T-Value	Sig.
(Constant)	-379.352	-11.149	0.000
EPS	13.986	18.351	0.000
P/E	28.026	11.959	0.000
DY	3.943	11.921	0.000

Earnings Per Share (EPS) (b = 13.98): This value indicates that for every 1 Re.1 increase in EPS, there is a 13.98 Re.1 increase in MP. This view holds water only if P/E and DY are held fixed in their effects.

Price/Earnings Ratio (b = 28.02): This ratio suggests that for every 1 rupee increase in P/E, MP rises by Rs 28.02. This view holds only in the absence of EPS and DY's impacts.

Dividend Yield (DY) (b = 3.94): This value suggests that there is a 3.94 Indian Rupee rise in MP for every 1 Rupee increase in DY. This understanding holds only if EPS and P/E impacts are ignored.

Table 4.54: S&P CNX Nifty Mahindra & Mahindra Company Index Coefficients

Model	B -Value	T-Value	Sig.
(Constant)	-266.432	-4.089	0.001
EPS	15.116	9.444	0.000
P/E	19.290	4.445	0.001
DY	5.652	4.421	0.000

Earnings Per Share (EPS) (b = 15.11): According to this value, the market capitalization rises by Rs.15.11 for every increase of 1 in EPS. Only if we ignore the contributions of P/E and DY can we accept this interpretation.

Price/Earnings Ratio (b =19.29): This implies that for every 1 rupee increase in P/E, there will be a 19.29% rise in MP. If the effects of EPS and DY are held constant, then this interpretation holds.

Dividend Yield (DY) (b = 5.65): According to this value, the monetary value of MP rises by Rs. 5.65 for every 1 Re. increase in DY. This understanding holds only if EPS and P/E impacts are ignored.

The t-test determines if the predictor is significantly influencing the model. If the t-test associated with a b-value is statistically significant (i.e., the value in the column labelled significant is less than the 0.05 level of significance), then the predictor is a powerful one. The bigger the predictor's contribution, the smaller significant and the larger t. Both models show that earnings per share (EPS), price to earnings ratio (P/E), and dividend yield (DY) are significant predictors of market price when their values are below the 0.05 threshold. The size of the t-statistics indicates that in both scenarios, EPS is more influential than P/E and DY.

❖ HERO MOTORS ANALYSIS

The F-test was used to determine the statistical significance of the entire multiple regression model. According to Table 4.55, the F-values are statistically significant because they are lower than the 0.05 cutoff. Therefore, in both the instance of BSE (H_{oq}) and NSE (H_{or}), the null hypothesis that there is no association between the market price and independent variables is rejected. Durbin-Watson test values of 1.78 for BSE and 1.45 for NSE were calculated. Therefore, there is no autocorrelation.

The values of 'R' are 0.997 (BSE) and 0.996 (NSE), indicating a highly significant correlation. The coefficient of determination (R^2) for the regression equation is 0.994 (BSE) and 0.996 (NSE), suggesting that 99.4% and 99.6% of the change in market price is explained by variations in Earning Price Share, Price/Earnings Ratio, and Dividend Yield, respectively.

Table 4.55: Hero Motors' ANOVA and Summary of Regression Model

Model	R	R^2	F- Change	Sig. F-Change	Durbin-Watson
BSE (Sensex)	0.997	0.994	198.68	0.000	1.788
NSE (Nifty)	0.996	0.992	124.028	0.000	1.450

Regression Equation:

For BSE Sensex

$$\text{Market Price (MP)} = b_0 + b_1 \text{ Earning Per Share (EPS)} + b_4 \text{ Price/Earnings Ratio (P/E)} + b_5 \text{ Dividend Yield (DY)}$$

$$= -406.13 + 17.24 \text{ EPS} + 25.77 \text{P/E} - 18.15 \text{ DY}$$

For S&P CNX Nifty

$$\text{Market Price (MP)} = b_0 + b_1 \text{ Earning Per Share (EPS)} + b_4 \text{ Price/Earnings Ratio (P/E)} + b_5 \text{ Dividend Yield (DY)}$$

$$= -497.43 + 17.79 \text{ EPS} + 29.15 \text{P/E} - 11.62 \text{DY}$$

Relationships between the dependent variable and each predictor are indicated by the b-values. Two of the predictors in each regression equation have positive b-values, indicating positive associations, while one has a negative b-value, suggesting a negative link. Price-earnings ratios and earnings per share both rise when the market values the company more highly. When Dividend Yield goes down, however, share prices go up. Each predictor's impact on the result, when other predictors' effects are held constant, is described by its b-value.

Table 4.56: Calculating Hero Motors' (BSE Sensex) Coefficients

Model	B -Value	T-Value	Sig.
(Constant)	-406.132	-7.822	0.000
EPS	17.241	38.273	0.000
P/E	25.768	9.736	0.000
DY	-18.152	-2.795	0.016

Earnings Per Share (EPS) (b = 17.24): This ratio suggests that for every 1 Rupee gain in EPS, there is a 17.24 Rupee increase in MP. This interpretation holds solely with the assumption that P/E and DY have no influence.

Price/Earnings Ratio (b = 25.76): An increase in P/E of 1 represents a rise in MP of Rs. 25.76, as indicated by this ratio. In order for this interpretation to hold, the impacts of EPS and DY must be ignored.

Dividend Yield (DY) (b = -18.15): According to this estimate, the MP falls by Rs. 18.15 for every 1 Re. increase in DY. Keeping the impacts of EPS and P/E constant, this view seems correct.

Table 4.57: Hero Motors (S&P CNX Nifty) Index Coefficients

Model	B -Value	T-Value	Sig.
(Constant)	-497.427	-10.835	0.000
EPS	17.787	27.760	0.000
P/E	29.155	11.556	0.000
DY	-11.619	-2.374	0.035

Earnings Per Share (EPS) (b = 17.78): This value indicates that for every 1 Re.1 increase in EPS, there is a 17.78 Re.1 increase in MP. Assuming the effects of P/E and DY are constant, only then does this view hold water.

Price/Earnings Ratio (b = 29.15): This indicates that for every 1 rupee increase in P/E, there is a 29.15 rupee increase in MP. If the effects of EPS and DY are held constant, then this interpretation holds.

Dividend Yield (DY) (b = -11.61): This number suggests that for every 1 Rupee increase in DY, MP falls by Rs. 11.61. In order for this interpretation to hold, the impacts of EPS and P/E must be ignored.

The significance of the predictor's role in the model is determined by the t-test. Therefore, a predictor is significantly contributing to the model if the t-test linked with a b-value is significant (if the value in the column labelled significant is less than the significance level of 0.05). The bigger the contribution of the predictor, the smaller the value of significant and the greater the value of t. Values for EPS, P/E, and DY that are lower than the 0.05 threshold are considered significant predictors of market price in both models. In both instances, the size of the t-statistics indicates that EPS is more influential than P/E and DY.

4.4 THE RELATIONSHIP BETWEEN VOLATILITY AND STOCK PRICE RETURNS

Researchers in the field of finance have paid a lot of attention to the correlation between the volatility (or variance) of an asset's return and the level of risk associated with that asset. Theoretical asset pricing models (e.g., Sharpe, 1964; Linter, 1965; Mossin, 1966; Merton, 1973, 1980) often associate the return (or the price change) of an asset with its own return variance or with the covariance between its return and the return on the market portfolio. Whether or not such a connection is beneficial has been a point of contention, though. Ballie and DeGennaro (1990) summarised the literature on the topic, finding that most asset-pricing models (e.g., Sharpe, 1964; Linter, 1965; Mossin, 1966; Merton, 1973) assume a positive relationship between the expected returns and volatility of a stock portfolio. The finance literature, however, has a long history of modelling stock return volatility as negatively linked with stock returns (Black, 1976; Cox and Ross, 1976; Bekaert and Wu, 2000; Whitelaw, 2000). According to Bekaert and Wu (2000), for

instance, it seems that volatility in equity markets is asymmetric; returns and conditional volatility are negatively associated.

The volatility is assumed to be unaffected by the sign of the error component in the standard GARCH model, whether it be positive or negative. That is to say, under this model, the impact of both positive and negative news on volatility is the same. For example, stock returns frequently defy this notion by becoming more volatile "after bad news" than "after good news," indicating that the latter is more likely to occur. Black (1976) was the first to describe this so-called Leverage Effect, noting that:

"When a company's stock value drops, investors lose money because their leverage increases. Stock volatility is expected to increase in tandem with a higher debt-to-equity ratio".

Negative returns imply a larger share of debt through a reduced market value of the firm, which leads to higher volatility; this is a simple but valid explanation for the leverage effect. However, actual evidence shows that there is considerable volatility even after modest changes in the market value, so the risk, or volatility, does react to market movements. However, Black did not mention how good returns would affect the volatility. Positive returns lead to moderate expansions, but they also increase volatility. Several parameterized extensions of the classic GARCH model, such as EGARCH, QGARCH, and TGARCH, have recently been proposed as a result of empirical findings that volatility reacts asymmetrically to the sign of the shocks.

Compared to the traditional GARCH specification, the EGARCH model has a number of benefits. To begin, if you model the log (σ^2_t), then even if the parameters are negative, σ^2_t will still be positive. As a result, arbitrary non-negativity requirements on the model parameters are unnecessary. Furthermore, the EGARCH formulation permits asymmetries; if the correlation between volatility and returns is negative, γ, will also be negative (Brooks, 2008).

EGARCH MODEL

In 1991, Nelson proposed the EGARCH model. The primary goal of this model is to clarify why the market reacts differently to positive and negative shocks. Here is the conditional variance specification:

$$\text{In}\,(\sigma_t^2) = \omega + \beta \text{In}\left(\sigma_{t-1)}^2 + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + a\,|\frac{|u_{t-1}|}{\lfloor^{--1}} - \sqrt{\frac{2}{\pi}}\right|$$

The conditional variance log is on the left. This indicates that the leverage effect is exponential, not quadratic, and hence conditional variance forecasts are always non-negative. The hypothesis that $\gamma < 0$ tests the leverage effect. The impact is asymmetric if $\gamma \neq 0$.

4.4.1 DISCUSSION AND ANALYSIS

EGARCH Model Fitting

The correlation between stock returns (BSE Sensex and NSE Nifty) and volatility has been studied using the most well-known model in the GARCH family, the EGARCH model. The software package EViews 5 was used to analyse the connection. The outcomes are shown in Table 4.58 and Table 4.59.

Table 4.58: BSE Sensex EGARCH Model Correlation Coefficient

	Coefficient	Std. Error	Z-Statistic	Prob.
C	0.060662	0.019763	3.069469	0.0021
Variance Equation				
C(2)	-0.155475	0.009579	-16.23074	0.0000
C(3)	0.247142	0.013459	18.36192	0.0000
C(4)	-0.077313	0.007431	-10.40423	0.0000
C(5)	0.958650	0.004080	234.9542	0.0000
R^2	-0.000140	Mean dependent variance		0.040432
Adjusted R^2	-0.001150	S.D. dependent variance		1.711505
S.E. of regression	1.712489	Akaike info criterion		3.662615
Sum squared residual	11613.16	Schwarz criterion		3.670541
Log likelihood	-7256.134	Durbin-Watson statistic		1.860334

Source: Using EViews 5, the data was compiled using information found on the NSE website over the specified time period.

The following are the conditional variance equations obtained by applying the EGARCH method on the BSE Sensex and the NSE Nifty.

For BSE Sensex

$$\text{In}\,(\sigma_t^2) = \omega + \beta \text{In}\left(\sigma_{t-1)}^2 + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \left|\left|\frac{|u_{t-1}|}{--} - \sqrt{t-1}\right|\right.$$

Where, Constant C(2), i.e., ω = - 0.155

GARCH coefficient C(5), i.e., α = 0.958

ARCH coefficient C(3), i.e., β = 0.247

Leverage coefficient C(4), i.e., γ = -0.077

Table 4.59: NSE Nifty's Coefficient in The EGARCH Model

	Coefficient	Std. Error	Z-Statistic	Prob.
C	0.061056	0.020487	2.980304	0.0029
Variance Equation				
C(2)	-0.144746	0.007440	-19.45437	0.0000
C(3)	0.239162	0.009918	24.11423	0.0000
C(4)	-0.083336	0.007381	-11.29087	0.0000
C(5)	0.955600	0.003803	251.2848	0.0000
R-squared		-0.000143	Mean dependent variance	0.040753
Adjusted R-squared		-0.001146	S.D. dependent variance	1.700851
S.E. of regression		1.701826	Akaike info criterion	3.668464
Sum squared residual		11550.09	Schwarz criterion	3.676343
Log likelihood		-7319.088	Durbin-Watson statistic	1.874163

Source: Compilation of data downloaded from the NSE website for the specified time period using EViews 5.

For NSE Nifty

$$\text{In}\,(\sigma_t^-) = \omega + \beta \text{In}\left(\sigma_{t-1)}^- + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \left|\frac{|u_{t-1}|}{--} - \sqrt{\frac{2}{\pi}}\right|\right.$$

Where, Constant C(2), i.e., ω = - 0.144

GARCH coefficient C(5), i.e., α = 0.955

ARCH coefficient C(3), i.e., β = 0.239

Leverage coefficient C(4), i.e., γ = -0.083

The Following Are Some Ways to Check for Leverage Effects:

- When $\gamma = 0$, a positive surprise of equal magnitude has the same impact on volatility as a negative surprise.
- If $-1 < \gamma < 0$, positive surprises boost volatility less than negative ones.
- If $\gamma < -1$, positive surprises decrease volatility whereas negative surprises raise it.
- The impact is asymmetric if $\gamma \neq 0$.

4.4.2 RESULTS

All the coefficients are statistically significant, it has been determined. The ARCH and GARCH coefficients are positive and the leverage term is negative (-0.077 for the BSE Sensex and -0.083 for the NSE Nifty), both of which are statistically different from zero, indicating the existence of the leverage effect for the stock market returns during the time period under consideration. The relationship between return and volatility is hence negative. There is a clear asymmetry in the stock market, with returns being more volatile in the face of negative news and less volatile in the face of positive news. Schwert (1989), French et al. (1987), Christie (1982), and Black (1976) all came to similar conclusions, which the present study's observations only corroborate. Furthermore, they discovered that volatility is inversely connected to returns. This inverse relationship between stock price and volatility is due mostly to the leverage effect, which states that as stock prices fall, the value of equity falls in comparison to corporate debt. As a result, the danger of investing in equities rises.

4.5 VOLATILITY PREDICTION IN THE STOCK MARKET USING THE GARCH MODEL

As high levels of volatility can disrupt the normal operation of any stock market, their study is always a major issue for analysts and scholars. There's a chance it might also dampen corporate activity and inflation (Srivastava, 2008). A rise in stock market volatility may be indicative of a rise in other asset types, such as debt. This change may increase the cost of

capital for firms, particularly startups, as investors move their focus to the shares of more established, successful companies. Though there is consensus on what constitutes stock market volatility and to a lesser extent, how to quantify it, there is far less agreement on the causes of variations in volatility. Researchers looked into what triggers the sudden shifts in the flow of news that might alter stock prices and returns. Because of this, shifts in market volatility would simply reflect shifts in the domestic or global economic climate. Alternatively, some argue that variables including changes in macroeconomic policies, variations in investor risk appetite, and increased uncertainty are the primary drivers of market volatility (Srinivasan et al., 2010).

Investment strategy development and portfolio management would benefit greatly from the detection of volatility tendencies. Risk-averse investors, for instance, may choose to modify their portfolios by decreasing their exposure to assets with projected increases in volatility or by employing more complex dynamic diversification strategies to hedge against such increases. Option pricing models may function better if accurate predictions of stock market volatility are used. Accurately predicting the future standard deviation of returns during the remaining life of the option is crucial for arriving at an accurate value for the option. Option buyers and sellers might benefit from this information. For dynamic portfolio insurance strategies, the anticipated volatility of the stock market is also a crucial input (Srinivasan and Ibrahim, 2010).

Therefore, the effects of financial market volatility extend across the economy. Almost the entire Indian economy was jolted on Black Monday, May 17, 2004, leaving regulators, self-regulators, market players, and government bureaucrats on edge. Even the average citizen is worried about high-profile incidents like the Harshad Mehta Scam and the Ketan Parekh debacle. Events such as the 1987 stock market disaster, the 1989 "mini-crash," the currency turbulence in Southeast Asia, etc., all show how volatility may affect markets around the world. Since events in one region of the world might have instantaneous effects in another (Srivastava and Jain, 2006), predicting volatility is a topic with great practical importance in the current environment.

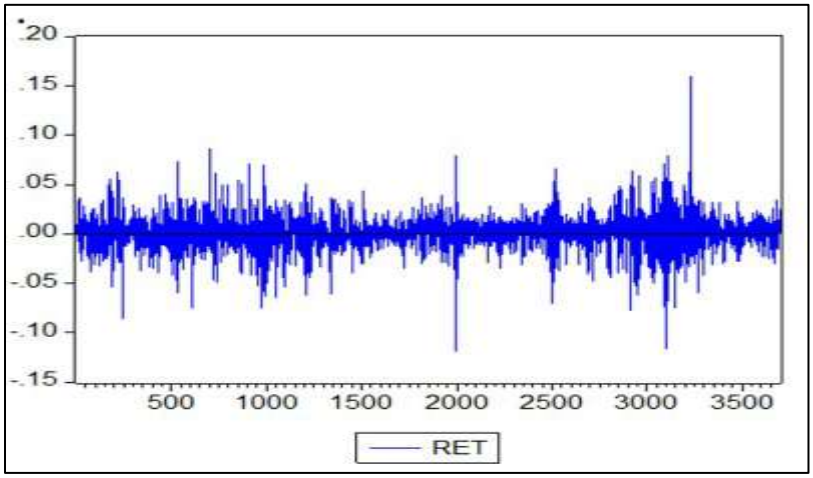
Thus, it can be said without a doubt that volatility assessment is a crucial component of most financial choices, including those involving asset allocation, derivative pricing, and risk management. However, there is no definitive solution to the question of what model should be used to compute volatility, as various volatility models have been published in literature and are being employed by practitioners, each of which produces its own volatility estimate.

Volatility in the financial markets is predictable, and a forecast of high volatility is essentially just a forecast of a high variance. Thus, even if the variance can be predicted perfectly, the size and direction of market swings cannot. You can correctly anticipate the likelihood of rain, yet there still might not be rain if you're trying to predict volatility (Engle, 1993).

The statistical term for this behaviour is autoregressive conditional heteroskedasticity (ARCH), which means that volatility tends to cluster together. Using Conditional Heteroscedasticity (ARCH) to model stock market volatility has become increasingly common. When comparing ARCH models to more standard time series models, it is clear that the conditional variances can evolve over time as functions of earlier errors. The initial strategy involved enhancing the univariate ARCH model by adding a new variance function requirement. Bollerslev (1986) established the Generalised Autoregressive Conditional Heteroscedasticity (GARCH) technique, which represents one advancement in the field. After that, whenever a re-specification of the variance equation was being considered, the integrated GARCH (IGARCH) (Engle et al., 1994) and the exponential GARCH (EGARCH) (Nelson, 1991) were major ones. The volatility of stock returns in emerging countries such as India, however, has received little empirical attention. While Roy and Karmakar (1995) looked at average sample standard deviation to determine if volatility has increased, Goyal (1995) employed conditional volatility estimates, as suggested by Schwert (1989), to identify the underlying trend. In addition, he examined how the carry forward method affected the level of volatility. Pattanaik and Chatterjee (2000) have modelled the volatility of the Indian financial market using ARCH/GARCH models.

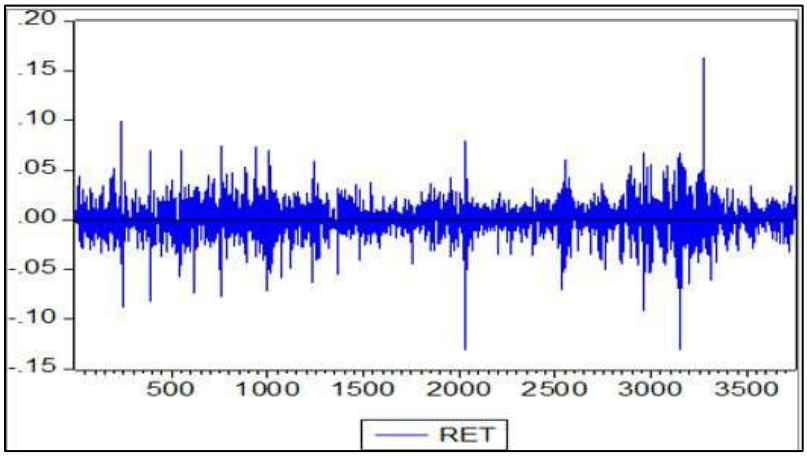
4.5.1 DISCUSSION AND ANALYSIS

Daily Sensex and Nifty returns were shown (Figures 4.2 and 4.3), and a descriptive analysis of the data showed that the returns fluctuated consistently around a mean value close to zero. The return metrics were mixed, falling both in the positive and negative. Periods of calmer conditions were typically interspersed with more pronounced oscillations. This matched the pattern of "volatility clustering" that Fama (1965) had observed (wherein large changes in a time series are typically followed by large changes and minor changes by little changes). When looking at the time series graph of return data for both markets, it is clear that periods of high volatility are followed by periods of high volatility, and periods of low volatility are followed by periods of low volatility. This suggests that the variances in a time series are very time dependent. To further illustrate the effect of risk on returns, it is reasonable to incorporate conditional variance into the function. As a result, the GARCH model is a great resource for this research.



Source: Using BSE website data for given period.

Figure 4.2: BSE Sensex Daily Return Volatility Clustering



Source: Using NSE website data for given period.

Figure 4.3: Clustering S&P CNX Nifty Daily Return Volatility

Table: 4.60: A Daily Returns Descriptive Analysis

	Sensex	**S&P CNX Nifty**
Observation Period	April 1996-March 2011	April 1996-March 2011
Number of Observations	3699	3747
Mean	0.000471	0.000472
Median	0.001128	0.001162
Maximum	0.159900	0.163343
Minimum	-0.118092	-0.130539
Std. Dev.	0.017296	0.017168
Skewness	-0.103023	-0.184996
Kurtosis	8.102657	9.297716
Jarque-Bera	4018.426 (2-tailed p =0.00)	6211.823(2-tailed p =0.00)
Q(1)	19.720 (2-tailed p =0.00)	12.42 (2-tailed p =0.00)
$Q^2(1)$	122.89 (2-tailed p =0.00)	150.61 (2-tailed p =0.00)
ARCH LM statistics (at lag = 1)	127.95	158.40

Source: Estimated using information gathered from the BSE and NSE websites during the specified time frame.

Notes:

- A series' skewness indicates how unevenly the data points are distributed around the mean.
- The kurtosis statistic evaluates how skewed or flat the series distribution is.

- To determine if a series follows a normal distribution, statisticians use the Jarque-Bera test.
- The presence of first order autocorrelation in the returns can be detected using the Ljung Box statistic Q(K). It follows a chi-square (K) distribution when the absence of autocorrelation is assumed.
- The presence of first order autocorrelation in the squared returns can be detected using the Ljung Box statistic Q2(K). In the absence of any autocorrelation, it follows a chi-square (K) distribution.
- The Lagrange Multiplier test statistic for ARCH is known as the ARCH LM statistic. It follows a chi-square (K) distribution when the absence of heteroskedasticity is assumed. The critical value at the 1% significance level is 6.63 for a single degree of freedom. Significant values can also be found for other, higher lags.

Table 4.60 compiles descriptive statistics on Sensex and Nifty returns. The daily returns of the Sensex and the Nifty are discovered to have a non-zero skewness statistic, indicating that the distribution of the returns is not symmetric. In addition, the substantial excess kurtosis versus the normal distribution indicates that the underlying data is leptokurtic, or heavily tailed and sharply peaked about the mean. Calculating the Jarque-Bera statistic to test for normalcy, the null hypothesis of normality is rejected. These findings provide credence to the widely held belief that daily stock returns are not normally distributed but instead follow a leptokurtic and asymmetric distribution.

Analysing the Unit Root

The Dickey-Fuller test was used to examine the stationarity of the return series. For both markets, the estimated p-values of ADF were less than the 0.05 significance level, suggesting that the data in the time series under consideration is stationary. Both return series were found to be stationary in the tests. The outcomes of these examinations are shown in Tables 4.61 and 4.62.

Table 4.61: The Sensex Daily Returns Index as Measured by ADF Tests

	T-Statistic	Probability
Augmented Dickey-Fuller test statistic	-56.49521	0.0001
Test critical value	1% level	-3.465014
	5% level	-2.876677
	10% level	-2.574917

Source: Estimated using information gathered from the BSE website within the specified time frame.

Table 4.62: Daily Returns (Nifty) Test Data from the ADF

	t-Statistic	Probability
Augmented Dickey-Fuller test statistic	-57.75137	0.0001
Test critical value	1% level	-3.465014
	5% level	-2.876677
	10% level	-2.574917

Source: Estimated using information retrieved from the NSE website within the specified time frame.

The Box-Jenkins Technique in Practise

Since volatility clustering is indicative of a high degree of autocorrelation in squared returns, determining the first-order autocorrelation coefficient in squared returns provides a straightforward way for identifying volatility clustering. $Q = n\,(n + 2)\,\Sigma\, r^2\, k\,/\,(n\text{-}k)$, where n = sample size, k = lag length, and $\Sigma\, r^2\, k$ = autocorrelation function, is a statistic devised by Ljung and Box that can be used to evaluate this hypothesis (Ljung and Box, 1978). The null hypothesis can be rejected in an application if the computed Q value is greater than the crucial Q value from the Chi-square table at the selected level of significance. Table 4.60 displays the results of the $Q2(1)$ test statistic, which indicates that the presence of first-order autocorrelation in the series cannot be ruled out. Calculating the value of the Lagrange Multiplier (LM) which rejects the null hypothesis confirmed the existence of a leptokurtic distribution and the presence of volatility clustering, both of which are consistent with an ARCH or GARCH process. In conclusion, the study shows that the index's daily return series is not normal and shows evidence of the so-called "ARCH effect."

GARCH (1,1) Model Fitting

Volatility of Sensex and Nifty returns have been modelled using the GARCH (p, q) model, the most widely used model in the ARCH family. In order to estimate the models, EViews 5 was employed. The estimated model results are shown in Tables 4.63 and 4.64.

The following conditional variance equations are computed for Sensex and Nifty when the GARCH (1,1) method is executed.

For Sensex

$ht = \omega + \alpha 1\ \varepsilon\ t\text{-}1^{\ 2} + \beta 1 h\ t\text{-}1$

$h_t = 6.5E\text{-}06 + .120\ \varepsilon_{t-1}^{\ 2} + 0.863\ h_{t-1}$

For Nifty

$h_t = \omega + \alpha_1\ \varepsilon_{t-1}^{\ 2} + \beta_1 h_{t-1}$

$h_t = 7.55E\text{-}06 + .130\ \varepsilon_{t-1}^{\ 2} + 0.851\ h_{t-1}$

Table 4.63: Table Sensex GARCH Model Coefficients

	Coefficient	Std. Error	Z-Statistic	Prob.
C	0.001148	0.000208	5.509233	0.0000
RET(-1)	0.087753	0.017837	4.919702	0.0000
Variance Equation				
C	6.56E-06	8.29E-07	7.909030	0.0000
RESID(-1)^2	0.120143	0.007744	15.51357	0.0000
GARCH(-1)	0.862982	0.007805	110.5744	0.0000
R^2	0.003396	Mean dependent variance		0.000471
Adjusted R^2	0.002317	S.D. dependent variance		0.017298
S.E. of regression	0.017278	Akaike info criterion		-5.520149
Sum squared residual	1.102212	Schwarz criterion		-5.511743
Log likelihood	10209.00	F-statistic		3.145587
Durbin-Watson statistic	2.018649	Probability (F-statistic)		0.013613

Source: Using EViews 5, the data was compiled using information found on the BSE website over the specified time period.

Table 4.64: Coefficients of GARCH Model (Nifty)

	Coefficient	Std. Error	Z-Statistic	Prob.
C	0.001092	0.000220	4.962655	0.0000
RET(-1)	0.083970	0.017566	4.780146	0.0000
Variance Equation				
C	7.55E-06	7.73E-07	9.767712	0.0000
RESID(-1)^2	0.130346	0.006860	19.00021	0.0000
GARCH(-1)	0.851039	0.006154	138.2827	0.0000
R^2	0.001139	Mean dependent variance		0.000470
Adjusted R^2	0.000071	S.D. dependent variance		0.017169
S.E. of regression	0.017169	Akaike info criterion		-5.524704
Sum squared residual	1.102431	Schwarz criterion		-5.516389
Log likelihood	10350.01	F-statistic		1.066612
Durbin-Watson statistic	2.042994	Probability (F-statistic)		0.371309

Source: Data was collected from the NSE website during a specified time period and imported into EViews 5.

4.5.2 RESULTS

Stationary series are ideal for time series analysis. To determine series stationarity, sum α1+ β1 and ensure the value is less than one. Stationarity of the variance process was observed with an α1+ β1 of 0.983 for Sensex. Table 4.63 shows that α1+ β1 is 0.981 for S&P CNX Nifty, with α1 at +0.120 and β1 at +0.863. The stationarity requirement (α1+ β1 < 1) is met in both markets. However, the sum was close to one, indicating long-term volatility shocks. It suggests 'long memory'. Large GARCH lag coefficients (β1 = 0.863 for Sensex, +0.851 for Nifty) suggest prolonged volatility due to shocks to conditional variance taking a long time to resolve. A low error coefficient α1 (≈ 0.120 for Sensex and +0.130 for Nifty) indicates that market surprises cause minor changes in future volatility.

GARCH (1,1) matches the BSE Sensex and S&P CNX Nifty return time series well, according to this study's volatility projection model.

Forecasts of Market Volatility

Market return series (i.e., Sensex and Nifty) must be fitted into the model before it can be used to predict volatility. The model has been used to make intraday volatility projections.

For Sensex $h_t = \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1}$

$h_t = 6.56\text{ E-}06 + .120\ \varepsilon_{t-1}^2 + 0.863 h_{t-1}$

$h_{t+1} = 6.56\text{E-}06 + .120\ (-0.00608)^2 + 0.863\ (.000163)$

$= .00008118$

For Nifty $h_t = \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1}$

$h_t = 7.55\text{E-}06 + .130\ \varepsilon_{t-1}^2 + 0.851\ h_{t-1}$

$h_{t+1} = 7.55\text{E-}06 + .130\ (-0.00609)^2 + 0.851\ (.000158)$

$= .00008663$

The one-day volatility projection is h_{t+1}. Both ε_{t-1}^2 and ht-1 are determined using EViews 5. One-day-ahead volatility for (Sensex is) 00008118 and (Nifty is) 00008663. Model can predict one-day-ahead volatility.

CHAPTER - 5

THE ANALYSIS OF BANK NIFTY VOLATILITY

5.1 INTRODUCTION

This chapter looked at the bank nifty's volatility in terms of how expiration day affects the volumes of Nifty Bank Stocks, how maturity day affects the returns of Nifty Bank Stocks, how expiration day affects Nifty Bank Stocks, and how price reversal affects the day after expiration days.

5.2 NIFTY BANK STOCK VOLUMES ON EXPIRATION DAY

Derivatives in the financial markets, such as stock futures, are generally considered to be the most significant innovations of modern times. Changing the structure of the financial market with the intent of reducing the risk of financial investment is the primary objective. With an eye towards keeping up with the rest of the world, NSE developed several financial products in India to keep the financial market functioning smoothly and at a high standard. A restricted offering of common shares began trading on the NSE on November 9, 2001.

However, the number of stock futures traded on the NSE increased by a factor of ten, and by 2007 the NSE had established itself as the premier stock futures exchange in the world. There are currently 160 stocks that can be traded in the futures market on the NSE. Many investors are concerned about the impact of derivatives on the equities market and other securities as stock futures gain popularity as an investment option. Consequently, the purpose of this Chapter is to investigate how the expiration of stock futures contracts affects trading activity for the underlying Nifty Bank Stocks.

- **Proof of Stationarity**

Unit root testing in time series was pioneered by Dickey and Fuller (1979 and 1981). It is a diagnostic tool for finding time series that have become stationary. Only if the data is stationary can its behaviour over a period of interest be analysed.

- **Arithmetic Mean with Autocorrelation**

The Ordinary Least Squares Method is used to pick the ARMA process for the mean equation based on the SBC (Schwarz Bayesian Criterion). The model with the smallest SBC wins the competition.

- **EGARCH**

The exponential version of the skedastic function in the EGARCH model ensures positive conditional variance without the need to restrict parameters.

- **Dummy 1**

The dummy1 takes a value of one for days that are about to expire and a value of zero for the remaining days.

- **Dummy 2**

The volume reversal was analysed using this variable, with the value assumed to be one on trading days immediately after the expiration date and zero on all other trading days.

The daily volume of Nifty Bank Stocks is shown as a rising line, indicating that there is a volume trend at the time of study.

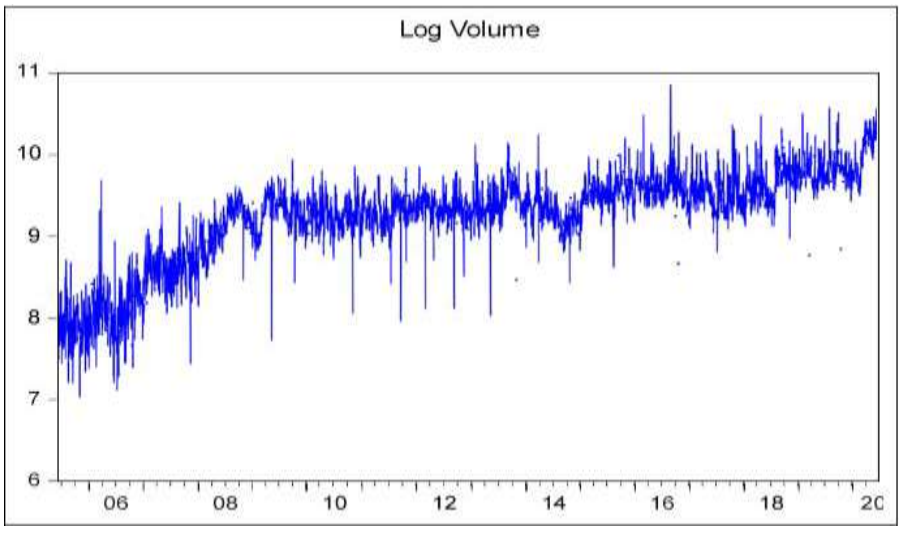


Figure 5.1: Line Graph of The Axis Bank

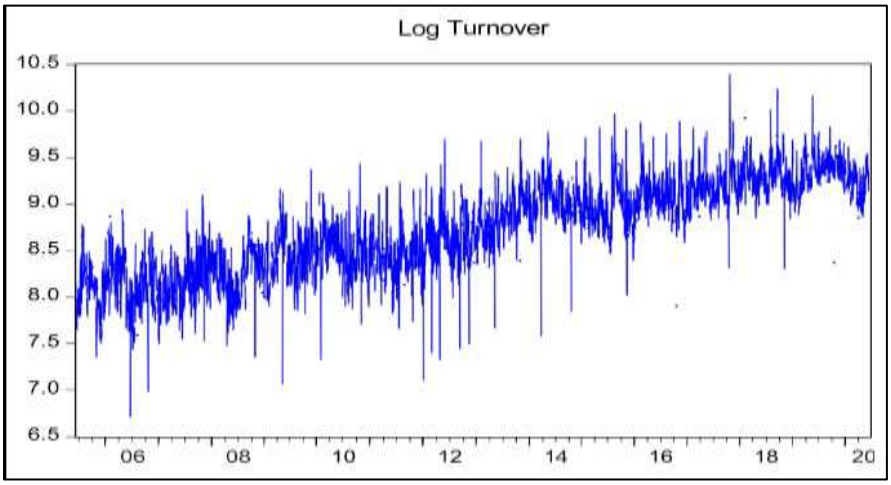


Figure 5.2: Line Graph of The Bank of Baroda

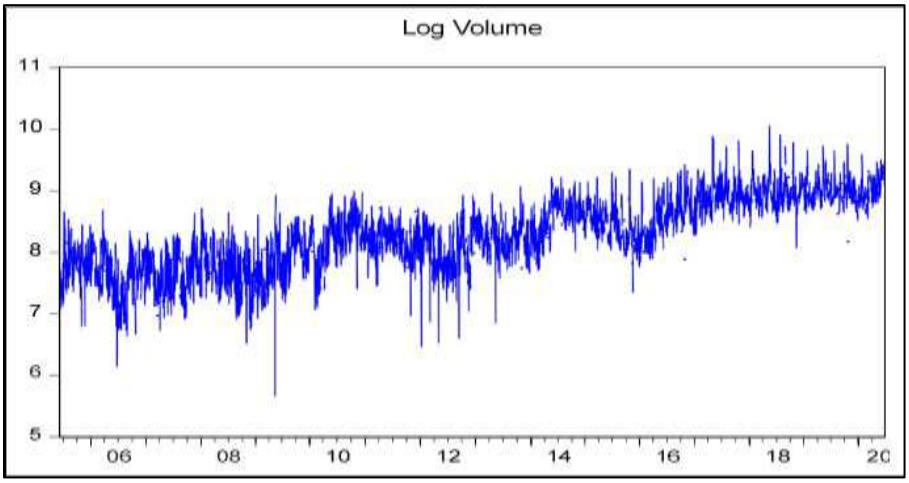


Figure 5.3: Line Graph of Federal Reserve Bank

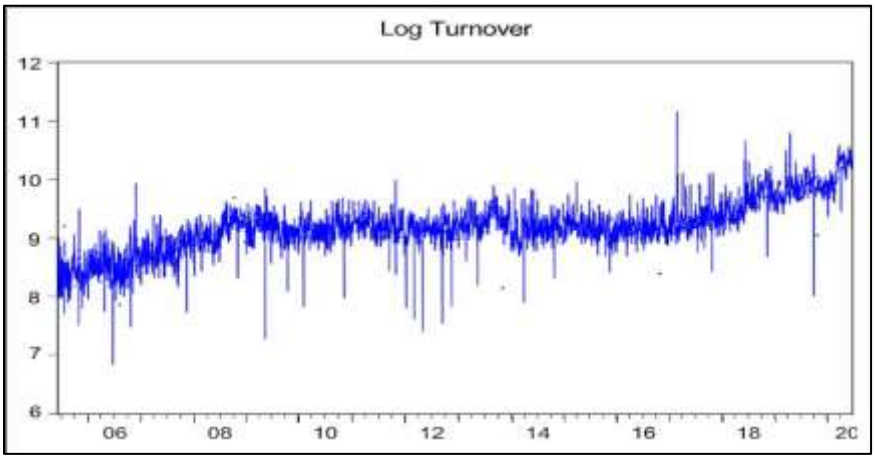


Figure 5.4: Line Graph of The HDFC Bank

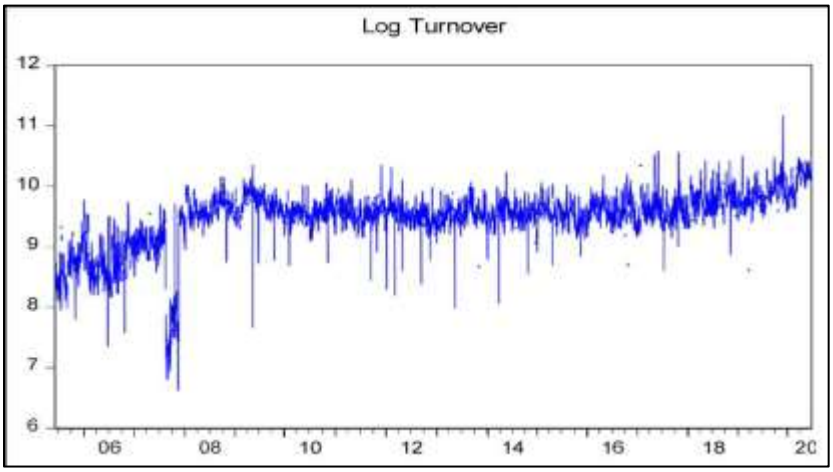


Figure 5.5: Line Graph of ICICI Bank

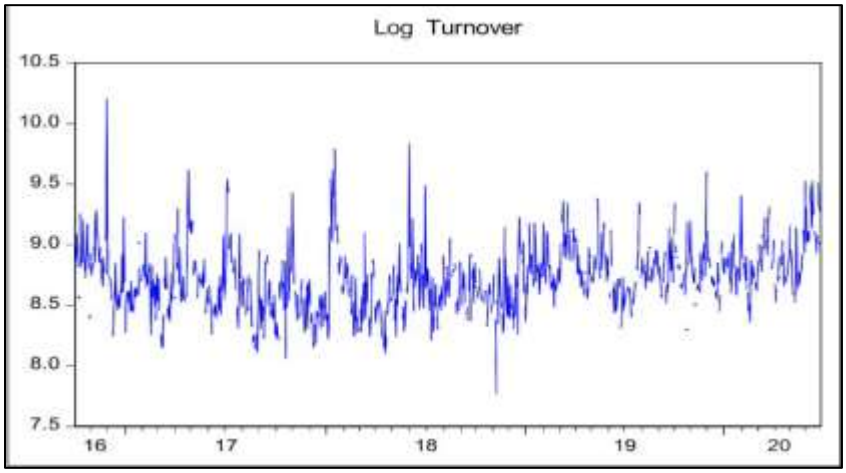


Figure 5.6: Line Graph of IDFC FIRST Bank's Branch Network

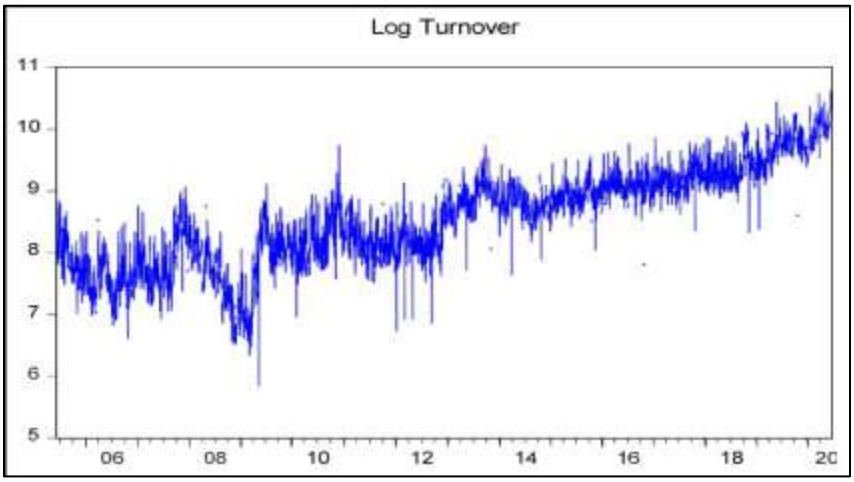


Figure 5.7: Line Graph of Bank of IndusInd

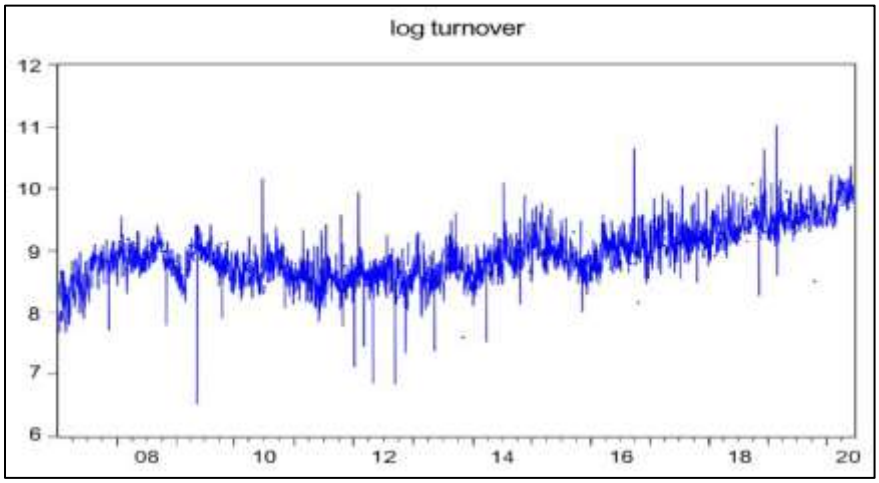


Figure 5.8: Line Graph of Kotak Bank

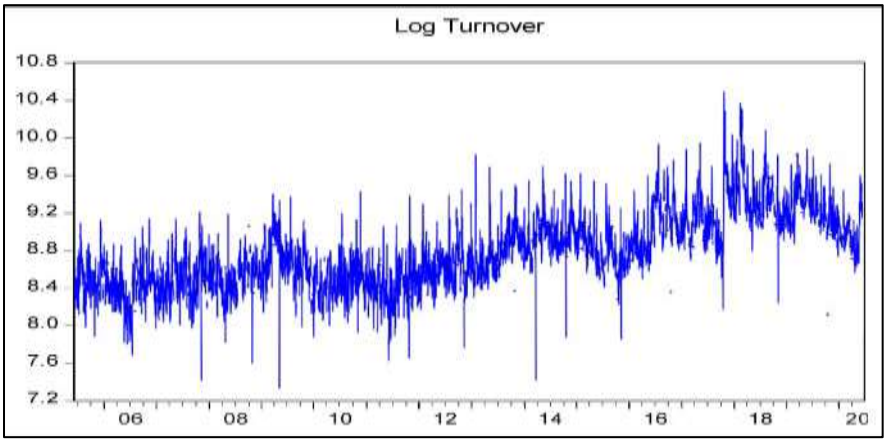


Figure 5.9: Line Graph of The Punjab National Bank

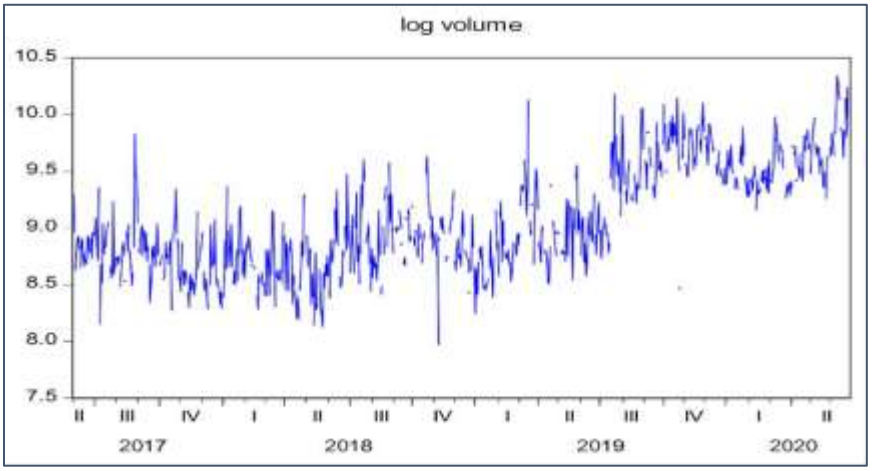


Figure 5.10: Line Graph of Ratnakar Bank

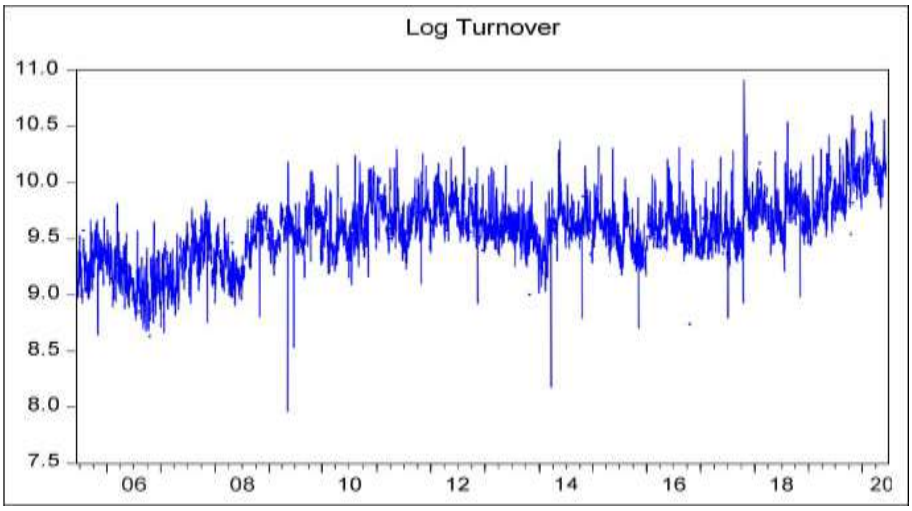


Figure 5.11: Line Graph of The State Bank of India

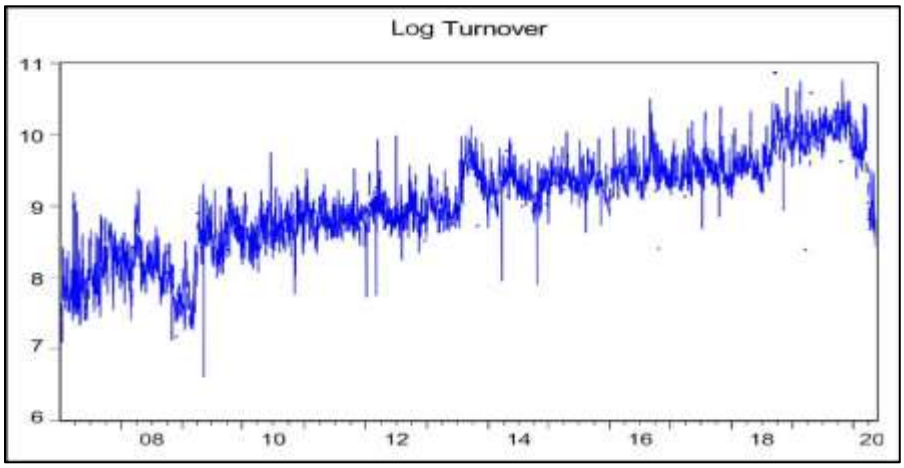


Figure 5.12: Line Graph of Yes Bank's Line

Figure 5.1 through Figure 5.12 show a line graph of a series of daily volumes for the Nifty Bank Stocks, which include 12 different banks. Means and standard deviations of the banking stocks utilised in the study all appear to be volatile across the study period, as seen by the direction in the volumes of the means and standard deviations in the line diagrams. The selected volume series data is de-trended using the first difference approach in order to determine the impact of the expiration day on volume.

The volume series of banking stocks are de-trended using the first differencing approach so that the impact of the study's chosen expiration days on turnover can be evaluated.

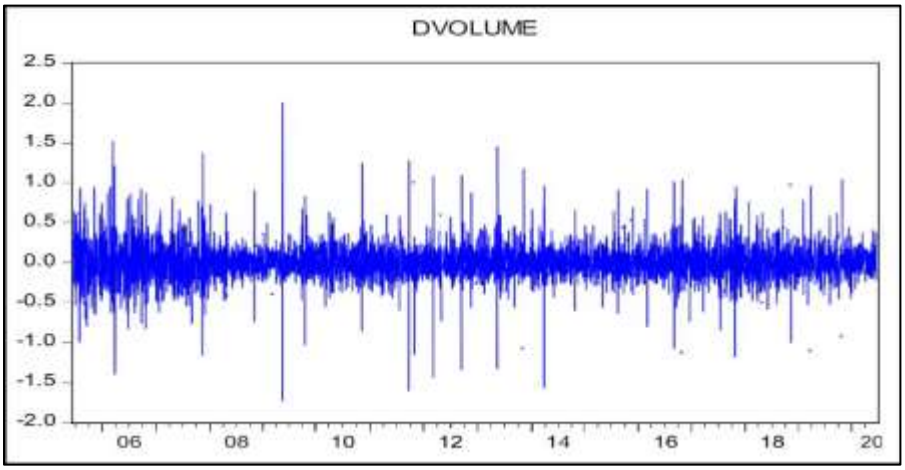


Figure 5.13: Graph of Axis Bank

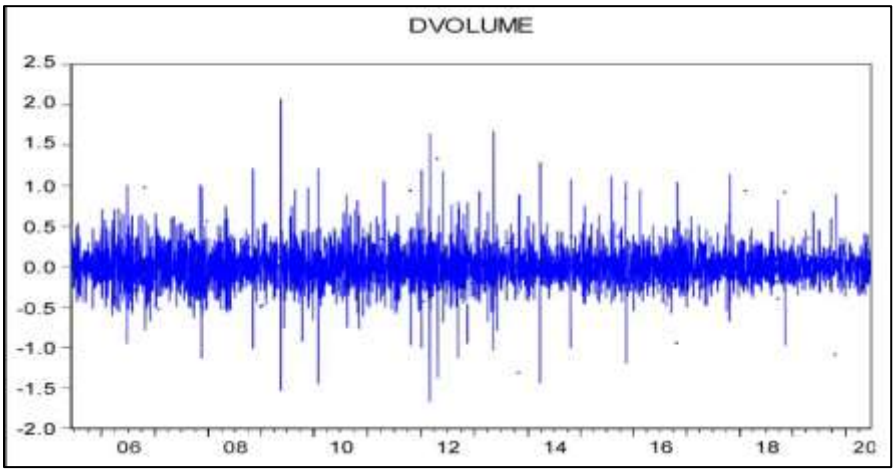


Figure 5.14: Graph of A Bank of Baroda

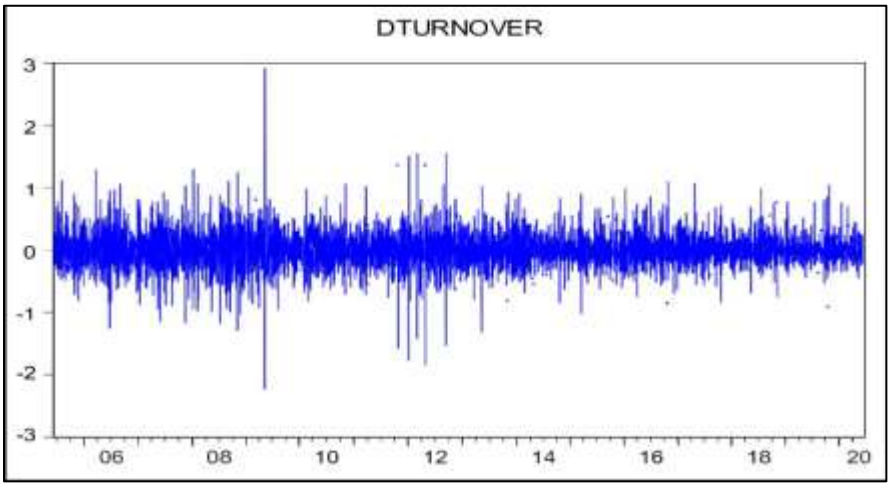


Figure 5.15: Graph of Federal Reserve Bank

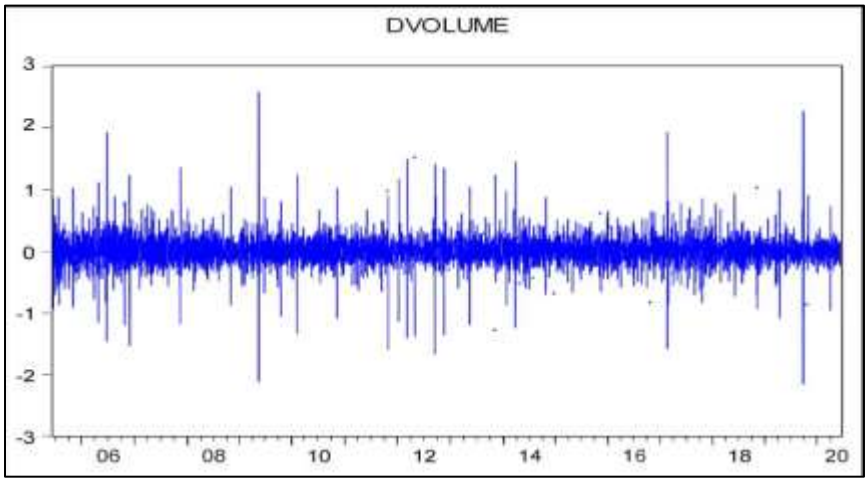


Figure 5.16: Graph of HDFC Bank

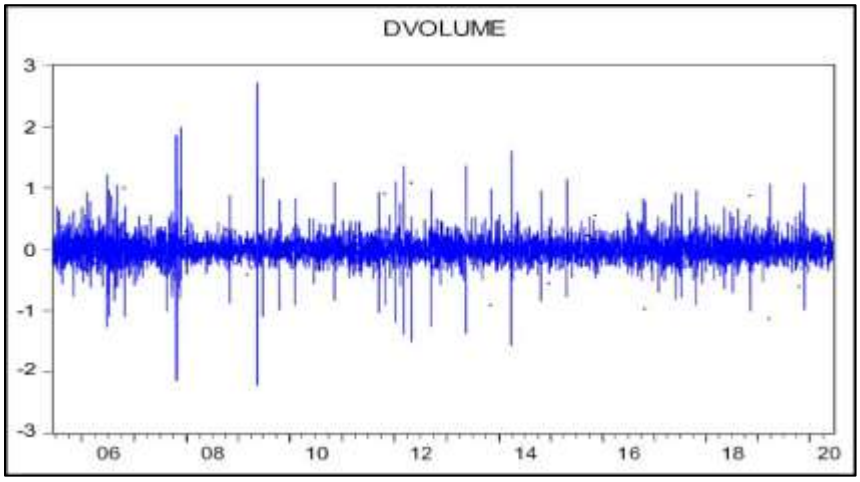


Figure 5.17: Graph of ICICI Bank

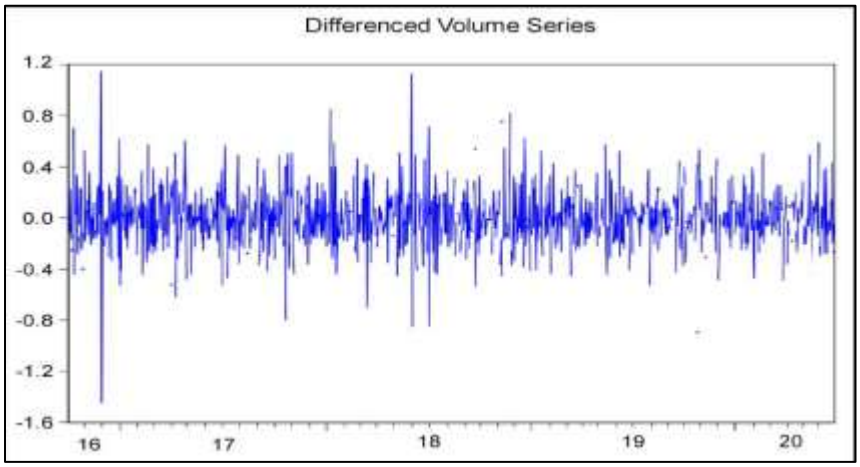


Figure 5.18: Graph of IDC FIRST Bank

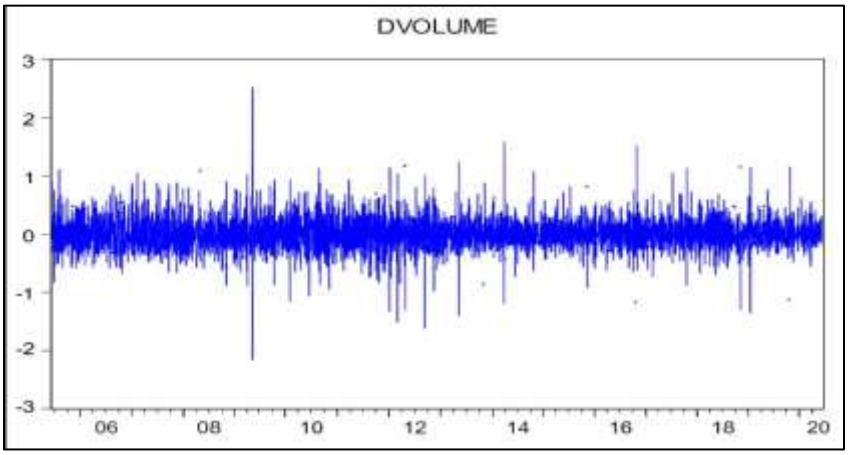


Figure 5.19: Graph of IndusInd Bank

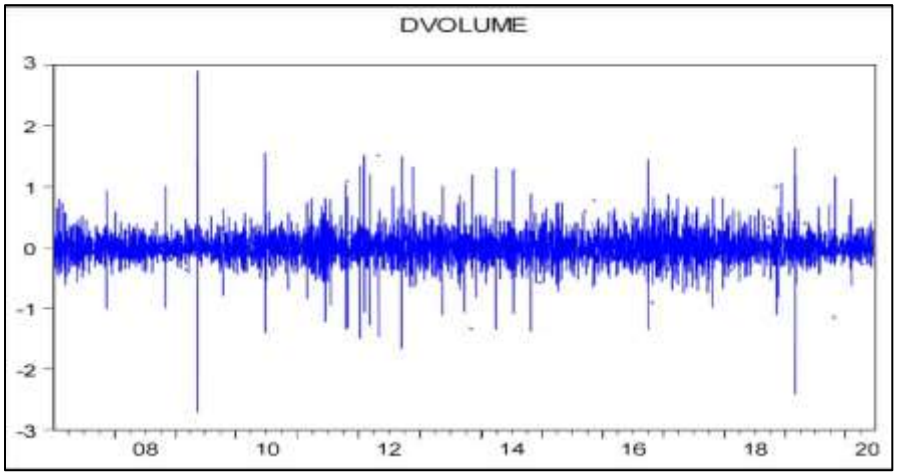


Figure 5.20: Graph of Bank of Kotak

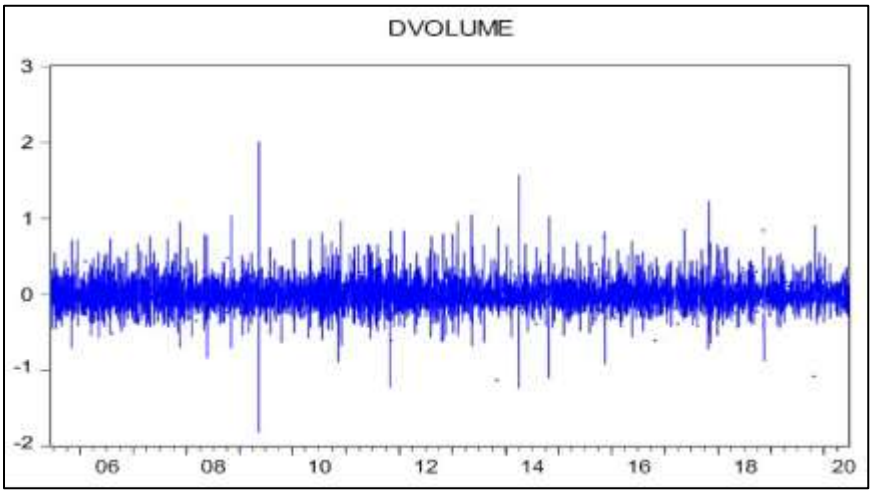


Figure 5.21: Graph of A Punjab National Bank

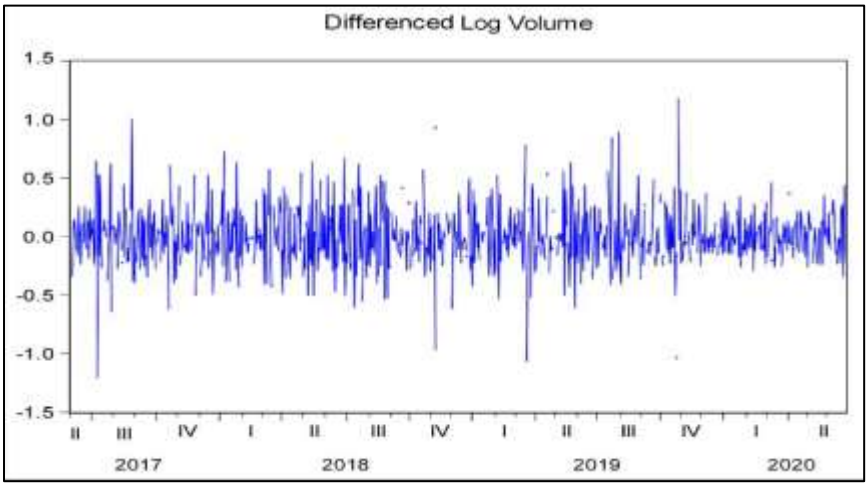


Figure 5.22: Graph of Ratnakar Bank

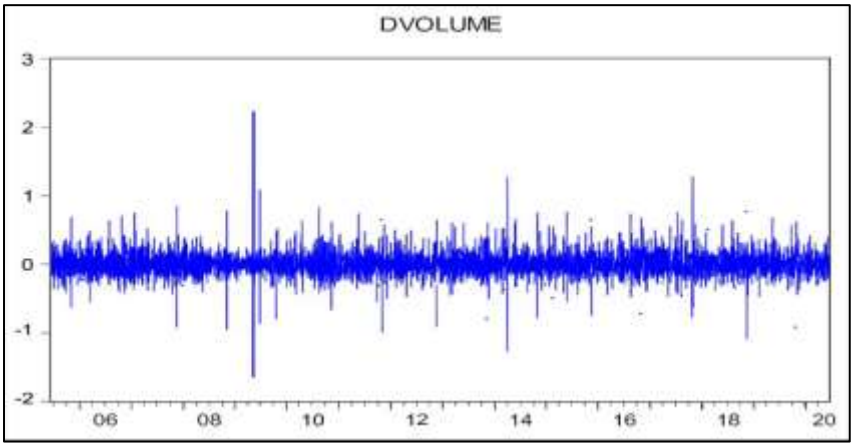


Figure 5.23: Graph of State Bank of India

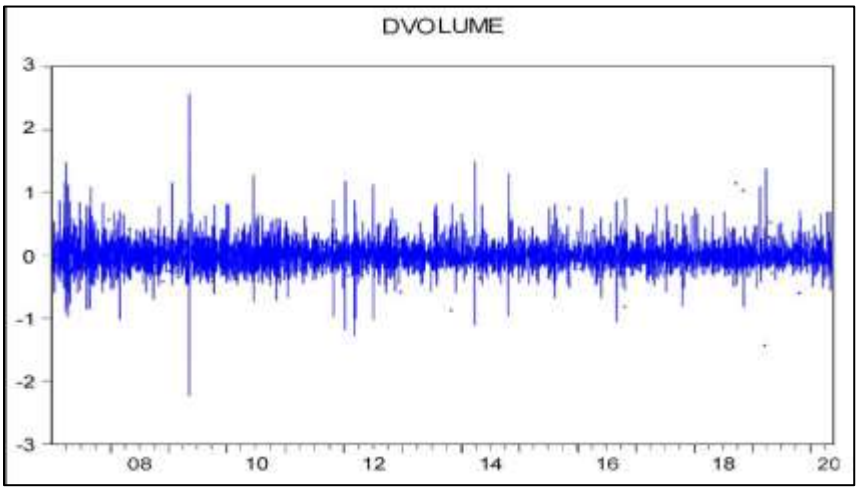


Figure 5.24: Graph of Yes Bank

The volume trend visible in Figures 5.1-5.12 has been removed after the series was de-trended (Figures 5.13-5.24), allowing us to test for stationarity in the volume series. Due to the increased emphasis on stationarity in modern time series, the ADF test was used to ensure the series of stock volumes used in the analysis were stationary.

5.2.1 HYPOTHESIS

H0: The price series for Nifty Bank Stocks is not stationary.

H1: The Nifty Bank Stocks number series does not change over time.

Table 5.1: Analysis of Nifty Bank Stock Volume for Stationarity

Stocks	T-Statistic	First Difference	Second Difference
Federal Bank	-29.35917	-2.862121	--
HDFC Bank	-23.36158	-2.862123	--
ICICI Bank	-27.86744	-2.862121	--
IDFC FIRST Bank	-27.09572	-2.864479	--
IndusInd Bank	27.71570	-2.862121	--
Kotak Bank	-24.31662	-2.862213	--
PNB	26.36404	-2.862123	--
Ratnakar Bank	-17.28065	-2.865173	--
SBIN	-29.59139	-2.862123	--
Yes Bank	-29.53666	-2.862218	--
Axis Bank	-25.53848	-2.862123	--
Bank of Baroda	-27.14950	-2.862121	--

The ADF test is performed on data from the banking sector to verify the unit root hypothesis. The Nifty Bank Sectoral Stocks are not moving, as shown by the ADF test's t-statistic being below the 5% significance level. Therefore, the lack of stationarity in banking stocks is a rejected null hypothesis.

Table 5.2: Calculation Of an Autoregressive Moving Average for The Volume Series of Nifty Bank Stocks

Stocks	ARMA
Axis	(1,1)
BOB	(1,1)
Federal	(1,1)
HDFC	(1,1)
ICICI	(1,1)
IDFC First	(1,1)
IndusInd	(1,1)
Kotak	(1,1)
PNB	(1,1)
RBL	(1,1)
SBI	(1,1)
Yes Bank	(1,1)

The Ordinary Least Square (OLS) technique employs the Schwartz Bayesian Criterion (SBC) to determine the optimal fit for the ARMA process in volume series. All of the Nifty Bank stocks are best fit by ARMA (1,1), as shown in Table 5.2. This means the information can be used in further studies.

H0: The trading volumes of Nifty Bank Stocks are not affected by expiration day.

H1: The trading volumes of Nifty Bank Stocks fluctuate significantly on expiration day.

Table 5.3: The Impact of Expiration Days on Nifty Bank Share Trading Volume

Stocks	Dummy1 Coefficient	p-value	Dummy2 Coefficient	p-value
Axis	0.123602	0.0000	-0.126457	0.0000
BOB	0.192531	0.0000	-0.129160	0.0000
Federal	0.159546	0.0000	-0.147092	0.0000
HDFC	0.231973	0.0000	-0.254241	0.0000
ICICI	0.144196	0.0000	-0.111082	0.0000
IDFC FIRST	0.236516	0.0000	-0.174406	0.0000
IndusInd	0.171656	0.0000	-0.158315	0.0000
Kotak	0.176955	0.0000	-0.182272	0.0000
PNB	0.153735	0.0000	-0.076376	0.0000
RBL	0.078886	0.0493	-0.144920	0.0003
SBIN	0.100112	0.0000	-0.080852	0.0000
Yes Bank	0.092331	0.0000	-0.096787	0.0000

Table 5.2 presents the Auto Regressive Moving Average framework used to analyse the impact of maturity day on volume. Table 5.3 exhibits the results.

Table 5.3 shows that the Dummy1 has a coefficient that is statistically significant at the 5% level for each of the twelve Nifty Bank stocks used in the analysis, indicating that volume is higher on expiration-days than on other days. This suggests that Nifty Bank Stock volumes were significantly affected by the expiration.

The negative sign at the key threshold of 5% for Dummy2 suggests that trading volume will return to its pre-expiration levels after all stock expiration days have passed.

5.3 THE EFFECT OF EXPIRATION DAY ON NIFTY BANK STOCK RETURNS

The study of derivatives' volatility has recently risen to prominence in the field of finance. The empirical distribution of asset returns is evaluated with time dependences in mind. The serial dependence of time series has typically been modelled using autoregressive integrated moving average (ARIMA) structures. But the model can't figure out the asset return volatility clustering because of the homoscedasticity. It is important to consider the heteroscedastic repercussions of the time series process while analysing the observed fat tails, also known as clustering of volatility.

Since the returns, volatility, and price reversal are all dependent on the closure price, a stationarity check and the diagnostic models like the Normality test, Auto-Correlation, and Arch Test are shared by the remaining three parts of the analysis.

- **The Unit Root Test**

The time series data have seasonality removed using a stationarity test.

- **Examining the Norm**

To determine if the time series follows a normal distribution, the Jarqua-Bera test was used.

- **Correlation In a Series**

In statistics, autocorrelation is used to describe the relationship between observations of the same variable collected over specified intervals of time. Partial autocorrelation is performed only on residuals.

- **Examining Lagrange Multipliers**

It was used to look for signs of heteroscedasticity in the study's data.

- **ARMA**

The ordinary least squares method was used to determine ARMA for each stock. The model with the best fit was chosen based on the Schwarz Information Criterion (SIC).

- **EGARCH**

Dummy1 and Dummy2 make up the mean equation, which is the subject of the. The procedure of returning an item on its expiration date is described by the dummy1 variable. On the day after the expiration date, returns are inverted, as described by the Dummy2 variable.

Discuss the variance equation that dummy1 used to explain the price volatility of banking shares on the maturity day.

The dummy2 of the variance equation described the price reversal in nifty bank stocks on the Monday after expiration day (i.e., Friday).

The following graphs illustrate that nifty banking stocks have experienced both stable and volatile periods, indicating that the return procedure's variance is not constant.

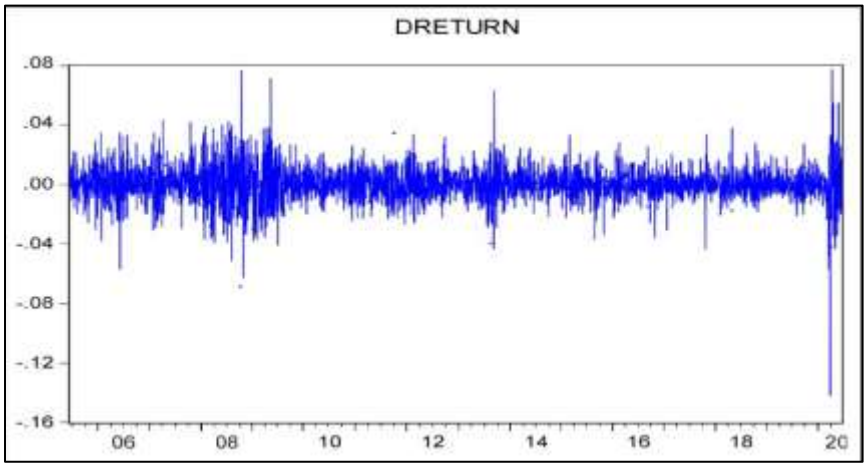


Figure 5.25: Axis Bank Return Series

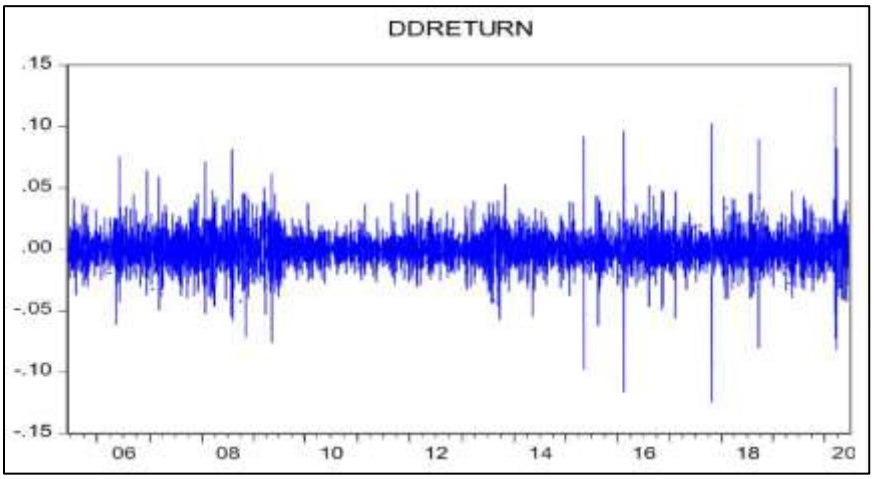


Figure 5.26: Bank of Baroda Return Series

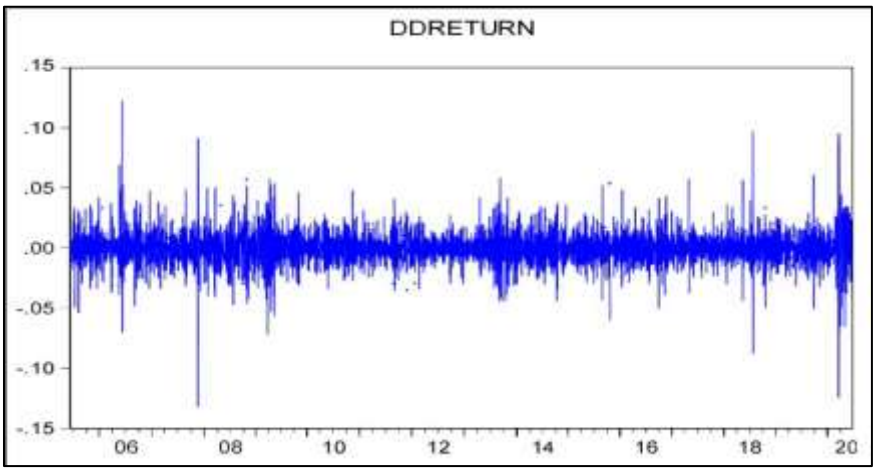


Figure 5.27: Federal Bank Return Series

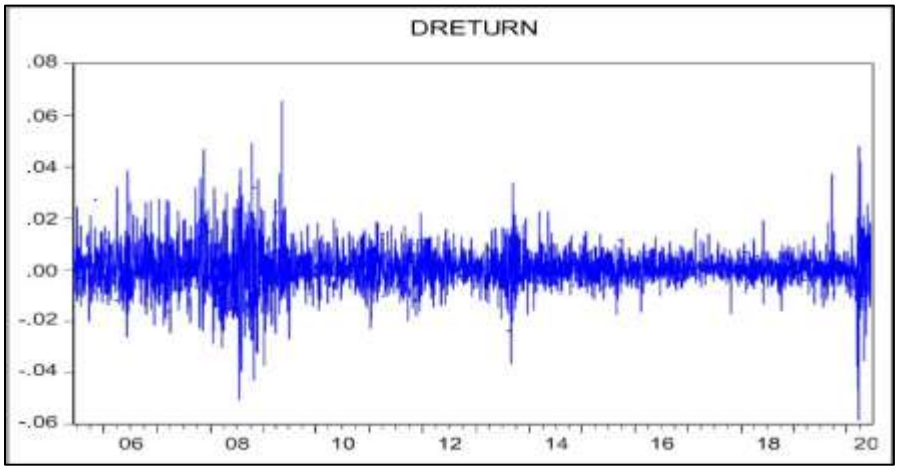


Figure 5.28: HDFC Bank Return Series

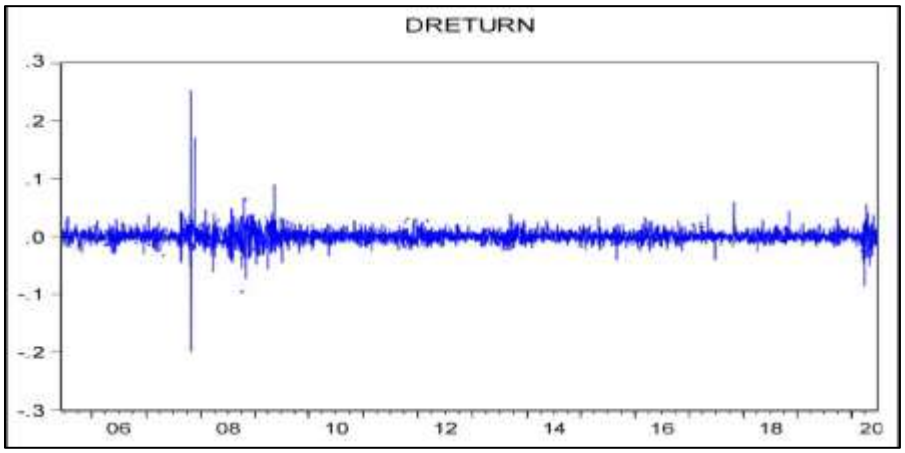


Figure 5.29: ICICI Bank Return Series

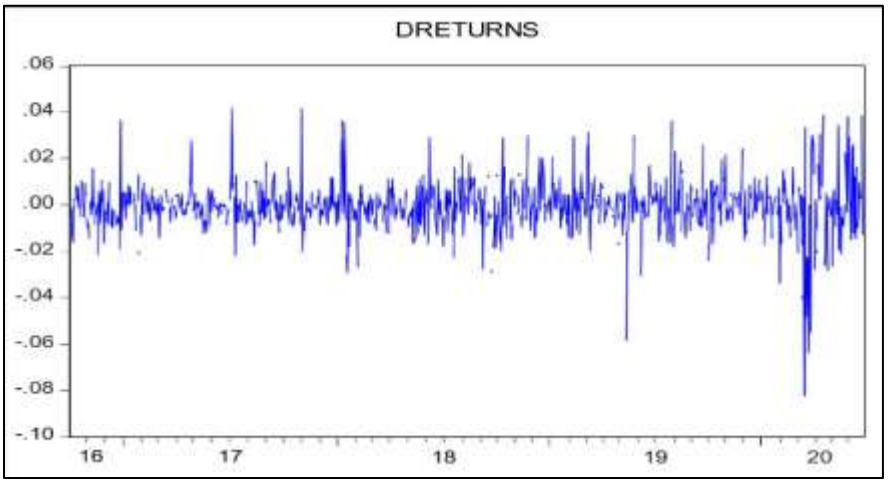


Figure 5.30: IDFC FIRST Bank Return Series

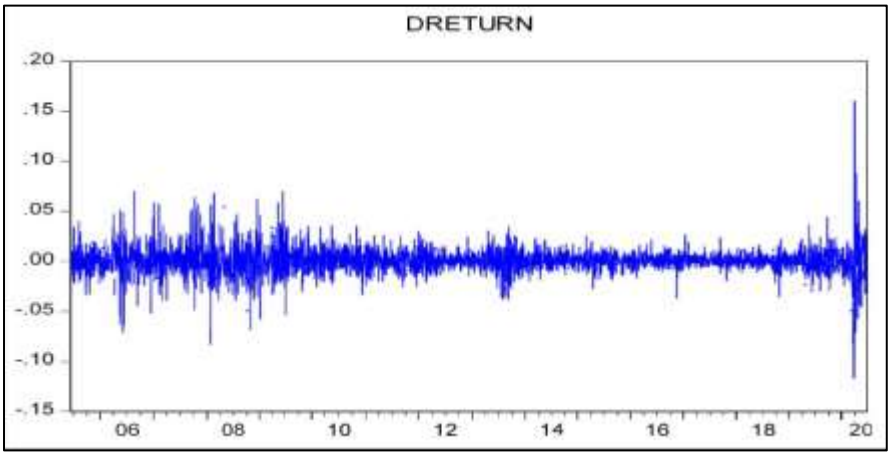


Figure 5.31: IndusInd Bank Return Series

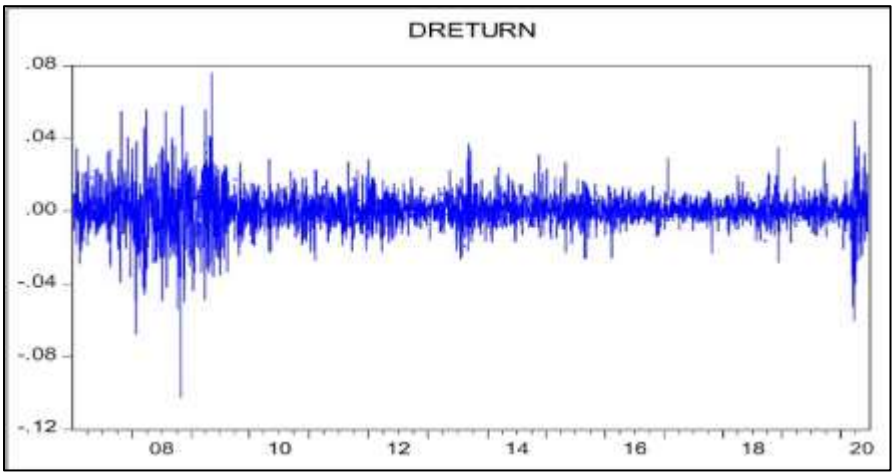


Figure 5.32: Kotak Bank Return Series

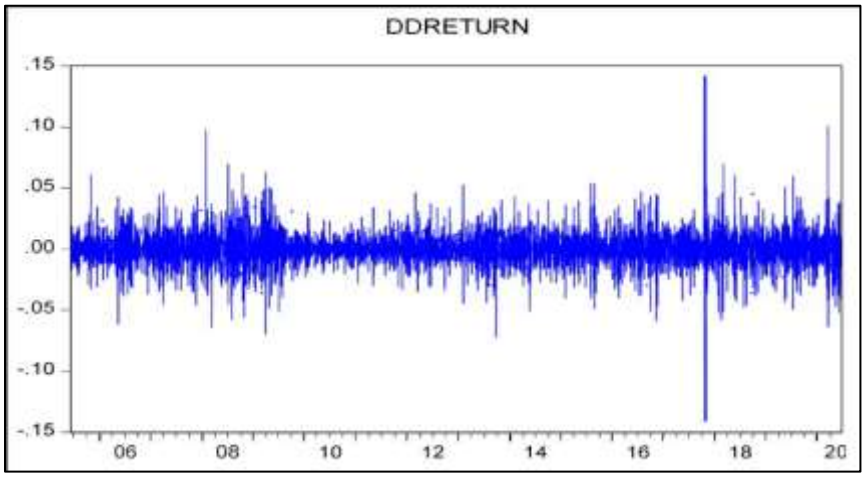


Figure 5.33: Punjab National Bank Return Series

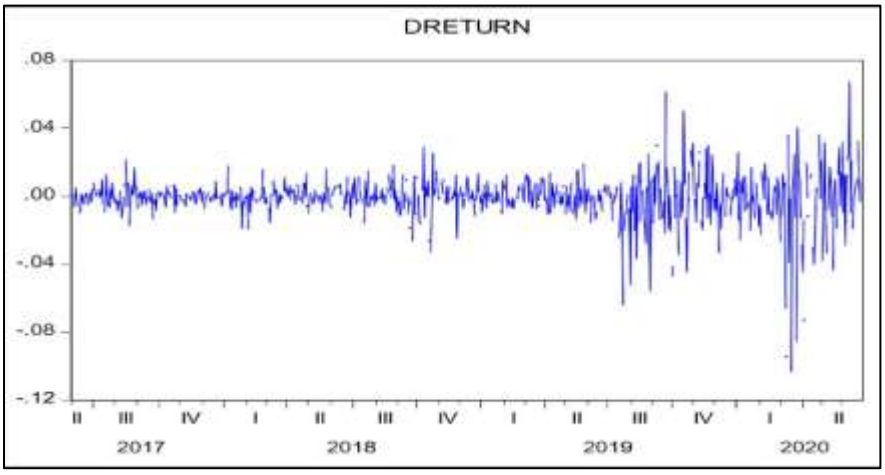


Figure 5.34: Ratnakar Bank Return Series

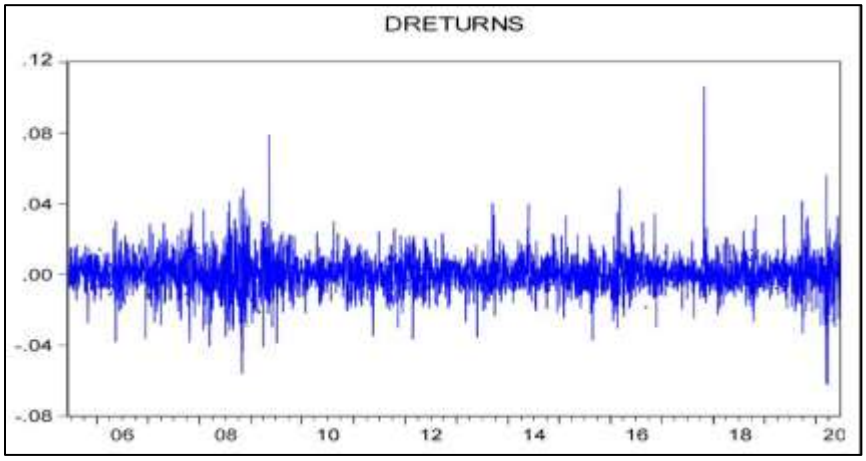


Figure 5.35: Indian State Bank Return Series

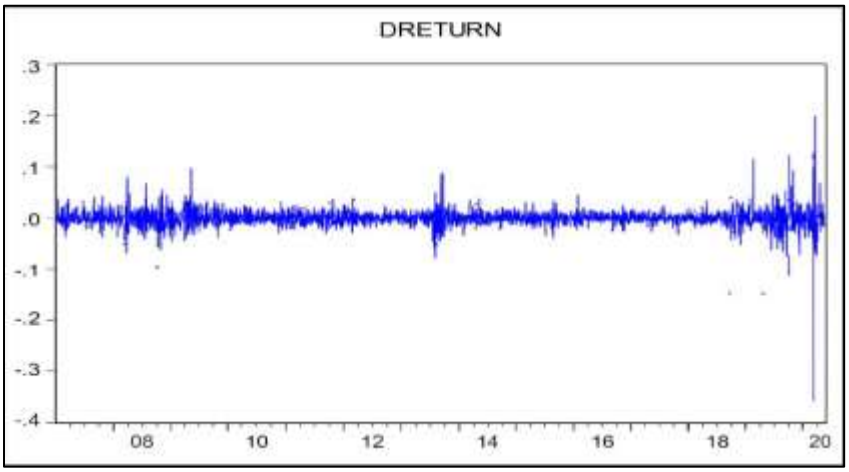


Figure 5.36: Yes Bank Return Series

It may be concluded that the variances of the return process are not continuous since there have been distinct phases of less volatility followed by stages of low volatility and also times of significant fluctuations followed by stages of high volatility. The data for further analysis was prepared by first differencing nine stocks and then using the second differencing tool for the remaining three equities.

5.3.1 HYPOTHESIS

H0: The Nifty Bank Stocks Return Series Does Not Have a Unit Root.

H1: The Nifty Bank Stocks Return Series Contains a Unit Root.

Table 5.4: Results Of the Augmented Dickey Fuller Test with A Significance Level Of 5% On the Return Series of Nifty Bank Stocks

Stocks	t-statistic	First Difference	Second Difference
Federal Bank	-24.96670	---	-2.862123
HDFC Bank	-44.90509	-2.862119	--
ICICI Bank	-63.47730	-2.862119	--
IDFC FIRST Bank	-28.44861	-2.864472	--
IndusInd Bank	-57.28153	-2.862119	--
Kotak Bank	-54.40882	-2.862209	--
PNB	-23.06576	---	-2.862125
Ratnakar Bank	-25.07934	-2.865148	--
SBIN	-57.32481	-2.862121	--
Yes Bank	-26.44665	-2.862217	--
Axis Bank	-58.75968	-2.862120	--
Bank of Baroda	-26.72971	---	-2.862122

This test uses the Augmented Dickey Fuller to see if the differenced return series of Nifty Bank stocks is stationary. Since the ADF test result is less than the 5% confidence level, the unit root test displays that all stocks being looked at are stable. Therefore, the null hypothesis is not true, which means the return series is stable.

H0: The Nifty Bank Stocks return series does not show any signs of correlations.

H1: There is inconsistency in the return series for Nifty Bank Stocks.

Table 5.5: The Role of Serial and Partial Autocorrelation in Axis Bank

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	0.100	0.100	37.040	0.000
2	0.158	0.149	129.76	0.000
3	0.065	0.038	145.32	0.000
4	0.074	0.043	165.51	0.000
5	0.114	0.093	214.12	0.000
6	0.099	0.067	250.36	0.000
7	0.177	0.138	366.95	0.000
8	0.107	0.057	409.27	0.000
9	0.243	0.190	628.73	0.000
10	0.088	0.025	657.61	0.000
11	0.097	0.017	692.82	0.000
12	0.055	-0.006	704.27	0.000
13	0.062	0.001	718.49	0.000
14	0.086	0.011	745.84	0.000
15	0.145	0.085	824.50	0.000
16	0.099	0.003	860.82	0.000
17	0.087	0.010	888.87	0.000
18	0.044	-0.047	896.02	0.000
19	0.043	-0.012	902.87	0.000
20	0.067	0.016	919.86	0.000

Table 5.6: Serial And Partial Autocorrelation of Bank Baroda

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	-0.490	-0.490	893.88	0.000
2	-0.002	-0.318	893.89	0.000
3	0.000	-0.228	893.89	0.000
4	-0.011	-0.191	894.35	0.000
5	0.003	-0.158	894.39	0.000
6	-0.024	-0.174	896.57	0.000
7	0.046	-0.108	904.32	0.000
8	-0.050	-0.146	913.84	0.000
9	0.035	-0.114	918.41	0.000
10	0.002	-0.086	918.43	0.000
11	-0.023	-0.104	920.36	0.000
12	0.028	-0.069	923.19	0.000
13	-0.025	-0.083	925.52	0.000
14	0.004	-0.091	925.58	0.000
15	0.007	-0.078	925.79	0.000
16	-0.000	-0.073	925.79	0.000
17	0.008	-0.052	926.02	0.000
18	0.005	-0.023	926.12	0.000
19	-0.024	-0.048	928.31	0.000
20	0.015	-0.033	929.17	0.000

Table 5.7: Federal Bank Serial and Partial Autocorrelation

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	-0.451	-0.451	756.40	0.000
2	-0.075	-0.349	777.28	0.000
3	0.029	-0.248	780.33	0.000
4	-0.019	-0.226	781.71	0.000
5	0.053	-0.122	792.26	0.000
6	-0.063	-0.163	807.26	0.000
7	0.036	-0.112	812.18	0.000
8	-0.014	-0.116	812.94	0.000
9	-0.013	-0.129	813.61	0.000
10	0.035	-0.087	818.23	0.000
11	-0.025	-0.094	820.63	0.000
12	0.033	-0.042	824.66	0.000
13	-0.033	-0.059	828.68	0.000
14	0.008	-0.049	828.92	0.000
15	0.007	-0.041	829.13	0.000
16	-0.033	-0.081	833.15	0.000
17	0.030	-0.066	836.59	0.000
18	-0.004	-0.059	836.64	0.000
19	0.015	-0.027	837.45	0.000
20	-0.010	-0.019	837.82	0.000

Table 5.8: HDFC Bank Serial and Partial Autocorrelation

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	0.050	0.050	9.4293	0.002
2	-0.064	-0.066	24.504	0.000
3	-0.050	-0.044	33.831	0.000
4	-0.026	-0.026	36.403	0.000
5	-0.024	-0.027	38.520	0.000
6	-0.028	-0.032	41.508	0.000
7	0.002	-0.001	41.516	0.000
8	0.031	0.025	45.189	0.000
9	-0.026	-0.034	47.783	0.000
10	0.021	0.026	49.404	0.000
11	0.021	0.017	51.123	0.000
12	0.007	0.006	51.332	0.000
13	0.013	0.017	52.001	0.000
14	-0.001	0.002	52.006	0.000
15	0.015	0.019	52.868	0.000
16	-0.011	-0.010	53.355	0.000
17	0.008	0.016	53.612	0.000
18	0.005	0.003	53.719	0.000
19	-0.041	-0.040	60.084	0.000
20	-0.025	-0.019	62.384	0.000

Table 5.9: ICICI Bank Serial and Partial Autocorrelation

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	-0.040	-0.040	5.8394	0.016
2	-0.038	-0.040	11.328	0.003
3	-0.005	-0.008	11.414	0.010
4	0.006	0.004	11.534	0.021
5	-0.006	-0.006	11.668	0.040
6	-0.094	-0.095	44.995	0.000
7	0.005	-0.004	45.073	0.000
8	0.026	0.019	47.646	0.000
9	0.025	0.026	49.964	0.000
10	0.012	0.017	50.505	0.000
11	-0.006	-0.004	50.641	0.000
12	0.022	0.015	52.528	0.000
13	0.006	0.007	52.642	0.000
14	-0.004	0.003	52.694	0.000
15	0.015	0.021	53.522	0.000
16	-0.007	-0.003	53.687	0.000
17	0.052	0.051	63.682	0.000
18	-0.075	-0.070	84.658	0.000
19	0.061	0.061	98.662	0.000
20	-0.036	-0.038	103.52	0.000

Table 5.10: Serial And Partial Autocorrelation of IDFC FIRST Bank

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	0.150	0.150	20.790	0.000
2	0.328	0.313	120.24	0.000
3	0.180	0.113	150.24	0.000
4	0.137	0.011	167.67	0.000
5	0.311	0.241	257.33	0.000
6	0.050	-0.059	259.69	0.000
7	0.224	0.070	306.45	0.000
8	0.079	0.004	312.20	0.000
9	0.113	0.003	324.12	0.000
10	0.077	-0.046	329.59	0.000
11	0.047	0.010	331.66	0.000
12	0.057	-0.040	334.71	0.000
13	0.029	0.005	335.50	0.000
14	0.028	-0.023	336.22	0.000
15	0.060	0.055	339.59	0.000
16	0.070	0.052	344.13	0.000
17	0.097	0.078	352.98	0.000
18	0.073	0.023	357.95	0.000
19	0.020	-0.039	358.34	0.000
20	0.032	-0.036	359.34	0.000

Table 5.11: Serial and Partial Autocorrelation of IndusInd Bank

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	0.064	0.064	15.050	0.000
2	-0.003	-0.007	15.092	0.001
3	-0.064	-0.064	30.350	0.000
4	0.008	0.016	30.599	0.000
5	0.001	-0.001	30.601	0.000
6	0.019	0.015	31.880	0.000
7	0.038	0.038	37.276	0.000
8	0.014	0.009	37.996	0.000
9	0.040	0.042	44.098	0.000
10	0.006	0.005	44.224	0.000
11	-0.000	-0.000	44.224	0.000
12	-0.029	-0.024	47.346	0.000
13	-0.012	-0.010	47.870	0.000
14	-0.004	-0.005	47.925	0.000
15	0.001	-0.004	47.927	0.000
16	0.041	0.038	54.268	0.000
17	0.012	0.006	54.816	0.000
18	-0.010	-0.012	55.182	0.000
19	0.033	0.042	59.261	0.000
20	-0.013	-0.017	59.886	0.000

Table 5.12: Kotak Bank Serial and Partial Autocorrelation

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	0.059	0.059	11.586	0.001
2	-0.004	-0.008	11.651	0.003
3	0.009	0.010	11.915	0.008
4	-0.024	-0.026	13.909	0.008
5	-0.039	-0.036	18.899	0.002
6	-0.049	-0.045	26.830	0.000
7	-0.015	-0.010	27.624	0.000
8	0.012	0.013	28.068	0.000
9	0.031	0.029	31.273	0.000
10	-0.036	-0.042	35.496	0.000
11	-0.010	-0.009	35.809	0.000
12	0.029	0.027	38.624	0.000
13	0.007	0.005	38.773	0.000
14	0.015	0.016	39.512	0.000
15	0.051	0.049	48.177	0.000
16	0.058	0.050	59.312	0.000
17	0.041	0.035	64.916	0.000
18	-0.009	-0.010	65.201	0.000
19	-0.039	-0.032	70.251	0.000
20	-0.028	-0.020	72.932	0.000

Table 5.13: Punjab National Bank Serial and Partial Autocorrelation

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	-0.478	-0.478	849.71	0.000
2	-0.023	-0.326	851.63	0.000
3	0.012	-0.229	852.20	0.000
4	-0.022	-0.203	853.93	0.000
5	0.020	-0.152	855.41	0.000
6	-0.036	-0.175	860.13	0.000
7	0.040	-0.121	866.23	0.000
8	-0.020	-0.119	867.65	0.000
9	0.011	-0.093	868.14	0.000
10	-0.013	-0.099	868.78	0.000
11	0.014	-0.075	869.46	0.000
12	-0.004	-0.068	869.53	0.000
13	-0.007	-0.070	869.73	0.000
14	0.012	-0.053	870.27	0.000
15	-0.028	-0.087	873.10	0.000
16	0.020	-0.078	874.66	0.000
17	0.018	-0.039	875.84	0.000
18	-0.007	-0.020	876.01	0.000
19	-0.029	-0.056	879.06	0.000
20	0.032	-0.022	882.95	0.000

Table 5.14: Serial And Partial Autocorrelation of Ratnakar Bank

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	0.090	0.090	6.2092	0.013
2	-0.013	-0.021	6.3344	0.042
3	-0.088	-0.085	12.198	0.007
4	0.025	0.041	12.674	0.013
5	0.081	0.074	17.711	0.003
6	0.005	-0.017	17.731	0.007
7	0.003	0.011	17.740	0.013
8	0.040	0.052	18.939	0.015
9	0.176	0.166	42.734	0.000
10	0.068	0.035	46.260	0.000
11	0.017	0.020	46.488	0.000
12	-0.055	-0.031	48.825	0.000
13	0.065	0.072	52.118	0.000
14	-0.006	-0.044	52.142	0.000
15	-0.008	-0.021	52.192	0.000
16	-0.042	-0.036	53.543	0.000
17	0.116	0.116	63.990	0.000
18	0.037	-0.030	65.035	0.000
19	-0.015	-0.038	65.213	0.000
20	-0.092	-0.078	71.853	0.000

Table 5.15: State Bank of India Serial and Partial Autocorrelation

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	0.061	0.061	13.642	0.000
2	-0.008	-0.012	13.894	0.001
3	-0.012	-0.011	14.409	0.002
4	-0.021	-0.020	16.110	0.003
5	-0.008	-0.006	16.345	0.006
6	-0.046	-0.046	24.384	0.000
7	0.028	0.033	27.279	0.000
8	0.036	0.031	32.053	0.000
9	0.027	0.023	34.774	0.000
10	0.019	0.015	36.081	0.000
11	-0.007	-0.007	36.257	0.000
12	0.037	0.039	41.435	0.000
13	-0.038	-0.038	46.701	0.000
14	0.008	0.016	46.919	0.000
15	-0.002	-0.003	46.934	0.000
16	0.015	0.016	47.827	0.000
17	0.046	0.040	55.764	0.000
18	-0.013	-0.016	56.437	0.000
19	0.014	0.012	57.193	0.000
20	-0.007	-0.007	57.396	0.000

Table 5.16: Yes Bank Serial and Partial Autocorrelation

LAG Number	Serial Correlation	Partial Auto-Correlation Function	Q-Statistic	P-Value
1	0.222	0.222	162.55	0.000
2	0.132	0.087	219.94	0.000
3	0.075	0.031	238.68	0.000
4	0.079	0.049	259.15	0.000
5	0.199	0.174	390.54	0.000
6	0.265	0.198	623.58	0.000
7	0.039	-0.090	628.61	0.000
8	0.027	-0.025	631.03	0.000
9	0.047	0.029	638.34	0.000
10	0.046	-0.006	645.24	0.000
11	0.031	-0.064	648.45	0.000
12	0.039	-0.006	653.40	0.000
13	0.021	0.039	654.81	0.000
14	0.009	-0.009	655.08	0.000
15	0.012	-0.015	655.59	0.000
16	0.015	0.017	656.37	0.000
17	0.008	0.015	656.59	0.000
18	0.010	-0.008	656.95	0.000
19	0.003	-0.012	656.99	0.000
20	0.011	0.018	657.36	0.000

The current study analysed serial correlation coefficients and partial autocorrelation coefficients up to 20 lags in order to determine the auto regressive order (m) and moving average order (n) for a suitable ARMA (m, n) model to the Nifty Banking Stocks Return Series. Any ACF that falls outside +/-1.99/√T is considered sizable, where T is the total number of bank stock samples. Axis Bank, Bank of Baroda, Federal Bank, HDFC Bank, ICICI Bank, IndusInd, IDFC First Bank, Kotak Bank, Punjab National Bank, Ratnakar Bank, State Bank of India, and Yes Bank are all outside the asymptotic band for both ACF and PACF at lags 1 and 2, respectively.

The large Q statistic values indicate autocorrelation for all stocks. All stocks' Q-statistic rejects null hypothesis at 5% significance level for all lags. These results suggest modelling Nifty Bank Stocks using ARMA.

Ho: The Nifty Bank Stocks don't have any arch affect.

H1: In the Nifty Bank Stocks, there is an arch impact.

Table 5.17: ARCH Test on Selected Nifty Bank Stocks

Stock	F-Statistic	Observed R-Squared	Probable Chi-square Value
Axis Bank	37.35393	37.00217	0.0000
Bank Baroda	861.6790	1178.796	0.0000
Federal Bank	798.0193	1117.849	0.0000
HDFC Bank	12.95906	25.75964	0.0000
ICICI Bank	5.905532	11.78319	0.0028
IDFC First Bank	21.13300	20.70199	0.0000
IndusInd Bank	7.649024	15.24771	0.0005
Kotak Bank	5.910622	11.79006	0.0028
Punjab National Bank	835.3527	1153.076	0.0000
Ratnakar Bank	26.42386	25.59691	0.0000
State Bank of India	85.44976	83.57099	0.0000
Yes Bank	9.488700	18.88621	0.0001

Based on the results shown in Table 5.17, it can be concluded that the null hypothesis is rejected at the 5% level in the LM test for ARCH effects on all Nifty Bank stocks. Therefore, it is demonstrated that the arch effect is real in the equities used in the analysis.

H0: Nifty Bank Stocks do not follow a typical distribution.

H1: Nifty Bank Stocks follow a typical distribution.

Table 5.18: Brief Characteristics Study of Selected Shares

Stocks	Mean	Median	Minimum	Maximum	Std. Dev	Skewness	Kurtosis	Jarque- Bera Value	P-Value
Axis Bank	0.000260	4.71e-025	-0.142130	0.077298	0.011629	-0.362711	12.51533	14115.490	0.000000
Bank Baroda	-1.35e-06	-9.98e-05	-0.124405	0.132320	0.016247	0.095862	8.666447	4987.892	0.000000
Federal Bank	8.97e-08	-3.58e-05	0.122504	-0.132455	0.014988	0.012626	10.16195	7959.152	0.000000
HDFC Bank	0.000338	0.000159	-0.058523	0.065581	0.008167	0.205041	8.884598	5400.732	0.000000
ICICI Bank	0.000246	0.000000	-0.197715	0.252847	0.012981	1.560428	66.92705	635796.500	0.000000
IDFC FIRST Bank	-0.000509	-0.000520	-0.282323	0.041637	0.011123	-0.492147	10.12404	1982.632	0.000000
IndusInd Bank	0.000231	5.42e-05	-0.117632	0.160388	0.013239	0.116068	16.70230	29149.190	0.000000
Kotak Bank	0.000338	0.000393	-0.102605	0.076052	0.010800	-0.273366	10.12132	7089.149	0.000000
PNB	-2.55e-06	-0.000185	-0.140808	0.141714	0.015744	0.097022	8.469554	4636.580	0.000000
RBL Bank	-0.000608	0.000000	-0.103343	0.067542	0.014094	-1.555655	14.46173	4449.002	0.000000
SBIN	0.000116	0.000171	-0.062793	0.106147	0.010308	0.344606	9.379844	6370.491	0.000000
Yes Bank	5.99e-06	0.000000	-0.357675	0.198894	0.017251	-2.058634	75.18828	720824.200	0.000000

Statistical descriptions the stock market's mean values are too low and its standard deviation is too high relative to the market's mean, as seen in Table 5.18. If the skewness statistic for the set of chosen stocks isn't zero, it means that the distribution of returns isn't perfectly symmetrical. The stock market is positively skewed by seven stocks, adversely skewed by the other five. And when compared to a normal distribution, the strong peak around the average return in all the stocks' excess kurtosis indicates that the underlying data is leptokurtic. The assumption of normality is rejected by the calculated p-value of the histogram when testing the null hypothesis.

Table 5.19: Moving Average Autoregression OLS for Return Series

Stocks	ARMA
Axis Bank	(0, 1)
Bank Baroda	(0, 1)
Federal Bank	(1, 1)
HDFC Bank	(2, 1)
ICICI Bank	(3, 3)
IDFC First Bank	(0, 2)
IndusInd Bank	(3, 1)
Kotak Bank	(0, 1)
Punjab National Bank	(0, 1)
Ratnakar Bank	(0,1)
State Bank of India	(0,1)
Yes Bank	(2, 2)

In the current setting, the number of auto regressive and moving average terms utilised in fitting the ARMA (m, n) process to Nifty Bank Stocks is determined using the Schwartz Bayesian Criterion (SBC). From lag1 to lag5, the SBC values are calculated, and the model with the lowest SBC is selected. The table's Auto Regressive Moving Averages of Nifty Bank Stocks provide the best match because they record the lowest SBC values.

H0: The returns of Nifty Bank Stocks are unaffected by the expiration day.

H1: The prices of Nifty Bank Stocks tend to rise or fall on the day of expiration.

Table 5.20: Nifty Bank Stock Return Series Expiration-Day Effect

Stocks	Dummy1 Coefficient	P-Value	Dummy2 Coefficient	P-Value
Axis Bank	-0.0005280	0.4132	0.001927	0.0006
Bank Baroda	0.0010120	0.2027	0.000555	0.4739
Federal Bank	0.0013880	0.0470	0.001207	0.1145
HDFC Bank	0.0033350	0.0000	0.002379	0.0001
ICICI Bank	0.0000365	0.9487	0.000978	0.0735
IDFC First Bank	-0.0007930	0.6110	0.005220	0.0001
IndusInd Bank	0.0011930	0.0493	0.001225	0.0434
Kotak Bank	0.0011430	0.0443	0.001243	0.0149
PNB	-0.0009780	0.1707	0.001538	0.0277
Ratnakar Bank	0.0015630	0.0567	0.002159	0.0470
State Bank of India	-0.0018430	0.0204	0.000726	0.4071
Yes Bank	0.0013590	0.0944	0.003450	0.0000

The ARMA process controls the average return whereas the typical EGARCH (1, 1) process displays the volatility of the returns. It was found that the coefficient of dummy1 is negative and statistically significant for State Bank of India, indicating that the bank experiences downward pressure on expiration days, while the coefficient of dummy1 is positive and statistically significant for Federal Bank, HDFC Bank, IndusInd, Kotak Bank, and Axis Bank, IDFC FIRST Bank, PNB, and Bank of Baroda, ICICI, RBL, and Yes Bank, indicating that these institutions experience more upward pressure on expiration.

5.4 MATURITY IMPACT ON NIFTY BANK STOCK PRICE VOLATILITY

The derivative contract expiration date affects cash market volatility. Arbitrageur and speculator techniques activate this operation, which is documented by the settlement mechanism in a market. Due to their position not being equal to volume traded, arbitrators' ability to hedge decreases when volatility rises and cannot be calculated in advance. Prices may change if many arbitrageurs liquidate simultaneously. A naked speculator in a contract expiring could have a significant financial interest in the settlement price and be willing to put small cash markets at imbalance prices to influence the index. During derivative contract exchange settlement, volumes and volatility rise dramatically around expiry.

Table 5.21: The Impact of Expiration Dates on Price Fluctuation

Stocks	C6	P-Value	C7	P-Value	C8	P-Value	C9	P-Value
Axis Bank	0.179427	0.0000	-0.058859	0.0000	0.974264	0.0000	-0.135304	0.1865
Bank Baroda	0.261435	0.0000	-0.034593	0.0000	0.910722	0.0000	0.169318	0.0274
Federal Bank	0.226367	0.0000	-0.028979	0.0000	0.908159	0.0000	-0.068946	0.4299
HDFC Bank	0.881880	0.0000	0.717989	0.0000	0.032513	0.1130	-0.579003	0.0000
ICICI Bank	0.219083	0.0000	-0.084397	0.0000	0.981898	0.0000	-0.214717	0.0243
IDFCFIRST Bank	0.359284	0.0000	-0.066571	0.0003	0.914251	0.0000	0.722588	0.0000
INDUSIND Bank	0.185561	0.0000	-0.049766	0.0000	0.989270	0.0000	0.067068	0.4600
Kotak Bank	0.136808	0.0000	-0.038105	0.0000	0.990180	0.0000	0.150095	0.0755
Punjab National Bank	0.168307	0.0000	-0.019753	0.0023	0.963601	0.0000	-0.012821	0.8381
Ratnakar Bank	0.171949	0.0000	-0.085561	0.0000	0.985215	0.0000	-0.695134	0.0021
State Bank ofIndia	0.389631	0.0000	-0.520293	0.0000	0.035229	0.2757	-1.118342	0.0000
Yes Bank	0.255152	0.0000	-0.098427	0.0000	0.971130	0.0000	0.024204	0.7961

Table 5.21 presents the findings of expiration-day effects using the ARMA-EGARCH framework. This suggests that variance increases more in response to negative shocks than it does to positive shocks for SBI and HDFC Banks, but decreases in response to positive shocks in their case. The results indicate that the stocks of Bank of Baroda, HDFC Bank, ICICI Bank, IDFC FIRST Bank, Ratnakar Bank, and State Bank of India have lower volatility on expiration days compared to non-expiration days. Conversely, the coefficient of dummy1 for the stocks of Axis Bank, Federal Bank, IndusInd Bank, Kotak Bank, Punjab National Bank, and Yes Bank has been found to be above the critical 5% significance level, indicating higher volatility on expiration days compared to non-expiration days.

5.5 NIFTY BANK STOCKS PRICE REVERSAL AFTER EXPIRATION

H0: Prices do not reverse after expiration in Nifty Bank Stocks.

H1: Price reversal occurs after expiration in Nifty Bank Stocks.

Table 5.22: Effect on Nifty Bank Stock Price Reversal After Expiration

Stocks	Dummy1	P-value	Dummy2	P-value
Axis Bank	-0.135304	0.1865	-0.045789	0.6528
Bank Baroda	0.169318	0.0274	-0.043582	0.5357
Federal Bank	-0.068946	0.4299	-0.104724	0.2158
HDFC Bank	-0.579003	0.0000	-0.487159	0.0000
ICICI Bank	-0.214717	0.0243	0.149549	0.1113
IDFCFIRST Bank	0.722588	0.0000	0.056655	0.7505
INDUSIND Bank	0.067068	0.4600	-0.032261	0.7250
Kotak Bank	0.150095	0.0755	-0.203663	0.0190
PNB	-0.012821	0.8381	0.146715	0.0489
Ratnakar Bank	-0.695134	0.0021	0.353831	0.1074
State Bank of India	-1.118342	0.0000	-0.815137	0.0000
Yes Bank	0.024204	0.7961	-0.074053	0.3996

From Table 5.22, we can see that Dummy2 has a significant coefficient with the opposite sign to that of Dummy1 only for Kotak Bank and Punjab National Bank. This means that the short-term differences in stock volatility during expiration days will return to their previous level after expiration days. For the other stocks, Dummy2 has either the same or the opposite sign to that of Dummy1 but is not significant. This means that the volatility of the stocks will be the same on both expiration and non-expiration days.

CHAPTER - 6

CONCLUSION

Volatility is a risk factor that should be taken seriously by everyone who deals with money or invests in the stock market or other financial instruments. As a result, the importance of addressing volatility as a topic for the finance industry, market participants, retail investors, regulators, and academics has grown in recent years.

Despite the critical nature of the problem of stock market volatility, there have been few attempts to investigate it experimentally and thoroughly in India. There is an abundance of literature on this topic for both established markets like the United States, Australia, the United Kingdom, and other European markets, and developing markets like Southeast Asia and Latin America. There have been few attempts to quantify and analyse the nature of stock market volatility in India. This research tries to fill that void by conducting an empirical examination of India's stock market's volatility.

Since Nifty Bank is one of the most liquid and highly volatile indices in the financial services sector, this research focused on how expiry days affect the price movements of Nifty Bank stocks on the National Stock Exchange. The Equity derivatives acquired importance among all the financial instruments. Derivatives are a type of risk management tool that can be used to reduce exposure across a wide range of parties. India's derivatives industry has experienced spectacular growth during the past two decades. There are many types of investors who utilise derivatives as a hedge. Subsequent to creation of derivatives market, within a span of three years the turnover futures & options topped the whole volume of the underlying market. The Indian equity derivatives market as a whole was quite promising and fruitful. There was expansion in the derivatives market, but the initiatives taken to further the industry were more reactive than proactive. As a result, it's crucial to take concrete measures to inform investors everywhere from nuclear power plants to rural towns. The expansion of financial derivatives worldwide and in India can be attributed to a number of interrelated causes, including stronger risk management, greater

participation from individual and institutional investors, and an improved regulatory and supervisory framework.

The stationarity of the data is checked in order to do empirical analysis on the volumes of nifty Bank stocks. At the first level of differentiation, the data is static. All of the equities in the study had their ARMAs computed using the ordinary least squares approach. Higher turnover is indicated on expiration days compared to other days. The considerable increase in turnover on expiry days provides empirical support for the theoretical notion that the expiration-day effect is mostly attributable to the unwinding of hedging agreements by arbitrageurs on the expiration day in order to earn risk-free profit.

Stock prices are used in empirical research on effects such as return, volatility, and price reversal. Using first differencing technique data for nine stocks was made detrended and three stocks by means of second differencing technique. Normality, Serial Correlation, and Heteroscedasticity checks were performed to clean the data for further examination. In general, Nifty Bank stock performance is more inconsistent on expiration day than on other days. Based on historical data, it seems that on expiration days, SBIN faced downside risk, while Kotak Bank, HDFC Bank, IndusInd Bank, and Federal Bank experienced upward pressure, and Punjab National Bank, IDFC FIRST Bank, Axis Bank, Yes Bank, Ratnakar Bank, Bank of Baroda, and ICICI Bank were neutral.

The major purpose was to the investigate effect on price volatility during expiration days in banking stocks. The study noticed mixed impact on the volatility of Nifty Bank Stocks on expiration days. Several Indian financial institutions found that volatility was lower on expiration days compared to other days because the expiration coefficient is statistically significant. On the other hand, Axis Bank, Federal Bank, IndusInd Bank, Kotak Bank, Punjab National Bank, and Yes Bank discovered that volatility on maturity days was the same as volatility on other days. In addition to increased asymmetry of information, price volatility is possible if arbitrageurs close all of their positions in one direction.

The findings suggested that during the duration of derivative contracts, participants constructed arbitrage portfolios consisting of long and short stock positions. Therefore, equilibrium was maintained in some stocks with no pressure on returns as a result of winding up of cash holdings by arbitrageurs, which cancelled out all trades on both sides. As a result of the considerable rise in stock price, selling pressure has remained high, resulting in heavy volumes for specific shares.

6.1 EXTENT AND CHARACTERISTICS OF STOCK INDEX VOLATILITY

The following is a synopsis of the findings from the studies conducted on the market indices BSE Sensex and S&P CNX nifty.

6.1.1 ANNUAL CHANGES IN MONTHLY RETURNS

It was discovered that the years 1997 (in the case of BSE 28.10% and in the case of NSE 27.51%), 2000 (in the case of BSE 27.62% and in the case of NSE 27.35%), and 2008 (in the case of BSE 41.47% and in the case of NSE 43.13%) saw the highest levels of market volatility.

- In 2008, stock prices fluctuated wildly due to factors such as (a) investor dissatisfaction after Reliance Power stock debuted at a price lower than its issue price, (b) the Chinese government's announcement of a $586-billion infrastructure and public welfare spending package on Sunday to support the economy, and (c) the Bear Stearns crisis, which caused a precipitous decline in the US market and was subsequently reflected in Asian markets.
- 2009 was also a year with more instability. The main reasons were (a) Mr. B. Ramalinga Raju, Chairman of Satyam Computer Services, admitted that the company's balance sheet was way too high; (b) News of a US plan to help banks and other financial institutions get rid of their bad assets; and (c) The stock market was happy about the victory of the alliances led by Congress.

- The main things that caused stock prices to go up and down in 1997 were (a) The president of Congress announced that his party would no longer back the government that was in power, the United Front Government. President asks PM to show majority before April 7th; (b) Stock markets crash around the world.
- During the time period that was looked at, the Sensex moved 7.35 percent each month and the Nifty moved 7.40 percent each month. The annualised numbers for these are 25.43 percent and 25.60 percent, respectively. Sensex has been volatile every month between 4% and 12%, and Nifty has been volatile every month between 5% and 13%. Year-over-year, the Sensex has been volatile between 17% and 42% and the Nifty has been volatile between 16% and 44%.

6.1.2 ANNUAL CHANGES IN DAILY RETURNS

- It was found that 2008 had the most variation (44.7% for BSE and 44.05% for NSE), followed by 2009 (34.19% for BSE and 33.40% for NSE). A study that looked at volatility by year found that it was lower from 1996 to 1999, but it went up in 2000 (33.20% for BSE and 31.65% for NSE). Again, it was less busy from 2001 to 2007, but for the next two years, 2008 and 2009, it hit a record high for each year.
- During the whole time period that was looked at, both the Sensex and the Nifty had daily fluctuation of 1.64%. The equivalent numbers when viewed over a year are 25.91% each. The daily changes for both the Sensex and the Nifty have been between 1% and 3%. It has been between 16% and 45% per year for both the Sensex and the Nifty.

6.1.3 DAILY RETURN VOLATILITY ON A MONTHLY BASIS

- The level of volatility has changed from month to month and from year to year. The most unpredictable year was 2008. It was found that most of the months in 2008 were more unpredictable than the same months in other years.

- This is also true for the Sensex. The riskiest month was May (1.78%), followed by March (1.74%) and April (1.71%). This might have been because the Union budget is generally shared at the very end of February.
- October (1.81%) has been the most volatile month for Nifty. May (1.77%) and April (1.74%) have been the next most volatile months. It's possible that this is because of Diwali.

6.1.4 THE 25 MONTHS WITH THE MOST CHANGES

- It was found that October 2008 was the most unpredictable month for the Sensex. May 2009 came in second. October 2008 was the most volatile month for Nifty. May 2004 was the next most volatile month. In an interesting twist, the most unpredictable months for both the Sensex and the Nifty were in 2008 and 2009, when they were at their highest levels.
- For the Sensex, 9 of the 25 most risky months during the time period under study were in 2008. For the Nifty, 7 of those months were in 2008. It shows that 2008 was the most unstable year.
- For both the Sensex and the Nifty, the 15 most volatile months were in 2008, 2009, 2000, and 1997. The next two most volatile months were in 1998 and 2006, and the third most volatile months were in 1999, 2004 and 2007. For Sensex, however, three of the most volatile months were in 2001. For Nifty, two of the most volatile months were in 2001, and one was in 1996.

6.1.5 SPIKE VOLATILITY

- "Spikes" are daily gains of more than ±4.92%. For both indices, the year 2008 (BSE 27 and NSE 25) has the most spikes, whether they are positive or negative. The year 2000 (BSE 10 and NSE 7) comes in second. One could say that the years with more frequent spikes also had more total volatility.
- As for the Sensex, there were 70 days out of the 3965 trade days that were chosen for the study when the daily return was more than or less than 4.92%.

- In the same way, the spikes happened on 64 of the 3992 trade days that were chosen for the study period for Nifty.
- As the stock market celebrated the win of the Congress-led alliance on May 18, 2009, prices went up the most in a single day, by 15.99% for the Sensex and 16.33% for the Nifty. This was very different from what happened on May 17, 2004, after the general elections that put the same UPA run by Congress in power.
- On May 17, 2004, the values of the Sensex (-11.8%) and Nifty (-13.05%) went down the most. In the Parliamentary elections, the NDA government lost badly, which was a surprise.

6.2 ISSUES THAT IMPACT THE VOLATILITY OF THE STOCK MARKET

6.2.1 FII'S EFFECTS ON THE STOCK MARKET

- The ADF number for FII has been found to be -4.408207. The ADF value for FII is less than the critical values, which means that the hypothesis is not true at the 1%, 5%, or 10% level of significance. It shows that the time series of net FII investments stays the same over time.
- This means that the ADF figure for the BSE Sensex return is -4.588579 and for the NSE Nifty return it is -5.136850. The ADF values for the BSE Sensex and NSE Nifty stock market returns are both less than the critical values. This means that the theory is not true at the 1%, 5%, or 10% level of significance. This shows that the time series data of how volatile the BSE Sensex and NSE Nifty stock markets are stays the same.
- The Granger Causality test results show that FII and stock market volatility (BSE Sensex and NSE Nifty) are not linked. This means that FII asset flows and the volatility of returns on the Indian stock market have nothing to do with each other.
- It has been concluded that FII equity flows have not made the Indian stock market returns more volatile or less volatile. There are a few possible reasons why the bond is so unimportant.

- FIIs are only allowed to trade based on delivery and cannot engage in short selling, which could be one of the reasons. This makes dealing much more difficult.
- FIIs had to sign up with an Indian broker in order to do business (Mazumdar, 2004). When they traded, they had to pay more in brokerage fees than big investors from their own country. This meant that their activities cost more than those of institutions in their own country.
- FIIs have a lot of experience and can correctly predict how emerging markets will do in the future. This means they can be proactive about whether to invest or pull their money out (Dhillon and Kaur, 2007).
- Even though foreign institutional investments are allowed to make up a big part of India's stock market, there isn't a strong statistical link between FII equity flows and the volatility of India's stock market results.

6.2.2 HOW THE UNION BUDGET WILL AFFECT THE STOCK MARKET

- Budget day returns (ignoring the sign) are usually higher than the returns from the last 30, 15, and 3 trade days.
- Compare the budget day returns (Z) to the long-term pre-budget return for the Sensex. Budget day returns are higher in all 19 budget years compared to the medium-term (19 budget years) and short-term (13 budget years).
- It is shown that for Nifty, budget day returns are higher than (18 out of 19 budgets) when compared to long-term pre-budget returns. It is also shown that budget day returns are higher than (18 out of 19 budgets) when compared to medium-term pre-budget returns and higher than (14 out of 19 budgets) when compared to short-term pre-budget returns.
- Paired t test has been used to look at it scientifically even more. It is known that budgets always catch the markets off guard. The real values are higher than the table values in all of the tests, which means that the alternative hypothesis is correct.
- The budget had the most effect in the short term (alternative ideas were accepted in all three cases) in the second set of tests. In the middle term, two out of three times, the alternative hypothesis was accepted. In the long term, none of the alternative

hypotheses were accepted. In five of the nine cases at the left tail, the actual numbers are higher than the tabular values (3+2+0).

- When looking at budgets as a whole, they have the biggest effect in the short term after the budget is made. They also have some effect in the middle term, but they don't have any effect at all on the average returns over the long term.
- F-test shows that for Sensex, the real value never went above the tabular value, except for 2002. But when it came to Nifty, there was never a time when the real value was higher than the table value. This means that instability doesn't usually get worse as time goes on after the budget.
- When you compare the changes in Sensex and Nifty returns over the short, medium, and long term after the budget with those in the long term before the budget. For Sensex, the longest-term period had the most important cases (9 out of 19 budgets), followed by the medium-term period (6 out of 19 budgets) and the short-term period (2 out of 19 budgets). But for Nifty, the most important cases (in 10 of the 19 budgets) happened in the long-term period, followed by the medium-term period (in 7 of the 19 budgets) and the short-term period (in 2 of the 19 budgets). The long-term period after the budget is more likely to be unstable than the medium-term and short-term periods. This is in contrast to the similar long-term period before the budget.
- There have been changes on Budget Day since 1996, but the biggest drop was in 2009, when the Sensex and Nifty fell over 6%. The decline was caused by a number of factors, including the lack of major policy changes, a rise in MAT, and rising deficits.
- Once more, in 2000, the Sensex fell more than 5% and the Nifty fell more than 4%. Investors were disappointed with the budget because it didn't live up to the "hype" that was built up before it was released. The market did not like the Budget's plans to raise taxes on companies' dividends and tax export earnings at a rate of 20% per year for the next five years. The Budget also did not address big problems in the economy, like the budget deficit, government spending, and public sector underinvestment.

- With a weak budget in 2002, the stock markets dropped 3%. Four percent of the stock market fell in 2007. Within the last few years, this was the biggest drop on a Budget Day. The drop was caused by the less-than-welcoming Union budget. It raised the profit distribution tax from 12.5% to 15%. Next, it raised the excise duty on cement prices and made the minimum alternate tax (MAT) apply to more businesses in the IT sector.
- Budget has helped the market move up quickly on some occasions. In 1997, 1999, 2001, and 2005, the Sensex and Nifty went up a lot because the finance minister did things like lower taxes that were well received.

6.2.3 STOCK MARKET EFFECTS OF INFLATION

- It has been discovered that the ADF statistic for inflation is -4.956150. At 1%, 5%, and 10% level of significance, it is implied that the hypothesis is rejected since the ADF value is less than critical values.
- The findings indicate that the ADF statistic is - 4.588579 for the BSE Sensex return volatility and -5.136850 for the NSE Nifty return volatility. Both the BSE Sensex and NSE Nifty's ADF values for stock market return volatility are lower than the critical values, inferring the rejection of the unit root hypothesis at the 1%, 5%, and 10% levels of significance. This demonstrates the stationary nature of the time series data on stock market volatility in the BSE Sensex and NSE Nifty.
- Granger Causality results point to a lack of correlation between inflation and stock market volatility, as measured by the BSE Sensex and NSE Nifty. The null hypothesis (H_{om}: Inflation does not Granger cause Stock Market Volatility (BSE), H_{on}: Stock Market Volatility (BSE) does not Granger cause Inflation) is accepted because it is clearly evident that the probability values for the H_m and H_n hypotheses are 0.91553 and 0.12785, respectively, which are greater than the critical value 0.05. It demonstrates that neither stock market volatility (BSE Sensex) nor inflation-related volatility affects the other. The H_o and H_p hypotheses are in a similar situation, thus the null hypothesis (H_{oo}: Inflation does not Granger cause

Stock Market Volatility (NSE), Hop: Stock Market Volatility (NSE) does not Granger cause Inflation) is similarly accepted in these circumstances.

- It can be concluded that the volatility of stock market returns in India is neither increased nor decreased by inflation. There may be a number of causes for this unimportant association. It might, however, be the result of net FDI and FII inflows.

6.2.4 INTEREST RATE EFFECTS ON THE STOCK MARKET

- The majority of the time, returns on interest rate announcement days (ignoring signs) outperform returns on the prior 30, 15, and 3 trading days.
- In the case of the Sensex, the comparison between the announcement of interest rate day returns (Z) and the long-term pre-announcement of interest rate return reveals that the announcement of interest rate day returns outperforms the medium-term (12 out of 15) and short-term (11 out of 15) in all years.
- When the announcement of interest rate day returns (Z) is compared to the long-term pre-announcement of interest rate return in the case of the Nifty, it is evident that the announcement of interest rate day returns exceeds (14 out of 15) when compared to the medium-term (12 out of 15) and short-term (12 out of 15) that budget day returns exceed.
- Paired t-test was used to conduct additional statistical analysis on it. The markets are always caught off guard when interest rate announcements are made. The results of all tests show that the real numbers are higher than those in the table, supporting the alternative hypothesis.
- In the second set of tests, it is demonstrated that the short-term period is when the announcement of interest rates has the greatest influence (alternative hypotheses have been accepted in all three situations). The alternative ideas, however, have been accepted in one out of every three instances during the course of medium- and long-term periods. Overall, five out of nine occurrences (3+1+1) at the left tail show actual values that are higher than the tabular values. This demonstrates that the short-term post-announcement interest rate period is where interest rate

announcements have the most impact, with some effects even affecting the medium- and long-term average returns.

- In the case of the Sensex and Nifty, the F-test reveals that, aside from two years, no other year's real value exceeds the tabular value. This shows that when the length of the time period rises, volatility does not often increase in the post-announcement of interest rate situation.
- when there is a long-term pre-announcement of interest rate period and a long-term post-announcement of interest rate period in the returns of the Sensex and Nifty. In the long-term timeframe for the Sensex and Nifty, 9 out of 15 important cases have occurred, while 8 out of 15 and 4 out of 15 significant cases, respectively, have occurred in the medium-term and short-term periods. Comparing the long-term period after the announcement of the interest rate to a similar long-term period prior to the announcement of the interest rate shows that the long-term and medium-term periods tend to be more volatile than the short-term period.

6.3 CORPORATE FUNDAMENTALS' EFFECT ON THE STOCK MARKET

❖ HDFC Bank Analysis

The test's findings show that the F-values in both cases—BSE and NSE—are significant because they are less than 0.05, which is the threshold for significance. As a result, the null hypothesis that there is no correlation between market price and independent variables in the cases of both BSE (H_{oq}) and NSE (H_{or}) is rejected. In the cases of BSE and NSE, respectively, the calculated values of Durbin-Watson statistics are 1.78 and 1.75. It follows that there is no autocorrelation.

A greater association can be seen because both situations' R values are 0.985. In both instances, the R^2 for the regression equation is 0.970, suggesting that fluctuations in the Earnings Price Share and Price/Earnings Ratio account for 97.0 percent of the variation in Market Price.

Two of the predictors have positive b-values in both regression models, implying that there are positive correlations between them. Consequently, an increase in both the price-to-earnings ratio and the earnings per share causes an increase in the market price in both instances.

HDFC Bank Coefficients (BSE Sensex)

- Earnings Per Share (EPS) (b = 27.37): According to this calculation, for every Re increase in EPS, MP rises by Rs. 27.37. Only if the impact of P/E is maintained constant does this interpretation hold true.
- Price-to-Earnings Ratio (P/E) (b = 10.11): According to this number, MP rises by Rs. 10.11 for every Re increase in P/E. Only when the impact of EPS is held constant does this interpretation hold true.

HDFC Bank (S&P CNX Nifty) Coefficients

- Earnings Per Share (EPS) (b = 27.35): According to this calculation, for every Re increase in EPS, MP rises by Rs. 27.35. Only if the impact of P/E is maintained constant does this interpretation hold true.
- Price to Earnings Ratio (P/E) (b = 10.09): According to this number, MP rises by Rs. 10.09 for every Re increase in P/E. Only when the impact of EPS is held constant does this interpretation hold true.
- Because their values are below the significance level of 0.05 for both models, EPS and P/E are significant predictors of market price. The size of the t-statistics shows that in both situations, EPS has a bigger impact than P/E.

❖ **State Bank of India Analysis**

The test's findings show that, despite the F-values in both cases being less than the significance criterion of 0.05, they are significant. Therefore, the null hypothesis that, in the cases of both BSE (H_{oq}) and NSE (H_{or}), there is no association between the market price and independent variables is rejected. For BSE and NSE, respectively, the calculated Durbin-Watson statistics are 1.77 and 1.19. As a result, there is no autocorrelation.

The values of 'R' are 0.983 (BSE) and 0.977 (NSE), which show a stronger association. The fluctuations in Earnings Per Share, Book Value, and Price/Earnings Ratio account for 96.6 percent and 95.4 percent, respectively, of the variation in market price, according to the regression equation's R^2 values of 0.966 (BSE) and 0.954 (NSE).

One predictor has a negative b-value indicating a negative link, while two predictors in both regression equations have positive b-values indicating positive relationships. As a result, market price rises along with an increase in both book value and the price-earnings ratio. On the other hand, a rise in market price results from a decline in earnings per share.

State Bank of India coefficients (BSE Sensex)

- Earnings Per Share (EPS) (b = -2.21): According to this calculation, MP rises by 2.21 rupees for every rupee that EPS drops. Only when the effects of BV and P/E are held constant does this interpretation hold true.
- Book Value (BV) (b =1.64): According to this value, MP rises by 1.64 as BV rises by Re. Only when the impacts of EPS and P/E are held constant does this interpretation hold true.
- Price-to-Earnings Ratio (P/E) (b = 36.53): This result shows that MP rises by Rs. 36.53 for every Rs. 1 increase in P/E. Only when the effects of EPS and BV are held constant does this interpretation hold true.

State Bank of India's Coefficients (S&P CNX Nifty)

- Earnings Per Share (EPS) (b = -10.60): According to this calculation, MP rises by Rs. 10.60 for every Re. 1 fall in EPS. Only when the effects of BV and P/E are held constant does this interpretation hold true.
- Book Value (BV) (b =1.84): According to this value, MP rises by 1.84 as BV rises by Re. Only when the impacts of EPS and P/E are held constant does this interpretation hold true.
- Price/Earnings Ratio (B = 97.49): According to this number, MP rises by Rs. 97.49 for every Re increase in P/E. Only when the effects of EPS and BV are held constant does this interpretation hold true.

- Because their values are below the significance level of 0.05 for both models, EPS, BV, and P/E are significant predictors of market price. The size of the t-statistics shows that P/E in both situations has a bigger effect than BV and EPS.

❖ **Tata Motors Analysis**

The test's findings show that, in both instances, the F-values are noteworthy for falling below the threshold of 0.05. The null hypothesis, which states that there is no correlation between market price and independent variables for both BSE (H_{oq}) and NSE (H_{or}), is thus rejected. The calculated Durbin-Watson statistics for BSE and NSE are 1.57 and 1.92, respectively. There is hence no autocorrelation.

R values of 0.947 for the BSE and 0.982 for the NSE demonstrate a stronger link. 89.7% and 96.44%, respectively, of the variation in market price is explained by changes in dividend per share, book value, and dividend yield, according to the regression equation's R^2 values of 0.897 (BSE) and 0.964 (NSE).

Two of the predictors in each regression equation have positive b-values, indicating positive associations, and one predictor has a negative b-value, indicating a negative link. Consequently, as other factors like Book value and Dividend Yield remain constant, the market price rises along with the growth in Dividend Per Share. Similar to how market price grows when both book value and dividend yield go up individually (assuming all other factors stay the same). By holding the effects of all other predictors constant, the b-values also reveal how much each predictor influences the result.

Tata Motors (BSE Sensex) Coefficients

- Dividend Per Share (DPS) (b = 50.77): According to this figure, MP rises by Rs. 50.77 for every Re increase in DPS. Only if the effects of BV and DY are held constant does this interpretation hold true.
- This metric, Book metric (BV) (b=1.25): Implies that for every unit increase in BV, MP rises by 1.25 units. Only if the effects of DPS and DY are kept constant does this interpretation hold true.

- Dividend Yield (DY) (b = -127.85): This number shows that for every Re rise in DY, MP falls by 127.85 Re. Only if the effects of DPS and BV are kept constant does this interpretation hold true.

Tata Motors' Coefficients (S&P CNX Nifty)

- Dividend Per Share (DPS) (b = 58.12): According to this number, MP rises by Rs. 58.12 for every Re increase in DPS. Only if the effects of BV and DY are held constant does this interpretation hold true.
- This result shows that while Book result (BV) grows by Re 1, MP only rises by 97 paise. Only if the effects of DPS and DY are kept constant does this interpretation hold true.
- Dividend Yield (DY) (b=-145.46): This value illustrates how MP drops by Rs. 145.46 for every Re increase in DY. Only if the effects of DPS and BV are kept constant does this interpretation hold true.

As long as their values are below 0.05, DPS, BV, and DY are all significant predictors of market price for both models. The size of the t-statistics shows that in both cases, DPS has a greater impact than DY and BV.

❖ Mahindra And Mahindra's Analysis

The test's findings show that both cases, BSE and NSE, have F-values that are significant because they are below the threshold of 0.05. Therefore, the null hypothesis that, in the cases of both BSE (H_{oq}) and NSE (H_{or}), there is no association between the market price and independent variables is rejected. In the cases of BSE and NSE, the estimated values of the Durbin-Watson test are 1.28 and 1.46, respectively. As a result, there is no autocorrelation.

The coefficients 'R' had stronger values of 0.991 (BSE) and 0.959 (NSE), indicating a stronger association. For the regression equation, the R^2 values are 0.983 (BSE) and 0.920 (NSE), showing that fluctuations in the Earning Price Share, Price/Earnings Ratio, and Dividend Yield account for 98.3 percent and 92.0 percent, respectively, of the variation in market price.

Three of the predictors in both regression models have positive b-values, indicating positive correlations. Therefore, as Earnings Per Share rises and other factors like Price Earnings Ratio and Dividend Yield hold steady, the market price also rises. Similar to this, market price increases with increases in P/E and DY separately (assuming other variables remain constant).

Mahindra And Mahindra's Coefficients (BSE Sensex)

- Earnings Per Share (EPS) (b = 13.98): This value illustrates how MP rises by Rs 13.98 for every Re.1 increase in EPS. Only under the assumption that P/E and DY's effects are constant does this interpretation hold up.
- Price/Earnings Ratio (b = 28.02): According to this number, MP rises by Rs. 28.02 for every Re.1 increase in P/E. Only when the effects of EPS and DY are held constant does this interpretation hold true.
- Dividend Yield (DY) (b = 3.94): According to this number, MP rises by Rs. 3.94 for every Re increase in DY. Only when the impacts of EPS and P/E are held constant does this interpretation hold true.

Mahindra And Mahindra's Coefficients (S&P CNX Nifty)

- Earnings Per Share (EPS) (b = 15.11): According to this calculation, MP rises by Rs. 15.11 for every Re.1 increase in EPS. Only under the assumption that P/E and DY's effects are constant does this interpretation hold up.
- Price/Earnings Ratio (b = 19.29): This number indicates that for every Re increase in P/E, MP rises by 19.29. Only when the effects of EPS and DY are held constant does this interpretation hold true.

- Dividend Yield (DY) (b = 5.65): According to this number, MP rises by Rs. 5.65 for every Re increase in DY. Only when the impacts of EPS and P/E are held constant does this interpretation hold true.

Because their values are smaller than the significance level of 0.05 for both models, EPS, P/E, and DY are significant predictors of market price. The size of the t-statistics shows that in both cases, EPS has a bigger effect than P/E and DY.

❖ **Hero Motors Analysis**

The test's findings show that, in both instances, the F-values are significant because they are less than the threshold of 0.05. Therefore, the null hypothesis that, in the cases of both BSE (H_{oq}) and NSE (H_{or}), there is no association between the market price and independent variables is rejected. The calculated Durbin-Watson test results for BSE and NSE are 1.78 and 1.45, respectively. As a result, there is no autocorrelation.

The values of 'R' are 0.997 for the BSE and 0.996 for the NSE, which demonstrate a stronger link. R^2 values for the regression equation are 0.994 (BSE) and 0.996 (NSE), suggesting that fluctuations in the Earning Price Share, Price/Earnings Ratio, and Dividend Yield account for 99.4% and 99.6 percent of the variation in market price, respectively.

Two predictors in each regression equation have positive b-values, indicating positive associations, while one predictor has a negative b-value, indicating a negative link. As a result, market price rises along with rising price-to-earnings ratio and earnings per share. However, a rise in market price results from a decline in dividend yield.

Hero Motors (BSE Sensex) Coefficients

- Earnings per share (EPS) (b = 17.24): According to this number, for every Re increase in EPS, MP rises by 17.24. Only under the assumption that P/E and DY's effects are constant does this interpretation hold up.
- Price/Earnings Ratio (b = 25.76): According to this value, MP rises by Rs. 25.76 for every Re increase in P/E. Only if EPS and DY effects are held constant does this interpretation hold valid.

- Dividend Yield (DY) (b = -18.15): This number illustrates that for every Re increase in DY, MP falls by 18.15 rupees. Only when the impacts of EPS and P/E are held constant does this interpretation seem to hold true.

Hero Motors' Coefficients (S&P CNX Nifty)

- Earnings Per Share (EPS) (b = 17.78): According to this calculation, MP rises by Rs 17.78 for every Re.1 increase in EPS. Only under the assumption that P/E and DY's effects remain constant can this interpretation hold true.
- Price/Earnings Ratio (b = 29.15): This value illustrates how MP rises by Rs. 29.15 for every Re increase in P/E. Only when the effects of EPS and DY are held constant does this interpretation hold true.
- Dividend Yield (DY) (b = -11.61): This result shows that for every Re rise in DY, MP falls by 11.61 Re. Only if the impacts of EPS and P/E are maintained constant does this interpretation hold true.

The EPS, P/E, and DY are the significant market price predictors for both models because their values are smaller than the significance level of 0.05. The size of the t- test shows that in both situations, EPS has a bigger effect than P/E and DY.

The test's findings show that all of the chosen companies—HDFC Bank, State Bank of India, Tata Motors, Mahindra & Mahindra, and Hero Motors—as well as both cases (i.e., BSE and NSE—have significant F-values because they are smaller than the significance level of 0.05. Because of this, the null hypothesis that the market price and independent variables have no relationship in the cases of both BSE (H_{oq}) and NSE (H_{or}) is rejected. All of the selected companies' computed Durbin-Watson test results are less than 2, which indicates that there is no autocorrelation.

All of the companies under study, as well as the BSE and NSE, have R and R^2 values greater than 0.90, demonstrating a stronger correlation between market price and independent variables. R^2 also shows that 90.0% of the variation in market price can be accounted for by changes in independent variables.

According to the regression analysis, EPS, P/E, and DY have had the biggest roles in influencing share prices across all of the firms under consideration as well as on the BSE and NSE. Additionally, it has been discovered that DY, P/E, and EPS are the most relevant variables in the vehicle business, whereas EPS and P/E are the most critical factors in the banking sector.

6.4 VOLATILITY AND STOCK PRICE RETURNS: A RELATIONSHIP

The significance of each coefficient has been determined. Both the BSE Sensex and the NSE Nifty's ARCH and GARCH coefficients are positive while the leverage term is negative, i.e., the BSE Sensex is -0.077 and the NSE Nifty is -0.083, respectively, and these values are statistically different from zero, indicating the existence of the leverage effect for the stock market returns over the course of the study period. As a result, return and volatility have a negative relationship. This suggests that there is an imbalance in stock price behaviour, with returns typically being more volatile in response to bad news and less volatile in response to good news. The conclusions developed by Schwert (1989), French et al. (1987), Christie (1982), and Black (1976) are only supported by the observations of the current investigation. They also discovered that returns and volatility are adversely associated. The leverage effect, which occurs when stock prices fall and equity value relative to corporate debt likewise decreases, is the primary cause of the negative correlation between stock and volatility. As a result, the risk associated with stock ownership increases.

6.5 PREDICTING STOCK MARKET VOLATILITY WITH THE GARCH MODEL

- The daily returns on the Sensex and Nifty time series graph shows that returns were continuously fluctuating around the mean value, which was close to zero. Both good and negative areas might be seen in the return measures. Periods of relative

calmness were interspersed between the more frequent swings, which tended to group together.

- High volatilities are followed by high volatilities and low volatilities are followed by low volatilities, according to the time series graph of the returns for both markets. Therefore, there are significant time changing differences in time series. To further clarify how risk affects returns, conditional variance should be included in the function. Consequently, the GARCH model is a great tool for the research.
- The skewness statistic for daily returns for the Sensex and Nifty is found to be different from zero, indicating that the return distribution is not symmetric.
- In addition, the comparatively high excess kurtosis shows that, in contrast to a normal distribution, the underlying data is leptokurtic, or strongly tailed and abruptly peaked about the mean.
- The normalcy assumption is rejected by the Jarque-Bera statistic used to test the null hypothesis of normality. The findings support the widely held belief that daily stock returns are leptokurtic and skewed rather than regularly distributed.
- Both the return series for the BSE Sensex and S&P CNX Nifty were inferred to be stationary since the estimated p-values of ADF for both markets (BSE Sensex and S&P CNX Nifty) were less than the significance level of 0.05.
- The first-order autocorrelation in the series was confirmed by the results of the Q2(1) test statistic, which disproves the null hypothesis. The null hypothesis was rejected by estimating the value of the Lagrange Multiplier (LM), which was done since the leptokurtic distribution and volatility clustering suggested an ARCH or GARCH process. In conclusion, the analysis shows that the index's daily return series are abnormal and display the "ARCH effect."
- As for the stationarity of the variance process, it was found that 1+ 1 is 0.981 for S&P CNX Nifty and Sensex (values of 1 are +0.130 and 1 is +0.851 and 1+ 1 is 0.983 for Sensex and 1+ 1 is 0.981 for Sensex). Because of this, the stationarity criterion (1+ 1 1) is met in both markets.
- The sum, however, was very near to one, indicating long-lasting shocks in volatility and a "long memory."

- The volatility is said to be "persistent" when GARCH lag coefficients 1 have large values (+0.863 for the Sensex and +0.851 for the Nifty), indicating that shocks to conditional variance take a long time to dissipate.
- Low error coefficient 1 values (i.e., +0.120 for the Sensex and +0.130 for the Nifty) imply that market shocks cause very minor modifications to future volatility.
- The BSE Sensex and S&P CNX Nifty were used in this study's attempt to develop a volatility forecast model. We found that the GARCH (1,1) specification matches the Sensex return and Nifty return time series pretty well.
- For the Sensex and Nifty, the one-day-ahead volatility values are respectively.00008118 and.00008663. As a result, the developed model can forecast volatility one day in advance.

6.6 PERSPECTIVES FOR FUTURE RESEARCH

Although every effort has been made to ensure that the current study is typical of stock market volatility, its scope is yet constrained to just look at the particular goals. Following are some of the significant topics that could be investigated further:

- The two main stock market indices are the only ones covered by the current study. Nowadays, research firms and financial newspapers maintain a large number of indexes that are specifically created to measure a certain industry sector or market capitalization category. Other available indexes can be used in future research.
- A variety of factors influence the increase or decline of stock values. The current study, however, only looks at a small number of variables that affect stock market volatility.
- According to certain theories, volatility is correlated with trading volume and frequency. Research can be done to determine how volatility relates to trading volume and frequency thanks to the online availability of high frequency trading data.

- Volatility may be influenced by the type of trade that takes place in a certain market. Different volatility patterns during the trading day may result from different procedures for starting and ending deals. The impact of the mechanisms employed to reduce excessive volatility, such as circuit breakers and circuit filters, might be worth looking into. The impact of arbitrage opportunities across several Indian stock markets may be a related field of study.
- Only two sectors were examined in the current study, which examined the impact of numerous company-related fundamental characteristics on stock prices. Future studies can focus on examining how basic variables affect stock values across different industries.
- The effect of volatility on investors' trust in the capital market is one of the most significant areas of research in this subject. Surveys or appropriate proxies could be used to gauge investor confidence during periods of extreme market volatility.
- Future studies can focus on examining potential uses of volatility forecasts in portfolio management and developing complex trading products like options and futures.
- There are several additional aspects that seem intriguing for additional research on modelling the volatility of the stock market. It would be a fascinating exercise to study the applicability of GARCH models to individual firm share price data, for instance, given that the majority of research have taken the volatility of returns on an aggregate stock market index into account. Any big discoveries on the variation in share price for a certain company would have a significant impact on how options on its shares are valued.

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