Chapter II

Review of Literature and Research Design
This Chapter includes two sections as follows:

Section -A: Review of Literature
Section -B: Research Design

Section -A
REVIEW OF LITERATURE

Several studies have been conducted to analyze the Calendar Anomaly of Indian as well as Global Capital Market. The reviews of previous studies made in India and abroad are given below.

1. **Studies Relating to Calendar Anomalies /Seasonality**

   The study entitled, “*Seasonality in the Athens Stock Exchange*”, by Mills Siriopoulos C, Markellos RN, Harizanis (2000) investigated Calendar Effects for each of the constituent stocks of the Athens Stock Exchange General Index for the period from October 1986-April 1997. The result indicated that the calendar regularities vary significantly across the constituent shares of the General Index. It was found that factors such as beta coefficients and company type influenced significantly the intensity of Calendar Effects.

   Harvinder Kaur (2004), in his paper entitled, “*Time Varying Volatility in the Indian Stock Market*”, analyzed the nature and characteristics of Stock Market Volatility in India and the US. The study found that the response to news arrival was asymmetrical, meaning that the impact of good and bad news is not the same. The return and volatility on various weekdays have somewhat changed after the introduction of Rolling Settlement. There was mixed evidence of return and volatility spillover between the US and Indian Markets.

   A study by Pandey IM (2004) entitled, “*Stock Return Seasonality in the Emerging Malaysian Market*”, investigated the existence of Seasonality in Malaysian’s Stock Market. The study used the monthly return of Kula Lumpur Stock

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Exchange’s Composite Index and EMAS (Exchange Main Board All Share) Index. The result of the study confirmed the Seasonal Effect in stock returns in Malaysia. It was found that the returns were statistically significant in the Months of February and December in the case of EMAS³.

Sarma.SN (2004), in his paper entitled, “Stock Market Seasonality in an Emerging Market”, explored the presence of Seasonality in the Indian Stock Market returns during the post liberalization period. The study provided evidence to the presence of Seasonality across the days of the week. The study confirmed the conclusions of earlier studies as to the leptokurtic distribution of equity returns, presence of high variance on Mondays, Weekend Effect and Regularity of Returns across the Indices⁴.

The paper entitled, “Seasonality in Asia’s Emerging Stock Markets: India and Malaysia”, by Chotigcat T, Pandey IM (2005), investigated the Monthly Effect on stock returns for the Stock Market in India and Malaysia. This study confirmed the existence of Seasonality in stock returns in Capital Markets, and suggested that the Indian Stock Market would move in the direction of higher level of efficiency and investors would earn returns commensurate with risk⁵.

Bing Zhang, Xindan li (2006), in their paper entitled, “Do Calendar Effects Still Exist in the Chinese Stock Markets?”, investigated time – varying Calendar Effect in the Chinese Stock Market, using the GARCH (1,1) – GED(General Error Distribution) Model. The study found that the Friday Effect exists with low volatility at the early stage, but since 1997, the Positive Tuesday Effect has been noticed. Besides, there was a Small Firm January Effect with high volatility. The Turn-of-the Month Effect has also disappeared in the Chinese Stock Market since 1997⁶.

study. The result revealed that the Turn of the Month Effects as well as Time of the Month Effect were almost the same. It was found that Early Days of the Month witnessed higher mean returns than Later Days of the Same Month.

Ash Narayana Sah (2010), in his study entitled, “Stock Market Seasonality: A Study of Indian Stock Market”, examined whether Seasonality existed in Nifty and Nifty Junior Returns. It was found that the daily and monthly Seasonality was present in Nifty and Nifty Junior Returns. The results established that the Indian Stock Market was not efficient and investors could improve their returns by timing their investments.

2. Studies Relating to Day of the Week Effect

The study entitled, “Evidence on Weak Form Efficiency and Day of the Week Effect in the Indian Stock Market”, by Sunil Poshakwale (1996), used daily closing prices of Bombay Stock Exchange Index from 2nd January 1987 to 31st October 1994. The results provided evidence of Day of the Week Effect observed on the BSE.

Another study entitled, “Day-of-the Week Effects on the Bombay Stock Exchange”, by Ravi Anshuman V, Ranadev Goswami (2000), examined the Week-End Effects by using equally weighted portfolio constructed from 70 stocks listed on the BSE during the period (April 1991 – March 1996). The study evidenced the (heteroskedasticity adjusted) excess positive returns on Friday and excess negative returns on Tuesday.

Amanulla S, Thiripalraju (2001), in their study entitled, “Week–End Effect: New Evidence from the Indian Stock Markets”, proposed to find out whether the carry-forward transactions in different periods have any impact on Week-End Effect

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in Indian Stock Market. This study used the daily stock returns of 82 companies traded in the BSE with respect to indices viz, BSE Sensex, BSE National index and S&P CNX Nifty Index to identify Week-End Effects. The results from the sub-sample period strongly supported the existence of week-end effect during the period of ban on carry forward (badla) transactions. This study also evidenced a reversal in Week-End Effects, i.e., positive Monday return and negative Friday return in modified and revised modified carry forward transactions\textsuperscript{14}.

Brooks, Persand (2001), in their paper entitled, “\textit{Seasonality in South East Asian Stock Markets: Some New Evidence on Day-of-the-Week Effects\textquotedblright}, examined the evidence for the Day of the Week Effect in five Southeast Asian Stock Markets, including Taiwan, South Korea, the Philippines, Malaysia and Thailand. The Authors found that neither South Korea nor the Philippines recorded significant Calendar Effects. But both Thailand and Malaysia registered significant positive average returns on Monday and significant negative average returns on Tuesday. In addition, the study also documented a significant negative Wednesday Effect in Taiwan\textsuperscript{15}.

Another study entitled, “\textit{Day of the Week Effect Anomaly in the Indian Equity Market\textquotedblright}, carried out by Goloka C Nath, Manoj Dalvi (2005), used both high frequency and end of day data for the benchmark index (S&P CNX Nifty). The study, using Regression with bi-weights and dummy variables, found that before the introduction of Rolling Settlement in January 2002, Monday and Friday were significant days. However, after the introduction of the Rolling Settlement, Friday has become significant. Mondays were found to have higher Standard Deviations followed by Fridays. The market inefficiency still exists and the market was yet to price the risk appropriately\textsuperscript{16}.


A study entitled, “Does Friday repeat itself on Monday? An Analysis of the Day-of-the-Week Effect on Autocorrelations of Stock Market Index Returns”, by Badhani KN, Kavidayal BD, Kavidayal PC (2006), investigated differences in autocorrelations of S&P CNX Nifty Index Returns across the different trading days of the week. According to this study, Indian Stock Market followed the international trend. Besides, there was a significant highest positive first order autocorrelation between Friday returns and returns of Next Trading Day\(^{17}\).

Syed A. Basher, Perry Sadorsky (2006), in their paper entitled, “Day-of-the Week Effects in Emerging Stock Markets”, used both unconditional and conditional risk analysis to investigate the Day-of-the-Week Effect in 21 Emerging Stock Markets. The results of this study showed that while the Day-of-the-Week Effect was not present in the majority of Emerging Stock Markets studied, some Emerging Stock Markets did exhibit strong Day-of-the-Week Effect even after accounting for conditional market risk\(^{18}\).

According to the study entitled, “Efficiency of Indian Stock Market: A case of Day of the Week Effect”, by Hareesh Kumar V, Malabika Deo (2007), analyzed the efficiency of Indian Stock Market by using S&P CNX 500 Index. They discovered the presence of Day of the Week Effect in the Indian Stock Market, which affected both the stock returns and volatility, thereby proving the Indian Stock Market to be inefficient\(^{19}\).

A study entitled, “Monday Effect and Stock Return Seasonality: Further Empirical Evidence”, by Rengasamy Elango and Nabila Al Macki (2008), investigated whether the anomalous Week End Effect was found in the rapidly emerging Indian Equity Market. The study used three major indices of the NSE for the period 1999-2007. Their analysis produced mixed results indicating that the Monday Returns were negative and low in the case of two out of three indices. The study also

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examined the Week End Effects and showed that Monday Returns were negative in one of the benchmark indices\textsuperscript{20}.

Ushad Subadar Agathee (2008), in his study entitled, “Day of the Week Effects: Evidence from the Stock Exchange of Mauritius (SEM)”, examined the Day of the Week Effects in the Stock Exchange of Mauritius. The study found that there was no significant presence of the Day of the Week Effect across all given years as well as for the whole sample period of 1998-2006. The study showed that the Friday Returns appeared to be higher than Other Trading Days of the Week\textsuperscript{21}.

Bhagaban Das, Inun Jariya AM (2009), in their paper entitled, “Day of the Week Effect and the Stock Returns in the Colombo Stock Exchange: An Analysis of Empirical Evidence”, used the daily returns of the Colombo Stock Exchange for the period of 1985-2004 comprising of 4771 observations. The analysis confirmed that the Day of the Week Effect existed at CSE and Friday was the most significant day whose return was statistically significant in CSE, which is inconsistent with the developed market behavior\textsuperscript{22}.

Nageswari P, Selvam M (2010), in their paper entitled, “Day-of-the-Week Effect on the Indian Stock Market: An Empirical Analysis”, examined the Day-of-the-Week Effect on the Indian Stock Market after the introduction of the Compulsory Rolling Settlement. The study provided the evidence that the market was not able to price the risk appropriately as higher returns were possible by taking less risk and this indicated market inefficiency\textsuperscript{23}.

The study entitled, “Analysis of Week End Effect in Indian Stock Market”, by Nageswari P, Babu M (2011), examined the Week End Effect in the Indian Stock Market. The study found that the mean returns were positive for all days of the week, highest on Friday and lowest on Monday. It was inferred that the Day of the Week Pattern did not exist in the Indian Stock Market during the study period24.

Nageswari P, Selvam M (2011), in their study entitled, “Re-Examination of the Day of the Week Effect on the Indian Stock Market: A study with reference to S&P CNX 500 Index”, examined the Day of the Week Effect during the Post Rolling Settlement Period. The study found that the Highest Mean Return on Friday and the Lowest Mean Return on Tuesday were observed during the study period. Further, there was strong significant positive relationship between Monday – Friday and no significant relationship among other days of the week. The results indicated that the Day of the Week Effect did not exist in the Indian Stock Market during the study period25.


The paper entitled, “An Empirical Study on January Anomaly and Return Predictability in an Emerging Market: Evidence from India”, by Rengasamy Elango, Dayanand Panday (2008), examined the January Anomaly and market return-pattern for the five prominent indices of the NSE. The analysis revealed that March and April recorded significant negative returns and therefore, these two months are the best period to buy the scrips and November and December showed significant positive high returns, prompting us to conclude that these two months are the best period to sell the securities (sell high)26.

Pandey IM (2002), in his paper entitled, “Is there Seasonality in the Sensex Monthly Returns?”, investigated the existence of Seasonality in India’s Stock Market

for the post reform period. After examining the Stationarity of the return series, the study found that there was Monthly Effect in stock returns in India. The results of the study indicate that the Stock Market in India was inefficient, and hence investors can time their share investments to improve returns\textsuperscript{27}.

The study entitled, “Anomalies in US Equity Markets: a Re-Examination of the January Effect”, by Seyed Mehdian, Mark J. Perry (2002), investigated the January Effect in US Equity Markets. It was found that January Returns were positive and significant in all three Stock Market Indices. After 1987, January Returns were positive but not statistically different from zero\textsuperscript{28}.

Gagari Chakrabarti, Chitrakalpa Sen (2008), in their paper entitled, “November Effect: an Example of Calendar Anomaly in Indian Stock Market”, investigated the Month of the Year Effect in the Indian Stock Market. This study studied the presence of Calendar Anomaly, with asymmetric market reactions, using TGARCH Model. It confirmed the presence of such Seasonal Anomaly in the form of a November Effect\textsuperscript{29}.

The study entitled, “Calendar Effects and the Months of the Year: Evidence from the Mauritian Stock Exchange”, by Ushad Subadar Agathee (2008), examined the possible Month of the Year Effect in the Stock Exchange of Mauritius (SEM). The result showed that returns were the lowest in the Month of March and highest in the Month of June. But equality of mean returns test showed that returns were statistically the same across all months\textsuperscript{30}.

Khokan Bepari, Abu Taher Mollik (2009), in their study entitled, “Seasonalities in the Monthly Stock Returns: Evidence from Bangladesh Dhaka

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\textsuperscript{27}Pandey IM (2002). Is There Seasonality in the Sensex Monthly Returns?. (Electronic copy available at http://www.iimahd.ernet.in/-impandey/).


Stock Exchange (DSE)", investigated the existence of Seasonality in return series of DSE of Bangladesh. The study confirmed the existence of Seasonality in stock returns in DSE but did not support the Tax Loss Selling Hypothesis. The study found that there was an April Effect in DSE and invalidated the paradigm of the Efficient Market Hypothesis in DSE

4. Studies Relating to Semi-Month and Turn of the Month Effect

Bodla BS, Kiran Jindal (2006), in their paper entitled, “Monthly Effects in Stock Returns: New Evidence from the Indian Stock Market”, investigated one such Anomaly, namely, Monthly Effects in an Emerging Indian Capital Market. For this, the daily price index (S&P CNX Nifty) data were collected and analyzed for the period from January 1998 – August 2005, by segmenting Pre and Post Rolling Settlement. The study found that the returns of the Month Effect and Semi Monthly Effect were prevalent in the Indian Stock Market.

An article entitled, “The Day of the Week, Turn of the Month and January Effect on Stock Market Volatility and Volume: Evidence from Bursa Malaysia”, by Huson Joher Ali Ahmed, Ziaul Haque (2008), focused on three important Calendar Events, namely, Day of the Week Effect, Turn of the Month and January Effect. The Study could not identify any clear pattern of January or Turn of the Month Effect during the full sample period.

A study entitled, “An Empirical Analysis of Semi-Monthly Effects: Evidence from the Indian Stock Market”, by Nageswari P, Selvam M, Karpagam V (2011), examined the existence of Semi-Month Effect in the Indian Stock Market. The study found that the mean returns in the First Half of Calendar Month were lower than the mean returns in the Second Half of the Calendar Month during the study period. The

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paper reports an Insignificant Semi-Monthly Effect across all years, except for 2005-06\textsuperscript{34}.

5. Studies Relating to Holiday Effect

Chan-wung Kim, Jinwoo Park (1994), in their study entitled, “Holiday Effects and Stock Return: Further Evidence”, provided evidence of the Holiday Effect in stock return. The study reported that there was abnormally high return on the trading markets in the US, namely, the NYSE, AMEX and NASDAQ. The Holiday Effect was also present in the UK and Japanese Stock Markets\textsuperscript{35}.

A study on, “Holiday Effect in the Indian Stock Market”, by Madhusudan Karmarkar, Madhumitha Chakraborty (2000), examined the Holiday Effect and found out that stock showed abnormally high return on days prior to holidays. This study investigated the Holiday Effect in the Indian Stock Market by comparing the mean return of Pre Holiday, Post Holiday and Weekday\textsuperscript{36}.

The earlier studies concentrated on estimating only the Day of the Week Effect and Monthly Effect. None of the Researchers studied all Anomalies like Day of the Week Effect, Monthly Effect, Turn of the Month Effect, Semi-Month Effect and Holiday Effect up to date after the Introduction of Compulsory Rolling Settlement System. In order to fill this gap, the present study was undertaken to analyze the Calendar Anomalies like Day of the Week Effect, Monthly Effect, Semi-Month Effect, Turn of the Month Effect and Holiday Effect in Indian Stock Market during the Post Rolling Settlement Period.


Statement of the Problem

An efficient stock market can instantaneously process the information which would be reflected on security prices. The Information Transmission Mechanism ensures that the stock returns across all days of the weeks and months are equal and the Market Participant, and the Rational Financial Decision Maker, cannot earn any extra-normal profits. It is to be noted that the returns constitute only one part of the decision making process. Another part of decision making is the calculation of risk or volatility of returns. It is important to note that there are variations in Volatility of Stock Returns by the Day-of-the Week, Month of the Year and Semi-Month. Besides, a high (low) return is associated with a correspondingly high (low) volatility for a given day. Investors, who wish to reduce their tax liability, may sell the loss making shares before filing their tax returns in order to off-set capital losses against capital gains. This would reduce the share price further. Similarly, in the Month of January, firms release new information pertaining to the previous accounting year. When new positive information reaches the market, the prices become bullish due to buying pressure. If the investors can identify a certain pattern in volatility, then it would be easier to make investment decision based on both returns and risk. Some of the previous studies have not provided sufficient information to the Readers and Users in general and to the Market Participants in particular. Besides, the findings of these studies are not in agreement with each other. It is against this background that an attempt has been made in this study to examine Calendar Anomalies in the Indian Stock Market afresh so as to remove the ambiguity in results, if any.

Need for the Present Study

The effect of Calendar Anomalies may hike or depress the share price on a particular day/week or month as compared to the mean. The changes in the price cannot be explained by traditional asset pricing models and the changes also violate the Weak Form of Market Efficiency (i.e. asset prices fully reflect all past information). It is to be noted that the capital flows take place on a massive scale in India in order to capitalize the promising and profitable business opportunities. As a result, International Investors are concerned with the market efficiency, timing of investment, and the market
integration with other developed countries. The present study would be useful to the Native and Foreign Investors, Traders and Arbitrageurs who can formulate profitable Trading Strategies. This study is of great use to predict the share price behavior, if Anomalies are properly understood. The share price behavior in one market spreads slowly to the other developing and developed markets. The presence of Calendar Anomalies in stock markets across the country is widely reported and these Anomalies should be investigated in India. The detailed investigation of this Calendar Anomaly would help all the stakeholders in India and outside India to plan their investment. Further, the periodical study of this nature is of use to all types of users, including the Market Participants.

**Objectives of the Study**

The following are the objectives of the present study.

1. To investigate the existence of Day of the Week or Weekend Effect in the Indian Stock Market.
2. To identify the Monthly Effect in the Indian Stock Market.
3. To discover whether the Semi-Month and Turn of the Month Effect exist in the Indian Stock Market.
4. To test the Holiday Effect in the Indian Stock Market.
5. To analyze the Stationarity and Volatility of the Returns of sample Indices in the Indian Stock Market.
6. To summarize the Findings and Suggestions of the Study.

**Hypotheses of the Study**

The following Null Hypotheses were developed and tested.

**NH**₁: There is no significant difference in daily mean returns among the trading days in a week.

**NH**₂: There is no significant relationship among the different days in a week and months of the year.

**NH**₃: There is no equality of mean returns across all months of the year

**NH**₄: There is no significant difference between the returns of first half month and rest of the days of the month.

**NH**₅: The returns among the pre, post holidays and weekdays are not significant.

**NH**₆: The Stationarity in the returns of sample indices is not significant.
There is no significant difference among the returns of volatility in mean and variance equation.

Methodology of the Study

1. Sample Selection

Indian Stock Market is one of the most dynamic and efficient markets in Asia. The two national level exchanges operating in India are the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE). These exchanges are well equipped with Electronic Trading Platforms and handle large volume of transactions on a daily basis.

As on 30th September 2010, there were eighteen indices in NSE and twenty four indices in BSE (Refer Annexure I & II). But for the purpose of this study, only two indices from each National Stock Exchange, namely, S&P CNX Nifty and S&P CNX 500 Index in NSE and BSE Sensex and BSE 500 Index in BSE were considered as sample for this study. These two indices are important in the Indian Stock Market. The S&P CNX Nifty is well diversified, with 50 stocks accounting for 22 Sectors of the Economy. It is used for Benchmarking Fund Portfolios, Index Based Derivatives and Index Funds. Further, Nifty Stocks represent about 56% of the Free Float Market Capitalization as on September 30th, 2010. The S&P CNX 500 is India’s first broad based benchmark. It represents about 90% of the Free Float Market Capitalization and about 87% of the total turnover on the NSE as on Sept 30, 2010. The S&P CNX 500 Companies are disaggregated into 72 industry indices viz. S&P CNX Industry Indices.

Sensex is the value-weighted index of the companies listed on the stock exchange. Bombay Stock Exchange (BSE) in 1986 came out with a stock index that subsequently became the Barometer of the Indian Stock Market. On August 9, 1999, the Bombay Stock Exchange constructed a new index, namely, BSE-500, consisting of 500 Scrips in its basket. BSE-500 Index represents nearly 93% of the total market capitalization on Bombay Stock Exchange Limited. Against this background, this study considered the following four indices, namely,

37 www.nseindia.com, as on 30th September, 2010.
a) S&P CNX Nifty  b) S&P CNX 500 Index  
c) BSE Sensex  d) BSE 500 Index

2. Sources of Data

The present study mainly depended upon Secondary Data and used daily index closing values. The required information of every day’s closing values was collected from PROWESS, a corporate database maintained by CMIE and websites of respective stock exchanges (www.nseindia.com and www.bseindia.com). The other relevant information for this study was collected from different Websites, Journals, and Books.

3. Period of Study

The Compulsory Rolling Settlement System was introduced by SEBI on January 02, 2002 in the stock exchange. It reduces the market risk of stocks to a considerable extent. The investors get their money / securities much faster, thus enhancing their liquidity. The introduction of Rolling Settlement leads to high turnover and creates impact on the Anomalous Behavior of stock prices (Ramesh Chander, Kiran Mehta, Renuka Sharma, 2008)\textsuperscript{38}. Against this background, an attempt has been made in this study, to identify the Calendar Anomalies in the Indian Stock Market during the Post Rolling Settlement Period from April 2002 to March 2010. Hence the period of present study covers a period of 8 years from 1\textsuperscript{st} April 2002 to 31\textsuperscript{st} March 2010 (i.e. Post Rolling Settlement Period).

4. Tools Used for Analysis

The following tools were used for the analysis of the returns and volatility for the sample indices taken for this study.

i) Returns

To compute the daily returns for each of the index series, the following formula was used:

\[ R_t = \ln \left( \frac{I_t}{I_{t-1}} \right) \times 100 \]

Where,

- \( R_t \) = Daily return on the Index (I),
- \( \ln \) = Natural log of underlying market series (I),
- \( I_t \) = Closing value of a given index (I) on a specific trading day (t), and
- \( I_{t-1} \) = Closing value of the given index (I) on preceding trading day (t-1).

ii) Descriptive Statistics

Under Descriptive Statistics, the Average Daily Returns (mean), Standard Deviation, Skewness, Kurtosis and Jarque-Bera were used. The details are as follows.

a) Mean

Mean is the average value of the series, obtained by adding up the series and dividing by the number of observations. It is the most common Measure of Central Tendency.

\[
\text{Mean (} \bar{x} \text{)} = \frac{\sum x_i}{n}
\]

Where,

- \( \bar{x} \) = represents the mean,
- \( \Sigma \) = Symbol of Summation
- \( X_i \) = Value of the \( i^{th} \) item \( x \), \( i = 1, 2, 3 \ldots n \), \( n \) = total Number of items

b) Standard Deviation

Standard Deviation is known as the root mean square deviation for the reason that it is the square root of the mean of the squared deviation from the arithmetic mean. It measures the absolute dispersion. Greater the standard deviation, greater will be the magnitude of the deviations of the values from their mean. A small Standard Deviation means a high degree of uniformity of the observation as well as homogeneity of a series. A large Standard Deviation means just the opposite. The Standard Deviation of a random variable \( X \) is defined as:

\[
\sigma = \sqrt{E((X - E(X))^2)} = \sqrt{E(X^2) - (E(X))^2} = \sqrt{\text{Var}(X)}
\]
Where,

\[ E(X) \] is the expected value of \( X \), and \( Var(X) \) is the variance of \( X \).

c) **Skewness**

Skewness is a measure of symmetry, or more precisely, the lack of symmetry. A distribution of a data set is symmetric if it looks the same to the left and right of the center point. Skewness, the third standardized moment, is written as \( \gamma_1 \) and defined as

\[
\gamma_1 = \frac{\mu_3}{\sigma^3}
\]

Where,

\[ \mu_3 \] is the third movement about the mean, and \( \sigma \) is the standard deviation

Skewness can be defined as the ratio of the third cumulant \( \kappa_3 \) and the third power of the square root of the second cumulant \( \kappa_2 \):

\[
\gamma_1 = \frac{\kappa_3}{\kappa_2^{3/2}}
\]

The Skewness for a normal distribution is zero, and any symmetric data should have skewness near zero. Negative values for the skewness indicate that data that are skewed left and positive values for the skewness indicate that data that are skewed right. By skewed left, we mean that the left tail is long relative to the right tail. Similarly, skewed right means that the right tail is long relative to the left tail. Some measurements have a lower bound and are skewed right. For example, in reliability studies, failure times cannot be negative.

d) **Kurtosis**

The fourth standardized moment is defined as

\[
\gamma_1 = \frac{\mu_4}{\sigma^4}
\]

Where,

\[ \mu_4 \] is the fourth movement about the mean, and \( \sigma \) is the standard deviation

Kurtosis is more commonly defined as the fourth cumulant divided by the square of the variance of the probability distribution.
The Jarque-Bera Test is a goodness-of-fit measure of departure from normality, based on the sample kurtosis and skewness. The test statistic $JB$ is defined as

$$JB = n/6(s^2 + (k-3)^2)/4$$

Where,

- $n$ = number of observations (or degrees of freedom in general)
- $S$ = sample skewness
- $K$ = sample kurtosis

Under the null hypothesis of a normal distribution, the Jarque-Bera Statistic is distributed with two degrees of freedom. The reported Probability is the probability that a Jarque-Bera statistic exceeds (in absolute value) the observed value under the Null Hypothesis—a small probability value leads to the rejection of the null hypothesis of a normal distribution.

The Kruskall-Wallis Test is a non-parametric test alternative to one-way (between group) ANOVA. The Kruskall-Wallis Test is employed for testing the equality of mean returns for different days of the week. It ranks the entire set of observations (i.e. higher the value, higher the rank and vice-versa) and then arranges them into $nj \times 5$ matrix where $nj$ represent the rank of the return and columns represent the day-of-the-week — Monday through Friday. The formula for calculating the Test Statistic ‘$H$’ is as under:

$$H = \frac{12}{N(N+1)} \sum_{j=1}^{5} \frac{R_j^2}{nj} - 3(n+1)$$

Where:

- $R_j$ = Sum of the Ranks in the $j$th Column
- $nj$ = Number of Cases in the $j$th Column, and
- $N$ = Sum of Observations in all the Columns
iv) Cross Correlation

Cross Correlation is a standard method of estimating the degree to which two series are correlated. To know the relationship between ratios, the following equation is used:

\[
r = \frac{n \left( \sum xy - \left( \sum x \right) \left( \sum y \right) \right)}{\sqrt{n \left( \sum x^2 - \left( \sum x \right)^2 \right) \left( \sum y^2 - \left( \sum y \right)^2 \right)}}
\]

Where,
\[N = \text{Number of observations}
\]
\[\sum x = \text{Dependent variables, and}
\]
\[\sum y = \text{Independent variables}
\]

v) Linear Regression Model

A standard methodology is initially employed to test the daily Seasonality, Month-of-the-Year Effect, Semi& Turn-of-the Month Effect and Holiday Effect in stock market adjusted returns by estimating the following regression formula.

\[
R_t = \alpha_t + \sum_{k=1}^{K} \delta_{kt} + \epsilon_t
\]

Where \(R_t\) is the logarithmic return of the market index; \(\alpha_t\) is the parameters; \(\epsilon_t\) is an error term; \(\delta_{kt}\) is dummy variables for daily, monthly, Semi& Turn of the month and holiday effect. For daily effect, \(K\), which is the maximum of \(K\) is 5, which corresponds to 5 trading days in a week. In this case, \(\delta_{kt} = 1\) if day \(t\) is a Monday, 0 otherwise, \(\delta_{kt} = 1\) Tuesday and 0 and so on. For monthly effect, \(K\) is 12, which corresponds to 12 months in a year. In this case, \(\delta_{kt} = 1\) if month \(t\) is January and zero otherwise, \(\delta_{kt} = 1\) for February and 0 otherwise, and so on.

vi) Unit Root Test

A Unit Root Test is designed to find out whether a time series variable is non-stationary. The most famous test is an Augmented Dickey-Fuller test. Another Test is the Phillips –Perron Test. Both these tests were used in this study to examine the existence of a unit root to test the null hypothesis.
a) Augmented Dickey-Fuller Test

An Augmented Dickey-Fuller Test (ADF) is an augmented version of the Dickey-Fuller test for a larger and more complicated set of time series models. The Augmented Dickey-Fuller (ADF) statistic, used in the test, is a negative number. The more negative it is, stronger the rejection of the hypothesis that there is a unit root at some level of confidence.

The testing procedure for the ADF Test is the same as for the Dickey-Fuller Test that is applied to the model.

\[ \Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \ldots + \delta_p \Delta y_{t-p} + \varepsilon_t \]

Where \( \alpha \) is a constant, \( \beta \) the coefficient on a time trend and \( p \) the lag order of the autoregressive process. Imposing the constraints \( \alpha = 0 \) and \( \beta = 0 \) corresponds to modeling a random walk and using the constraint \( \beta = 0 \) corresponds to modeling a random walk with a drift.

b) Phillip-Perron Test

Phillip-Perron Test is a non-parametric modification to the standard Dickey-Fuller t-statistic to account for the autocorrelation that may be present if the underlying DGP is not AR (1). Thus, ADF and PP Tests suffer from quite opposite problems. While the ADF Test does not suffer from as severe size distortions, it is not as powerful as the PP Test.

vii) Generalized Autoregressive Conditionally Heteroskedasticity (GARCH)

To get around the drawbacks with ARCH-type models, a more parsimonious model, that is less likely to breach the non-negativity constraint, was developed by Bollerslev (1986) and Taylor (1986). The ARCH-model is generalized to include, except for the squared error in the variance, previous own lags. The conditional GARCH-model, as it is called, both includes the squared errors in the variance, as in the ARCH, but also previous own conditional variance lags.

When including the fitted variance from the model during the previous period, a GARCH (1,1) is expressed as following

\[ \sigma^2_t = \alpha_0 + \alpha_1 u^2_{t-1} + \beta \sigma^2_{t-1} \]
The GARCH (1,1) is often used in empirical studies due to its sufficiency to capture volatility clustering in the data. The GARCH-models can be extended to include q lags of the squared error and p lags of the conditional variance. Rarely any higher order model is used in empirical studies. Also due to that, the GARCH (1, 1) only includes three variables, it is more parsimonious than the GARCH (p ,q)-model. The GARCH (p ,q) is expressed as follows

\[ \sigma^2_t = \alpha_0 + \alpha_1 u^2_{t-1} + \alpha_2 u^2_{t-2} + \ldots + \alpha_q u^2_{t-q} + \beta_1 \sigma^2_{t-1} + \beta_2 \sigma^2_{t-2} + \ldots + \beta_p \sigma^2_{t-p} \]

The past squared residuals capture high frequency effects, while the lagged variance captures long term influences. The GARCH Models are used to study Volatility of Index Returns during the study period.

Limitations of the Study

The following are the limitations of the present study covering two major stock exchanges, namely, NSE and BSE.

♣ The present study was restricted to Indian Capital Market alone and to only four indices belonging to two exchanges (BSE & NSE).

♣ This study was based mainly on secondary data.

♣ The CMIE is one of the agencies which have been publishing data on closing prices of all indices in the Indian Stock Market and this study used only the data from CMIE.

♣ This study used certain limited statistical tools which have certain inherent limitations.

♣ The study did not analyze the relationship between Week of the Month Effect and Monthly Effect.

♣ The study did not analyze the Quarterly Effect, Week of the Month Effect, Turn-of the Year Effect etc, due to time and money constraints.
Important Terms Used in the Study

Calendar Effect

Calendar Effects (sometimes less accurately described as ‘Seasonal Effects’) are cyclical anomalies in returns, where the cycle is based on the calendar. The most important calendar anomalies are the January Effect and the Weekend Effect.

Efficient-Market Hypothesis (EMH)

Efficient-Market Hypothesis (EMH) asserts that financial markets are "informationally efficient". That is, one cannot consistently achieve returns in excess of average market returns on a risk-adjusted basis, given the information publicly available at the time the investment is made.

Market Efficiency

“Efficient Market” is used to describe the market price that fully reflects all available information.

Day of the Week Effect

The most common case is the Monday Effect, meaning that the Monday’s Average Returns are significantly lower than the Other Days’ Average Returns.

January Effect

January Effect is the most studied pattern of Month of the Year Effect. It is established that the stock return in January is higher than that of Other Months of the Year.

Semi-Month Effect

The mean return of the First Half Month witnessed higher return than Rest of the Days of the Month.

Turn of the Month Effect

The tendency of stock prices to increase during the last two days and the first three days of each month, is called the Turn of the Month Effect.
**Holiday Effect**

Holiday Effect implies that the stock shows abnormally high return on days prior to holidays.

**Rolling Settlement System**

Rolling Settlement is a mechanism whereby trading done on a stock exchange is settled on T+X days. T is the Trade Day and if "X" is 5, settlement was on the 5th working day, excluding the T day.

**Tax Loss Selling Hypothesis**

March is the month in which income-tax is assessed and paid. Normally generating the required amount is an uphill task for the investors and they would sell the scrips before the Month of March to settle their tax dues. This could possibly create a bearish trend pushing the share prices down and the same is closely related to the Tax-Loss Selling Hypothesis. In April, the investors again start buying the shares.

**Volatility**

Volatility refers to the amount of uncertainty or risk about the size of changes in a security's value. A higher volatility means that a security's value can potentially be spread out over a larger range of values. This means that the price of the security can change dramatically over a short time period in either direction. A lower volatility means that a security's value does not fluctuate dramatically, but changes in value at a steady pace over a period of time.

**Stationarity**

A stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed.
Chapter Scheme of the Study
The present Study is organized into Eight Chapters.

Chapter-I: Introduction
The First Chapter begins with the introduction of market efficiency, definition and different forms of Efficient Market Hypothesis, implications of the EMH for optimal investment strategies, different time patterns, Market Efficiency Anomalies, Other Anomalies, and the Rolling Settlement System.

Chapter-II: Review of Literature and Research Design
The reviews of previous studies in Calendar Anomalies and Seasonality in Market and research design are presented in the Second Chapter. The Research Design of the Study covers the Statement of the Problem, Need of the Study, Objectives of the Study, Hypotheses of the Study, Sample Selection, Period of the Study, Sources of Data, Tools used for Analysis, Limitations of the Study and Chapter Scheme.

Chapter-III: Analysis of the Day of the Week Effect
The analysis (year wise as well as whole study period) of Descriptive Statistics, Kruskall- Wallis Test, Analysis of Cross-Correlation and OLS Regression Model are provided in the Third Chapter.

Chapter-IV: Analysis of the Monthly Effect
The Fourth Chapter discusses the analysis of Descriptive Statistics, Kruskall- Wallis Test, Cross-Correlation and OLS Regression Model (year wise as well as the whole study period).

Chapter-V: Analysis of Semi-Month and Turn of the Month Effect in Indian Stock Market
The results (year wise as well as the whole study period) of Descriptive Statistics and Analysis of OLS Regression Model for Semi-Month and Turn of the Month returns are shown in the Fifth Chapter.
Chapter-VI: Analysis of the Holiday Effect
The Sixth Chapter focuses on the Analysis of Holiday Returns by using Descriptive Statistics, and OLS Regression Model.

Chapter-VII: Analysis of the Stationarity and Volatility of Indian Stock Market
The Performance of ADF Test and analysis of Volatility using GARCH (1,1) Model are given in the Seventh Chapter.

Chapter-VIII: Summary of Findings, Suggestions and Conclusion
The Last Chapter covers the important findings, suggestions and conclusion of the Study.

Scope for Further Research
The Scope for Further Research is summarized below.

1. A study, with similar objectives, could be made with reference to other types of stock indices.
2. A study, with similar objectives, could be made from time to time.
3. A study, with similar objectives, could be made with reference to Spot, Futures, and Commodity and Derivative Markets.
4. A comparative study could be made before and after the introduction of Compulsory Rolling Settlement System.
5. A study could be made with Other Calendar Effects like Week of the Month Effect, Month of the Quarter Effects, Turn of the Year Effect, Summer Effect, Hour of the Day Effect etc.,
6. A study may be conducted to investigate the Calendar Effect of the Trading Days across the individual securities.
7. A comparative study, with similar objectives, could be made to study the in-between ideas of Indian Stock Market and indices of other Stock Markets like Dow Jones Industrial Average, NYSE, etc.,
8. A study, with similar objectives, could be made on Sectoral Indices like Automobile, IT, FMCG, Metal etc.,
9. A study could be made to analyze the Seasonality Effect on Exchange Rate and ETF etc.,
10. Similar study could be made for a longer study period, say 10years/ 20 years.