An Empirical Study on Seasonal Analysis in the Indian Stock Market

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Abstract
The presence of the Seasonal or Monthly Effect in stock returns has been reported in several developed and emerging stock markets. This study investigates the existence of seasonality in India's stock market. The Efficient Market Hypothesis suggests that all securities are priced efficiently to fully reflect all the information intrinsic in the asset. The Seasonal Effects create higher or lower returns depending on the Time Series. They are called Anomalies because they cannot be explained by traditional asset pricing models. Examples of such patterns include e.g. the January Effect, the Day-of-the Week Effect and the Week of the Month Effect etc. Studies on the Seasonal Effects in the Indian Stock Market are limited. In an attempt to fill this gap, this study explores the Indian Stock Market's Efficiency in the 'weak form' in the context of Seasonal Effects. The objective of this paper is to explore the Seasonal Effect on the Indian Stock Market. For the purpose this analysis BSE Sensex index was chosen for a period of ten years from 1st April 2000 to 31st March 2010. The study found that the Day of the Week Effect and Monthly Effect Pattern did not appear to exist in the Indian Stock Market during the study period.

Keywords
Calendar Anomalies, Day-of-the Week Effect, Efficient Market Hypothesis, Indian Stock Market, Monthly Effect.

I. Introduction

Seasonality refers to regular and repetitive fluctuation in a Time Series which occurs periodically over a span of less than a year. The main cause of seasonal variations in time series data is the change in climate. For example, sales of woolen clothes generally increase in winter season. Besides this, customs and tradition also affect economic variables for instance sales of gold increase during marriage seasons. Similarly, stock returns exhibits systematic patterns at certain times of the day, week or month. The most common of these are Monthly Patterns. Certain Months provide better returns as compared to others i.e. the Month of the Year Effect. Similarly, some Days of the Week provide lower returns as compared to other trading days i.e. Days of the Week Effect. The existence of Seasonality in stock returns, however, violates an important hypothesis in finance called the Efficient Market Hypothesis (EMH). The Efficient Market Hypothesis is a central paradigm in finance. New Data constantly enter the market place via Economic Reports, Company Announcements, Political Statements, and or Public Surveys. If the market is Informationally Efficient then security prices adjust rapidly and accurately to new information. According to EMH, THE security prices reflect fully all the information that is available in the market. Since all the information is already incorporated in prices, a trader cannot make any excess returns. Thus, EMH proposes that it is not possible to outperform the market through Market Timing or Stock Selection.

The presence of Seasonality in stock returns violates the weak form of market efficiency because equity prices are no longer random and can be predicted based on past pattern. This facilitates market participants to devise trading strategy which could fetch abnormal profits on the basis of past pattern. For instance, if there are evidences of 'Day of the Week Effect', investors may devise a trading strategy of selling securities on Fridays and buying on Mondays in order to make excess profits. Aggarwal and Tandon (1994) and Mills and Coutts (1995) pointed out that mean stock returns were unusually high on Fridays and low on Mondays.

II. Review of literature

A brief review of select studies has been presented here to identify research gap and understand methodologies employed in the research area of Calendar Anomalies. Amanulla.S and Thiripalraju (2001), found that there was consistent positive returns on Wednesdays and negative returns on Tuesdays due to possible impact of the Week End Effect. Chotigcat .T and Pandey I M. (2005) investigated the Monthly Effect on stock returns for the stock market in India and Malaysia. This study empirically confirmed the existence of Seasonality in stock returns in both capital markets. The study suggested that the Indian Stock Market would move in the direction of higher level of efficiency and the investors would earn returns commensurate with risk. Hareesh Kumar.V and 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. Ushad Subadar Agathee (2008) found the average returns of Stock Exchange of Mauritius (SEM) to be the lowest in the Month of March and Highest in the Month of June. The equality of means-return tests shows that returns were statistically the same across all months. The regression analysis reveals that returns were not independent of the Months of the Year, except for January. Selvarani.M and Leena Jenefa (2009) analyzed the trends in annual returns and daily returns. A set of parametric and non-parametric tests were employed to test the equality of mean returns and standard deviations of the returns. It was found that in the NSE, there was strong evidence of April and January Effect. After the introduction of the Rolling Settlement, Friday had become significant. As far as the Day Effect was concerned, Tuesday Effect was more prevalent than Monday Effect. Nageswari.P and 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 period. Nageswari .P and Selvam .M (2011) 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 period

The above literature provides an overview of Valuation of Seasonality Effects in various Stock Markets. An attempt has been made in this study to analyze the Stock Market Seasonality in India by taking the model from the above study.

III. Statement of the Problem

An efficient stock market can instantaneously process the information and it will be reflected on security prices. This Information Transmission Mechanism ensures that the stock returns across all Days of the Weeks and Months are equal. Hence the market participant, 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 that there are variations in volatility of stock returns by the Day-of-the Week, Month of the Year, Semi-Month. Besides, a high (low) return is associated with a correspondingly high (low) volatility for a given day. 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. 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 were not in agreement with each other. It is against this background, an attempt has been made in this study to examine Seasonal Analysis in the Indian Stock Market afresh so as to remove the ambiguity in results, if any.

IV. Need of the Present Study

The capital flows are taking place on a massive scale to India in order to capitalize the promising profitable opportunities. The 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 investors, traders and arbitrageurs who could formulate profitable trading strategies if they were able to predict the share price behavior with full information on these anomalies. The share price behavior in one market spreads slowly to the other developing and developed markets. Since the presence of Calendar Anomalies in these markets was proven, these anomalies should be investigated in India. Such detailed investigation of the Seasonal Anomalies like Day-of-the Week Effect, and Monthly Effect in the Indian Markets would help the international and Indian investors to plan their investment. The periodical study of this nature is of use to all types of users, including market participants.

V. Objectives of the study

The following are the objectives of the present study

- To examine whether the Day of the Week Pattern still exists in Indian Stock Markets.
- To identify the Presence of Monthly Effect in Indian Stock Markets.

A. Hypotheses of the Study

The present study tested the following Null Hypothesis

NH1- There is no significant difference in the returns among Different Trading Days of the week.

NH2- There is no significant difference in the returns among the Different Months of the Year.

B. Methodology of the Study

1. Sample Selection

For the purpose of this study BSE Sensex Index considered to study the Stock Market in India. Sensex is the value-weighted index of the companies listed on the stock exchange. Bombay Stock Exchange (BSE) came out in 1986, with a stock index that subsequently became the Barometer of the Indian Stock Market. Besides, it considered to be the best indicators of the performance of the whole economy.

2. Sources of Data

The required information for the present study were the daily closing prices of BSE Sensex Index and they were collected from the Prowess, which is a corporate database maintained by CMIE.

3. Period of the Study

The present study covered a Period of Ten Years from 1st April 2000 to31st March 2010.

VI. Tools Used for Analysis

In this study, independence of return series was investigated for BSE Sensex Index and the returns were calculated as follows.

i) Returns

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

$$R_t = \ln (I_t/It\text{-}1)*100$$

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

In this part, Statistics of the Daily Return, Standard Deviation, Skewness, Kurtosis and Jerque-Bera were used for the purpose of analysis.

iii) Kruskall-Wallis Test

The Kruskall-Wallis Test is employed for testing the equality of mean returns among different months of the year. The formula for calculating the Test Statistic 'H' is as under:

$$H = \frac{12}{N(N+1)} X \sum_{nj}^{R2\,j} - 3(n-1)$$

Where,

R_j = Sum of the Ranks in the j_{th} Column, n_j = Number of Cases in the j_{th} Column, and

N= Sum of Observations in all the Columns

iv) Linear Regression Model

According to the Day of the Week Effect, some systemic patterns in the stock returns depending on the day could be noticed. To examine whether there exists any Day of the Week Effect, the following mode was employed:

$$R_{it} = \alpha_{1i} D_{1t} + \alpha_{2i} D_{2t} + \alpha_{3i} D_{3t} + \alpha_{4i} D_{4t} + \alpha_{5i} D_{5t} + V_{it}$$

In the model, R_{it} is the return of the index on day t, D_{1t} is a dummy variable for Monday taking the value of 1 for all Monday observations and zero otherwise. D_{2t} is a dummy variable for Tuesday taking the value of 1 for all Tuesday observation and

zero otherwise and so on.

The α is the coefficient that is estimated for each day of the week from Monday to Friday. V_{it} is the disturbance term.

Similarly for testing the monthly patterns, constructed almost an identical model. This model has been used by Mehdian and Perry (2001). Therefore, we employ the following regression was employed.

$R_{it} = \alpha_{1i} D_1 + \alpha_{2i} D_2 + \alpha_{3i} D_3 +,..., \alpha_{10} i D_{10} + \alpha_{11} i D_{11} + \alpha_{12} i D_{12} + V_{it}$

where Rit is the monthly return of the index i as defined earlier in equation 1, D_1 through D_{12} are dummy variables for each month of the year such that D_1 takes a value of 1 for all January observations and zero otherwise and so on. The coefficients from α_1 through α_{12} are estimates of the return for each month from January through December. V_{it} is the disturbance term.

VII. Analysis of Stock Market Seasonality

For the purpose of this study, the following analysis was made as given below,

A. Analysis of Day of the week Effect for BSE Sensex Index Returns

- Analysis of Descriptive Statistics
- Analysis of Kruskall-Wallis Test
- Analysis of OLS Regression Model

B. Analysis of Monthly Effect for BSE Sensex Index Returns

- Analysis of Descriptive Statistics
- Analysis of Kruskall-Wallis Test
- Analysis of OLS Regression Model

A. Analysis of Day of the week Effect for BSE Sensex Index Returns

1. Analysis of Descriptive Statistics for BSE Sensex Index Returns

Table-1 describes the Descriptive Statistics of Standard Deviation, Skewness, Kurtosis and Jarque Bera Test for BSE Sensex Daily Returns for the study period from April 2000 to March 2010. It is understood that the BSE Sensex Index earned the maximum daily mean return of 0.1179 on Wednesday, with a Standard Deviation of 1.6357. There was negative mean return recorded on Monday during the study period. The Highest Value of Standard Deviation (2.0556) was recorded on Monday and the Least Value of Standard Deviation (1.5691) was recorded on Thursday. This clearly indicates that the market was more volatile on Monday and least volatile on Thursday during the study period. The kurtosis measure of return distribution was Leptokurtic for all days of the week, showing the Highest Value (12.98) on Monday. The return distribution is Positively Skewed for Monday and Negatively Skewed for other trading days of the week. The Coefficient Value of Jerque-Bera Test was Significant at 1 percent level for all trading days, which implies that the returns were asymmetric and did not conform to normal distribution during the study period.

2. Analysis of Kruskall-Wallis Test of BSE Sensex Index

The Analysis of Kruskall-Wallis Test for BSE Sensex Index from April 2000 to March 2010 is given in Table 2. The Kruskall-Wallis Statistics of 0.723 was very lower than the Table Value of 9.49 at 5% level of significance for 4 degrees of freedom. Hence the Null Hypothesis "There is no significant difference in the mean returns among the trading days of the week", cannot be rejected. In other words, the Day of the Week Pattern did not exist in the BSE Sensex.

3. Analysis of OLS Regressions Model to Test Seasonality

Table-3 presents the Results of Regression Model to test Seasonality from April 2000 to March 2010. From the above Table, it is clearly observed that only one variable (Thursday) recorded Positive Coefficient Value for Thursday and other variables recorded Negative Coefficient Value during the study period. But none of the coefficients were significant at conventional levels of significance indicating that there was no Day of the Week Effects in the Sensex Returns. The value of Adjusted R2 (0.0070) was low, and F-Statistic indicates that the overall fit of the model was poor. Further, Durban-Watson Statistic Value of 2.14 indicates autocorrelation in the residuals. The insignificant F –value did not confirm Seasonality during the study period.

B. Analysis of Monthly Effect for BSE Sensex Index Daily Returns

1. Analysis of Descriptive Statistics for BSE Sensex Index

Table 4 shows the Results of Descriptive Statistics of month wise daily returns for BSE Sensex Index during the study period from 1st April 2000 to 31st March 2010. The above Table clearly indicates that there was the Highest Mean Return (0.2512) recorded in November. It is to be noted that months of January, February, March and October registered Negative Mean Returns. The possible reason for this is that January, February and March were the months during which income-tax are generally assessed and paid. Hence investors normally sell the scrips during the months of January, February and March 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, investors may again start buying the shares. The April puts the upward pressure that provided higher return in the month of April. It is also found from the analysis above Table that Months of November and December witnessed reasonably high returns. Therefore, logically, logically, if investors want to sell their holdings, these Two Months (November and December) could be considered as the best period.

The Highest Value (2.3586) and the Lowest Value (1.2840) of Standard Deviation were recorded in the Months of May and August respectively. This indicates that the market (BSE) was more volatile in the Month of May and least volatile in the Month of August during the study period. Investors are advised keep this in their mind before investing. According to the analysis of skewness the month wise return distribution was positively skewed for the month of May, June and December and negatively skewed for the remaining months. The peak of the return distribution was leptokurtic for all months of the year and highest (15.62) for the month of May. Jarque- Bera test shows that the series are normally distributed, is rejected at 1% significance level. The reason for non-normality could be the high kurtosis.

2. Analysis of Kruskall-Wallis Test for BSE Sensex Index

Analysis of Kruskall-Wallis test for BSE Sensex Index is presented in Table 7. According to the analysis of above Table

the Kruskall-Wallis test Statistic of 12.413 was lower than the Table Value of 19.67 at 5% level of significance for 11 degrees of freedom. It indicates that there was no significant difference between the returns of different months of the year. So, the null hypothesis "that there is no difference in the mean returns among the months" has been accepted. In other words, the monthly effects did not exist for BSE Sensex Index during the study period.

3. Analysis of OLS Regression Model for BSE Sensex Index

The results of the regression analysis for BSE Sensex Index based month wise Returns during the study period from April 2000 to March 2010 demonstrated in Table- 8. It is to be noted from the analysis that there was negative coefficient value earned for the month of January, March, May, July, September and December while the positive coefficient value has been earned for the remaining months. The coefficients in August seem to be high and statistically insignificant at 5% risk level. The study found that none of the coefficients is significant. R2 of -0.0111 is negative, and the insignificant F-statistic suggests poor model fit. Durbin- Watson statistic of less than 2 indicates serial correlation in the residuals. It clearly shows that there was no significant difference between the returns of different months of the year. So, the null hypothesis cannot be rejected for the reason did not able to confirm the monthly anomalies in BSE Sensex Index during the sample period.

VIII. Summary of Findings and Suggestions of the Study

The following are important findings and suggestions of the study

- The study found that the BSE Sensex index earned maximum daily mean return of 0.1179 on Wednesday, and negative mean return recorded on Monday during the study period. Therefore, it is suggested that the investors would yield good returns on Wednesday.
- So, it is advised that the investors should buy the shares on Monday and sell these shares on Wednesday in the Bombay Stock Market.
- The study also found that the highest value of standard deviation was recorded on Monday and least value of standard deviation on Thursday. This indicates that the Indian stock market was more volatile on Monday and least volatile on Thursday during the study period.
- The Kruskall-Wallis Test Statistic value was lower than the Table Value, which clearly indicate that day of the week pattern did not appear to exist for BSE Sensex Index.
- During the study period, the kurtosis measure of return distribution was leptokurtic for all days of the week, but the highest (12.98) being on Monday.
- It is to be noted that the return distribution is positively skewed for Monday and negatively skewed for remaining trading days of the week (Tuesday, Wednesday, Thursday and Friday).
- The OLS Regression analysis reveals that only one variable recorded positive coefficient value for Thursday and other variables recorded negative coefficient value during the study period.
- The none of the coefficients were significant at 5 percent level which indicates that there is no weekend effect in Sensex returns during the study period.
- The returns of month wise analysis revealed the fact that there was a highest mean return recorded for the month of November (0.2512) and negative mean returns recorded for the month of January, February, March and October.
- The study found that the months of November and December offer reasonably high returns. So, it is advised that the investors want to sell their holdings, these two months could be considered as the best period.
- The Study provides evidence that the market was not able to price the risk appropriately as higher returns were possible by taking less risk and this indicates market inefficiency. So the market regulators should make appropriate steps to stabilize the volatility for the benefits of long term and small investors.
- The highest value (2.3586) and lowest value (1.2840) of Standard Deviation has been recorded in the month of May and August respectively. This found that the market (BSE) was more volatile in the month of May and least volatile in the month of August.
- According to the analysis of skewness the month wise return distribution was positively skewed for the month of May, June and December and negatively skewed for the remaining months.
- The peak of the return distribution was leptokurtic for all months of the year and highest (15.62) for the month of May. Jarque- Bera test shows that the series are not normally distributed. The reason for non-normality could be the high kurtosis.
- The Kruskall-Wallis test Statistic of 12.413 was lower than the Table Value of 19.67 at 5% level of significance for 11 degrees of freedom. It indicates that there was no significant difference between the returns of different months of the year.
- The returns of month wise analysis found that that there was negative coefficient value earned for the month of January, March, May, July, September and December while the positive coefficient value has been earned for the remaining months. The coefficients in August seem to be high and statistically insignificant at 5% risk level.
- It clearly indicates that the monthly effect did not exist in the Bombay Stock market during the study period.

IX. Conclusion

The present study investigated the existence of seasonality effect on stock returns for BSE Sensex index. The study analyzes the day of the week effect and monthly effect in BSE Sensex index returns for the period from 1st April 2000 to31st March 2010. The study found that there was maximum return earned on Wednesday and negative returns recorded on Monday during the study period. The regression results confirmed the seasonal effect does not exist in stock returns in India. The study further reveal that January, February and March have negative returns but are the best months to buy the scrips (buy low) and November and December show significant positive high returns goading us to conclude that these two months are the best period to sell the securities (sell high). Tax-loss selling hypothesis could be the possible explanations for the above phenomenon. The returns in the stock market are not independent across different trading days of the week. The Study also provides evidence that the market was not able to price the risk appropriately as higher returns were possible by taking less risk and this indicates market inefficiency. The Study found out that the day of the week effect and monthly effect pattern

did not appear to exist in Indian Stock Market. The findings of this study would possibly help in understanding and explaining such seasonality for the Indian stock markets. These findings have important implications for financial managers, financial analysts and investors. The understanding of seasonality should help them to develop appropriate investment strategies.

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Table 1 : Results of Descriptive Statistics for BSE Sensex Index from 1st April 2000 to 31st March 2010

Statistics	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	-0.0243	0.0592	0.1179	0.0293	0.0573
Std. Dev.	2.0556	1.6229	1.6357	1.5691	1.9059
Skewness	0.1928	-0.2911	-0.0661	-0.2602	-0.5767
Kurtosis	12.9803	6.8206	5.1840	5.1696	7.4231
Jarque-Bera	2061.58	309.291	100.13	103.29	424.84
Probability	0	0	0	0	0
Observations	496	497	502	498	488

Source: Computed from PROWESS

Table 2 : Results of Kruskall-Wallis Test for BSE Sensex Index from 1st April 2000 to 31st March 2010

Test Statistics	Degrees of freedom	Significant level	Table Value
H. value: 0.7234	N-1 - 4	1%	1% - 13.277
Asy.Sig.: 0.9484	N=5	5%	5% - 9.488

Source: Computed from PROWESS.

Table 3 : Result of Linear Regression Analysis for BSE Sensex Index from 1st April 2000 to 31st March 2010

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Monday	-0.0091	0.0938	-0.0971	0.9227
Tuesday	-0.0923	0.0575	-1.6050	0.1091
Wednesday	-0.1127	0.0575	-1.9580	0.0508
Thursday	0.0720	0.0598	1.2037	0.2293
Friday	-0.0001	0.0493	-0.0027	0.9978
Adjusted R-squared	0.0070	F-statistic		1.8602
Durbin-Watson stat	2.1367	Prob(F-statistic)		0.1162

Source: Computed from PROWESS.

Table 4 : Analysis of Descriptive Statistics for BSE Sensex Index from 1st April 2000 to 31st March 2010

Month	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Observations
January	-0.0582	1.7246	-0.4459	6.6875	125.941	0.0000	210
February	-0.0077	1.4729	-0.2850	4.3022	16.502	0.0003	196
March	-0.0881	1.8756	-0.3411	4.5491	24.594	0.0000	206
April	0.0881	1.9162	-0.3279	5.0053	35.796	0.0000	193
May	0.0004	2.3586	0.7291	15.6155	1431.328	0.0000	213
June	0.0364	1.6714	0.0649	4.2346	13.870	0.0010	216
July	0.0798	1.7606	-0.3112	4.7795	32.580	0.0000	220
August	0.1434	1.2840	-0.4452	4.3218	22.544	0.0000	213
September	0.0361	1.6769	-0.6736	5.0159	50.704	0.0000	207
October	-0.0950	2.1304	-0.6098	8.5920	283.897	0.0000	208
November	0.2512	1.6258	-0.2675	5.9243	74.751	0.0000	203
December	0.2140	1.3573	0.0640	4.8112	28.571	0.0000	208

Source: Computed from PROWESS

Table 5 : Results of Kruskall-Wallis Test for BSE Sensex Index from 1st April 2000 to 31st March 2010

Test Statistics	Degrees of freedom	Significant level	Table Value
H. value - 12.413	N-1 - 11	1%	24.725
Asy.Sig - 0.333	N=12	5%	19.675

Source: Computed from PROWESS.

Table 6 : Results of the Linear Regression Analysis for BSE Sensex Index from 1st April 2000 to 31st March 2010

Variable	Coefficient	Std. Error	t-Statistic	Prob.
January	-0.04525	0.134374	-0.33677	0.7367
February	0.001718	0.092418	0.018591	0.9852
March	-0.04741	0.069144	-0.68572	0.4938
April	0.044094	0.068855	0.64039	0.5227
May	-0.01305	0.064752	-0.20158	0.8405
June	0.031173	0.080297	0.388216	0.6983
July	-0.08044	0.078749	-1.02141	0.3084
August	0.118991	0.107751	1.104316	0.2709
September	-0.01445	0.07552	-0.19137	0.8485
October	0.067489	0.059748	1.129559	0.2602
November	0.105566	0.080048	1.318783	0.1889
December	-0.13067	0.095878	-1.36289	0.1746
F-statistic	0.807089		Durbin-Watson Stat	1.801371
Prob(F-statistic)	0.632924		Adjusted R2	-0.01118

Source: Computed from PROWESS.