

Calendar Anomalies in BSE Sensex Index Returns in Post Rolling Settlement Period

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Abstract Calendar Anomalies in the stock market are those patterns that cannot be explained by traditional asset pricing models. Examples of such patterns include the January Effect, the Day-of-the-Week Effect, and the Week of the Month Effects. These anomalies allow investors to develop trading strategies to earn abnormal profits. Recent liberalization policies have led to significant capital flows from investors into India seeking to capitalize on promising and profitable business opportunities. The results of this study will be useful to such investors, traders, and arbitrageurs who can formulate profitable trading strategies to capitalize on calendar anomalies. The Securities and Exchange Board of India (SEBI) introduced the Compulsory Rolling Settlement System for stocks on January 02, 2002. This was expected to boost liquidity and thereby reduce the market risk of stocks to a considerable extent. The introduction of Rolling Settlement was also expected to lead to higher equity turnover and thereby potentially impact the anomalous behavior of stock prices. In this context, the study provides further evidence on the anomalous behavior of stocks in the Indian Stock Market during the Post Rolling Settlement Period from April 2002 to March 2010. The post rolling settlement testing period distinguishes this study from other contemporaneous studies on anomalous behavior of stocks in the Indian stock market that have overlapped both the pre and post rolling settlement period (7 & 16) and thereby provides a more robust basis for drawing conclusions.

Keywords BSE Sensex Index, Calendar Anomalies, Post Rolling Settlement Period, Weekday Effect, Month Effect, Holiday Effect

1. Introduction

Calendar Anomalies in the stock market are those patterns that cannot be explained by traditional asset pricing models. Examples of such patterns include the January Effect, the Day-of-the-Week Effect, and the Week of the Month Effects.

Stock market anomalies allow investors to develop trading strategies to earn abnormal profits. Recent liberalization policies have led to significant capital flows into India seeking to capitalize on promising and profitable business opportunities. However, potential international investors are concerned with market efficiency, timing of investment, and market integration of the Indian stock market with other developed countries. The results of this study adds to the body of research that will be useful to domestic and foreign investors, traders, and arbitrageurs who can formulate profitable trading strategies to capitalize on any potential calendar anomalies.

Studies on stock market anomalies in the Indian Stock Market are sparse[16]. Data availability has been a major

constraint in conducting such studies in India. However, there have been a few recent studies documenting on some stock market anomalies in the Indian Stock Market. Chandra [7] confirmed turn-of-the-month and time-of-the month effect for the BSE Sensex index during the 1998-2007 time period. Patel[16] confirmed the months of November and December had the highest returns (month effect) during the 1999-2007 time period and the returns for the months for March-May were lower than the other nine months of the year. Bodla and Jindal[5] examined the month effect in the Indian stock market utilizing the S&P CNX Nifty Index for the period 1998-2005. However, they were unable to find any significant differences among individual months.

The Securities and Exchange Board of India (SEBI) introduced the Compulsory Rolling Settlement System for stocks on January 02, 2002 and thereby also reduced the settlement period to T+3 days. Rolling Settlement is a mechanism whereby trading done on a stock exchange is settled in T+X days. T is defined as the Trade Day and, if "X" is 3, settlement will be done by the 3rd working day excluding the Trade day. Rolling Settlement was expected to boost liquidity and equity turnover and thereby reduce the market risk of stocks to a considerable extent. The introduction of Compulsory Rolling Settlement was also expected to lead to higher equity turnover and thereby

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potentially impact the anomalous behavior of stock prices[17]. In this context, this study provides further evidence on the anomalous behavior of stocks in the Indian Stock Market during the Post Compulsory Rolling Settlement Period from April 2002 to March 2010. The post compulsory rolling testing period distinguishes this study from other contemporaneous studies on anomalous behavior of stocks in the Indian stock market and thereby provides a more robust basis for drawing conclusions. The results of this study also contributes to the growing body of research on Indian stock markets that is necessary to attract long term capital inflows into India and propel the Indian economy to realize its full potential and seek its rightful place in the world economic order.

The calendar anomalies that are the focus of this study include Day of the Week Effect, Month Effect, Semi-Month Effect, and the Holiday Effect. The most commonly studied day of the week effect is the Monday Effect, meaning that the Monday's average returns are significantly lower than the other days' average returns. January Effect is the most studied pattern of Month of the Year Effect. Many studies have found that stock returns in January are higher than that of other months of the year. The Semi-Month Effect postulates that the mean return for the first half of the month is higher than the second half of the month. Holiday Effect hypothesizes that stocks show abnormally high returns on days prior to holidays.

The remainder of the paper is organized as follows. The next section discusses the methodology that includes development of the null hypotheses, sample selection, data sources, data variables, and the statistical models used for testing. We then discuss our empirical results and the concluding section summarizes the major findings of our paper.

2. Methodology

Hypothesis Development

The following Null Hypotheses are developed and tested in this study:

NH₁: There is no significant difference in mean daily returns between the trading days in a week.

NH₂: There is no significant difference in mean returns across all months of the year.

NH₃: There is no significant difference between the returns of first half month and rest of the days of the month.

NH₄: There is no significant difference in returns among the pre, post holidays, and weekdays.

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 twenty-four indices in Bombay Stock Exchange (BSE). The most widely followed BSE Sensex index is the focus of this study. BSE Sensex, constituted in 1986, is the value-weighted index of the companies listed on the stock exchange and subsequently became the barometer of the Indian Stock Market.

Data Sources

The required data on closing prices were collected from PROWESS, a corporate database maintained by CMIE and website of BSE (www.bseindia.com). The other relevant information for this study was collected from different websites, journals, and books.

Time Period

The Securities and Exchange Board of India (SEBI) introduced the Compulsory Rolling Settlement System for stocks on January 02, 2002. This was expected to enhance liquidity for investors through reduced settlement period and also lead to higher equity turnover. Studies on anomalous behavior of stock prices in India have focused on shorter testing periods. In order to generate more robust results covering a longer testing period, the study covers a period of 8 years from 1st April 2002 to 31st March 2010 (i.e. Post Rolling Settlement Period).

Sample Variable: Index Return

The daily returns for the index series is computed as follows:

$$R_t = \ln \left[\frac{I_t}{I_{t-1}} \right] * 100$$

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).

Kruskall-Wallis Test for testing Equality of Mean Returns

The Kruskal-Wallis Test is used for testing the equality of mean returns for different days of the week and the equality of month wise mean returns. The entire set of observations are ranked (i.e. higher the value, higher the rank) and then re-arranged into a $n_j \times 5$ matrix where n_j represent the rank of the return and columns represent the day-of-the-week — Monday through Friday. The same process is repeated for testing the equality of month wise mean returns. The Test Statistic ' H ' is calculated as:

$$H = \frac{12}{N(N+1)} X \sum_{j=1}^5 \frac{R2j}{n_j} - 3(n+1)$$

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

Cross-Correlation Test

The cross correlation for the index returns in testing various hypotheses is computed using the following model:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{n(\sum x^2 - (\sum x)^2)(n\sum y - (\sum y)^2)}}$$

Where,

N = Number of observations

$\sum x$ = Dependent variable, and

$\sum y$ = Independent variable

Regression Model for Hypothesis Testing

The following regression model is employed to test the Daily Returns Effect, Month-of-the-Year Effect, Semi& Turn-of-the Month Effect and Holiday Effect in stock market adjusted returns.

$$R_t = \sum_{K=1}^K \alpha_t \delta_{kt} + \varepsilon_t$$

Where R_t is the logarithmic return of the market index; α_t is the regression parameter; ε_t is an error term; δ_{kt} is dummy variables for daily, monthly, Semi& Turn of the month and holiday effect. For daily effect, 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 otherwise 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.

3. Results

Analysis of BSE Sensex Daily Returns

The descriptive statistics for the daily data, for the study period from April 2002 to March 2010, is provided in Table 2. It shows that the mean daily returns of BSE Sensex Index were positive for all trading days, and were higher (0.1619) on Friday and lower (0.0169) on Monday. This seems to support the day of the week effect documented in other studies in that the returns are the lowest on Monday after the market digests all potential negative information released over the weekend. The Standard Deviation of Returns was the highest (2.0891) on Monday and the lowest (1.5495) on Thursday. Chart 1 describes the average daily returns of BSE Sensex Index for the period from April 2002 to March 2010.

The Kruskal-Wallis test for BSE Sensex Index Daily Returns, for the period from April 2002 to March 2010, is given in Table 3. The Kruskal-Wallis statistics value of 9.8501 was higher than the table value of 9.49 at 5% level of significance only in 2003-04, indicating there was a significant difference between the returns of different trading days of the week only for that particular year. There was statistically no significant difference in mean daily returns for other years during the study period.

The results of Cross Correlation test for BSE Sensex Index Daily Returns, for the period from April 2002 to March 2010, are provided in Table 4. It is observed that during the trading days of the week, the Correlation Coefficient between Tuesday and Wednesday was -0.1705 and significant at 1% level. The results also show that there was negative correlation between Monday-Tuesday and Tuesday – Thursday and positive correlation between returns of other trading days of the week during the study period.

The Regression Results of BSE Sensex Index Daily Returns, for the study period from April 2002 to March 2010, are presented in Table 5. It is noted that none of the coefficients are significant at 5% level for Day of the Week Effect in BSE Sensex Index Daily Returns during the study period. The value of the R^2 was 0.0008. The F-statistic indicates that the overall fit of the model was poor. It is found that there was no statistically significant Day of the Week Pattern in stock returns during the study period. Therefore, the Null Hypothesis (H_0), “There is no significant difference among the returns of different trading days of the week,” cannot be rejected.

Analysis of BSE Sensex Index (Month wise Daily Returns)

The Descriptive Statistics for BSE Sensex Index month wise daily returns, for the study period from 1st April 2002 to 31st March 2010, are presented in Table 6. The results show that the highest mean return (0.2718) was recorded in December with the lowest value (1.3443) for standard deviation. The months of January, February and October witnessed negative mean returns. This shows that the popular “January Effect” was not evident during the study period. The possible reason for the negative return in February could be that investors sell poorly performing stocks before the month of March for tax purposes and also raise money to settle their tax dues. However, the month of April witnessed positive returns and could be the result of the end of tax loss selling as the tax assessment period end on March 31 every year. It is also found that months of November and December recorded high returns. Most companies in India pay a bonus to employees in the months of November and December coinciding with major festivals such as Diwali, Ramzan, and Christmas and some of these bonuses are presumably invested in the stock market. These results are consistent with other recent studies (2 & 16). The average month wise returns for BSE Sensex Index during the study period from April 2002 to March 2010 are exhibited in Chart 2.

The results for the Kruskal-Wallis Test for BSE Sensex monthly returns are presented in Table 7. The Kruskal - Wallis test statistic value was lower than the table value of 19.67 at 5% level of significance. It indicates that there was no significant difference between the returns of different months of the year. In other words, the Monthly Effect did not exist for BSE Sensex Returns during the study period.

The Results of Cross Correlation Test for BSE Sensex Index monthly returns are presented in Table 8. The correlation coefficient was highest in the months of

July-October (0.3319), followed by February-December (0.2384), September-November (0.2353) and February - October (0.2184) and was significant at 1% level. The results also indicate that there was significant negative correlation between the returns of January-September and June-July at -0.1625, and -0.1921 respectively, and they were significant at the 5% level.

The Regression results for the BSE Sensex index month wise returns are presented in Table 9. It is noted that the coefficient in December was positive and significant at 5% level. For other months, returns were not significant at 5% level. Based on the F-Statistic, the Null Hypothesis (NH₃), "There is no significant difference among month wise returns," cannot be rejected.

Analysis of Semi-Month Wise Daily Returns for BSE Sensex Index

The descriptive statistics for semi-month wise BSE Sensex Index Daily Returns, from April 2002 to March 2010, are presented in Table 10. The results indicate that the highest mean return (0.1167) was recorded in the first half month. This could be as a result of the corporate sector announcing positive information during the first half month period. The average semi-month Returns for BSE Sensex Index Returns from 1st April 2002 to 31st March 2010 are

presented in Chart 3. It is observed that the first half month recorded the highest mean return.

The Regression Results of BSE Sensex index semi-month returns are presented in Table 11. The results reveal that the coefficient for the first half-month was significant at 1% level in 2003-04. In 2005-06, the coefficient was statistically significant at 5% level. The coefficient was negative in 2008-09, probably due to the impact of US financial crisis that affected global financial markets.

The coefficient was negative for second-half of the month in all years, except 2006-07 and 2007-08. The coefficient for the second-half of the month was statistically significant at 5% level in 2002-03. The F-value also was significant at 5% level and it indicates that the mean daily return for the second half was significantly lower than that of the first half for only 2002-03. The coefficient was significant for the first-half of the month for only 2005-06. For the entire study period, from April 2002 to March 2010, the coefficient for the first-half month was positive and significant at the 5% level, and the second-half month coefficient was negative and insignificant. However, based on the F-statistic, the null hypothesis (NH₄), "There is no significant difference between the returns of first-half month and rest of the days of the month," cannot be rejected.

Table 1. Calendar Anomalies

	Type of Anomalies	Authors	Findings
1.	<i>Turn-of-the-year Effect</i>	Dyl & Givoly (1977) and Ovadia (1983)	Trading volume is usually larger, for example, losing stocks in December.
2.	<i>Turn-of-the-year Effect</i>	Guin (2005)	This has to do with tax-related issues i.e., selling in December and buying in January.
3.	<i>Month-of-the quarter effect</i>	Penman (1987)	Firms usually have higher rate of returns in the first month of the quarter.
4.	<i>Week-of-the month Effect</i>	Linn & Lockwood (1988) and Hensel & Ziemba (1996)	Stocks usually have higher returns during the first week of the month than the last three.
5.	<i>Day-of-the-week effect or Weekend effect</i>	Cross (1973) and French (1980)	On an average, closing prices on Monday Evening are lower than Friday's closing prices.
6.	<i>Day-of-the-week effect or Weekend effect</i>	Guin (2005)	The weekend effect can be related to companies and Governments which tend to realize bad news over the weekends.
7.	<i>Day-of-the-week effect or Weekend effect</i>	Foster and Viswanathan (1990)	Trading volumes are increasing on Fridays due to information symmetry and decreasing on Mondays due to information asymmetry.
8.	<i>Monday effect</i>	French (1980), Barone (1990) and Gibbons & Hess (1981)	Average returns on Mondays are lower than any other day of the week. It is also found that the largest decline in stock prices takes place during the first two days of the week.
9.	<i>Hour-of-the-day effect or the End of- the-day effect</i>	Guin (2005)	Trading volumes and prices tend to increase during the last 15 minutes of a day.
10.	<i>Hour-of-the-day effect or the End of-the-day effect</i>	Harvey and Huang (1991)	Noticed higher interest rates volatility during first trading hours of Thursdays and Fridays.
11.	<i>Holiday effect</i>	Lakonishok & Smidt (1988) and Petengill (1989).	Stock markets usually tend to have higher abnormal returns before public holidays.
12.	<i>Political-cycle effect,</i>	Santa & Valkanov (2003)	The first and last year of a Presidential Administration Period have higher abnormal returns than other years.
13.	<i>Day-of-the-week effect or Weekend effect</i>	Nageswari.P & Selvam.M (2011)	Highest Mean earned on Friday and Lowest Mean Return on Tuesday were observed and also found that Day of the Week Effect exist in the Indian Stock Market.

Table 2. Descriptive Statistics for BSE Sensex Index Daily Returns: April 2002 - March 2010

Weekdays	Monday	Tuesday	Wednesday	Thursday	Friday	All Days
Mean	0.0169	0.0724	0.1083	0.0337	0.1619	0.0808
Median	0.1894	0.0792	0.0971	0.1606	0.2384	0.1601
Maximum	15.99	7.9311	5.7722	6.667	7.9005	15.9900
Minimum	-11.8092	-6.8389	-7.5231	-7.0033	-11.604	-11.8092
Std. Dev.	2.0891	1.5595	1.5971	1.5495	1.8497	1.7359
Skewness	0.3654	0.1068	-0.2279	-0.2639	-0.6915	-0.1020
Kurtosis	14.3671	6.7334	5.7426	5.5018	8.7573	10.5277
Observations	397	398	400	395	393	1983

Source: Computed from PROWESS

Table 3. Kruskal-Wallis Test for BSE Sensex Index Daily Returns: April 2002 - March 2010

Year	K-W Test	Df	P-value
2002-03	2.6534	4	0.6174
2003-04	9.8501	4	0.0430**
2004-05	4.2351	4	0.3751
2005-06	1.9114	4	0.7520
2006-07	3.4728	4	0.4820
2007-08	1.6439	4	0.8009
2008-09	0.9022	4	0.9242
2009-10	1.0837	4	0.8969
2002-2010	2.5395	4	0.6375
Degrees of freedom.	N-1 = 4 N= 5	Table value: 1% - 13.277 5% - 9.488	

Source: Computed from PROWESS

**Significant at 5% level

Table 4. Cross Correlation Test for BSE Sensex Index Daily Returns: April 2002 - March 2010

Week Days	Pearson Correlation	Monday	Tuesday	Wednesday	Thursday	Friday
Monday	Pearson Correlation	1				
	Sig. (2-tailed)	.				
Tuesday	Pearson Correlation	-0.0572	1			
	Sig. (2-tailed)	0.2555	.			
Wednesday	Pearson Correlation	0.0101	-0.1705	1		
	Sig. (2-tailed)	0.8411	0.0006*	.		
Thursday	Pearson Correlation	0.0093	-0.0411	0.0881	1	
	Sig. (2-tailed)	0.8535	0.4157	0.0804	.	
Friday	Pearson Correlation	0.0062	0.0049	0.0525	0.0230	1
	Sig. (2-tailed)	0.9021	0.9231	0.2993	0.6497	.

Source: Computed from PROWESS

* Significant at 1% level

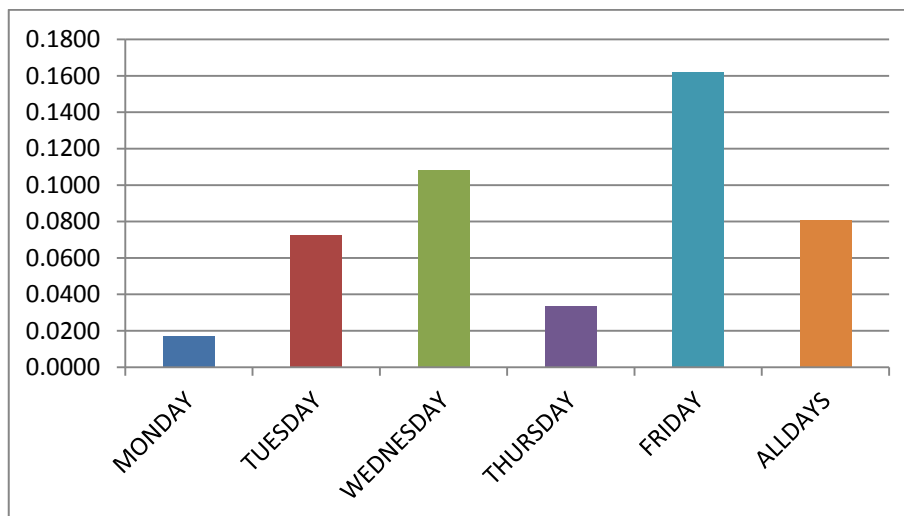
**Chart 1.** BSE Sensex Index Daily Returns: April 2002 - March 2010

Table 5. Regression Results for BSE Sensex Index Daily Returns: April 2002 - March 2010

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Tuesday	0.0524	0.1237	0.4240	0.6716
Wednesday	0.0843	0.1235	0.6827	0.4949
Thursday	0.0097	0.1239	0.0785	0.9374
Friday	0.1379	0.1241	1.1114	0.2665
C	0.0240	0.0876	0.2740	0.7841
R-squared	0.0008	F-statistic		0.4156
Durbin-Watson stat	1.8507	Prob.(F- statistic)		0.7975

Source: Computed from PROWESS

Table 6. Descriptive Statistics for BSE Sensex Index Month wise Daily Returns: April 2002 - March 2010

Month	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	N
January	-0.1349	-0.0807	6.4092	-7.6957	1.8496	-0.3910	6.2482	165
February	-0.0447	0.0015	4.7105	-4.8930	1.4486	-0.3801	4.3107	156
March	0.0054	0.1493	5.8931	-6.2240	1.7684	-0.3828	5.0222	166
April	0.1709	0.2373	4.4138	-4.8328	1.4904	-0.3365	3.7294	156
May	0.0111	0.1812	15.9900	-11.8092	2.3808	1.0446	18.1991	169
June	0.0343	0.1393	6.6670	-4.8397	1.7241	0.0719	4.3949	173
July	0.1791	0.2349	5.7722	-6.0084	1.7613	-0.1995	4.5716	177
August	0.1682	0.3212	3.6209	-4.3789	1.3541	-0.5550	4.2365	170
September	0.1847	0.2807	5.3139	-3.9419	1.3798	-0.1224	4.6858	167
October	-0.0973	-0.0461	7.9005	-11.6044	2.2564	-0.6564	8.4323	166
November	0.2114	0.3310	5.5805	-6.8389	1.6783	-0.2717	6.2081	161
December	0.2718	0.2822	5.3672	-3.9172	1.3443	0.1824	5.2850	169

Source: Computed from PROWESS

*Significant at 1% level

Table 7. Kruskal-Wallis Test of BSE Sensex Index Month Wise Daily Returns: April 2002 - March 2010

Year	K-W Test	Df	P-value
2002-03	19.5629	11	0.0517
2003-04	10.8860	11	0.4529
2004-05	9.3820	11	0.5867
2005-06	15.5175	11	0.1600
2006-07	5.4145	11	0.9094
2007-08	11.6188	11	0.3930
2008-09	10.3178	11	0.5020
2009-10	13.4861	11	0.2627
2002-2010	15.9088	11	0.1445
Degrees of freedom. N-1	11	Table value: 1% - 24.725	
N=12		5% - 19.675	

Source: Computed from PROWESS

Note: Df.-Degrees of Freedom

Analysis of the Holiday Effect

According to the Holiday Effect, stocks show abnormally high return on days prior to holidays. To measure the Holiday Effect, the trading days have been classified into three categories, namely, Weekdays, Pre-Holidays, and Post Holidays. Weekday is the day, which has both at least one preceding, and one succeeding day as trading days. Pre-Holiday is the day which has at least one preceding day as trading day but at least one succeeding day as holiday. Post-Holiday is the day which has at least one preceding day as holiday, but at least one succeeding day as trading day.

The descriptive statistics in Table 12 show that that the minimum average return was recorded on Weekdays and maximum return was registered on Pre-Holidays. The highest standard deviation (2.1097) was recorded in Post-Holidays and the lowest standard deviation (1.5404) was recorded for Weekdays during the study period. It indicates that the market was more volatile during Post Holidays and least volatile on Weekdays. The reasons for high Pre-Holidays returns may be due to psychological reasons. Chart 4 presents the Average Daily Returns during Pre-Holidays, Post-Holidays and Weekdays for BSE Sensex Index from April 2002 to March 2010.

The Regression results for BSE Sensex Index, from April 2002 to March 2010, are presented in Table 13. The results show that the coefficients for Post-Holidays (-0.1632) and Weekdays returns (-0.1769) were negative and also insignificant during the study period. The Pre-Holiday returns were higher than that of Post-Holidays and Weekdays and statistically significant at 1% level. However, the insignificant F-Statistic value (1.6923) did not confirm the Pre-Holiday Effect during the entire study period. Hence the Null Hypothesis (NH₅), "There are no difference in returns among

Pre-Holidays, Post-Holidays, and Weekdays, cannot be rejected.

Table 8. The Results of Cross Correlation Test for BSE Sensex Index Daily Returns - 'Month wise' from April 2002 to March 2010

Month	Pearson Correlation	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Jan	Pearson Correlation	1											
	Sig. (2-tailed)												
Feb	Pearson Correlation	0.1133	1										
	Sig. (2-tailed)	0.1589											
March	Pearson Correlation	-0.0332	0.0129	1									
	Sig. (2-tailed)	0.6720	0.8729										
April	Pearson Correlation	-0.0037	-0.0758	0.0325	1								
	Sig. (2-tailed)	0.9630	0.3467	0.6873									
May	Pearson Correlation	-0.1204	0.1162	-0.0042	0.0469	1							
	Sig. (2-tailed)	0.1234	0.1486	0.9570	0.5606								
June	Pearson Correlation	0.0137	0.1318	-0.0500	0.0633	0.0152	1						
	Sig. (2-tailed)	0.8612	0.1010	0.5227	0.4324	0.8440							
July	Pearson Correlation	0.0597	0.1493	-0.1025	-0.0324	-0.0011	-0.1921	1					
	Sig. (2-tailed)	0.4460	0.0629	0.1887	0.6881	0.9882	0.0113**						
Aug	Pearson Correlation	0.1497	0.0426	0.0410	0.0160	-0.0134	-0.0086	-0.0841	1				
	Sig. (2-tailed)	0.0550	0.5977	0.6002	0.8427	0.8627	0.9110	0.2756					
Sep	Pearson Correlation	-0.1625	-0.0392	-0.0262	-0.0663	-0.0355	0.0950	-0.0621	-0.0862	1			
	Sig. (2-tailed)	0.0371**	0.6269	0.7379	0.4109	0.6487	0.2220	0.4252	0.2681				
Oct	Pearson Correlation	0.1112	0.2184	0.1035	-0.0671	-0.0278	-0.0431	0.3319	0.0282	-0.0479	1		
	Sig. (2-tailed)	0.1551	0.0062*	0.1844	0.4053	0.7223	0.5812	0.0000*	0.7181	0.5398			
Nov	Pearson Correlation	0.0674	-0.0504	-0.1096	-0.0420	-0.0636	-0.0347	-0.0052	-0.0552	0.2353	0.0014	1	
	Sig. (2-tailed)	0.3953	0.5319	0.1664	0.6031	0.4228	0.6619	0.9482	0.4870	0.0027*	0.9856		
Dec	Pearson Correlation	-0.0711	0.2384	-0.0452	-0.1203	0.0246	0.0807	0.0297	0.0513	-0.0392	0.1251	-0.1068	1
	Sig. (2-tailed)	0.3640	0.0027*	0.5628	0.1346	0.7507	0.2972	0.7018	0.5073	0.6152	0.1083	0.1774	

Source: Computed from PROWESS.
 *, Significant at 1% level, ** Significant at 5% level.

Tables 9. Regression Results for BSE Sensex Index Month wise Daily Returns: April 2002 - March 2010

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FEB	0.0899	0.1948	0.4617	0.6444
MARCH	0.1404	0.1917	0.7322	0.4641
ARIL	0.2976	0.1951	1.5254	0.1273
MAY	0.1554	0.1906	0.8154	0.4149
JUNE	0.1696	0.1900	0.8928	0.3721
JULY	0.3140	0.1884	1.6665	0.0958
AUG	0.3031	0.1903	1.5928	0.1114
SEP	0.3196	0.1911	1.6721	0.0947
OCT	0.0352	0.1926	0.1829	0.8549
NOV	0.3489	0.1935	1.8032	0.0715
DEC	0.4067	0.1906	2.1340	0.0330**
C	-0.1349	0.1356	-0.9951	0.3198
R-squared	0.0054	F-statistic		0.9640
Durbin-Watson stat	1.8667	Prob(F-statistic)		0.4774

Source: Computed from PROWESS
Significant at 5% level

Table 10. Descriptive Statistics for BSE Sensex semi-month wise Daily Returns: April 2002 - March 2010

Statistics	First Half Month	Second Half Month
Mean	0.1167	0.0365
Standard Deviation	1.6291	1.8596
Kurtosis	3.1121	10.535
Skewness	-0.3244	0.0984
Observations	1099	894

Source: Computed from PROWESS

Table 11. Regression Results for BSE Sensex semi-month wise Daily Returns: April 2002 - March 2010

Year	Variables	Intercept	Second half	F-Statistics
2002-03	Coefficients	0.0632	-0.2669	4.3834
	t Stat	0.7587	-2.0937	
	P-value	0.4487	0.0373**	0.0373**
2003-04	Coefficients	0.2974	-0.1406	0.6691
	t Stat	2.6789	-0.8180	
	P-value	0.0079*	0.4141	0.4141
2004-05	Coefficients	0.1013	-0.1037	0.2925
	t Stat	0.8286	-0.5408	
	P-value	0.4081	0.5891	0.5891
2005-06	Coefficients	0.2209	-0.0020	0.0002
	t Stat	2.5775	-0.0153	
	P-value	0.0105**	0.9878	0.9878
2006-07	Coefficients	0.0102	0.1174	0.2725
	t Stat	0.0702	0.5220	
	P-value	0.9441	0.6021	0.6021
2007-08	Coefficients	0.0559	0.0371	0.0226
	t Stat	0.3484	0.1503	
	P-value	0.7278	0.8807	0.8807
2008-09	Coefficients	-0.1724	-0.0570	0.0245
	t Stat	-0.7309	-0.1565	
	P-value	0.4655	0.8758	0.8758
2009-10	Coefficients	0.2749	-0.0799	0.1077
	t Stat	1.7639	-0.3281	
	P-value	0.0790	0.7431	0.7431
2002-2010	Coefficients	0.1076	-0.0633	0.6475
	t Stat	2.1143	-0.8047	
	P-value	0.0346**	0.4211	0.4211

Source: Computed from PROWESS.

*Significant at 1% level.

**Significant at 5% level

Table 12. Descriptive Statistics for BSE Sensex Index Daily Returns for Pre, Post-Holidays and Weekdays: April 2002 - March 2010

Trading Days	N	Mean	Std. Deviation	Std. Error Mean
Pre-holidays	432	0.2137	1.7491	0.0842
Post-holidays	471	0.0525	2.1097	0.0972
Weekdays	1092	0.0404	1.5404	0.0466

Source: Computed from PROWESS

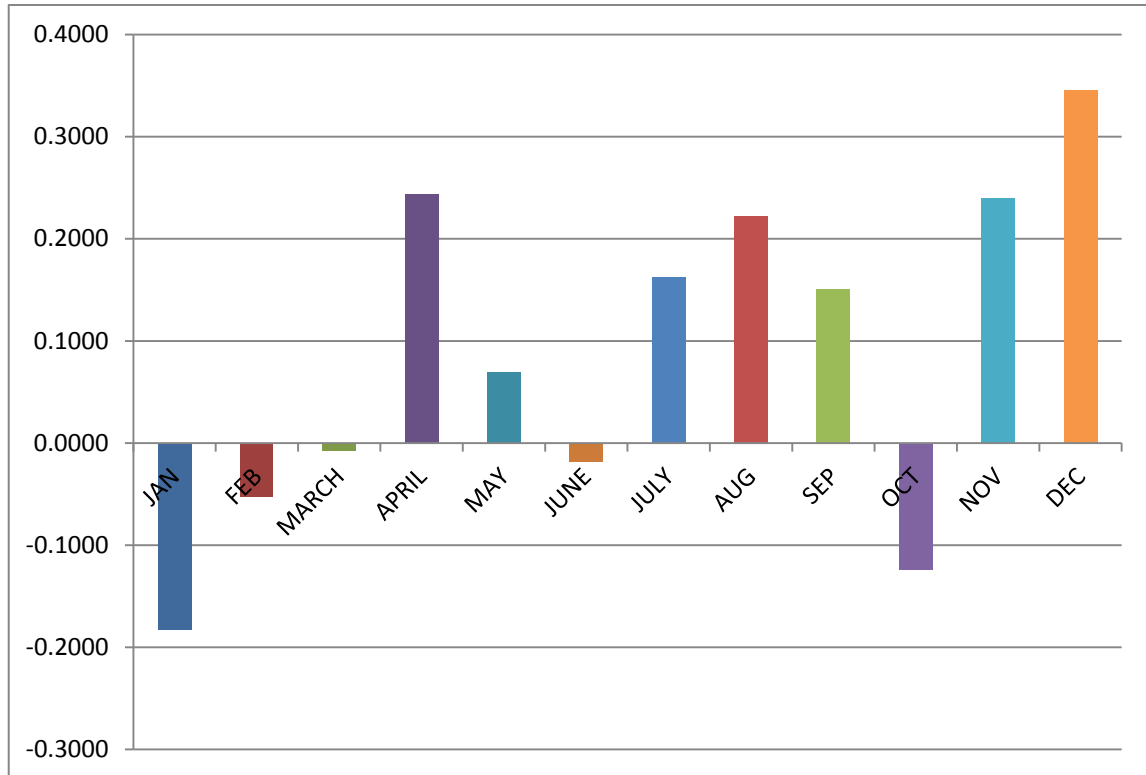


Chart 2. Month Wise daily returns for BSE Sensex Index: April 2002 - March 2010

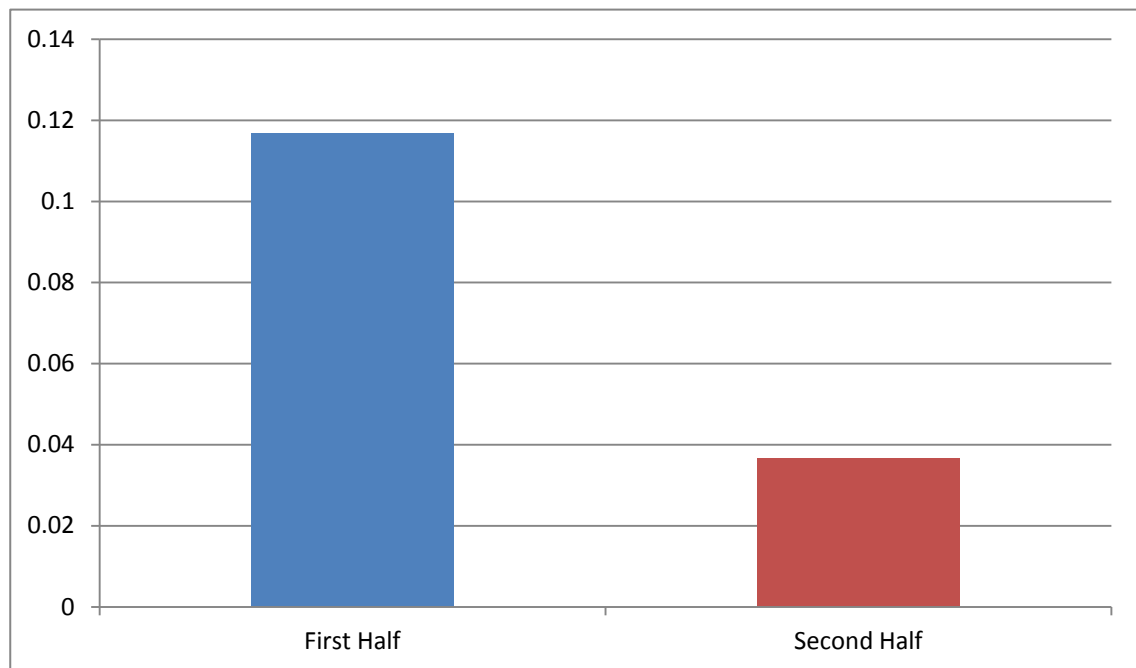


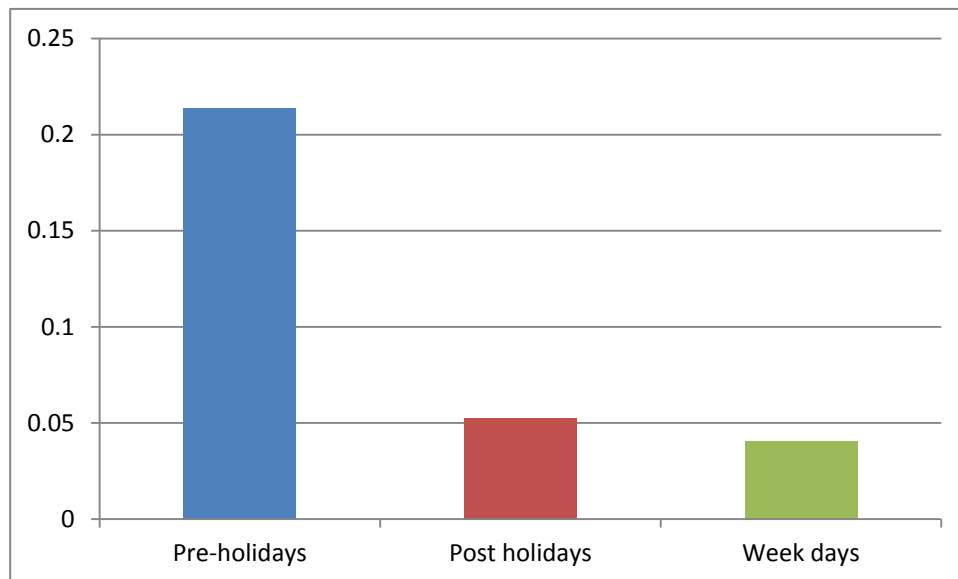
Chart 3. Semi-Month returns for BSE Sensex Index: April 2002 - March 2010

Table 13. Regression Results for BSE Sensex Index Daily Returns for Pre, Post-Holidays and Weekdays: April 2002 - March 2010

Trading days	Coefficients	Std. Error	t Stat	P-value
Intercept	0.2163	0.0835	2.5908	0.0096*
Post-holidays	-0.1632	0.1156	-1.4120	0.1581
Weekdays	-0.1769	0.0985	-1.7957	0.0727
R Square	0.0017	F-Statistics		1.6923
Adjusted R Sq.	0.0007	P-value		0.1844

Source: Computed from PROWESS

* Significant at 1% level

**Chart 4.** Average Daily Returns of Pre, Post-Holidays and Weekdays for BSE Sensex: April 2002 - March 2010

4. Conclusions

The present study investigated the calendar anomalies in the BSE Sensex Index following the Post Compulsory Rolling Settlement Period. The study found that there was positive mean returns recorded for all days of the week and highest mean return was recorded on Friday, and lowest mean return recorded on Monday. The Monthly Returns Analysis found that the highest mean returns were recorded in December and the negative mean returns recorded in January in all years. The returns for the first half month were higher than the returns for the second half month. Also, returns for the Pre-holiday period were higher than the returns for Post-holidays and Weekdays. However, all four null hypotheses were not rejected in the study. It appears that during the post rolling settlement period increased liquidity has eliminated some of the stock market anomalies as demonstrated by the BSE Sensex index.

Our findings may appear to contradict some of the findings of recent studies on stock market anomalies in the Indian Stock Market. Chandra[7], in his study encompassing the 1998-2007 time period for the BSE Sensex Index, found that the turn-of-month returns were statistically significant. It should be noted that our study did not test the turn-of-the-month effect. Patel[13], in his study encompassing the 1999-2007 time period for the BSE 500

index, found that the monthly returns for November and December were statistically significant and the mean return for the March-May period was lower than the mean return for the remaining nine months. It should be noted that Patel[13] used the BSE 500 and NSE 500 index in their study of stock market anomalies and we used the BSE Sensex index in our study. The BSE Sensex index is more liquid than the BSE 500 and NSE 500 index and could have contributed to apparently contradictory findings. In addition, the testing period for both recent studies overlapped the pre and post rolling settlement period and thereby did not probably account for the effect of increased liquidity and stock market turnover subsequent to post compulsory rolling settlement period and its potential effect on the anomalous behavior of stock prices.

Our study is the first to focus exclusively on the post compulsory rolling settlement testing period and thereby not confounded by changes in liquidity and increased stock market turnover subsequent to the post compulsory rolling settlement period. Although some of our results confirm the findings of earlier studies such as higher returns for the months of November and December[16], lower returns for Monday[6], we were unable to reject any of our four null hypotheses. The clear takeaway from our study is that we don't observe anomalous stock market behavior in the BSE Sensex index in an environment of increased liquidity and

stock market turnover subsequent to the post compulsory rolling settlement period.

$t=1121606$).

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