“Semi-monthly effect in stock returns: new evidence from Bombay Stock Exchange”

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SEMI-MONTHLY EFFECT IN STOCK RETURNS: NEW EVIDENCE FROM BOMBAY STOCK EXCHANGE

Abstract

Semi-monthly effect is a kind of calendar anomalies which is less explored in the financial literature. The main objective of this paper to investigate the presence of semi-monthly effect in selected sectoral indices of Bombay Stock Exchange (BSE). The study uses the daily stock returns of five sectoral indices viz S&P BSE Auto Index, S&P BSE Bankex, S&P BSE Consumer Durables Index, S&P BSE FMCG Index and S&P BSE Health Care Index for the period of 10 years starting from 1st April 2007 to 31st March 2017. The data were analyzed using two approaches namely calendar days approach and trading days approach. To test the equality of mean returns for the two halves of the month, Mann-Whitney U test is used. The empirical results of the study did not provide any evidence for the presence of semi-monthly effect in the selected sectoral indices. Nevertheless, BSE Auto Index showed significant difference in the mean returns of first half and second half of trading month during the study period.

Keywords semi-monthly effect, calendar anomalies, Bombay Stock Exchange, calendar days approach, trading days approach

JEL Classification G10, G14

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INTRODUCTION

Seasonal variations or calendar anomalies have been one of the widely researched areas in capital market research. The anomalies are patterns formed based on past prices and can be used to predict the future price. The presence of calendar anomalies contradicts the theory of Efficient Market Hypothesis (EMH). The most prominent types of anomalies documented in the earlier research were day of the week effect (Kelly, 1930; Field, 1931; Cross, 1973; Lakonishok & Levi, 1982; Keim & Stambaugh, 1984; Cornell, 1985; Jaffe & Westerfield, 1985; Smirlock & Starks, 1986), month of the year effect (Rozeff & Kinney, 1976; Banz, 1981; Keim, 1983; Mehta & Chander, 2010; Hawaldar, Shakila, & Pinto, 2017), semi-monthly effect (Ariel, 1987; Mills et al., 2000; Karmakar & Chakraborthy, 2000; Mangala & Sharma, 2007; Swami, 2011), turn of the month (Cadsby & Ratner, 1992; Hensel & Ziemba, 1996; Arsad & Coutts, 1997; Karmakar & Chakraborthy, 2000; Swami, 2011), holiday effects (Merrill, 1966; Ariel, 1985; Lakonishok & Smidt, 1988; Petengill, 1989).

The present study focuses on the semi-monthly effect in Indian Stock Market which is relatively less explored than other types of calendar anomalies in the literature. Semi-monthly effect refers to the stock returns for the first half of the month is significantly greater than second half of the month and vice versa.

Established in 1875, Bombay Stock Exchange (BSE) is located in Mumbai, India and it is the earliest stock exchange in the entire Asia. Presently, more than 5500 companies are publicly listed on it. The most popular equity index of BSE is the S&P BSE SENSEX. It is the benchmark index. The other important indices of BSE are S&P BSE 100, S&P BSE 200, S&P BSE 500 S&P BSE AllCap, and sectoral indices.

The paper is divided into four sections: section 1 presents an outline of literature, section 2 discusses the methodology adopted in the study, section 3 contains empirical findings of the study and last section concludes the study.

1. LITERATURE REVIEW

In financial literature we do not find many studies on semi-monthly effect. However, the significant work on semi-monthly effect in stock returns abroad and in India is quoted in this section. Ariel (1987) pioneered the literatures on semi-monthly effect. He studied US equity market and reported that stock returns earned positive average returns around the beginning and during the first half of the calendar month and zero average during the second part. The study conducted by Penman (1987) revealed that the reason for semi-monthly effect may be the firm's announcement of good news in the first half of the month and the bad news in the second half. In a study conducted by Jaffe and Westfield (1989), intra-month effects were found in Australian market, but not for Japanese, Canadian and British markets. Balaban and Bulu (1996) did not find any evidence of semi-monthly effects in an emerging Turkish Stock Market for the study period between 1988 and 1995. However, when individual years are examined separately, the study reported significant monthly effect in 1994. Arsad and Coutts (1997) employed a large sample of daily returns from the Financial Times Industrial Ordinary Shares Index and documented the existence of semi-monthly effect.

Karmakar and Chakraborthy (2000) found that mean returns in the first half of the month was significantly greater than that of second half of the month in Indian Stock Market. Mills et al. (2000) documented significantly higher average return during the first fortnight of the month for the ASE General Index for the period 1986 to 1999. Bahadur and Joshi (2005) did not find strong evidence for semi-monthly effect in the Nepalese Stock Market during the study period. Eleftherios Giovanis (2009) examined different types of calendar anomalies in 55 stock exchanges across the globe and found the presence of semi-monthly effect in Indian and Canadian Stock Exchange. Agathee (2009) studied official Mauritian Stock Market and reported the presence of significant higher stock returns for the first half of the calendar month as compared to the second half for the whole sample period. A study conducted by Mangala and Sharma (2007) revealed significantly high mean daily returns for the first half of the trading month. The study used daily closing prices of S&P CNX Nifty for a period between January 1994 through April 2005. Garg, Bodla, and Chhabra (2010) made an attempt to examine whether calendar anomalies still existed in developed and developing markets. They studied calendar effects such as turn of the month effect, semi-monthly effect, monthly effect, Monday effect and Friday effect in the Indian and US markets for the period between January 1998 and December 2007. The analysis of the study confirmed the presence of the semi-monthly and turn of the month effect in both the markets. Swami (2011) examined different types of calendar anomalies in South Asian Markets and found semi-monthly effect only in Indian Stock Market during the study period. Nageswari, Selvam, and Gayathri (2011) examined the presence of semi-monthly effect in Indian Stock Market and concluded that the said anomaly was not present during the study period. Using daily returns of S&P CNX FMCG Index, Shakila, Pinto, and Rohit (2015) tested the presence of semi-monthly effect in Indian Stock Market for a period from 2007 to 2013 and the findings of the study did not provide any evidence for the said anomaly.

Abraham (2016) who analyzed Singapore Stock Market from 1995 to 2015 revealed that significant semi-monthly anomaly was not present in the market, even though the mean percentage returns during the first and second half show high relative difference.

Shakila, Pinto, and Rohit (2015) examined semi-monthly effect in the CNX Pharma Index of NSE, India, for a period between 2001 and 2013. The results of the study confirmed the presence of semi-monthly effect under two approaches viz. calendar day approach and trading day approach.

2. DATA AND METHODOLOGY

The present study intends to examine the semi-monthly effect in the selected sectoral indices of Bombay Stock Exchange (BSE) covering a period of 10 years from 1st April 2007 to 31st March 2017.

2.1. Hypothesis of the study

The following hypotheses are tested in this study:

H0: *There is no significant difference between the mean returns of the first half and second half of the month for the selected sectoral indices of BSE.*

H1: *There is a significant difference between the mean returns of the first half and second half of the month for the selected sectoral indices of BSE.*

The most prominent indices which represent the performance of Bombay Stock Exchange are the sectoral indices. This study used the closing prices of S&P BSE Auto Index, S&P BSE Bankex, S&P BSE Consumer Durables Index, S&P BSE FMCG Index and S&P BSE Health Care Index for the period of 10 years starting from 1st April 2007 to 31st March 2017.

Daily percentage returns on the select sectoral indices are calculated as follows:

$$R_t = I_n \cdot \frac{P_t}{P_{t-1}} \cdot 100, \qquad (1)$$

where R_t – daily return on the index;
I_n – natural log of underlying market series;
P_t – closing value of a given index on a specific trading day (t);
P_{t-1} – closing value of a given index on a preceding day $(t-1)$.

To test semi-monthly effect in selected sectoral indices of BSE, the non-parametric Mann-Whitney U-test is used. It is the alternative test to the independent sample t-test. It is applied when there are two independent samples drawn from the same population. Hence, to test the equality of mean returns for the two halves of the month, Mann-Whitney U-test is used.

$$U = n_1 \cdot n_2 + \frac{n_2 \cdot (n_2 + 1)}{2} - \sum_{i-nt+1}^{n_2} R_i, \qquad (2)$$

where U – Mann-Whitney U-test;
n_1 – sample size one;
n_2 – sample size two;
R_i – rank of the sample size*.

Note: * Mangala and Sharma (2007).

The present study analyzes the semi-monthly in a more recent context. To examine semi-monthly effect and turn of the month effect, the present study uses two approaches viz. calendar day approach and trading day approach.

2.1.1. Calendar day approach

The calendar days for the study period have been identified on the basis of working days of the BSE i.e., from Monday to Friday totaling 2.479 calendar days.

Under calendar day approach, first half of the month includes last two calendar days of the previous month they are thirtieth (30th) and the thirty first (31st) and then the first (1st) to thirteenth (13th) calendar days of the following month are considered in total fifteen calendar days. The second half of the month takes into consideration fourteenth (14th) to the twenty-ninth (29th) calendar days of the month in total, sixteen calendar days.

2.1.2. Trading day approach

The trading days for the study period have been identified on the basis of minimum number of trading days available in a month. The study covers a time period of 120 months. The least number of trading days available in a month during the period of study is 16. Therefore, the total number of trading days identified is 1.920.

Eight trading days before the start of each month (–8 to –1) and eight trading days (+1 to +8) after the commencement of month are considered. The mean returns for 16 trading days are calculated.

Under trading approach, the first half of the trading month includes last trading day of the previous month and first seven days of the following month, i.e. (–1 to 7). The second half begins from the eighth day to the second last trading day of the month, i.e. (8 to –2).

3. ANALYSIS OF DATA AND RESULTS

3.1. Analysis of daily returns semi-monthly wise (calendar day approach) for selected sectoral indices of BSE

3.1.1. Analysis of descriptive statistics and Mann-Whitney U-test results for S&P BSE Auto Index

As depicted in Table 1, the first half of the calendar month for the S&P BSE Auto Index documents mean returns of 0.0752 (median = 0.0866, minimum = –6.342 and maximum = 6.190), standard deviation 1.441.

Percentile analysis denotes 25% of the days out of 1175 days have returns below –0.756.

75th percentile denotes 25% of the days have returns above 0.899.

50% of the days the first half of the calendar month in the Auto sector have returns between –0.756 and 0.899.

Similarly, second half of the calendar month for the Auto Index reports mean returns of 0.0477 (median = 0.10046, minimum = –11.01 and maximum = 10.62), standard deviation 1.528.

Percentile analysis denotes 25% of the days out of 1304 days have returns below –0.731.

75th percentile denotes 25% of the days have returns above 0.873.

50% of the days of the second half of the calendar month in the banking sector have returns between –0.731 and 0.873.

The return distribution is negatively skewed for both the periods. The kurtosis measure for return distribution was Platykurtic for the first half of the calendar month and Leptokurtic for the second half during the study period.

However, the results of Mann-Whitney test ($P = 0.917 > 0.05$) confirm that there is no statistically significant difference between mean returns of the first half of calendar month and the second half. Hence, the null hypothesis that there is no significant difference in the mean returns of first half and second half of calendar month in BSE Auto Index is accepted.

Table 1. Results of descriptive statistics for the first half of the calendar month and second half of the calendar month and Mann-Whitney *U* (*Z*-score) for the difference of these two means of S&P BSE Auto Index from April 2007 to March 2017

Period	N	Mean	Std. Dev.	Min.	Max	Percentiles			Skewness	Kurtosis
						25th	50th (median)	75th		
1st half of the calendar month (30, 31, 1,...., 13)	1175	0.0752	1.441	–6.342	6.190	–0.756	0.0866	0.899	–0.072	1.585
2nd half of the calendar month (14 to 29)	1304	0.0477	1.528	–11.01	10.62	–0.731	0.10046	0.873	–0.471	6.525

Note: Mann-Whitney *U* (Z-score) –0.105. $P = 0.917$ (NS)*. $0.01 < P > 0.05$. * not significant.

3.1.2. Analysis of descriptive statistics and Mann-Whitney U-test results for S&P BSE Bankex

As shown in Table 2, the first half of the calendar month for the S&P BSE Bankex documents mean returns of 0.0411 (median = 0.05303, minimum = –8.975 and maximum = 11.60), standard deviation 1.913.

Percentile analysis denotes 25% of the days out of 1175 days have returns below –0.925.

75th percentile denotes 25% of the days have returns above 0.972.

50% of the days of the first half of the calendar month in the banking sector have returns between –0.925 and 0.972.

Similarly, second half of the calendar month for the BSE Bankex reveals mean returns of 0.0638 (median = 0.097, minimum = –13.48 and maximum = 17.54), standard deviation 2.052.

Percentile analysis denotes 25% of the days out of 1304 days have returns below –0.894.

75th percentile denotes, 25% of the days have returns above 1.068.

50% of the days of the second half of the calendar month in the banking sector have returns between –0.894 and 1.068.

The return distribution is positively skewed for both the periods. The kurtosis measure for return distribution is Leptokurtic for both the periods during the study period.

However, the results of Mann-Whitney test ($P = 0.516 > 0.05$) confirm that there is no statistically significant difference between mean returns of the first half of calendar month and the second half. Thus, the null hypothesis is accepted as the mean returns for two halves of the calendar month for BSE Bankex do not exhibit any significant difference.

3.1.3. Analysis of descriptive statistics and Mann-Whitney U-test results for S&P BSE Consumer Durables Index

As depicted in Table 3, the first half of the calendar month for the S&P BSE Consumer Durables Index exhibits mean returns of 0.0265 (median = 0.1245, minimum = –11.6 and maximum = 8.978), standard deviation 1.763.

Percentile analysis denotes 25% of the days out of 1175 days have returns below –0.822.

75th percentile denotes 25% of the days have returns above 0.968.

50% of the days of the first half of the calendar month in the Consumer Durables sector have returns between –0.822 and 0.968.

Similarly, second half of the calendar month for the Consumer Durables Index reports mean returns

Table 2. Results of descriptive statistics for the first half of the calendar month and second half of the calendar month and Mann-Whitney *U* (*Z*-score) for the difference of these two means of S&P BSE BANKEX from April 2007 to March 2017

Period	N	Mean	Std. Dev.	Min.	Max	Percentiles			Skewness	Kurtosis
						25th	50th (median)	75th		
1st half of the calendar month (30, 31, 1, ..., 13)	1175	0.0411	1.913	–8.975	11.60	–0.925	0.0530	0.972	0.081	3.571
2nd half of the calendar month (14 to 29)	1304	0.0638	2.052	–13.48	17.54	–0.894	0.097	1.068	0.141	7.051

Note: Mann-Whitney U (Z-score) –.649 P = 0.516 (NS)*. 0.01 < P > 0.05. * not significant.

Table 3. Results of descriptive statistics for the first half of the calendar month and second half of the calendar month and Mann-Whitney *U* (*Z*-score) for the difference of these two means of S&P BSE Consumer Durables Index from April 2007 to March 2017

Period	N	Mean	Std. Dev.	Min.	Max	Percentiles			Skewness	Kurtosis
						25th	50th (median)	75th		
1st half of the calendar month (30, 31, 1, ..., 13)	1175	0.0265	1.763	–11.6	8.978	–0.822	0.1245	0.968	–0.606	4.736
2nd half of the calendar month (14 to 29)	1304	0.0862	1.815	–10.1	12.47	–0.871	0.1192	0.971	–0.109	6.146

Note: Mann-Whitney U (Z-score) –0.427. P = 0.670 (NS)*. 0.01 < P > 0.05. * not significant.

of 0.0862 (median = 0.1192, minimum = –10.1 and maximum = 12.47), standard deviation 1.815.

Percentile analysis denotes 25% of the days out of 1304 days have returns below –0.871.

75th percentile denotes 25% of the days have returns above 0.971.

50% of the days of the second half of the calendar month in the banking sector have returns between –0.871 and 0.971.

The return distribution is negatively skewed for both the periods. The kurtosis measure for return distribution is Leptokurtic for both the periods during the study period.

However, the results of Mann-Whitney test ($P = 0.670 > 0.05$) confirm that there is no statistically significant difference between mean returns of the first half of calendar month and the second half. Hence, the null hypothesis that there is no significant difference in the mean returns of first half and second half of calendar month in BSE Consumer Durables is accepted.

3.1.4. Analysis of descriptive statistics and Mann-Whitney U-test results for S&P BSE FMCG Index

As depicted in Table 4, the first half of the calendar month for the S&P BSE FMCG Index shows mean returns of 0.0455 (median = 0.410, minimum = –5.75 and maximum = 5.28), standard deviation 1.257.

Percentile analysis denotes 25% of the days out of 1175 days have returns below –0.61.

75th percentile denotes 25% of the days have returns above 0.686.

50% of the days of the first half of the calendar month in the FMCG sector have returns between –0.61 and 0.686.

Similarly, second half of the calendar month for the FMCG Index documents mean returns of 0.0873 (median = 0.123, minimum = –8.29 and maximum = 6.96), standard deviation 1.249.

Percentile analysis denotes 25% of the days out of 1304 days have returns below –0.523.

75th percentile denotes 25% of the days have returns above 0.734.

50% of the days of the second half of the calendar month in the FMCG sector have returns between –0.523 and 0.734.

The return distribution is positively skewed for the first half and negatively skewed for the second half of the calendar month. The kurtosis measure for return distribution is Platykurtic for the first half of the calendar month and Leptokurtic for the second half during the study period.

However, the results of Mann-Whitney test ($P = 0.081 > 0.05$) confirm that there is no statistically significant difference between mean returns of the first half of calendar month and

Table 4. Results of descriptive statistics for the first half of the calendar month and second half of the calendar month and Mann-Whitney *U* (*Z*-score) for the difference of these Two Means of S&P BSE FMCG Index from April 2007 to March 2017

Period	N	Mean	Std. Dev.	Min.	Max	Percentiles			Skewness	Kurtosis
						25th	50th (median)	75th		
1st half of the calendar month (30, 31, 1, ... 13)	1175	0.0455	1.257	–5.75	5.28	–0.61	0.410	0.686	0.051	2.151
2nd half of the calendar month (14 to 29)	1304	0.0873	1.249	–8.29	6.960	–0.523	0.123	0.734	–0.458	4.505

Note: Mann-Whitney U (Z-score) –1.745. P = 0.081 (NS)*. 0.01 < P > 0.05. * not significant.

the second half. Therefore, the null hypothesis cannot be rejected as there is no major variation between mean returns for the first half and second half of the calendar month in BSE FMCG Index.

3.1.5. Analysis of descriptive statistics and Mann-Whitney U-test results for S&P BSE Health Care Index

As depicted in Table 5, the first half of the calendar month for the S&P BSE Health Care Index reports mean returns of 0.769 (median = 0.108, minimum = –4.904 and maximum = 4.724), standard deviation 1.058.

Percentile analysis denotes 25% of the days out of 1175 days have returns below –0.476.

75th percentile denotes 25% of the days have returns above 0.703.

50% of the days of the first half of the calendar month in the Health Care sector have returns between –0.476 and 0.703.

Similarly, second half of the calendar month for the Health Care Index exhibits mean returns of 0.0398 (median = 0.0738, minimum = –8.61 and maximum = 7.749), standard deviation 1.239.

Percentile analysis denotes 25% of the days out of 1304 days have returns below –0.507.

75th percentile denotes 25% of the days have returns above 0.691.

50% of the days of the second half of the calendar month in the Health Care sector have returns between –0.507 and 0.691.

The return distribution is negatively skewed for the periods. The kurtosis measure for return dis-

Table 5. Results of descriptive statistics for the first half of the calendar month and second half of the calendar month and Mann-Whitney *U* (*Z*-score) for the difference of these two means of S&P BSE Health Care Index from April 2007 to March 2017

Period	N	Mean	Std. Dev.	Min.	Max	Percentiles			Skewness	Kurtosis
						25th	50th (Median)	75th		
1st half of the calendar month (30, 31, 1....13)	1175	0.769	1.058	–4.904	4.724	–0.476	0.108	0.703	–0.277	1.558
2nd half of the calendar month (14 to 29)	1304	0.0398	1.239	–8.61	7.749	–0.507	0.0738	0.691	–0.809	7.346

Note: Mann-Whitney U (Z-score) –0.437. P = 0.662 (NS)*. 0.01 < P > 0.05. * not significant.

tribution is Platykurtic for the first half of the calendar month and Leptokurtic for the second half during the study period.

However, the results of Mann-Whitney test ($P = 0.662 > 0.05$) confirm that there is no statistically significant difference between mean returns of the first half of calendar month and the second half. Hence, the null hypothesis that there is no significant difference in the mean returns of first half and second half of calendar month in BSE Health Care Index is accepted.

3.2. Analysis of daily returns semi-monthly wise (trading day approach) for selected sectoral indices of BSE

3.2.1. Analysis of descriptive statistics and Mann-Whitney U-test results for S&P BSE Auto Index

As depicted in Table 6, the first half of the trading month for the Auto Index documents mean returns of 0.16261 (median = 0.181, minimum = –6.342 and maximum = 6.19), standard deviation 1.489.

Percentile analysis indicates that 25% of the days out of 960 days have returns below –0.657.

75th percentile states 25% of the days have returns above 0.959.

50% of the days of the first half of the trading month in the Auto sector have returns between –0.657 and 0.959.

Whereas, second half of the trading month for the Auto Index reports negative mean returns of –0.0018 (median = 0.082, minimum = –11.01 and maximum = 6.225), standard deviation 1.473.

Percentile analysis denotes 25% of the days out of 960 days have returns below –0.758.

75th percentile denotes, 25% of the days have returns above 0.823.

50% of the days of the second half of the trading month in the Auto sector have returns between –0.758 to 0.823.

The return distribution is negatively skewed for both the periods. The kurtosis measure for return distribution is Platykurtic for the first half of the trading month and Leptokurtic for the second half in the Auto sector during the study period.

The results of Mann-Whitney test ($P = 0.039 < 0.05$) confirm that the mean returns for the first half of trading month is statistically significant compared to the second half. Hence, the null hypothesis that there is no significant difference in the mean returns of first half and second half of trading month in BSE Auto Index is rejected.

Table 6. Results of descriptive statistics for the first half of the trading month and second half of the trading month and Mann-Whitney *U* (*Z*-score) for the difference of these two means of S&P BSE AUTO from April 2007 to March 2017

Period	N	Mean	Std. Dev.	Min.	Max	Percentiles			Skewness	Kurtosis
						25th	50th (median)	75th		
First half of the trading month (–1 to 7)	960	0.1626	1.489	–6.34	6.19	–0.65	0.181	0.959	–0.094	1.893
Second half of the trading month (8 to –2)	960	–0.001	1.473	–11.01	6.22	–0.75	0.082	0.823	–0.811	6.167

Note: Mann-Whitney U (Z-score) –2.068. P = 0.039 (Sig)*. P < 0.05. * significant.

3.2.2. Analysis of descriptive statistics and Mann-Whitney U-test results for S&P BSE Bankex

As illustrated in Table 7, the first half of the trading month for the Bank Index exhibits mean returns of 0.1059 (median = 0.085, minimum = –8.521 and maximum = 11.60), standard deviation 1.965.

Percentile analysis signifies 25% of the days out of 960 days have returns below –0.847.

75th percentile implies 25% of the days have returns above 1.094.

50% of the days of the first half of the trading month in the Auto sector have returns between –0.847 and 1.094.

Whereas, second half of the trading month for the Bank Index reveals negative mean returns of –0.043 (median = 0.0052, minimum = –13.48 and maximum = 9.525), standard deviation 1.949.

Percentile analysis denotes 25% of the days out of 960 days have returns below –0.959.

75th percentile denotes 25% of the days have returns above 0.953.

50% of the days of the second half of the trading month in the banking sector have returns between –0.959 to 0.953.

The return distribution is positively skewed for the first half and negatively skewed for the second half of the trading month. The kurtosis measure for return distribution was Leptokurtic for both the periods in the Auto sector during the study period.

The results of Mann-Whitney test ($P = 0.185 > 0.05$) confirm that the mean returns for the first half of trading month is not statistically significant compared to the second half. Hence, the null hypothesis that there is no significant difference in the mean returns of first half and second half of trading month in BSE Bankex is accepted.

3.2.3. Analysis of descriptive statistics and Mann-Whitney U-test results for S&P BSE Consumer Durables Index

As shown in Table 8, the first half of the trading month for the Consumer Durables Index discloses mean returns of 0.081 (median = 0.990, minimum = –11.66 and maximum = 8.978), standard deviation 1.789.

Percentile analysis denotes 25% of the days out of 960 days have returns below –0.786.

75th percentile denotes 25% of the days have returns above 2.056.

50% of the days of the first half of the trading month in the Consumer Durables sector have returns between –0.786 and 2.056.

Whereas, second half of the trading month for the Consumer Durables Index showed mean returns of 0.063 (median = 0.1364, minimum = –9.44 and maximum = 9.245), standard deviation 1.791.

Table 7. Results of descriptive statistics for the first half of the trading month and second half of the trading month and Mann-Whitney *U* (*Z*-score) for the difference of these two means of S&P BSE BANKEX from April 2007 to March 2017

Period	N	Mean	Std. Dev.	Min.	Max	Percentiles			Skewness	Kurtosis
						25th	50th (median)	75th		
First half of the trading month (–1 to 7)	960	0.1059	1.965	–8.521	11.60	–0.847	0.085	1.094	0.173	3.364
Second half of the trading month (8 to –2)	960	–0.0430	1.949	–13.48	9.5258	–0.959	0.0052	0.953	–0.396	4.574

Note: Mann-Whitney U (Z-score) –1.324. P = 0.185 (NS)*. 0.01 < P > 0.05. * not significant.

Table 8. Results of descriptive statistics for the first half of the trading month and second half of the trading month and Mann-Whitney *U* (*Z*-score) for the difference of these two means of S&P BSE Consumer Durables from April 2007 to March 2017

Period	N	Mean	Std. Dev.	Min	Max	Percentiles			Skewness	Kurtosis
						25th	50th (median)	75th		
First half of the trading month (–1 to 7)	960	0.081	1.7893	–11.66	8.978	–0.786	0.990	2.056	–0.530	4.827
Second half of the trading month (8 to –2)	960	0.063	1.791	–9.44	9.245	–0.867	0.1364	0.979	–0.203	4.247

Note: Mann-Whitney U (Z-score) –0.0312. P = 0.755 (NS)*. 0.01 < P > 0.05. * not significant.

Percentile analysis denotes 25% of the days out of 960 days have returns below –0.867.

75th percentile denotes 25% of the days have returns above 0.979.

50% of the days of the second half of the trading month in the Auto sector have returns between –0.867 and 0.979.

The return distribution is negatively skewed for both the period of trading month. The kurtosis measure for return distribution was Leptokurtic for both the periods in the Auto sector during the study period.

The results of Mann-Whitney test ($P = 0.755 > 0.05$) confirm that the mean returns for the first half of trading month is not statistically significant compared to the second half. Hence, the null hypothesis that there is no significant difference in the mean returns of first half and second half of trading month in BSE Consumer Durables Index is accepted.

3.2.4. Analysis of descriptive statistics and Mann-Whitney U-test results for S&P BSE FMCG Index

As described in Table 9, the first half of the trading month for the FMCG index reveals mean returns of 0.0691 (median = 0.070, minimum = –5.75 and maximum = 5.286), standard deviation 1.295.

Percentile analysis denotes 25% of the days out of 960 days have returns below –0.570.

75th percentile denotes 25% of the days have returns above 0.725.

50% of the days the first half of the trading month in the consumer durables sector have returns between –0.570 and 0.725.

Whereas, second half of the trading month for the FMCG index exhibited mean returns of 0.0712 (Median = 0.1072 Minimum = –8.29 and Maximum = 4.886), standard deviation 1.192.

Percentile analysis denotes 25% of the days out of 960 days have returns below –0.577.

75th percentile denotes 25% of the days have returns above 0.693.

50% of the days of the second half of the trading month in the Auto sector have returns between –0.577 and 0.693.

The return distribution is positively skewed for the first half and negatively skewed for the second half of trading month. The kurtosis measure for return distribution was Platykurtic for the first half of the trading month and Leptokurtic for the second half in the FMCG sector during the study period.

The results of Mann-Whitney test ($P = 0.753 > 0.05$) confirm that the mean returns for the first half of trading month is not statistically significant compared to the second half. Hence, the null hypothesis that there is no significant difference in the mean returns of first half and second half of trading month in BSE FMCG Index is accepted.

Table 9. Results of descriptive statistics for the first half of the trading month and second half of the trading month and Mann-Whitney *U* (*Z*-score) for the difference of these two means of S&P BSE FMCG Index from April 2007 to March 2017

Period	N	Mean	Std. Dev.	Min.	Max	Percentiles			Skewness	Kurtosis
						25th	50th (median)	75th		
First half of the trading month (–1 to 7)	960	0.0691	1.295	–5.75	5.286	–0.570	0.07028	0.725	0.035	2.279
Second half of the trading month (8 to –2)	960	0.0712	1.192	–8.29	4.886	–0.577	0.1072	0.693	–0.499	4.950

Note: Mann-Whitney U (Z-score) –0.315. P = 0.753 (NS)*. 0.01 < P >0.05. * not significant.

3.2.5. Analysis of descriptive statistics and Mann-Whitney U-test results for S&P BSE Health Care Index

As described in Table 10, the first half of the trading month for the Health Care index depicts mean returns of 0.1104 (median = 0.158, minimum = –4.90 and maximum = 4.724), standard deviation 1.106.

Percentile analysis denotes 25% of the days out of 960 days have returns below –0.464.

75th percentile denotes 25% of the days have returns above 0.733.

50% of the days of the first half of the trading month in the Consumer Durables sector have returns between –0.464 and 0.733.

Whereas, second half of the trading month for the Health Care Index exhibits mean returns of 0.0535 (median = 0.0631, minimum = –8.615 and maximum = 5.434), standard deviation 1.167.

Percentile analysis denotes 25% of the days out of 960 days have returns below 0.48.

75th percentile denotes 25% of the days have returns above 0.706.

50% of the days of the second half of the trading month in the Auto sector have returns between –0.48 and 0.706.

The return distribution is negatively skewed for both the periods of trading month. The kurtosis measure for return distribution was Platykurtic for the first half of the trading month and Leptokurtic for the second half in the Health Caresector during the study period.

The results of Mann-Whitney test ($P = 0.227 > 0.05$) confirm that the mean returns for the first half of trading month is not statistically significant compared to the second half. Hence, the null hypothesis that there is no significant difference in the mean returns of first half and second half of trading month in BSE Health Care Index is accepted.

Table 10. Results of descriptive statistics for the first half of the trading month and second half of the trading month and Mann-Whitney *U* (*Z*-score) for the difference of these two means of S&P BSE Health Care Index from April 2007 to March 2017

Period	N	Mean	Std. Dev.	Min.	Max	Percentiles			Skewness	Kurtosis
						25th	50th (median)	75th		
First half of the trading month (–1 to 7)	960	0.1104	1.106	–4.90	4.724	–0.464	0.158	0.733	–0.260	1.652
Second half of the trading month (8 to –2)	960	0.0535	1.167	–8.615	5.434	–0.48	0.0631	0.706	–0.822	6.855

Note: Mann-Whitney U (Z-score) –1.207. P = 0.227 (NS)*. 0.01 < P > 0.05. * not significant.

CONCLUSION

This study was carried out to detect the presence of semi-monthly effect in the select sectoral indices viz S&P BSE Auto Index, S&P BSE Bankex, S&P BSE Consumer Durables Index, S&P BSE FMCG Index and S&P BSE Health Care Index of Bombay Stock Exchange for the period between 2007 and 2017. The analysis was done using both calendar days approach and trading days approach. The results of the study showed none of the selected sectoral indices of BSE exhibited significant difference in the mean returns for the first and half of both calendar month and trading month. However, BSE Auto Index showed significant difference in the mean returns of first half and second half of trading month during the study period. The findings of the study indicate anomalies do not exist currently in Indian Stock Market and it is a sign of market efficiency as far as Bombay Stock Exchange is concerned. This study provides a scope for the researchers to explore other kinds of calendar anomalies in the sectoral indices of BSE.

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