Stock Market Anomalies: A Test Of Calendar Effect In The Bombay Stock Exchange (BSE)

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INTRODUCTION

Whether inexplicable patterns of abnormal stock market returns are detected in empirical studies of the stock market, a return anomaly is said to be found. There are other similar anomalies existing in the stock market. Economically meaningful stock market anomalies not only are statistically significant, but also offer meaningful risk adjusted economic rewards to investors. Statistically significant stock market anomalies have yet-unknown economic and/or psychological explanations. A joint test problem exists because anomalies evidence that is inconsistent with a perfectly efficient market could be an indication of either market inefficiency or a simple failure of Capital Asset Pricing Model (CAPM) accuracy. Some of the most-discussed about market anomalies are return anomaly, market capitalization effect, value effect, calendar effect, and announcement effect. Though various studies have been conducted to find out the presence of these anomalies across the stock markets worldwide, very few studies with reference to Indian stock market are available in the financial literature. This study aims to find the evidence of one of the anomalies, calendar effect in BSE Sensex, India's leading stock exchange. Calendar effect connotes the changes in security prices in stock markets following certain trends based on seasonal effects. Such trends or consistent patterns occur at a regular interval or at a specific time in a calendar year. Presence of such anomalies in any stock market is the biggest threat to the concept of market efficiency as these anomalies may enable stock market participants beat the market by observing these patterns. This notion again violates the basic assumption of efficient market hypothesis (EMH) that no one can beat the market and earn the profit in excess of market. Anomalies are the result in the shortfalls in the models applied for testing market efficiency, rather than of inefficiency of market **(Bowman and Buchanan, 1995)**. There could be a number of calendar anomalies that exist in the stock. A January effect has been documented in several studies that show unusually large positive rate of returns for stocks during the first few trading days of the year **(Cooper et al., 2006)**. Unusually good performance for the stocks on the day prior to market closing holidays have also been documented; this phenomena be known as Holiday effect.

Monday is the only day of the week that averages a negative rate of return. This Monday effect has given rise to the refrain, *"Do not sell stocks on Blue Monday"*. Change in the month itself acts as a psychological stimulator and boosts up the purchase behaviour in the stock market. This implies that average daily returns of stock on turn of the month are different from the average daily returns in rest of the month.

Ariel (1987) was the first to identify this anomaly in US stock prices at the beginning of one month and end of the other month. He studied this effect by considering last day of one month and the first three days of the upcoming month. Changes in stock prices in these days were found to be positive. However, different studies have given different conclusions for this effect, which could be opposite to these results as well. Daily stock returns are also different from each other at different points of time during a month. This study tried to test this difference by dividing a month into segments and then analyzing the returns for these segments separately in order to find out that in which segment daily stock returns are highest. The objective of our paper is to investigate the calendar effects in the Indian stock market. Besides discussing the presence of the calendar effects in the Bombay Stock Exchange (BSE) Sensex, India's leading stock index, which has not been covered in academic researches thus far, the researcher studies the calendar effects at different points of time during a month by segmenting it into two parts and analyzing the returns in the two parts separately. Since calendar effects are considered to be short-term phenomena due to learning of market participants **(Haugen and Jorion, 1996)**, these effects may disappear over time - given that investors are familiar to these calendar anomalies and formulate their trading strategies accordingly.

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DATA AND METHODOLOGY

To analyze the calendar effects during two different parts of the month, this study uses the market index of the Bombay Stock Exchange (BSE). Daily stock index of BSE 30 for the period April 1998 to March 2008 has been used in this study. The selection of this specific period is obvious for certain reasons. Among them are the said period that has witnessed significant development as far as policy measures in the stock market functioning and investors' awareness are concerned. Up-gradation of technology and Indian companies becoming more global than ever contributed to the increased investment activities. Flow of information became smoother and facilitated informed investment decisions. All these factors made this period interesting for any study of this nature. This ten-year window is very relevant to test the monthly effects of calendar anomalies in the Indian stock market.

TURN OF THE MONTH EFFECT

Different researchers used different event windows to study Turn of the Month Effect. **Ariel (1987)** while evaluating turn of the month effect, defined his event window as (-1, +4) i.e. last working day of previous month and first four days of the upcoming month. **Lakonishok and Smidt (1988)** analyzed Dow Jones Industrial Average (DJIA) for turn of the month effect with an event window of (-1, +3) i.e. last working day of the previous month and the first three days of the new month. Evidence of turn of the month effect for USA, Canada, Switzerland, Germany, UK and Australia has also been found; however, no such effect has been reported from Japan, Hong Kong, Italy, and France **(Cadsby and Ratner, 1992)**. Existence of turn of month effect has also been proved for stock markets of eighteen countries in 1970s **(Agarwal and Tondon, 1994)**.

The existence of The Turn Of The Month Effect is attributed to the following hypothetical issues:

(a) The proponents of the turn of the month effect argues that turn of the month effect in stock returns is caused by the investors' increased trading activity during the last few days of the month backed by their cash requirements for paying some sort of bills, such as compensation to the employees, interests and dividend, etc **(Ogden, 1990; Bahadur and Joshi, 2005).**

(b) Investors in general and institutional investors in particular tend to keep their portfolio attractive at the end of the month and show that they have only winners in their portfolio as an indicator of their high performance. This makes them more frequent selling and buying activities during the turn of the month, causing abnormal returns for some investors during that period **(Thaler, 1987; Lakonishok' et al, 1991)**.

(c) Corporate news tends to flow during the turn of the months. As positive news arrives in the market, they are reflected in the stock returns. Similarly, investors launch positive news in the beginning of a new quarter and so, positive returns along with new announcement are observed, especially in the beginning of the quarter **(Penman, 1987).**

As far as the Time of Month Effect is concerned, very first evidence about this effect is found back in 1999 when **Kohers and Patel** tested this effect in USA using S&P index for period 1960-1995 and NASDAQ index for period 1972-1995 by dividing the whole month into three parts. Their results revealed stock returns were highest in first segment, second segment showed a decreasing trend and in the third and the last segment, returns were either too low or negative in most cases. **Cadsby and Torbey (2003)** questioned the robustness of **Kohers and Patel's (1999)** time of month effect and argued whether it is a reality or just a mirage or illusion? Their study focused on two things. One, whether time of month effect is present in other than US markets as well, and second, whether it is independent of turn of month effect or just an extension of it? Significant results for Time of Month effect were found for Canada, France, Switzerland, Germany, UK, Hong Kong and Italy. For three out of nine countries, other than USA, time of month effect partially presents when turn of the month days are removed. But two other countries provided evidence in the opposite direction as well.This study has been conducted to test the market efficiency in the Indian stock market by examining calendar effect present in Bombay Stock Exchange, the largest stock exchange in India. In order to test the evidence of calendar anomalies, BSE's leading index BSE 30 SENSEX has been selected as a sample for this study. The main objective of the present study is to find out whether **Turn of the Month Effect** and **Time of the Month Effect** exists in BSE-SENSEX. Data pertaining to daily stock index of SENSEX, the capital weighted index of Bombay Stock Exchange (BSE) for the period April 1998 to March 2008 has been used in this study.

In order to test the calendar effect, daily logarithmic market returns were calculated for the specified period of ten

years using the following formula:

$$R_t = Ln\ (P_t / P_{t-1})*100 \quad ----- \quad (1)$$

Where:

R_t = Continuously compounded rate of change

Ln = Natural Log

P_t = BSE 30 index at time t

P_{t-1} = BSE 30 index at time t-1.

For Turn of the Month effect, a four-day window has been used as suggested by **Lakonishok and Smidt (1988)** and the following regression equation has been run to find out the Turn of the Month effect:

$$R_t = \beta_0 + \beta_1 d_{2t} + \varepsilon_t \quad ----- \quad (2)$$

This regression model follows the approach suggested by academic research of similar nature **(Lakonishok and Smidt, 1988; Zafar et al., 2009)**. In this equation, R_t refers to the daily return of stock index, β_i stands for coefficients for the mean returns in two segments, namely rest of the month (β_0) and turn of the month (β_1), d_{it} is the dummy variable for the TOM returns.On the basis of the above discussions, the researcher formulates the following hypothesis in order to test the turn of the month (TOM) effect in the Bombay Stock Exchange (BSE) index Sensex:

Hypothesis 1: The mean returns from stocks during the turn of the month are significantly different from that during remaining days of the month.

Since in our regression equation, β_1 refers to the difference between the average returns during the two periods of the month, s**ignificant positive value of coefficient** β_1 will prove the Turn of the Month effect in the BSE Sensex.

For Time of the Month Effect, this study follows the model in lines with that of **Bahadur and Joshi (2005)**. Time of the month connotes that different parts of any month have varying implications as far as stock returns are concerned. This is an additional assumption apart from the turn of the month effect assumption. For the study, a month is divided into two almost equal segments for analyzing the effects of time of the month. Following regression equation with dummy variables is used to find out the Time of the Month effect:

$$R_t = \beta_0 + \beta_{12t} + \varepsilon_t \quad ----- (3)$$

R_t is the change in daily value of the index in period t; Υ_{it} refers to the dummy variables for weeks of the month, i.e. Υ_{2t} will be 1 if the first half of the month witnesses positive returns, otherwise zero; and so on. β_i are regression coefficients for daily expected daily average stock returns for both the segments of the month, and ε_t is random error term for the day t. The preceding arguments lead the researcher to assume that during different segments of any given month, the average stock returns are significantly varying; this becomes the basis of formulation of our next hypothesis as follows:

Hypothesis 2: The difference between the average stock returns during each segment of any given month is different.

βi implies the difference between the mean stock returns during each of the equal segments of a month, hence, one significant positive value of any of the coefficients β_1, and β_2 can prove the Time of the Month effect in Bombay Stock Exchange (BSE 30 SENSEX). The following section discusses the results obtained from the analysis of data on stock returns from the Bombay Stock Exchange (BSE) index Sensex.

TURN OF THE MONTH EFFECT: EMPIRICAL ANALYSIS

The present section covers the analysis of the tests run on the data described as above. It focuses on the turn of the month effect as the calendar anomalies in the Indian stock market index BSE Sensex. First, we discuss the descriptive statistics for a clearer picture of the trends of the data reflected in the result of the data analysis. Then, the discussion proceeds towards the regression results and further analysis thereof. Descriptive statistics for the turn of the month (TOM) and the rest of the month (ROM) are shown in the Panel A Of Table 1. A comparative observation of descriptive statistics shown above in the Panel A of table 1 depicts that mean returns for the turn of the month (TOM, i.e.0.2698) are significantly higher than mean returns of the remaining days of the month (ROM, i.e. 0.0702) for the entire period of April 1998-March 2008. However, the direction of the mean returns is the same for all years except 2002 when the ROM mean returns are found to be in opposite direction from TOM mean returns. But, for the years

Table 1 Panel A: Descriptive Statistics For The Turn Of The Month Effect (TOM) And The Rest Of The Month (ROM) In BSE 30 (Sensex) For Individual Years From April 1998 To March 2008

Periods	Turn of the Month (TOM)	Rest of the Month (ROM)
1998		
Mean	-0.9143	-0.1626
Median	-0.0373	-0.1654
Standard Deviation	3.4434	2.1353
No. of observations	38	150
1999		
Mean	0.9034	0.2195
Median	0.9498	0.1133
Standard Deviation	3.2465	2.0682
No. of observations	48	197
2000		
Mean	-0.4301	-0.1553
Median	0.6309	-0.0782
Standard Deviation	4.2431	2.2386
No. of observations	48	199
2001		
Mean	-0.3181	-0.1289
Median	-0.0526	-0.0120
Standard Deviation	3.3738	1.8825
No. of observations	48	199
2002		
Mean	-0.0354	1.5108
Median	0.1703	0.5516
Standard Deviation	2.9243	2.7867
No. of observations	48	201
2003		
Mean	0.9079	0.2733
Median	0.4686	0.2848
Standard Deviation	3.1528	1.3657
No. of observations	48	202
2004		
Mean	0.1658	0.0458
Median	0.3435	0.1628
Standard Deviation	3.4466	1.8089
No. of observations	48	203
2005		
Mean	0.6041	0.1826
Median	0.5831	0.0924
Standard Deviation	3.0032	1.2948
No. of observations	48	201
2006		
Mean	0.8211	0.1815

Median	0.6538	0.3262
Standard Deviation	3.4029	1.8712
No. of observations	48	199
2007		
Mean	0.7476	0.1871
Median	0.5102	0.1165
Standard Deviation	3.5351	1.6578
No. of observations	48	201
1998-2007		
Mean	0.2698	0.0702
Median	0.3983	0.1079
Standard Deviation	3.4137	1.7792
No. of observations	470	1952

1998, 2000, and 2001, mean returns for both TOM and ROM are found to be negative. The year 2003 witnesses the highest mean returns for TOM, i.e. 0.9079. The evidence of the Turn of the Month (TOM) Effect exists there as is obvious from the higher mean returns for TOM than that for ROM in all the years. Higher mean returns are realized during the turn of the month as compared to the remaining days of the month, and this supports the existence of the turn of the month effect in the index under study.

Table 1 Panel B: Regression Coefficients For The Turn Of The Month Effect (TOM) In BSE 30 (Sensex) For Individual Years From April 1998 To March 2008

Period	ß$_0$	ß$_1$	R Square	F-value
1998	-0.0296 (-0.0182)	0.0445 (0.0611)	0.6429	3.8261*
1999	-0.0204 (-0.0321)	0.0509 (0.0361)	0.5161	1.2388
2000	-0.0421 (-0.0556)	-0.0638 (-0.0467)	0.5488	1.7447
2001	0.0217 (0.0321)	0.0406 (0.0253)	0.6184	2.8040
2002	0.0218 (0.0321)	-0.0374 (-0.0238)	0.6346	1.2713
2003	-0.0130 (0.0155)	0.3179 (0.1546)	0.5605	3.4190*
2004	-0.0188 (-0.0324)	0.0418 (0.0237)	0.4923	1.8528
2005	-0.0211 (-0.0343)	0.0403 (0.0560)**	0.6071	0.7714**
2006	-0.0211 (-0.3641)*	0.0428 (0.0244)	0.5694	1.3969
2007	-0.0211 (-0.0361)	0.4359 (0.0618)	0.5776	1.7082
1998-2007	0.0205 (0.3807)*	0.0859 (0.5812)*	0.4213	1.5428

*Significant at 95% level of confidence.
** Significant at 90% level of confidence.
t-values are given in parenthesis.

A detailed analysis of the regression coefficient results reveal that almost similar patterns in stock returns are found through all the years covered in this study. The trends in stock returns support the turn of the month (TOM) effect in the Bombay Stock Exchange index (BSE Sensex).

All the years except 2000 and 2002 have higher coefficient for TOM than coefficient for ROM, and notably with significant t-values and F statistics. In the years 2000 and 2002, where the values of β_0 (coefficient for ROM) are significant and that of β_1 (coefficient for TOM) are negatively insignificant. Here, it is interesting to note that in the year 2002, coefficient for ROM is positively significant and that for TOM is negatively insignificant with sufficiently significant F statistics (F = 1.2713).In the year 2003, where coefficient for TOM is positively significant (β_1 = 0.3179) with significant t-value and F statistics (t = 0.1546, F = 3.4190), it provides evidence for the existence of strong effect

of turn of the month. Almost similar pattern is revealed by the statistics for the entire period of April 1998 to March 2008. The regression coefficient for TOM is positively significant with overall significant regression ($\beta_0 = 0.0205$, $\beta_1 = 0.0859, t = 0.5812, F = 1.5428$). All these statistical figures are significant enough for rejecting our null hypothesis and supporting the alternative hypothesis. Thus, we can support the presence of the turn of the month effect in the Bombay Stock Exchange leading index Sensex for the given period of April 1998 to March 2008.

Here, it would be interesting to note that the results of the analyses for the turn of the month effect in BSE Sensex for the ten-year window period are very much in lines with the findings of studies of similar nature by **Lakonishok and Smidt (1988), Bahadur and Joshi (2005), and Gao and Kling (2005)**.

TIME OF THE MONTH EFFECT: EMPIRICAL ANALYSIS

As discussed in one of the previous sections (refer to the Data and Methodology section), the time of the month effect implies that different segments of any month witnesses significantly varying stock returns. This is another assumption of our study in addition to one of the turn of the month effect. In the present section, the researcher intends to discuss the results obtained from the analysis of data pertaining to the Bombay Stock Exchange leading index Sensex. The data are analyzed using the regression equation formulated earlier as mentioned in the Data and Methodology section of this research paper. For the purpose of analyzing the time of the month effect in the Sensex, a month is divided into two equal segments on the basis of trading days. β_0 is the coefficient for the first segment of any given month and β_1 is the coefficient for the second segment of the month. Υ is the dummy variable introduced in the equation. Any positive returns during the first segment of the month gives the value of 1 to Υ and in case of negative returns in the first segment, a value of 0 would be assigned. As discussed earlier, in the hypothesis 2, if we get $\beta_0 = \beta_1 = 0$, then the proposition of significantly varying returns in both the segments of any month would be rejected. A review of descriptive statistics in the Panel A of Table 2 reveals that there is no strong indication of varying mean stock returns during different time segments of a given month. A general trend depicting un-anomalous behaviour of mean stock returns in each of the two segments of the month is shown in our results. In the year 2004, 2006 and 2007, the mean stock returns are higher in the first segment of the month as compared to the second segment of the month. The

Table 2 Panel A: Descriptive Statistics For The Time Of The Month Effect In BSE Sensex For Individual Years Of April 1998 To March 2008

Periods	Time of the Month (Segment-1)	Time of the Month (Segment-2)
1998		
Mean	-0.0399	-0.0932
Median	0.2443	-0.2472
Standard Deviation	2.4003	3.1432
No. of observations	120	121
1999		
Mean	0.2851	0.2648
Median	0.4267	0.2509
Standard Deviation	2.7541	2.9511
No. of observations	124	127
2000		
Mean	-0.2293	-0.2444
Median	0.2091	-0.0153
Standard Deviation	3.2321	2.6485
No. of observations	122	124
2001		
Mean	0.0118	0.0523

Median	0.0917	-0.0812
Standard Deviation	1.8415	2.7308
No. of observations	121	124
2002		
Mean	-0.1006	-0.0863
Median	0.0136	0
Standard Deviation	1.7384	1.4268
No. of observations	118	131
2003		
Mean	0.4781	0.4742
Median	0.2980	0.4562
Standard Deviation	2.2571	1.9258
No. of observations	122	129
2004		
Mean	0.1298	0.0810
Median	0.1468	0.1281
Standard Deviation	1.7021	2.6271
No. of observations	125	126
2005		
Mean	0.4133	0.4657
Median	0.2714	0.4906
Standard Deviation	1.5330	1.6799
No. of observations	119	130
2006		
Mean	0.0666	0.1005
Median	0.2267	0.1741
Standard Deviation	2.8042	1.9213
No. of observations	122	124
2007		
Mean	0.1961	0.1031
Median	0.0225	0.2222
Standard Deviation	2.3441	2.7589
No. of observations	120	129
1998-2007		
Mean	0.1216	0.1042
Median	0.1808	0.1204
Standard Deviation	2.3259	2.4740
No. of observations	1213	1265

difference is significant enough to conclude that there exists the evidence of the time of the month effect in these years. When we compare the mean stock returns during each of the two segments of a month, we find that in most of the periods covered under this study, the mean returns are positively significant in one segment than the other segment. Though, this difference is not continuous in all the periods. In the years 1999, 2003, 2004, and 2007, the returns in first segment of the month are positively significant as compared to that in second segments of the month. But in the years 2001, 2005, and 2006, it is the second segment of the month which witnesses higher stock returns. The overall result for the entire period of 1998-2007 depicts higher positively significant stock returns in first segment of the month than

in the second segment of the month. In the years of 1998 and 2002, stock returns are negatively significant.
Coming to the regression equation results for the time of the month effect in the Bombay Stock Exchange index Sensex, the result, shown in the Panel B of Table 2, again supports the above discussion. It reveals that the stock returns follow a non-anomalous behaviour during different time periods of the month.

Table 2 Panel B: Regression Statistics For The Time Of The Month Effect In The BSE Sensex For Individual Years During April 1998 To March 2008

Periods	$ß_0$	$ß_1$	R Square	F-value
1998	-0.0382 (-0.2263)	0.0314 (0.2574)	0.6235	0.0149
1999	0.2247 (1.3262)	-0.2171 (-0.9075)	0.3297	0.8237
2000	-0.1343 (-0.6636)	0.0226 (0.0099)	0.2771	0.6751
2001	0.0046 (0.0323)	-0.0371 (-0.1909)	0.1509	0.0364
2002	0.0983 (0.1126)	-0.1336 (-1.0407)	0.3349	1.0839**
2003	0.1406 (0.9204)	0.1490 (0.8082)	0.2616	0.6532
2004	-0.0191 (-0.1094)	0.1167 (0.5362)	0.5351	0.2875
2005	0.0225 (0.1583)	0.2518 (1.5693)*	0.9872	2.4627**
2006	-0.0158 (-0.0829)	0.1158 (0.4897)	0.9819	0.2398
2007	-0.1914 (-0.9091)	0.3978 (1.5375)*	0.9480	2.3641
1998-2007	0.0304 (0.0579)	0.0874 (1.2895)	0.6711	1.6629

*Significant at 95% level of confidence.
** Significant at 90% level of confidence.
t-values are given in parenthesis

In the results of regression equation (as shown in the table above), the value of β_0 and β_1 are seen to be positively different from each other. Though the trend is not similar in all the periods of the study, it supports the proposition made in the beginning of this study that the stock returns in different segment of a month are positively significant and different from each other.
The returns in each of the two segments of the month in all the periods show no anomalous behaviour. An examination of the values of coefficients reveals that the values of β_0 are higher than the values of β_1 in the years 1999, 2001, 2002, and 2003, but the values of β_1 are positively significant as compared to that of β_0 in the years 1998, 2000, 2004, 2005, 2006, and 2007. For the entire period of 1998-2007, the value of β_1 is positively significant as compared to the value of β_0 ($\beta_1 = 0.0874$, $\beta_0 = 0.0304$, $F = 1.6629$) with the overall regression statistics of F and t-values.
On the basis of the results revealed from the analysis of data, the researcher is in a position to reject our null hypothesis that the returns in each of the two segments of a month remains equal. The preceding discussions also support the time of the month effect in the BSE Sensex.

CONCLUSION

The Bombay Stock Exchange (BSE) index of 30 stocks, Sensex exhibits calendar anomalies in its returns; the calendar anomalies examined in this study are *The Turn Of The Month Effect and The Time Of The Month Effect*. The main idea of the present study was to find out whether the Indian stock market suffers from calendar effects. To test this issue, the researcher selected the Bombay Stock Exchange index (BSE-Sensex) for the study. The choice was obvious as BSE-Sensex is the leading exchange of Indian stock market.
Using data from the BSE 30 (Sensex), the study found that a monthly pattern of market returns exists in the index. First, the turn of the month effect has been tested. Our results reveal that mean returns in early days of a month are higher than remaining days of the same month. This trend depicts the increased frequency of selling by investors at the end of the month, which further results in higher returns during the first few days of the next month. Another calendar effect that has been tested in this study was the time of the month effect. An evidence of the time of the month effect has

been found in the BSE Sensex, supporting the existence of anomalous behaviour of stock returns in the index. Yet, the time of the month effect in the BSE Sensex possesses a minor magnitude and relevance for determining average returns compared to the findings in other studies of similar nature; this might be explained by the fact that Indian investors tend to be engaged in trading during end of the month and in the early days of the month. And these trades effect in the turn of the month anomaly - as is evident from the empirical findings. This explanation is, however, not statistically tested and proved; rather it is based on narrative evidence observed by the researcher in India.

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