

## Calendar Anomalies in India: A Case of BSE SENSEX

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### Abstract

Calendar anomalies have been long since studied as they are beneficial to investors in deciding their time of investment. In India, studies on calendar anomalies have been done but they have not focused on the time period of COVID pandemic. This study attempts to check for the presence of two common anomalies i.e day-of-the-week effect and month-of-the-year effect in BSE Sensex. The comprehensive time period for the study is from 2017 to 2022. However, separate analysis has been done for 2020-2021 to check whether these anomalies have been present during the COVID pandemic years or not.

Keywords: Calendar anomalies, Day-of-the-week, Month-of-the-year, COVID pandemic

### Introduction

Investors have always wished to earn returns from their investments, and for that, they select a basket of securities to invest their funds in. Opportunistic investors have considered equity markets as a means to generate higher returns as compared to mundane investment avenues like fixed deposits, provident funds, etc.

Equity markets usually do generate returns; however these returns may or may not follow a certain pattern. This brings to light the concept of anomalies.

Anomalies mean any distortion from usual pattern. So, if there is some distortion in returns of the stock market, then there is a possibility of some or the other anomaly being present. This study focuses on calendar anomalies.

These calendar anomalies are related to time of the year for example, returns could change as per the month of the year, week of the month, day of the week, etc.

There are a lot of calendar anomalies, but this study focuses on the day-of-the-effect and month-of-the-year effect which are the most common calendar anomalies as compared to

others. These calendar anomalies have been studied in Developed Markets but not much study has been done in India especially in the pandemic era.

### **Review of Literature**

Researchers such as Drogalas et. al (2007) have stated that Day-of-the-Week is such a phenomenon that the average daily returns of stock market will differ on each day of the week. In simpler terms, it means that the average daily returns of an index will be different on Monday from other days of the week, similarly returns on Tuesday, Wednesday, Thursday, Friday, etc. will also be different.

Similarly, Month-of-the-year effect means that the average daily returns for each month of the year would differ from that of one another.

Below is a review of research conducted in various countries on day-of-the-week or month-of-the-year anomaly/ effect.

A study conducted by Dubois & Louvet (1996) aimed at finding out the presence of day-of-the-week anomaly in nine countries. For their study, the researchers had selected the period from 1969-1992. They had also further divided the period into two sub-periods, one from 1969 to 1984 and another from 1985 to 1992. There seemed to be disappearance of the day-of-the-week anomaly from US in the sub-period from 1985 to 1992. But the anomaly was still found to be present in some other countries' markets such as Hong-Kong, Toronto, etc.

Brooks & Persaud (2001) also conducted a study on select markets which are South Korea, Malaysia, Philippines, Taiwan and Thailand and checked whether there was day-of-the-week effect in those markets or not. The time period which was considered for the study was from 1989 to 1996. It was found by the researchers that there were differing average returns in various markets.

In the Indian context, Raj & Kumari (2006) conducted a study on both BSE and NSE. For their study, they had employed multiple regression using dummy variables technique on data from the two markets from 1990 to 1998. Based on the analysis, it was concluded that there are positive returns on Monday and rather negative returns on Tuesday in the markets under study.

Earlier, Sarma (2004) has also conducted a study on three indices of the Indian stock market namely BSE Sensex, Natex and BSE 200. The data collected from these indices were from the year 1996 to 2002. As a result of the study, it was found that there is presence of day-of-the-week effect and weekend effect in the indices under study. These studies show how calendar anomalies were present in the Indian stock market.

On the other hand, Jassal & Dhiman (2016) conducted a study in which the companies of a particular sector were selected for study rather than an index. They had selected top ten companies of hospitality industry ranked by Market Capitalization on BSE were studied. From the analysis, it was found that there were presence of calendar anomalies in various companies, and also the anomalies varied from company to company.

To consider a recent study which focuses not only on Indian market but also on COVID time period another study has been reviewed.

K & D'souza (2021) collected data on BSE-200 from the year 2010 to 2020 which is a time period of ten years. Also, considering that COVID-19 began in the end of 2019 and further into 2020, the pandemic time period has also been studied. With the help of descriptive statistics and regression analysis, it was found that there is existence of Day-of-the-Week effect in the BSE 200 as higher returns were found on Wednesday. Further it was also found that there is existence of Month-of-the-Year effect in the same index.

### **Research Methodology**

#### **Problem Statement**

This study focuses on bringing light to checking for existence of Day-of-the-Week and Month-of-the-Year effect in the Indian Stock Market. For this purpose, one index has been chosen as a representative that is the BSE Sensex. Also the study aims at checking for the presence of the anomaly during the recent years especially during the COVID-19 pandemic years.

#### **Research Objectives**

1. To study the presence of day-of-the-week effect in BSE Sensex
2. To study the presence of month-of-the-year effect in BSE Sensex

#### **Significance of the study**

The study will be useful in such a way that if there is presence of the calendar anomaly, investors will be able to identify the days on which they should invest or not invest so as to earn abnormal returns from the market.

#### **Source of Data**

The daily closing prices of the selected index i.e BSE Sensex has been collected from 1<sup>st</sup> January 2017 to 31<sup>st</sup> December 2022 from its official website ([www.bseindia.com](http://www.bseindia.com)).

#### **Limitations of the Study**

- The study is limited to only one index i.e BSE Sensex.

- The study is limited to two calendar anomalies only.
- The time frame used for this study is only 6 years.

### Importance of the Research

The study can be shows results that on specific days of the week and specific months of the year, the BSE Sensex generates negative returns. The investors can take an idea from this and try to minimize their loss knowing which month or day generates negative or positive returns.

### Hypothesis

H0: The mean returns of all the days of the week are equal

H1: The mean returns of all the days of the week are not equal

H0: The mean returns of all the months of the year are equal

H0: The mean returns of all the months of the year are not equal

### Data Analysis

#### Calculation of Returns

From the daily closing prices, log return has been calculated using the following formula:

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

Where  $R_t$  is the return at time t and  $P_t$  and  $P_{t-1}$  are closing prices at time t and t-1 respectively.

#### Day-of-the-Week

Table 1: Descriptive Statistics for Day-of-the-Week

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	-0.0926	0.2259	0.0774	0.0295	0.0427
Standard Deviation	1.537017	1.003363	0.986071	1.11035	1.063017
Kurtosis	26.45655	16.42598	11.19049	13.76043	5.338498
Skewness	-3.73925	2.387243	0.320323	-1.61474	0.661848
Count (observations)	296	297	299	300	292

As observed from Table 1, average returns for Tuesday were the highest with a mean of 0.2253. On the contrary, Monday displayed negative returns and it also displays the highest standard deviation.

Table 2: Regression Analysis for Day-of-the-Week effect from 1<sup>st</sup> January 2017 to 31<sup>st</sup> December 2022.

	Coefficients	Std. Error	T statistic	P-value
Monday (Intercept)	-0.09259	0.06729	-1.376	0.16902
Tuesday	0.31845	0.09508	3.349	0.00083
Wednesday	0.17003	0.09492	1.791	0.07345
Thursday	0.12213	0.09484	1.288	0.19806
Friday	0.13527	0.09548	1.417	0.15679
F-Stat= 2.892				
P-Value= 0.0212				

As the P-Value is 0.0212, which is less than 5% level of significance, the model is statistically significant. This shows that there is existence of Day-of-the-Week effect during the period under study. The Co-efficient value of Monday shows negative returns however looking at the P-Value of 0.16902, it is not of statistical significance, and thus there is absence of Monday effect. However, the P-Value of Tuesday is 0.00083 which is well below the 5% level of significance and therefore, the positive returns on Tuesday are statistically significant.

Table 3: Regression Analysis for Day-of-the-Week effect from 1<sup>st</sup> January 2020 to 31<sup>st</sup> December 2021.

	Coefficients	Std. Error	T statistic	P-value
Monday (Intercept)	-0.4330	0.1593	-2.719	0.00678
Tuesday	0.9327	0.2241	4.162	3.73e-05
Wednesday	0.5674	0.2236	2.538	0.01147
Thursday	0.5525	0.2241	2.465	0.01403
Friday	0.4662	0.2276	2.048	0.04107
F-Stat= 4.43				
P-Value= 0.001586				

As the P-Value is 0.001586, which is less 5% level of significance, the model is statistically significant. This shows that there is a presence of Day-of-the-Week effect during the period 1<sup>st</sup> January 2020 to 31<sup>st</sup> December 2021.

The P-Value of each day also indicates that all the five P-values are statistically significant. The P-value of Monday is also statistically significant, which shows that there is a Monday effect present in the BSE Sensex during the period under study.

**Kruskal-Wallis Test for Day-of-the-Week Effect (2020-2021)**

Null hypothesis = The average daily return of all the days of the week is equal

Alternate hypothesis= The average daily return of all the days of the week is not equal

Table 4: Non-Parametric Test for Day-of-the-Week Effect (2020-2021)

Kruskal-Wallis chi-squared	12.105
Df	4
P-Value	0.01659

As the P-Value of the Kruskal-Wallis Test is 0.01659 which is less than 5% level of significance, null hypothesis is not accepted, and it indicates that the Day-of-the-Week effect is observed in BSE Sensex during the period 1<sup>st</sup> January 2020 to 1<sup>st</sup> June 2022.

**Month-of-the-Year**

Table 5: Descriptive Statistics for Month-of-the-Year

Month-of-the-Year	Mean	Standard Deviation	Kurtosis	Skewness	Count (observations)
January	0.038317	0.784848	0.525883	-0.41119	129
February	-0.04775	1.256763	4.027646	-0.33359	118
March	-0.11719	2.356752	12.18746	-2.21826	123
April	0.155641	1.471761	9.631409	1.44223	114
May	0.046948	1.212201	5.780351	-0.86485	126
June	0.019769	0.815389	1.5676	-0.14703	127
July	0.167056	0.706941	0.240887	-0.31887	131
August	0.120543	0.821693	0.581799	-0.10132	124
September	-0.05478	1.022666	5.405488	0.97101	123
October	0.120233	0.941446	0.419105	-0.49739	121
November	0.139838	0.768016	1.608901	-0.47039	123
December	0.07603	0.820529	1.345726	-0.84361	128

As observed from the above table, average returns for February, March and September are in the negative whereas the returns for July are the highest.

**Kruskal-Wallis Test for Month-of-the-Year Effect (2020-2021)**

Null hypothesis= The average returns of all the months of the year is equal

Alternate hypothesis= The average returns of all the month of the year is not equal

Table 6: Non-Parametric Test for Month-of-the-Year Effect (2020-2021)

Kruskal-Wallis chi-squared	9.2403
Df	11
P-Value	0.5997

Result: From the table, the P-Value of the Kruskal-Wallis Test is 0.5997 which is more than 5% level of significance, which indicates that the Month-of-the-Year effect is not observed in BSE Sensex during the two years of COVID pandemic as well.

**Conclusion**

It has been found that from the year 2017 to 2022, there is a presence of Day-of-the-Week or in the BSE Sensex. Also, while considering the two years of COVID-19 pandemic (2020 and 2021), it can be seen that there is a presence of Day-of-the-Week effect precisely during those two years. There is evidence of negative returns being found on Monday and statistically significant positive Tuesday returns. The Month-of-the-Year effect still remains non-existent in BSE Sensex in 2020 and 2021 as well.

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