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MARKET EFFICIENCY AND DAY OF THE WEEK ANOMALY: A STUDY ON S & P BSE 200 INDEX

Mallesha L.
Doctoral Research Scholar, Department of Studies in Business Administration
Vijayanagara Sri Krishnadevaraya University, Ballari, Karnataka
malleshnaikmalla@gmail.com

Archana H.N.
Associate Professor
Department of Studies in Business Administration
Vijayanagara Sri Krishnadevaraya University, Ballari, Karnataka

ABSTRACT

Investors aim to achieve superior profits through meticulous examination of stock prices. One noteworthy phenomenon in this regard is the day-of-the-week effect, which proposes that stock returns follow a discernible pattern based on the trading day. In line with the Efficient Market Hypothesis, the expectation is that daily mean returns should be uniform. To investigate this phenomenon, the study focused on the day-of-the-week effect using the S&P BSE index. Daily closing prices of S&P BSE 200 from April 1, 2021, to March 31, 2023, were observed and sourced from the Bombay Stock Exchange website. Various statistical tests, such as the Jarque Bera test, Student's t-test, and Ordinary Least Square (OLS) model, were employed. The analysis of the findings revealed a deviation from a normal distribution. Both the Student's t-test and OLS regression identified Tuesday and Wednesday as statistically significant days. The study concludes that the S&P BSE 200 index exhibits the day-of-the-week effect anomaly, suggesting that investors can achieve abnormal profits by strategically observing specific trading days.

Keywords: Day of the week effect; Market anomaly; Market efficiency; OLS regression
JEL classification: G10; G11; G14

1. INTRODUCTION

Market efficiency is a fundamental financial concept that seeks to understand the extent to which stock prices reflect all available information (Mallesha & Archana, 2023). The efficient market hypothesis (EMH) posits that financial markets are efficient, meaning it is impossible to consistently achieve above-average returns through active trading strategies, as stock prices already incorporate all relevant information (Fama, 1965, 1970). The efficiency of developing markets is becoming more important as the trend of investments accelerates in

these markets due to legislative reforms and the removal of various impediments to international equity transactions (Mehla & Goyal, 2012). However, numerous studies have documented various anomalies that challenge the notion of market efficiency. One such anomaly is the day-of-the-week effect, which suggests that stock returns exhibit a predictable pattern depending on the trading day (Slater et al., 2021). This anomaly has been extensively studied in different financial markets worldwide, and researchers have sought to determine the underlying factors driving this phenomenon. Understanding the day of the week effect is crucial for investors because it provides insights into the profitability of different trading strategies (Bush & Stephens, 2016). If a systematic pattern can be identified, market participants may be able to exploit this information to earn abnormal returns. According to the Efficient Market Hypothesis, each daily mean return should be equal to each other (Berument & Kiymaz, 2001).. The present research aims to investigate the day-of-the-week anomaly in the context of the S&P BSE 200 Index, a broad-based stock market index comprising the top 200 companies listed on the Bombay Stock Exchange (BSE). India's stock market has experienced significant growth in recent years, attracting domestic and international investors. Thus, the day-of-week effect anomaly contradicts the weak form of EMH. Therefore, analysing the day-of-the-week effect in this market is relevant to investors, and traders, Additionally, policymakers and regulators can benefit from a comprehensive analysis of the day-of-the-week effect as it may inform the development of more efficient market regulations.

The article is organized as follows: the second section offers a concise overview of relevant literature related to the research; the third section outlines the problem statement; the fourth section details the study's methodology; the fifth section presents the study's results and discussions; and, lastly, the concluding remarks are provided in the final section.

2. LITERATURE REVIEW

Alagidede and Panagiotidis (2009) conducted a study on the Ghana Stock Exchange to examine the effects of the day of the week and month of the year effects. They used non-linear models from the generalized autoregressive conditional heteroscedasticity (GARCH) family in a rolling framework to analyze the role of asymmetries and the impacts of policy and institutional changes. They found an April effect instead of the usual January effect in Ghana, but it disappeared in the rolling framework. They also discovered a day-of-the-week

impact, with Friday's return being the most significant, although this seasonality disappeared when using a rolling window.

Tadepalli et al. (2022) studied the turn-of-the-month effect in Indian stock indices. They analyzed all the broad-market and sectoral indices of the National Stock Exchange and the Bombay Stock Exchange. The study used the ARIMAX methodology with dummy exogenous variables to represent the turn-of-the-month days. The authors presented comprehensive findings and insights into the changes in the strength and significance of the anomaly with various stock market reforms in both the broad-market and sectoral indices.

Sharma and Singh (2006) examined the weekend effect in the Indian stock market using daily closing prices of the Sensex. They found negative Monday returns and positive Friday returns, consistent with previous studies. They also observed correlations between certain days of the week during different periods, indicating the presence of the weekend effect.

Sharma (2011) investigated the day-of-the-week effect in the Indian stock market using data from January 2008 to December 2009 for Sensex and Nifty indices. The study concluded that the day-of-the-week effect did not exist in the Indian Stock Market during that period, suggesting that the market was informationally efficient. The study found Monday and Friday effects insignificant when comparing their returns with those of other days. The author suggested that the absence of anomalies may limit the opportunities for formulating profitable trading strategies.

Sahoo (2021) examined the day-of-the-week effect in various Indian stock market indices before and during the COVID-19 health crisis. The study used daily closing data for Nifty 50, Nifty 50 Midcap, Nifty 100, Nifty 100 Midcap, Nifty 100 Smallcap, and Nifty 200 from April 1, 2005, to May 14, 2020. The study employed dummy variable regression and the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model. The results showed a negative return for Mondays during the COVID-19 crisis, whereas it was optimistic before the crisis. The effect of Tuesday on index return was found to be statistically significant and positive for all indices during the COVID-19 crisis.

Rossi and Gunardi (2018) studied market anomalies in France, Germany, Italy, and Spain's stock exchange indexes from 2001 to 2010. They used statistical methods such as the GARCH model and OLS regression to analyze the distribution of returns and their autocorrelation. The analysis did not provide strong evidence of comprehensive calendar anomalies, and some effects were found to be country-specific. The study concluded that

these country-specific anomalies were unstable in the new millennium's first decade, casting doubt on their significance.

Abdulla (2012) conducted a study to investigate the presence of the random walk model and the day-of-the-week effect in the Saudi stock exchange. The analysis covered the period from 1999 to 2010 and employed various statistical tools, including autocorrelation, the Ljung-Box test, run tests, and regression models to examine the development of the day-of-the-week effect. The results of the study indicated market inefficiency in the Saudi stock exchange.

Freiberg et al. (1993) examined the Swedish stock market using monthly data to test the random walk hypothesis. The researchers utilized the variance ratio test and autoregressive analysis of multiple returns. The findings contradicted the random walk model, suggesting that Swedish stock prices do not follow it.

Ozdemir (2008) focused on studying market efficiency in the weak form for the Istanbul stock exchange. The researcher employed unit root tests, run tests, and variance ratio tests. The study confirmed that the Istanbul stock exchange adheres to the random walk model, indicating weak form efficiency.

Srivatsva (2010) investigated the weak form efficiency of the Indian stock market by analyzing the closing prices of five major indices listed in the National Stock Exchange. Various statistical tools, including autocorrelation function, run tests, and unit root tests, were used. The study concluded that the Indian stock market follows a random walk model and exhibits efficiency in its weak form.

Graham Smith et al. (2003) examined the adherence to the random walk model in five major European emerging stock markets. The researchers analyzed weekly closing prices and employed multiple variance ratios as a measure. The findings suggested that these stock markets need to adhere to the weak form of market efficiency. In another study focused on the National Stock Exchange.

3. STATEMENT OF THE PROBLEM

The day-of-the-week anomaly is a phenomenon where stock returns exhibit noticeable variations throughout different trading days. Although there have been minimal efforts to formally assess the impact of the day of the week on the Indian stock market, existing literature indicates that this anomaly exists in several global stock markets. However, there is a scarcity of research that concentrates on the Indian market and specifically the BSE 200

Index. As a result, this study aims to investigate the existence and extent of the day-of-the-week anomaly in the S&P BSE 200 Index and offer valuable insights into its implications for market efficiency.

4. OBJECTIVE AND HYPOTHESIS

Objective of the study

1. The purpose of this study is to investigate day of the week effect in stock market by examining the S&P BSE 200 index.

Hypothesis of the study

The central testable null hypothesis with the specified objective is formulated.

2. H_{01}: There is no statistical difference among mean returns for different days of the week.
3. H_{02}: There is no returns difference among the weekdays; they are all the same.

5. DATA AND METHODOLOGY

5.1.Data

For our research, we have utilized the daily closing prices of the S&P BSE 200. The S&P BSE 200 index consists of the top 200 companies listed on the BSE Ltd and is designed to monitor the performance of these companies. Our study encompasses the period from 01 April 2021 to 31 March 2023. We collected the closing prices of the indices from the website www.bseindia.in.

5.2.Methodology

The main objective of our study is to examine the weak form of market efficiency by analysing the day-of-the-week effect in the S&P BSE 200 index. To achieve this, used various statistical tests, including the Jarque-Bera for normally test, Student t-test for mean differences, and OLS regression model. The daily closing prices S&P BSE 200 index is converted into log returns. The formula express as:

$$R_t = ln\left(\frac{P_t}{P_{t-1}}\right)$$

where Rt is the contiguously compounded return of the S&P BSE 200 index, ln is the natural logarithm, Pt and Pt-1 are the daily closing prices for time t and time t-1 respectively, and t indicates the time, in this case the day.

5.3.Comparing Mean using t-test

In accordance with the Efficient Market Hypothesis, it is theorized that the daily mean return should be inherently uniform. To evaluate the statistical significance of a daily mean return differing from zero on specific weekdays, a direct T-statistic test is utilized. The t-statistic is often utilized in the context of the Student's t-test, which is a statistical test used to compare the means of two groups to determine if they are significantly different from each other.

6. REGRESSION MODEL OF DAY-OF-THE-WEEK EFFECT

To examine the day-of-the-week effect, we conducted OLS regression analyses. The daily index returns serves as the dependent variable, while four daily dummy variables act as independent variables, along with an intercept corresponding to Mondays. Each dummy variable takes a value of one on its respective day (e.g., the Tuesday dummy variable equals one on Tuesdays and zero otherwise). The intercept represents the average returns for Mondays, and the remaining dummy variables indicate the average deviation of return from Monday averages. The ordinary least square (OLS) regression expressed as:

$$R_t = \Phi_1 + \Phi_2 D_{2t} + \Phi_3 D_{3t} + \Phi_4 D_{4t} + \Phi_5 D_{5t} + \Phi R_{t-1} + R_{wt} + \varepsilon t$$

where Rt is daily index return on BSE 200, Φ1 is the intercept or the Monday return. Dit are the daily dummy variables, where D_{2t} is the dummy variable for Tuesday. Φ_2 toΦ_5 are the coefficients of the dummy variables. ΦR_{t-1} is the one day lagged return of the index or the autoregressive (AR) term. R_{wt} is the index returns from the BSE 200, acting as a control variable in order to improve the goodness of fit for the model. The error term is denoted as εt.

7. RESULTS AND DISCUSSIONS

The data analysis was conducted utilizing RStudio version 2023.09.1+494, a statistical software.

Table 1. Descriptive statistics for S&P BSE 200 index returns

Stats	All Days	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	0.0016	-0.001	0.0048	0.0025	0.0014	0.0001
Std.	0.0117	0.0149	0.0114	0.0089	0.0116	0.0105
Kurtosis	5.951	1.8997	16.8021	-0.0481	4.4546	1.37
Skewness	-0.2188	-0.9158	2.4023	0.0909	-0.8478	-0.3306

Min	-0.0557	-0.0557	-0.0295	-0.0178	-0.0515	-0.0337
Max	0.078	0.0424	0.078	0.0247	0.0386	0.0286
T-Stat	2.956	-0.686	4.165*	2.794*	1.175	0.061
JB test	0.000	0.000	0.000	0.000	0.000	0.000
Observations	496	100	100	100	101	94

*Note: * denotes significant @ 5 % level*
Source: Authors' estimation

Table 1 displays descriptive statistics, revealing that S&P BSE 200 returns exhibit negative skewness (-0.2188) and higher kurtosis (5.9510) than the expected 3, indicating deviation from normal distribution and hinting at weak form market inefficiency. The Jarque-Bera test confirms the S&P BSE 200 index does not follow a normal distribution, leading to the rejection of the null hypothesis normal distribution. On the other side, the result of t-stat had higher average returns on Tuesday and Wednesday compared to other weekdays. The results suggest a day-of-the-week effect, indicating potential abnormal profits. A student t-test confirms that it is statistically significant on Tuesday and Wednesday. The remaining weekdays show no significance, leading to the rejection of the null hypothesis, i.e. (There is no statistical difference among mean returns for different days of the week). Hence, it indicates that the day-of-the-week effect exists in the stock market.

Table 2. Results of S&P BSE 200 index Returns using OLS Regression

Days	Coefficients	Standard Error	T-stat	P-value
Monday	-0.001025	0.001167	-0.878	0.380458
Tuesday	0.005745	0.001643	3.497	0.000513*
Wednesday	0.003513	0.001647	2.134	0.033374*
Thursday	0.00238	0.001643	1.449	0.14802
Friday	0.001092	0.001673	0.653	0.514213
Adjusted R-squared	0.01919			

*Note: * denotes significant @ 5 % level*
Compiled from Rstudio

The p-value associated with each coefficient tests the null hypothesis that the true coefficient is zero (i.e., no effect). A p-value less than the conventional significance level (0.05) suggests that the variable is statistically significant. Yet, as per the regression results presented in Table 2, Tuesday and Wednesday exhibit statistical significance at a 95% confidence level. Consequently, the null hypothesis, i.e. There is no return difference among the weekdays; they are all the same, is rejected. This implies that a day-of-the-week effect prevails in the stock market, suggesting a potential avenue for abnormal profit due to this effect. Therefore,

the S&P BSE 200 returns contain day-of-the-week effect anomaly during the observation period.

8. CONCLUSION

The study observed the S&P BSE 200 index to determine weak form of efficiency, specifically focusing on the day-of-the-week effect anomaly. To achieve this, April 1, 2021, to March 31, 2023, was taken as a sample period and employed various statistical tests, including the Jarque Bera test, Student t-test, and Ordinary Least Squares (OLS) regression model. The results of this test indicate that the returns of the S&P BSE 200 are not normally distributed. The Student t-test reveals the presence of the day-of-the-week effect anomaly in the Indian stock market. The results of OLS regression also corroborate these findings by highlighting the significance of Tuesday and Wednesday. Consequently, the research suggests that the S&P BSE 200 index presence a day of the week effect during the study period. The findings of our study are similar to the results of previous studies (Poshakwale, 2002; Rehman et al., 2018; Sadat, 2019; Said & Harper, 2015; Siddiqui & Narula, 2013; Srinivasan, 2010). The presence of the day-of-week effect anomaly challenges the assumptions of the efficient market hypothesis. Therefore, investors and traders need to examine the day-of-the-week effect in this particular market. Moreover, policymakers and regulators can gain valuable insights from a thorough analysis of this effect, which could contribute to the establishment of more effective market regulations.

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