Original Article
ISSN (Online): 2582-7472

ShodhKosh: Journal of Visual and Performing Arts
January-June 2022 3(1), 1173–1178

CALENDAR EFFECTS IN DAILY RETURNS IN INDIAN STOCK MARKET: AN ANALYSIS

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ABSTRACT

The degree and scale of informational efficiency in stock markets are reflected in the frequency of calendar anomalies in general. Global stock markets experience a variety of oddities, and they differ from one nation to the next. Market players are constantly on the edge of exploiting stock market inefficiencies to produce extraordinary returns. Anomalies by day of the week significantly increase the degree of inefficiencies and distort the market. Using daily values from the BSE Sensex benchmark index from April 2015 to March 2020, the current study investigates whether the day of the week has an impact on daily returns in the Indian stock market. The GARCH model-based empirical analysis claim that the Indian stock market exhibits day-of-the-week abnormalities. By timing their investment actions correctly, market players can increase their average return and are expected to develop investment strategies to outperform the market. The results are useful, especially for small investors who are making decisions on when to enter and quit the financial market.

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DOI
10.29121/shodhkosh.v3.i1.2022.6165

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

1. INTRODUCTION

Financial markets have experienced calendar anomalies over the past thirty years, with the 'day of the week effect' being a notable phenomenon that has drawn the attention of numerous researchers from various economies to investigate the matter. The day of the week effect indicates that stock returns are influenced by the specific day of the week on which they occur. The presence of unusual patterns in returns and volatility is extensively recognized in financial studies, making it essential for investors to determine the appropriate timing for their entry and exit strategies. The increasing reliance on daily data has prompted further investigations in financial research, particularly broadening the examination of seasonal trends to encompass effects related to the days of the week, weekends, and bank holidays.

Numerous validations for these irregularities have been provided by the literature on the subject, including the lack of negotiations on weekends, the availability of information on Mondays regarding responses to information generated during non-listing days, the payment procedures for market transactions, the effects of liquidity, etc. Several studies have examined this seasonality and found empirical evidence of abnormal yield distributions based on the day of the week.

The original work was carried out using data available from the U.S. market. The different authors that made remarkable contributions include French (1980), Gibbons and Hess (1981), Lakonishok and Levi (1982) and Keim and Stambaugh (1984). This kind of changes has also been analyzed by Aggarwal and Rivoli (1989) and Chang, Pinegar and Ravichandran (1993) in security markets under an international setting. But even then, the concept of day of the week effect under a volatility has not attracted much attention in the literature. The present paper is divided into the three sections. Section II provides a brief review of the financial literature dealing with the anomaly commonly referred to as the day of the week effect. Section III provides a description of the database as well as the methodology used in the paper. The estimations from the GARCH model. Section IV ia all about the interpretations and results followed by conclusion in the last section.

Section II

2. REVIEW OF LITERATURE

Gultekin et al. (1983) looked at the stock markets of 16 industrial nations and found prove for calendar impacts within the frame of January returns. These impacts were especially huge in 15 out of 16 nations examined. Brown et al. (1985) looked at the month to month returns of the Australian stock advertise. They found the predominance of calendar impacts from December-January to July-August. They recognized this to the reality that the monetary year is from June to July in Australia. Mill and Coutts, 1995, looked at the calendar impacts on FTSE 100 indices, Mid 250 indices and 350 indices for 1986 and 1992.

Sharma (1977), Kennedy (1977), and Choudhuri (1991) did not provide any convincing evidence of calendar effects or information inefficiencies in their initial investigations on India. When Broca (1992) examined the daily returns of the BSE NATEX, he came to the conclusion that Wednesdays had the lowest average returns. This was the first time that he presented strong evidence for the day of the week effect. Using SENSEX monthly return data from April 1991 to March 2002, Pandey (2002) showed the existence of anomalies in India's stock markets throughout the post-reform era and ascribed them to the tax-loss selling hypothesis.

Sarma (2004) examined the daily returns of the SENSEX, NATEX, and BSE 200 for the period from January 1, 1996, to August 10, 2002, for the presence of calendar anomalies using a non-parametric Kruskall Wallis Test. Out of all the indices, the Monday to Friday set had the biggest positive deviation, indicating the potential for anomalous returns from Monday purchases and Friday sales. Patel (2008) examined the calendar effects of monthly mean returns in the NIFTY and the junior NIFTY during the study period (January 2005 to December 2008), while Sah (2008) tested calendar effects in the daily and monthly indices of the NIFTY & NIFTY Junior indices using GARCH modeling and discovered the existence of day of the week. They discovered two distinct effects; The November-December effect, in which the mean returns for November and December were higher than those for other months, and the March-to-May effect, in which the average monthly returns for March to May were lower than those for the other nine months, were the two separate impacts they discovered. Patel (2012) discovered a similar Monday effect in four Asian markets (China, Japan, Hong Kong, and India) after extending the same methodology to these countries.

Purohit (2015) examined the monthly return trends in China and India. In particular, utilizing the years 1995–2013, it was discovered that China had the "May-effect," while India experienced the "December impact." They ascribed these benefits to India's "pre-budgetary anticipation" and the country's festivals, which boost economic activity.

There is a lot of research on the day of the week effect in established markets, but there aren't as many studies on developing markets. The findings in various marketplaces throughout the years, in particular, have been inconsistent, which has prompted research on the day of the week effect. Section III

3. DATA AND METHODOLOGY

Daily price series from the BSE Sensex Index of Indian stock market has been used. The data spans from April 01,2015 to March 31, 2020. The returns have been calculated as first differences in natural logarithms according to the following expression: where pt and pt-1 are the values of index for period t and t-1, respectively. The day of the week effect is among the most prevalent seasonality anomalies. The premise of this analysis is that each security's yields are not independent on the day of the week. A regression model can be used to perform an initial estimate that could compare

the day of the week effect. Five dummy variables are included, one for each day of the week. It should be noted that seasonality is not implied even if the comparable return on a certain day of the week differs significantly from zero.

This research begins with a dummy regression model based on the usual OLS technique using the following equation in order to investigate the day of the week anomalies:

Sensex Returns = β0+ β1 Tuesday + β2 Wednesday + β3 Thursday+ β4 Friday + μt **Equation 1**

Since the study employs time series data, the regression results could be untrustworthy if the data series are non-stationary. The unit-root test can be used to confirm that the data series is non-stationary; non-stationary data is indicated by a unit root. Using Augmented Dickey Fuller (ADF) tests, the study proceeds to examine return series for a unit root. A stationary time series is one whose variance and mean remain constant across time, relying only on the lag or separation between the two time periods and not on the precise moment of computation. The given series has become unstable or non-stationary, exhibiting an uneven movement, when a unit root is present.

The series is stationary at first difference, according to the coefficient of the ADF test of the Sensex return series with zero probability. Furthermore, common characteristics of time series data, like the ARCH effect and auto correlation problem, are not addressed by OLS regression. In order to account for the heteroscedasticity in time series, the study suggests using the ARCH family of models. According to Bollerslev's (1986) conventional GARCH (p, q) model, conditional variance of returns is a linear function of previous squared error terms and lagged conditional variance. The following is an expression for a model with errors that adhere to the conventional GARCH (1, 1) model:

$$R_t = c + \varepsilon_t \ \ where,\ \varepsilon_t/\psi_{t-1} \sim N\ (0, h_t)$$ **Equation 2**

$$and\ h_t = \ \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1}$$ **Equation 3**

The underlying asset being the Sensex Index, the term R_t is replaced by R_(sensex,t) in the mean equation. The mean equation to be estimated is as follows:

$$R_{sensex,t} = \gamma_0 + \varepsilon_t$$ **Equation 3**

To study the relationship between day of the week and return, a dummy variable has been introduced in the conditional variance equation where the dummy takes on a value of zero for other weekdays and a value of one for the specific day. The conditional variance equation to be estimated is as follows:

$$h_t = \ \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1} + \alpha_3 D_{specific\ day}$$ **Equation 4**

where, D_t is a dummy variable and α_3 is the coefficient of the dummy variable. If α_3 is statistically significant, it can be said that the specific day has had an impact on return.

Section IV

4. EMPIRICAL RESULTS

The descriptive statistics in Table 1 pertaining to skewness and kurtosis indicate that the series is not normally distributed. Further, the Jarque-Bera test statistics for Sensex returns as shown in Table 1 are statistically significant as well as the time series have excess kurtosis.

Table 1

Descriptive Statistics for the Period (April 2015 to March 2020)

Descriptive Statistics	BSE SENSEX Return	Monday Return	Tuesday Return	Wednesday Return	Thursday Return	Friday Return
Mean	0.000536	0.000247	0.000259	0.000232	0.000642	0.001227
Std. Dev.	0.007254	0.006321	0.006458	0.00784	0.008145	0.007249
Skewness	-0.305476	-0.2871213	0.43541	-0.351453	-0.74854	-0.21025
Kurtosis	3.82968	3.843211	3.296587	4.223205	4.466124	3.816347
Jarque-Bera	21.480123	11.463155	13.31205	18.464625	18.95012	10.82568
Probability	0.000023	0.001254	0.000935	0.000799	0.000154	0.002413

Source: Computed

The output of OLS regression has been documented in Table 2. The coefficients of all the days of the week are different and none of them are statistically significant. The R2 is very low, and the total variation explained is less. Such results can be due to the typical properties of time series data like the stochastic characteristics of data.

Table 2

Results of OLS Regression for Sensex Daily Return				
	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
Monday	0.000952	0.001102	0.863795	0.3856
Tuesday	-0.148301	0.130215	-1.138852	0.2632
Wednesday	-0.159545	0.099698	-1.599321	0.1195
Thursday	0.039513	0.106896	0.369105	0.7165
Friday	0.019401	0.103512	0.187184	0.8602

Source: Computed

The ADF test for presence of unit root in Sensex Index daily returns have been compiled in Table 3. The results show that the series is stochastic at level having a t-statistics of 0.207542 with insignificant probability value. However, the series is deterministic at first difference with a t-statistic of -46.62014 with a significant probability value.

Table 3 Results of Unit Root Test

Augmented Dickey-Fuller Test Statistics				
Indices	**Price at Level**		**Price at First Difference**	
	t-Statistic	Prob.*	t-Statistic	Prob.*
BSE SENSEX	0.207542	0.973	-46.62014	0.0001

Source: Computed

Further, as a requisite diagnostic, heteroscedasticity test is conducted to explore the heteroscedastic behaviour of financial time series data. The F-statistic is 76.12536 with a significant p-value indicate the presence of ARCH effect in Sensex daily return. The GARCH model is exclusively designed to address the heteroscedastic behaviour of financial time series data.

Table 4 Heteroscedasticity Test: ARCH

Heteroscedasticity Test: ARCH			
F-statistic	76.12536	Prob.	0
Obs*R-squared	73.12743	Prob.	0

Source: Computed

In order to estimate the impact of day of the week on daily return, GARCH (1, 1) model has been adopted. A dummy variable for specific day of the week has been incorporated in the conditional variance equation. The results of the estimation for the impact of specific weekdays are presented in Table 4.

Table 5 Estimates of GARCH (1, 1) Model

Estimates of GARCH (1, 1) for the period (April 2015 to March 2020)

	Coefficient	Std. Error	t-Statistic	Prob.
Monday	-0.0000328	0.00000651	-2.820541	0.0051
Tuesday	-0.0000296	0.0000167	-3.059652	0.0026
Wednesday	0.0000401	0.0000108	3.62361	0.0029
Thursday	0.0000195	0.0000164	1.61528	0.1024
Friday	-3.47E-06	0.00000824	-0.446852	0.6365

Source: Computed

The coefficients of Monday, Tuesday and Wednesday dummies are exhibiting statistically significant value implying that there exists day of the week anomalies in Indian stock market. The coefficients are -0.0000328, -0.0000296 and 0.0000401 are having significant p-values.

5. CONCLUSION

The prevalence of calendar anomalies in general reflects the extent and magnitude of informational efficiency in stock markets. Stocks markets all over the world witness different forms of anomalies and it varies from country to country. The market participants are always on the verge of taking advantage of inefficiencies in the stock market to generate abnormal return. Day of the week anomalies are substantial in terms of contributing to the level of inefficiencies and misrepresent the market.

The present paper explores whether there exists day of the week effect on daily returns in Indian Stock Market by using BSE Sensex benchmark index daily value from April 2015 to March 2020. The empirical results based on GARCH model purport that day of the week anomalies are present in Indian stock market. Market participants are expected to devise investment strategies to beat the market and can magnify their average return through proper timing of their investment activities. The finding is fruitful particularly to small investors in relation to their decision regarding the timing of entry and exit from the financial market.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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