

An Empirical Study on Calendar Anomalies in the Indian Stock Market

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Abstract

The dynamic behavior of asset prices, particularly the stocks, deviate a large from their intrinsic values. This rationale leads to the argument of market efficiency. The evidence from existing literature proves that market anomalies exists, which can aid in developing trading strategies. The various forms of anomalies were categorized from the previous studies, and the present study was focused to investigate anomalies that exist in the Indian stock market. The most popular indices, Nifty50 was used for the analysis. The trading volumes in the Nifty50 were also considered to reflect the differences in the volume. This paper investigated the existence of the calendar anomalies effects such as day on week, week on month, and month on year effects. The values were obtained from the Nifty50 index from April 2011 to March 2017 for calculation of effects on price and volume using dummy variables. Kruskal- Wallis H statistical test was used to test the anomalies, and the findings would provide insights for making informed decisions for investment.

Key Words: [Stock market efficiency, Calendar Anomalies, Dummy variables]

Introduction

Market regulators observe information asymmetry as a cause to the insider trading activity, but a common behavior of the equity markets such as a calendar anomaly can provide strategies for devising trades. Anomalies refer to a situation in which a security or group of securities performs to the assumptions on any fundamental fact that effects on the market activities. Most discussed phenomenon is the seasonality effects, often called as Calendar effects which refers to regular and repetitive fluctuation in time series occurring periodically have been documented over several years, on the stock market returns. During the development of Indian stock market, researches have tried to find out whether the Indian stock market is efficient or not. If the market is not efficient there exists of some market anomalies, where the investors can gain some abnormal returns by using well planned strategies in the market.

Equities tend to produce abnormal returns over a period of time and even in efficient markets there exists various market anomalies due to new information, economic reports, company announcements, political statements or any other factors those effects the market.. This security prices should reflect fully at all the information that is available in the market Fama (1970) and prior literature evidences the foundation of our study to identify the existence of such anomalies in Indian stock market. Investments are decided based of a large number of factors. The predictability of returns is a herculean task among the investors. The study aims at analyzing calendar anomalies such as day of the week effect and month of the year effect. The variations so captured will benefit the investing community by way of informed decisions and implement better trading strategy. The paper is sequenced by the review of literature in the second section, research gap for the current study, followed by research design in section three briefing the

objectives of the study. The section four covers the data analysis and inferences of the analysis and, finally, the fifth section with discussion and conclusion.

II. Review of Literature

Movements of stocks are irregular over a period of time, say on certain days, week or certain month. The variations have been studied across various developed and developing markets and a lot of these variations have become notable such as the Monday effect, January effect etc. The studies have been of interest to market participants which act as a guide for investments and as well for policy makers to device measures to ensure smooth functioning of markets. Calendar anomalies such as day of week, week of month and month of year effect remained a interesting topic for research since long time.

The January effect or tax-loss effect was the most popular anomaly mainly observed in the western countries Patel Jayen (2002). It is not an international phenomenon and it reflected a higher average return for the month of January compared to other months and prior studies noted the phenomenon along with the study of market efficiency. Guo siqi (2007),Ciccone. B (2007), ullah Irfan (2016) had highlighted the phenomenon of the January effect across various stock market returns. Seasonal effect of higher returns in 1st half of the month was noted by Nageswari.P (2011) and Posadas (2006) and semi month effects were also observed by the prior studies Narayan Ash,sah (2009), M. Wong (2007) and Sudarvel.J (2016) and normal volume due to seasonal variations was noted with the effects on weekend return. Sharma D.S (2011) noticed the insignificant day of the week effect with inconsistency in stock prices as he observed a negative Monday and positive Friday returns. The analysis provided insights for investors and fund managers. Raiyani. R (2011), Verma P (2016) and Schwert G.W (2003), the different levels of financial anomalies differ from the random walk theory and pave way to devise risk return strategy and aid in predications of stock price. Archana.S (2014), T. Mallikarjunappa (2008) and Dash mihir (2011), observed significant anomalies and tested the various forms of market efficiency. The efficiency of the stock index needs to be known to device profitable trading strategies as it would impact investment planning Khanna vandana (2016) Deev (2012). Macroeconomic factors and firm specific factors were also used to check the market efficiency and were noted by Maria. G (2016) and Yeung W.H (2015) studied the access to overall information related to the foreign markets as a measure to reduce unsystematic risk, Sehgal.S (2014) Malkiel B.G (2003) and Bhattacharya.S (2012) stressed that the information access improve the more earnings to investors. Changes in policies, inside trading and the different tax structures deviate the random walk and the deviations have paved the way to the need of the study. Amarnani. N (2014), M. Naseer (2015),Latif. M (2011), had observed significant change in returns due to these policy changes. T. Bohl, M(2010) stressed that the underlying assumption of efficient market hypothesis is that the security prices reflect fully all the information that is available in the market, and any shock is treated as an external error term. Is the phenomenon common to in Indian stocks with respect to returns and also with volumes of trade? The current study was an attempt to capture the anomalies in price along with the volume of trades in Indian stock index Nifty 50.

III. Research Design

Nature of the Study

The study is analytical, quantitative, and historical. Analytical as it confines to analysis of an existing information, quantitative as it attempts to model the returns under study and historical as it uses past data for analysis and interpretation. The research is built upon the secondary data for a period of six years from financial year 2011 to 2017.

Objectives of the Study

1. To calculate the returns of the Indian stock index, on Nifty
2. To apply time dummies appropriate to the cyclicity.
3. To analyze the calendar anomalies namely day of the week effect and week of month effect and month of the year effect.

Research Hypothesis

H₀₁: The distribution of returns and volume is same across all days of the Week.

H₀₂: The distribution of returns and volume is same across all Weeks of the Month.

H₀₃: The distribution of returns and volume is same across all Months of the Year.

Research Methodology

Collection of data

National Stock exchange accounts more percentage of the total trading volume across the market segments; therefore, we used the Nifty Index to study the volatility behavior of the market. This study uses the daily closing prices of the Nifty Index, from the period 1st April 2011, through 31st March 2017. For the trading commenced from this day Nifty Index price data were collected from the NSE website www.nseindian.com. The closing price data were converted to daily compounded returns by taking the first log difference Returns of present day (R1) subtracted by the previous day closing returns (R0) and the time factor (T) is divided by closing price and total multiplied by (100).

Where; $(R1-R0)/R0*100$

R1= present day closing price

R0= previous day closing price

Tools used for analysis

Descriptive Statistics: Mean, Standard Deviation, Skewness & Kurtosis: This test is used to calculate the mean of the total values. And the standard deviation and with the values Skewness is to identify data which are not normally distributed which are lying extremely left or right, and the data of Kurtosis is used to find the higher or lower hump in the data

Kruskall- Wallis test: The Kruskal-Wallis H test is "one-way ANOVA on ranks", it is a rank-based non-parametric test that can be used to determine the differences between two or more groups of an independent variable on a ordinal or continuous dependent variable.

Dummy variables: Dummy variables are used to code the variables of nominal or ordinal scales for building models in multiple regressions. The returns are calculated values and the dummy variables are coded according to the effect that is to be measured.

IV. Data Analysis and Interpretation

The data was obtained from the National Stock Exchange and the Bombay stock exchange respectively, the calculation of returns and changes in volume was done in order to facilitate the study the three anomalies namely, Day of the week, Week of the Month and the Month of the year. Appropriate dummy variables were introduced to index the days, weeks and months.

Table 4.1: Descriptive statistics-Day of the week on Returns and Volume

Nifty50 Index		Analysis of Returns-Day of Week				Analysis of Volume-Day of Week			
Day	N	Mean	Std. Deviation	Kurtosis	Skewness	Mean	Std. Deviation	Kurtosis	Skewness
MON	275	-0.01	1.06	3.45	-0.56	7.05	149.29	60.49	7.62
TUE	275	0.01	1.07	1.46	-0.15	15.71	74.89	108.47	9.66
WED	275	0.06	0.87	1.08	0.39	5.4	26.36	6.67	1.1
THU	275	0.03	1.04	1.2	-0.19	13.77	51.96	122.03	9.25
FRI	275	0.06	1.08	0.74	0.11	6.85	65.12	89.05	8.5
Total	1375	0.03	1.03	1.72	-0.13	9.75	84.28	142.46	10.92
H value	0.136					163.038			

Nifty Returns for Day of Week analysis signifies that the mean return on Monday (-0.0114) is lower than all other days with a standard deviation of 1.06266. However highest standard deviation of 0.87229 is observed in Wednesday with the mean return of 0.0632. The negative skewness for Monday, Tuesday, and Thursday indicates the returns are negatively skewed, whereas Wednesday and Friday slightly positively skewed.

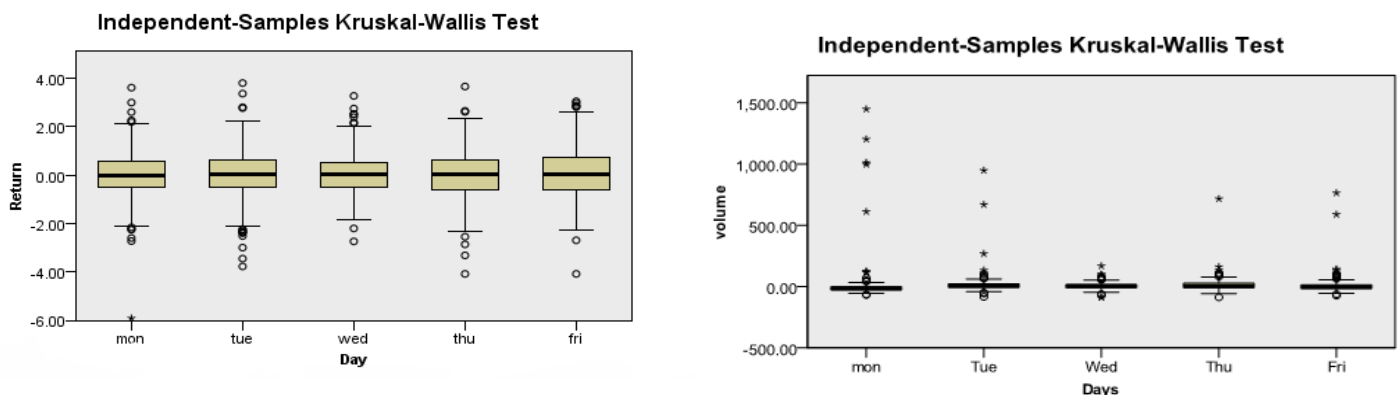
The analysis of Volume for Day of Week suggests that the mean volume of Monday 7.0508 with the highest standard deviation of 149.288 than compared to all other days. However the highest mean volume of Tuesday 15.7063 and standard deviation of 74.8912 and having the positively skewed value of 9.661. But the least mean volume of Wednesday 5.3963 and least standard deviation of 26.3618 and having the least positively skewed value of 1.103.

Table 4.2: Hypothesis Test -Day of the week on Returns and Volume

Hypothesis Test: Independent Sample Kruskal-Wallis Test		
Null Hypothesis	Significance	Decision
The distribution of return is the same	0.998	Accept Null
across categories of day		Hypothesis
The distribution of volume is the same	0.000	Reject Null
across categories of day		Hypothesis

Kruskall- Wallis H statistics is employed to test whether the differences in mean return across the weekdays are statistically significant or not, and the returns was same across categories of days. The calculated value of H for Nifty index for period is 0.136 which is lesser than the table value of 9.488 at 5% level of significance. Hence **we cannot reject the null hypothesis** and conclude that there is no significant different in the mean returns of weekdays. Similarly hypothesis for the mean differences in volume was calculated, the H for Nifty index for period is 163.038 which is higher than the table value of 9.488 at 5% level of significance. Hence we Reject the null hypothesis and concluded that there is significant different in the mean volume of weekdays.

**Graph 4.1: Box plot showing the distribution of data for Returns and Volume of Nifty 50
Days of the week effect**



The median returns are equally distrusted in all the days, were as the upper quartile and the lower quartile of each day was varied as observed from upper extreme and the lower extreme (whiskers) but are laying similarly in same range over the values, but the outliers which are seen above the whiskers line shows that the data for the period is non even and high volumes of trade

was observed in the beginning of the week, least outliers observed on Wednesday and positive returns were observed on Fridays.

Table 4.3: Descriptive statistics-Week of the Month on Returns and Volume

Nifty50 Index		Analysis of Returns-Week of Month				Analysis of Volume-Week of Month			
weeks	N	Mean	Std. Deviation	Kurtosis	Skewness	Mean	Std. Deviation	Kurtosis	Skewness
week 1	60	-0.08	1.90	-0.50	0.22	40.30	84.78	31.86	4.99
week 2	60	0.39	2.09	0.41	-0.68	16.10	26.34	0.01	0.71
week 3	60	0.33	2.06	1.35	0.92	17.61	49.37	11.31	2.49
week 4	60	0.43	2.19	-0.10	0.21	21.47	45.77	7.17	1.72
Total	240	0.26	2.06	0.23	0.18	23.87	56.20	46.46	5.16
H-value	3.772					6.536			

Week of the month mean returns of 1st week (-0.0841) was lower than all other week with the standard deviation of 1.8970. However, the highest standard deviation of 2.1898 is observed in 4th week with the mean return of 0.4270. The negatively skewed of 2nd week indicates that the returns are negative and positive on 3rd week. The mean volume of Monday 40.2970 which is higher than all other days with standard deviation of 84.7838 and skewness value of 4.986. But the lowest mean volume of 16.1024 and standard deviation of 26.3388 was found on Tuesday with the lowest skewness value of 0.707, but no negative value founded in the volume of weeks. During all weeks mean volume is 23.875 with standard deviation of 56.2043 and positively skewed at 5.161 for the period from 1st April 2011 to 31st March 2017.

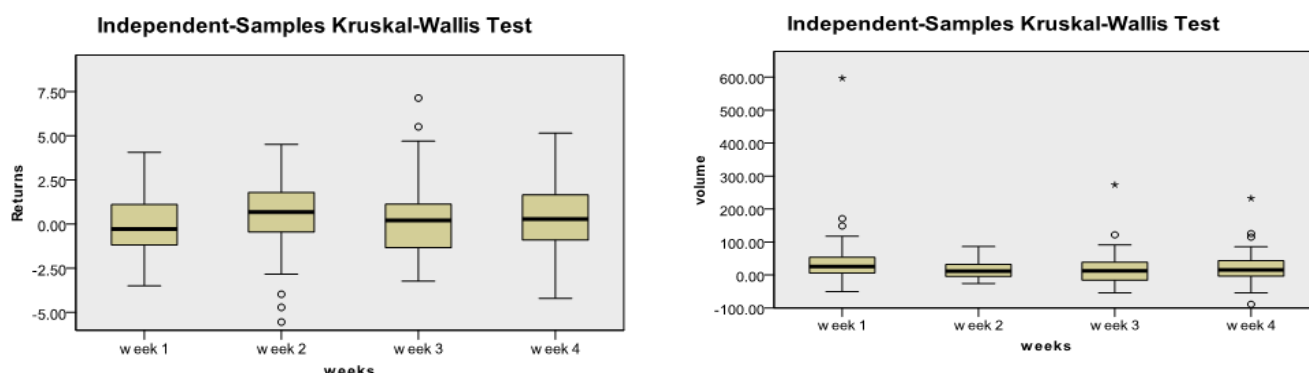
Table 4.4: Hypothesis Test -Week of the Month on Returns and Volume

Hypothesis Test: Independent Sample Kruskal-Wallis Test		
Null Hypothesis	Significance	Decision
The distribution of return is the same across categories of weeks	0.287	Accept Null Hypothesis
The distribution of volume is the same across categories of weeks	0.088	Accept Null Hypothesis

However the calculated H-value for the nifty index period of 01 April 2011 to 31 March 2017 is 3.772 which is lower than the table value of 7.814 at 5% level of significant . Hence, we cannot

the null hypothesis, that there is no significant difference and returns the same across all categories of weeks. The differences in the mean volume across the weeks is 6.536 which is as well lower than the table value 7.8147 at 5% level of significance. Hence we conclude that mean volume of the weeks and remains same.

**Graph 4.2: Box plot showing the distribution of data for Returns and Volume of Nifty 50
Week of the Month effect**



The median returns of all the weeks are been varying as depicted by the upper and lower quartiles of each week. The upper extreme and the lower extreme (whiskers) are gradually expanding to the end of the month and the outliers in the middle of the month shows the more fluctuation of returns and the high volume of trade in the month beginning and remains normal in second week.

Table 4.4: Descriptive statistics-Month of the year on Returns and Volume

Nifty50 Index		Analysis of Returns-Month of Year				Analysis of Volume- Month of Year			
Months	N	Mean	Std. Deviation	Kurtosis	Skewness	Mean	Std. Deviation	Kurtosis	Skewness
APR	6	-0.05	2.65	1.01	0.02	34.95	28.51	0.87	0.74
MAY	6	1.15	5.07	-0.79	-0.12	106.73	95.42	-0.77	0.61
JUN	6	2.05	3.84	2.21	1.42	43.48	29.36	-1.29	-0.61
JUL	6	-0.06	2.48	-0.75	0.45	35.29	25.09	-1.75	0.3
AUG	6	-2.3	5.38	-1.69	-0.05	56.87	42.66	0.84	0.77
SEP	6	1.57	4.04	0.87	1.14	11.3	32.09	3.73	1.89
OCT	6	3.66	5.02	-2.15	0.23	12.88	60.44	1.27	-0.72
NOV	6	-1.49	4.64	-0.97	-0.12	74.96	62.11	-0.19	-0.82
DEC	6	-1.29	2.92	0.77	-1.28	-33.02	18.26	1.8	1.39
JAN	6	2.69	6.39	-0.78	0.25	233.91	120.91	-0.14	1.16
FEB	6	-0.16	5.02	-1.42	-0.78	47.84	49.74	-2.51	0.18
MAR	6	1.45	4.63	-0.68	-0.08	6.01	23.55	-0.35	-0.43
Total	72	0.6	4.48	-0.04	0.19	52.6	83.73	6.46	2.07
H-value	7.912					37.11			

The mean returns of October 3.6642 is higher than all other months with a standard deviation of 5.022. However the highest standard deviation is observed in January with a mean return of 2.6933. On the other hand, a lower mean return was observed in August that is (-2.3016). The negatively skewness for May, August, November, December, February and March indicates the returns are negative, where as June month was observed with positive skewed. Whereas the total mean return is 0.6018 with a standard deviation of 4.4750 were both are positive whereas the skewed value is also positive that of 0.189 for the period

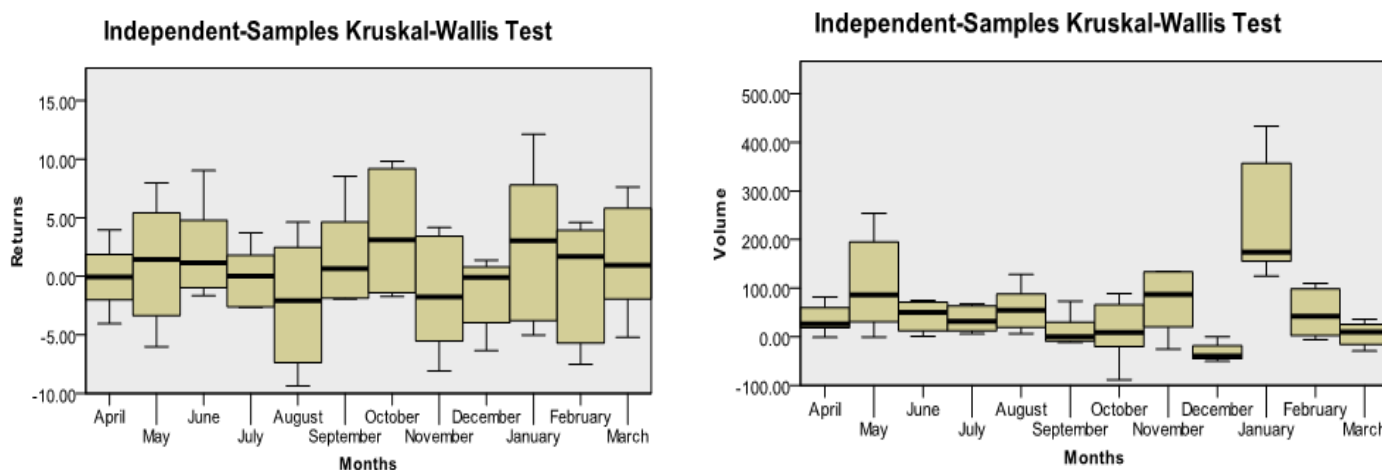
The highest mean volume was 233.9142, in January month with a standard deviation of 120.9124, followed by 106.73 and standard deviation of 95.4219 in the month of May. The highest skewed value is found in September month (1.8) and kurtosis value of 3.730. On the other hand the lower mean return was found in March 6.0112 with a standard deviation of 23.553 and with the negatively skewed that is -0.431 where as the least standard deviation was found in December 18.2638 with a positively skewed value of 1.386. But compared to returns skewed value the volume are less skewed her June, October, November and March remaining are positive. The all months mean volume is 52.599 with a standard deviation of 83.7251 with a skewed value of 2.066 during the period 2011 to 2017.

Table 4.5: Hypothesis Test -Week of the Month on Returns and Volume

Hypothesis Test: Independent Sample Kruskal-Wallis Test		
Null Hypothesis	Significance	Decision
The distribution of return is the same	0.721	Accept Null
across categories of Months		Hypothesis
The distribution of volume is the same	0.000	Reject Null
across categories of weeks		Hypothesis

Kruskall-Wallis H statistics was employed to test whether the differences in the mean return across the month are statistically significant or not. The calculated value of H for Nifty index for the period is 7.912 which is lower than the table value 19.675 at 5% level of significance. Hence the Retain the null hypothesis and concluded that there is no significant difference in the mean returns of the month and remains same. The calculated value of H for Nifty index volume for the period was 37.11 which is higher than the table value 19.675 at 5% level of significance. Hence the Reject the null hypothesis and concluded that there is a significant difference in the mean volume of the month and remains different.

**Graph 4.3: Box plot showing the distribution of data for Returns and Volume of Nifty 50
Month of the year effect**



The median returns of all the month are scattered along with the large and medium quartile range of the Nifty index and volume of trade was the highest trade in January month and very low in December month during the study period.

V. Discussion and Conclusion

The mean returns of the Nifty 50 index was observed negative on Monday with highest deviation on volumes. The hypothesis examining the difference among returns was noted similar on all days but the volumes differed. The week of the month also was noted with negative mean return in the first week with large variation in volumes. The returns and the volume difference were insignificant during the study period. The month of the year effect proved the January effect to be significant in case of volumes and the returns were also higher in case of box plot whisker. The findings of similar studies Jayen Patel(2016) noted no January effect in the international markets and by the findings we can conclude that the Indian markets are a weak form efficiency compares to its other developed counterparts. The analysis contrasted a few studies in case of the beginning of the week and 1st half period Sundervel (2016). Though the Hypothesis had not reflected the differences, a longer horizon analysis along with Sensex data can bring a better understanding of the phenomenon.

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