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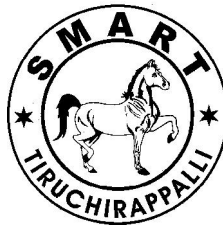
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ANALYSIS OF WEEK END EFFECT IN INDIAN STOCK MARKET

P. Nageswari

Ph.D Research Scholar, Department of Commerce and Financial Studies,
Bharathidasan University, Tiruchirappalli, Tamil Nadu, India.

M. Babu

Assistant Professor, Department of Commerce and Financial Studies,
Bharathidasan University, Tiruchirappalli, Tamil Nadu, India.

Abstract

The empirical Research in Finance has vigorously explored the apparent anomalies in Stock Returns Behavior. Many earlier studies have documented the average returns on Friday to be abnormally high and average returns on Monday to be abnormally low. This paper examines the week-end effect on the Indian Stock Market after the introduction of the Compulsory Rolling Settlement for the eight-year period from April 2002 to March 2010. The study uses Descriptive Statistics, Correlation, Non-Parametric - Kruskal-Wallis Test Statistic and Linear Regression Model to provide evidence to support the existence of the above phenomenon. The Study found that the Mean Returns were positive for all days of the week, highest being on Friday and lowest mean return on Monday during the study period. The Study found that, during the study period, the day of the week pattern did not appear to exist in the Indian Stock Market.

Key words: *Week-end Effect, Day-of-the Week Effect, Compulsory Rolling Settlement, Non-Parametric Test.*

Introduction

The Efficient Stock Market ensures rapid information access so that it may instantaneously process the information to reflect the security prices. The Information Transmission Mechanism ensures that the stock returns across all days of the week are equal. No market participant can earn any extra normal returns. Hence identical mean returns across all days support the proposition of the Efficient Market Hypothesis.

The Stock Return Behavior has been subjected to extensive research in the past. More specifically, the Researchers found that the returns on Monday were significantly negative and Friday experienced high positive returns. This observation is generally referred to as 'Day-of-the-Week-Effect' or 'the-Week-End-Effect'.

The Compulsory Rolling Settlement was introduced in Indian Stock Markets in January 2002. As a result, the weekly settlement cycles

at Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE) were done away with. Earlier, the NSE had arranged a settlement cycle of Wednesday to Tuesday with Wednesday being the first day of the cycle and Friday the last. The BSE has a trading cycle of Monday to Friday. These differences in the cycles permitted the speculators to switch their positions from one exchange to another convenient to their investment strategy. With the introduction of Rolling Settlement of t+2 days, the earlier speculative practices are just not easily possible. Now the positions are required to be squared on a daily basis and all open positions at the end of the day must compulsorily be settled after two trading days.

In this completely changed face of stock markets, it is useful to re-examine whether day-of-the-week pattern still exists in the Indian Stock Markets. The pattern, if it still exists, will be an anomaly under the Efficient Market

Hypothesis (EMH). The Day of the Week Effect refers to the existence of a pattern on the part of stock returns, according to which these returns could be linked to a particular day of the week. The presence of such an effect would mean that equity returns are not independent of the day of the week evidence against Random Walk Theory.

Review of Literature

A brief review of select studies has been presented here to identify the research gap and appropriate methodologies to be employed in the area of research.

Nageswari.P and Selvam.M (2010) examined the Day of the Week Effect on the Indian Stock Market after the introduction of the Compulsory Rolling Settlement. The study found that the Mean Returns were positive for all days of the week, highest being on Friday for the sample indices and the Day of the Week Pattern did not appear to exist in the Indian Stock Market. **Selvarani.M and Leena Jenefa (2009)** analyzed the trends in annual returns and daily returns for the period of 2002-07. A set of parametric and non-parametric tests were employed to test the equality of mean returns and standard deviations of the returns. It was found that in the NSE, there was strong evidence of April and January Effect. After the introduction of the Rolling Settlement, Friday had become significant. As far as Day Effect is concerned, Tuesday Effect was more prevalent than Monday Effect. **Ramesh Chander, Kiran Mehta and Renuka Sharma (2008)** tested the pattern in order to find out whether it yields abnormal returns consistently for any specific day of the week. The study discovered the lowest return on Friday under the BSE in the Pre-Rolling Settlement Period. After the Compulsory Rolling Settlement Period, the Friday returns were the highest and those on Monday were the lowest. This was credible evidence for the Day-of-the-Week Effect. **V.Hareesh Kumar& Malambika Deo**

(2007) analyzed the efficiency of Indian Stock Market by using S&P CNX 500 Index. They discovered the presence of Day of the Week Effect in the Indian Stock Market, which affected both the stock returns and volatility, thereby proving the Indian Stock Market to be inefficient. **Amitabh Gupta (2006)** reexamined the Day of the Week Effect on the Indian Stock Market after the introduction of Compulsory Rolling Settlement. The study found the highest returns on Friday for the sample indices and provided the evidence of the Day of the Week Effect for BSE100 and S&P CNX 500 Index in the Indian Stock Market. **Kumari and Mahendra (2006)** found the Monday returns to be higher compared with other days of the week but the returns on Tuesday were negative. In the case of monthly returns, the authors documented that the returns in April were significantly higher and different from the rest of the months. **Sarma. SN (2004)** explored the presence of seasonality in the Indian Stock Market returns during the post liberalization period. The study provided the evidence to the presence of seasonality across the days of the week. The study confirmed the conclusions of earlier studies on the leptokurtic distribution of equity returns, presence of highest variance on Mondays and weekend effect and regularity of returns across the indices. **Amanulla.S And Thiripalraju (2001)**, tested whether the carry - forward transactions in different periods have any impact on Week End Effect in Indian Stock Market. This study further found that there was consistently positive return on Wednesday and negative return on Tuesday due to possible impact of National Stock Exchange (NSE) on the Week End Effect

The above literature provides an overview of different methods used for the valuation of Day of the Week Effects in Indian Stock Markets. An attempt has been made in this study to analyze “**Week End Effects in Indian Stock Market**” taking into account the findings of these studies.

Statement of the Problem

It is a well proven fact in India that the returns in stock markets are usually higher on all Fridays. On the other hand, the investors begin their response on Mondays with a negative note. Therefore, investments and returns profiles are very low on Mondays. The returns constitute only one part of the decision making process. Another part, that must be taken into account while making investment decision, is the calculation of risk or volatility of returns. It is important to know whether there are variations in volatility of stock returns by the day-of-the week and whether high (low) return is associated with a correspondingly high (low) volatility for a given day. If the investors can identify a certain pattern in volatility, then it would be easier for them to make investment decisions based on both returns and risk. Hence an attempt has been made in the present study to investigate the Day-of-the Week Effect in Indian Stock Market by using the major index, namely, S&P CNX 500.

Objectives of the Study

The following are the objectives of the present study.

- Ø To identify the relationship between the returns of different trading days of the week.
- Ø To examine whether the day of the week pattern still exists in the Indian Stock Markets.
- Ø To summarize the findings of the study.

Hypothesis of the Study

The present study tested the following two null hypotheses

NH1-There is no significant relationship between the returns of different trading days of the week.

NH2-There is no significant difference in the returns of different trading days of the week.

Methodology of the Study

a) Sample Selection

The S&P CNX Nifty is a well diversified index with 50 stocks accounting for 22 sectors of the economy. It is used for benchmarking fund portfolios index based derivatives and index funds. Further, Nifty stocks represent about 56% of the free float market capitalization as on September 30th, 2010.

b) Sources of Data

The required information for the present study were collected from the www.nseindia.com and PROWESS, which is a corporate database maintained by CMIE.

c) Period of the Study

The period of study covers eight years from 1st April 2002 to 31st March 2010(Post Rolling Settlement Period).

Tools Used For Analysis

In this study, independence of return series was investigated for S&P CNX Nifty Index returns.

i) Returns:

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

Where,

R_t Return at the time t.

P_t The closing price of the day, and

P_{t-1} The closing price of the day t-1.

ii) Descriptive Statistics

In this part, statistics of the Daily Return, Standard Deviation, Skewness, Kurtosis and Jerque-Bera Tests were analyzed.

iii) Correlation

Correlation is the degree of relation between two variables. To know the relationship between ratios, the following equation is used:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{n(\sum x^2 - (\sum x)^2)(n\sum y - (\sum y)^2)}}$$

Where,

N = Number of observations

Σx = Dependent variables

Σy = Independent variables

iv) Kruskal-Wallis Test

The Kruskal-Wallis Test is an appropriate one for testing the data typified of non-normality, heteroskedastic variance like security returns (Jason, 1996). The Kruskal-Wallis Test was employed for testing the equality of mean returns for different days of the week. It ranks the entire set of observations-higher the value, higher the rank and vice-versa-and then arranges them into $n_j \times 5$ matrix where n_j represent the rank of the return and columns represent the day-of-the-week-Monday through Friday. The formula for calculating the Test Statistic 'H' is as under:

$$H = \frac{12}{N(N+1)} \sum_{j=1}^5 \frac{R_j^2}{n_j} - 3(n+1)$$

where: R_j = Sum of the Ranks in the j th Column

n_j = Number of Cases in the j th Column

N= Sum of Observations in all the Columns.

V) Linear Regression Model

The Day of the Week Effect recorded some systemic patterns in the stock returns. Therefore the Researcher tests if the daily returns are statistically different from each other. This is done by using Eviews Program and the Linear Regression Model and the Ordinary Least Squares-Method (OLS) were used for this purpose. To examine whether there was any Day of the Week Effect, the following model was employed.

$$R_{it} = \alpha_{1i} D_{1t} + \alpha_{2i} D_{2t} + \alpha_{3i} D_{3t} + \alpha_{4i} D_{4t} + \alpha_{5i} D_{5t} + V_{it}$$

R_{it} is the return of the index on day t , D_{1t} is a dummy variable for Monday taking the value of 1 for all Monday observations and zero otherwise. D_{2t} is a dummy variable for Tuesday

taking the value of 1 for all Tuesday observation and zero otherwise and so on.

The α_i is the coefficient that is estimated for each day of the week from Monday through Friday and V_{it} is the disturbance term.

Results and Analysis of the Study

For the purpose of this study, the following analyses were made.

- Ø Analysis of Descriptive Statistics
- Ø Results of Cross Correlation Test
- Ø Results of Kruskal-Wallis Test
- Ø Results of Linear Regression Model.

1. Analysis of Descriptive Statistics for S& P CNX Nifty Based Daily Returns

The **Table-1** presents the results of Descriptive Statistics of Standard Deviation, Skewness, Kurtosis and Jerque-Bera for S&P CNX Nifty during the study period from 2002 to 2010. It is inferred that the S& P CNX Nifty Index earned maximum daily mean returns of 0.1521 on Friday, with a Standard Deviation of 1.8616. It indicates that highest return were earned with low risk. The highest value for Standard Deviation (2.1226) was recorded on Monday and the least value of Standard Deviation (1.5687) was recorded on Tuesday. This clearly indicates that the market (NSE) was more volatile on Monday and least volatile on Tuesday during the study period. The Kurtosis measure of returns distribution was Leptokurtic for all days of the week, showing the highest value (15.59) on Monday. The return distribution was positively skewed for Monday and Tuesday and negatively skewed for other trading days of the week during the study period. The coefficient of Jerque-Bera was significant at 1 percent level of significance for all trading days. This implies that the returns were asymmetric and did not conform to normal distribution during the study period.

The **Graph - 1** exhibits the average mean return of different trading days of the

week for S&P CNX Nifty index during the period of 2002-2010. It is found that the mean returns were positive for all days of the week, highest mean return earned on Friday and lowest on Monday.

2. Results of Cross Correlation Test of S&P CNX Nifty Index Returns

The results of Cross Correlation Test for S&P CNX Nifty Index are given in **Table-2**. From the analysis of the above Table, it is observed that there was no significant and positive relationship between the returns of different trading days of the week during the study period. The above Table also reveals the fact that there was significant negative correlation coefficient between Tuesday - Wednesday at -0.1487 while the p-value for two-tailed test of significance was 0.0029 at 1% significance level. It is to be noted that there was negative correlation coefficient between the returns of Monday-Tuesday, Tuesday-Thursday and Tuesday-Friday and positive correlation coefficient between the returns of remaining days. As there was no significant relationship between the returns of other trading days of the week, the null hypothesis NH1, "There is no significant relationship between the returns of different trading days of the week," is partially accepted.

3. Results of Kruskal-Wallis Test of S&P CNX Nifty Index Returns

The **Table-3** shows the analysis of Kruskal-Wallis Test for S&P CNX Nifty Index. According to the results as given in the above Table, the Kruskal-Wallis Test Statistics value of 2.2938 was lower than the Table Value of 9.49 at 5% level of significance in 4 degrees of freedom. Hence the null hypothesis (NH1), "there is no significant difference in the mean returns among the trading days of the week", cannot be rejected. In other words, the Day of the Week Pattern did not appear to exist for S&P CNX Nifty Index. Hence there was no week

end effect in the Indian Stock Market during the study period.

4. Results of Linear Regression Model for S&P CNX Nifty Index Returns

The results of the Linear Regression Analysis to test the seasonality of S&P CNX Nifty Index Returns during the sample period (2002-2010), are shown in **Table 4**. The above Table also shows the estimated coefficient of each day of the week, t-value and p-value. It is to be noted that the coefficient value on Tuesday was negative and it was low for remaining days of the week during the study period. It is found that there was no statistically significant Day of the Week Pattern in stock returns of NSE. Based on the F-value, it cannot reject the null hypothesis 'NH2-There is no significant difference in the returns of different trading days of the week' cannot be rejected and therefore the seasonality effect was not proved to exist in S&P CNX Nifty Index during the study period.

Summary of Findings and Suggestions of the Study

The following are the important findings and suggestions of the study.

1. The Study found that the highest mean return was earned on Friday and lowest mean return was recorded on Monday during the study period. Hence the investors are advised that they could expect high returns on Fridays.
2. The investors are advised to buy the securities on Monday (with the lowest mean returns) and sell them on Friday (with the highest mean returns).
3. The Study also found that the highest value of Standard Deviation (2.123) was recorded on Monday and the least value of Standard Deviation (1.568) was recorded on Tuesday. This indicates that the Indian Stock Market was more volatile on Monday and least volatile on Tuesday during the study period.

4. The Kurtosis measure of Returns Distribution was leptokurtic for all days of the week. During the Study Period, the highest (15.59) was recorded on Monday.
5. It is noted that the Returns Distribution was positively skewed for Monday and Tuesday and negatively skewed for the remaining days.
6. There was no significant positive correlation between the returns of different trading days of the week during the study period.
7. There was significant negative correlation between the returns of Tuesday-Wednesday for S&P CNX Nifty Index during the study period.
8. The Study discovered negative correlation between the returns on Monday-Tuesday, Tuesday-Thursday and Friday and positive relation between the returns of remaining days.
9. The value of Kruskal-Wallis Test Statistic was lower than the Table Value. It clearly indicates that there was no significant difference in the mean returns of trading days of the week during the period.
10. It is found that the Day of the Week Pattern did not appear to exist for S& P CNX 500 Index during the period
11. The Linear Regression Analysis indicated the coefficient value on Tuesday to be negative and very low for remaining days of the week.
12. Based on the F- value and their P value, the null hypothesis cannot be rejected. In other words, the seasonality effect did not exist in S&P CNX Nifty Index during the study period.

Conclusion

The present study investigated the Week-End Effect on stock returns for S&P CNX Nifty Index of NSE. The Study found that there was maximum returns on Friday. The mean returns of all trading days of the week were positive. The National Stock Exchange

recorded positive trends during the study period. The returns in the stock market were not independent across different trading days of the week. Hence the investors should be cautious enough to exploit the benefit that he/ she may earn from the strategy i.e., to buy the securities on Monday (with the lowest mean returns) and sell them on Friday (with the highest mean returns). The findings of this study would possibly help in understanding and explaining Seasonality for the Indian Stock Markets.

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Table-1

Descriptive Statistics for S&P CNX Nifty Index for the period of 2002-2010

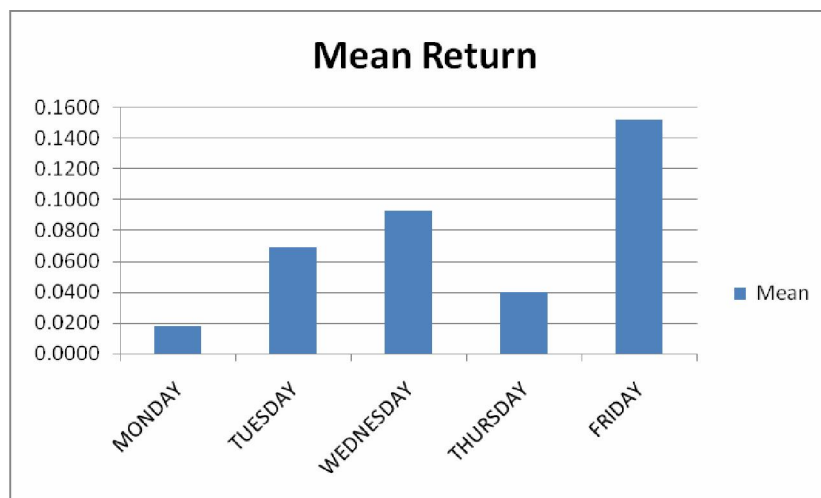
Statistics	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Mean	0.0175	0.0695	0.0926	0.0400	0.1521
Median	0.1843	0.1023	0.1553	0.1830	0.2112
Maximum	16.3343	7.9691	6.0220	6.1143	6.7574
Minimum	-13.0539	-6.8896	-6.3802	-7.0131	-13.0142
Std. Dev.	2.1226	1.5687	1.5951	1.5887	1.8616
Skewness	0.1140	0.1231	-0.1379	-0.3790	-1.0987
Kurtosis	15.5966	6.9146	5.1483	5.0695	10.9460
Jarque-Bera	2625.58*	255.13*	78.19*	79.94*	1112.96*
Probability	0.000	0.000	0.000	0.000	0.000
Observations	397	398	400	395	393

Source: Computed from PROWESS

* Significant at the 0.01 level (2 tailed).

Graph-1

Average Mean Returns for Trading Days of the Week for S&P CNX Nifty Index for the period of 2002-2010



Source: Computed from Table-1

Table-2
Result of Cross Correlation Test for S&P CNX Nifty Index for the period of 2002-2010

Week Days	Pearson Correlation	Monday	Tuesday	Wednesday	Thursday	Friday
Monday	Pearson Correlation	1				
	Sig. (2-tailed)	.				
Tuesday	Pearson Correlation	-0.0814	1			
	Sig. (2-tailed)	0.1053	.			
Wednesday	Pearson Correlation	0.0164	-0.1487**	1		
	Sig. (2-tailed)	0.7449	0.0029	.		
Thursday	Pearson Correlation	0.0165	-0.0532	0.0805	1	
	Sig. (2-tailed)	0.7432	0.2912	0.1103	.	
Friday	Pearson Correlation	0.0278	-0.0111	0.062	0.0122	1
	Sig. (2-tailed)	0.5828	0.8259	0.2204	0.8094	.

Source: Computed from PROWESS

**Correlation is Significant at the 0.01 level (2 tailed)

Table - 3
Results of Kruskal-Wallis Test of S&P CNX Nifty Index
from 01.04.2002 to 31.03.2010

Test Statistics	Degrees of freedom	Table Value
H. value - 2.2938	N-1 - 4	1% - 13.277
Asy.Sig - 0.6818	N=5	5% - 9.488

Source: Computed from PROWESS.

Table-4
Linear Regression Analysis for S&P CNX Nifty Index for the period of 2002-2010

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Tuesday	-0.1091	0.0693	-1.5728	0.1166
Wednesday	0.0025	0.0682	0.0370	0.9705
Thursday	0.0157	0.0680	0.2310	0.8174
Friday	0.0305	0.0580	0.5256	0.5994
C	0.0197	0.1084	0.1817	0.8559
Adjusted R-squared	-0.0027	F-statistic		0.7371
Durbin-Watson stat	2.1715	Prob(F-statistic)		0.5671

Source: Computed from PROWESS