

Day-of-the-Week Effect in Returns in the Indian Capital Market : Evidence from the National Stock Exchange

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Abstract

Evidence of empirical regularities in security returns leads to a rejection of the joint hypothesis that the asset pricing model used is adequate and that the markets are efficient. This paper examined the stability of the Day-of-the-Week effect in returns and volatility in the Indian capital market covering the period from November 3, 1994 to March 31, 2006 by considering the impact of capital market reforms, especially the Rolling Settlement Effect on the trading days of the week on the Indian stock exchange. The study is based on 203 companies listed on the National Stock Exchange. The results revealed the absence of Day-of-the-Week effect for the Aggregate period ; whereas, the Monday effect was found for the Post-Liberalization period. However, during the Pre-Rolling Settlement period, the Friday effect was documented ; whereas, a slight Wednesday effect was found for the Post-Rolling Settlement period. The anomaly Day-of-the-Week effect suggested that market participants could predict the market and can benefit from the market by timing their plans for investment and sale of securities.

Keywords: anomalies, capital market reforms, day-of-the-week effect, pre-rolling settlement, post rolling settlement and volatility

JEL Classification: G02, G14, G17, G32

Paper Submission Date : May 19, 2015 ; **Paper sent back for Revision :** June 4, 2015 ; **Paper Acceptance Date :** June 10, 2015

One of the cornerstones of modern financial economies is the EMH (efficient market hypothesis). Over the years, market efficiency has evolved from studying weak, semi-strong, and strong forms of efficiency, to studies of the predictability of returns based on fundamental variables, event studies, and tests for private information. The evidence indicates that future returns may be predicted from past returns, dividend yields term structure variables. This apparent violation of EMH is confounded by the joint hypothesis problem of whether there is a rational variation over time in expected return or whether the models used in measurement suffer from systematic and continuous deviations from fundamental values.

A well-known objection to efficient markets in this nature is the recurrent patterns in stock returns. Seasonal anomalies or calendar effect in securities markets are much discussed phenomenon among academics and practitioners. In fact, stock returns anomalies are in existence in various forms, that is, large versus small firms, long-term compared to short-term, over and under reactions to information, seasonal effects, and so on. The area of academic and practitioner research in financial economics that has generated the most excitement and attracted the utmost attention over the past four decades concerns persistent cross-sectional and time series patterns that have been documented worldwide (Alagidede, 2008).

In recent years, the testing for market anomalies in stock return has become an active field of research in empirical financial management and has been receiving attention globally (Al- Loughani & Chappel, 2001 ; Franes & Paap, 2000; Pandey 2002 ; Rossi, 2007 ; Tong, 2000). The conventional wisdom is that knowledgeable traders should eliminate them. Therefore, these potential departures from the EMH must be rigorously analyzed and tested. Even though a vast amount of empirical evidence for the calendar effects has been produced, there is

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still some skepticism regarding the reality of that phenomenon.

Moreover, seasonal anomalies in stock returns have indicated that investors can have different required rates of return on risky assets depending upon the calendar month or day on which investments occur. However, no peculiar pattern has been observed for the anomalous trading behavior of the Indian stock market. In addition to the existence of such anomalies, their persistent presence for such a long time - since their first discovery - is a puzzling phenomenon for many academicians and practitioners.

Therefore, it can be said that there is a research gap between the work which has been done and the work which should have been done. To fill this research gap, the present study undertakes the examination of day-of-the-week effect in the Indian stock market by analyzing 203 companies listed on the National Stock Exchange (NSE) (please refer to the Appendix). The present study could possibly help to understand and explain the typical and crucial nature of seasonality that exists in the Indian capital market.

Review of Literature

EMH assumes that at any given time, security prices fully reflect all available information, which implies that the price movements do not follow any pattern or trends (Fama, 1991; Dimson & Mussavian, 1998; Malkiel, 2003). It further assumes that trading returns on one day should not be significantly different from the trading returns available on any other trading day of the week (Draper & Paudyal, 2002). But the pioneering work done by a number of researchers has proved the existence of different trading returns on different trading days of the week known as the day-of-the-week effect. It is evident from the Table 1 that a huge literature is available on day-of-the-week effect in developed and developing economies.

There are some studies which have provided evidence that negative Tuesday effect is mainly caused by the stocks with the lowest turnover ratio; higher trading returns on Friday and Saturday (Huang, Hu, & Liao, 2006) are observed in non-January months most of the times (Lin & Lim, 2001). The most common explanation that has been provided for negative Tuesday's returns is that the bad news of the weekend affecting the U.S. market can have negative influence over some other markets globally. The impact of that negative information is reflected on the next day, that is, Tuesday as the market is lagged by one day (Nath & Dalvi, 2004).

Empirical evidence is available to support the positive Wednesday effect, which was documented by Poshakwale (1996), Tan and Tat (1998), Lian and Chen (2000), Kaur (2004), & Sharma and Singh (2006). Literature has supported that the reason for positive Wednesday trading returns might be due to the optimistic attitude of the Indian investors to make their dealings on Wednesday most of the times (Amanulla & Thiripalraju, 2001; Gupta & Aggarwal, 2004; Ranjan & Padhye, 2000; Sharma & Singh, 2006). In the Indian capital market, a number of studies have documented the positive Thursday effect (Bhattacharya, Sarkar, & Mukhopadhyay, 2003; Choudhry, 2000; Rahman, 2009).

There are some studies, which are available to support the positive Friday effect (Anshuman & Goswami, 2000; Bhattacharya et al., 2003; Balaban, 1995; Mittal, 1994; Nath & Dalvi, 2004; Singhal & Bahure, 2009) in the Indian stock market. The cause suggested by some of the pioneer studies for this particular effect might be the uncertainty of the opening position of the stock market on Monday.

Futures and cash markets were examined by Cornell (1985) and he found the existence of the seasonality in both the markets. It is proved that measurement errors might be the reason for the presence of the above-said effect in the cash market, but the author was unable to find any suitable justification for the presence of seasonality in the futures market. According to Chang, Pinegar, and Ravichandran (1993), even the release of private information by small firms or an attempt by market makers to avoid trading with informed investors on a private basis might be considered as an explanation of the day-of-the-week effect.

There are some studies that suggested that anomalous behaviour of stock markets lead the investors to earn abnormal profits (Chandra, 2011). However, the investors must make their decisions based on strategies formulated on the basis of trading behaviour of the market on different trading days. Mangala and Mittal (2005)

Table 1. Empirical Evidences on Day-of-the-Week Effect

Sr. no.	Author	Data	Period of study	Findings
1.	Rogalski (1984)	1. DJIA (US) 2. S & P 500 (US)	1974-1984 1978-1983	January effect dominates the Monday effect.
2.	Cornell (1985)	1. Spot S & P 500 (US) 2. S & P 500 Futures (US)	1982- 1984	Day-of-the-Week effect is present in cash market, but absent in futures market.
3.	Ho and Cheung (1991)	HSI (Hong Kong)	1986-1989	The trading volume at the end of the day has been significantly larger than that for the rest of the day.
4.	Broca (1992)	BSE National Index	1984-1989	Significant variation in Day-of-the-Week effect is found.
5.	Chang et al. (1993)	US index and 22 foreign indices	1986-1992	Day-of-the-Week effect has been exhibited by seven countries.
6.	Dickinson and Peterson (1995)	S&P 500 Options (US)	1983-1990	Annualized standard deviation over the life of the option decreases from Friday close to Monday close.
7.	Tan and Tat (1998)	SES (Singapore)	1975-1994	Returns on Wednesday are highest.
8.	Anshuman and Goswami (2000)	70 Frequently stocks traded on BSE	1991-1996	(-ve) Tue. Return, (+ve) Fri. return.
9.	Choudhry (2000)	1. BSE 100 (India) 2. JCI (Indonesia) 3. KLSECI (Malaysia) 4. MSEC (Philippines) 5. KSC (Korea South Composite) 6. TSEI (Taiwan) 7. SETI (Thailand)	1990-1995	Monday effect was present in Indonesia, Malaysia, and Thailand. Tuesday effect was found in Korea, Taiwan, and Thailand. Thursday effect was seen only in Thailand.
10.	Amanulla and Thiripalraju (2001)	1. BSE Sensitive Index 2. BSE National Index 3. S&P CNX Nifty Index	1990-1999	(-ve) Tue. Return and (+ve) Wed. return.
11.	Brooks and Persaud (2001)	1. South Korea, Stock Exchange Composite Price Index (South Korea) 2. Kuala Lumpur Composite Price Index (Malaysia) 3. Bangkok Stock Exchange Price Index (Thailand) 4. Taiwan Weighted Price index (Taiwan) 5. Philippines Stock Exchange Composite Price Index (Philippines)	1989-1996	South Korea and Philippines had no calendar anomalies, but Thailand and Malaysia had (+ve) Monday average trading returns and (-ve) Tuesday trading returns.
12.	Bayar and Kan (2002)	Stock indices of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong-Kong, Italy, Japan, The Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, UK and USA.	1993-1998	Volatility was lowest towards the end of the week in local currency returns and on Tuesday in terms of dollar returns.
13.	Bhattacharya et al. (2003)	BSE 100 Index	1991-2000	(+ve) Fri. return and (+ve) Thus. return.
14.	Kaur (2004)	1. BSE Sensex 2. S & P CNX Nifty 3. S & P 500 (US) 4. NASDAQ (US)	1993-2003	(+ve) Wed. returns.
15.	Keef and Roush (2005)	S & P 500 (US)	1930-1999	Monday effect was absent in Pre-Holiday trading returns in the pre 1987 era. The mean trading returns on the day before holiday falling on Wednesday were four times larger than the typical Pre-Holiday.

16.	Boynton et al. (2009)	PACAP VW index (Hong-Kong)	1975-2001	Until 1990s, Tuesday exhibited abnormal losses. In 1990s, Monday exhibited (-ve) return and there was decrease in volume as well.
17.	Sharma and Singh (2006)	BSE Sensex (India)	1992-2005	(-ve) Tues. and (+ve) Wednesday trading returns.
18.	Wickremasinghe (2007)	Daily and monthly share prices of 75 Companies (Sri Lanka)	1987-1999	(-ve) Tues. and (-ve) Wed. effect was found.
19.	Kenourgios and Samitas (2008)	ASE Index Three major industry Index FTSE- 20 FTSE- 40	1995-2000	Stock market anomaly had weakened in both returns and volatility.
20.	Ali and Akbar (2009)	KSE 100 VW Index (Karachi)	1991-2006	Thursday effect was documented.
21.	Nageswari and Selvam (2011)	BSE Sensex (India)	2000-2010	Day-of-the-Week effect was not found.
22.	Patel et al. (2012)	BSE Sensex (India) Hang-Seng Index (Hong-Kong) Nikkei 225 (Tokyo) SSC Composite (Shanghai)	2000-2007	Wednesday effect Friday effect Thursday effect Wednesday effect was found
23.	Mallick and debasish (2013)	Daily price series of selected eight Gas, Oil and Refineries companies	2007-2011	Monday, Tuesday, Wednesday, and Thursday effect was found for different companies.
24.	Mitra and Khan (2014)	NSE Nifty	2001-2012	(-ve) Monday returns (+ve) Wednesday returns

Where, ASE = American Stock Exchange, ASX = Australian Index, BSE = Bombay Stock Exchange, CAC = Cotation Assiste En Continu, CNX = Crisil and National Stock Exchange Index of Fifty Stocks, DAX = Deutsche Aktien Indexe, DGEN = DSE General Index, DJIA = Dow Jones Industrial Average, DM = German Ma, DSE = Dhaka AStock Exchange, DSI = Dhaka All Share Price Index, FT = Financial Times, Fri = Friday, FTSE = Financial Times Stock Exchange, HSI = Hang-Sang Index, IBEX = Iberia Index, ISECI = Istanbul Securities Exchange Composite Index, JCI = Jakarta Composite Index, KLSECI = Kuala Lumpur Stock exchange Composite Index, KSC = Korea South Composite, KSE = Karachi Stock Exchange, Mon = Monday, MSEC = Manila Stock Exchange Composite, NASDAQ = National Association of Security Dealers Automated Quotational, NYSE = New York Stock Exchange, PACAP VW = Pacific Basin Capital Market, SES = Stock Exchange of Singapore, SETI = Securities Exchange of Thailand Index, S & P 500 = Standard & Poor, SPDRS = Standard and Poor's Depository Receipts, TL = Turkish Lira, TSEI = Taiwan Stock Exchange Index, Tues = Tuesday, USD = US Dollar, Wed = Wednesday, (+) indicates positive and (-) indicates negative trading returns on the particular day.

suggested that securities should be purchased on Friday and should be sold on Wednesday due to higher trading return potential on Wednesday. These results are consistent with the results obtained by Gupta and Aggarwal (2004) and Sharma and Singh (2006).

Different studies have considered different causes for the above-said anomaly such as effects of previous week's market performance (Jaffe & Westerfield, 1985), lack of liquidity and information (Thaler, 1987), information efficiency (Kamara, 1997 ; Lakonishok & Maberly 1990), window-dressing (Haugen & Lakonishok, 1987), imperfections of the stock market, individual investors as net sellers on Monday (Arumugam, 1998 ; Miller, 1988) ; measurement problems (Anshuman & Goswami, 2000; Bhattacharya et al., 2003 ; Broca, 1992; Mittal, 1994) ; festival effect (Kumar, 2012). However, no explanation yet seems sufficient for this phenomenon.

Various empirical studies (Table 1) have supported the refutation of EMH, and different trading days of the week have documented different trading returns. The main results presented by the financial literature investigating the day-of-the-week effect indicate that different trading returns on different trading days are observed not only in domestic and international stock markets, but also in bond, option, and commodities markets.

The foregoing review of literature will be of immense help to academicians, market investors, practitioners,

market agents, and regulatory authorities to understand whether information dissemination at weekends affects the trading returns on other trading days or not. In such a way, empirical findings of the study can guide the future policy framework to exploit the opportunities arising in the stock market.

Database and Methodology

Financial market reforms have brought gradual improvement in the functioning of the Indian stock market that are aimed at enhancing competition, transparency, and efficiency in the Indian financial markets (Sah & Omkarnath, 2007). In the wake of the scam of 1992 and the information, communication, and entertainment (ICE) meltdown of 2001, major regulatory activities took place during this period. For example, screen based trading was introduced in the year 1994 on the NSE and in 1995 on BSE; circuit filters were introduced by the NSE in 1995; establishment of National Securities Clearing Corporation (NSCC) and National Depository Limited (NSDL) took place in 1996 ; abolition of *badla* transaction and introduction of Rolling Settlement happened in December 1999 ; introduction of index based futures took place in June 2000 ; index option was introduced in June 2001 to improve the capital market efficiency (Kaur, 2004). The scope and activities of the stock market have expanded rapidly due to the liberalization drive since 1991. Therefore, the need of the hour is to study the market by considering the impact of all these reforms on the Indian stock market.

The study period for NSE is bifurcated as:

- (1) November 3, 1994 to March 31, 2006 (Aggregate time period),
- (2) January 1, 1994 to December 31, 1995 (Initial years of post-liberalization and globalization era),
- (3) January 1, 1996 to June 21, 2001 (Pre-rolling settlement period),
- (4) June 22, 2001 to March 31, 2006 (Post-rolling settlement period).

The aggregated period is divided into different sub-periods. In the first sub-period, the impact of the globalization and liberalization era on the Indian stock market has been examined. The second sub-period considers the efficiency of the Indian stock market before the introduction of the Rolling Settlement in India. The third sub-period considers the impact of introduction of compulsory Rolling Settlement on the Indian stock market.

The use of daily data provides the possibilities to examine the relationship between the changes that occur in stock prices from one trading day to the next and over weekends to study the weekend effect. The study considers the period of 11 years and 4 months, that is, from November 3, 1994 to March 31, 2006 for companies listed on the National Stock Exchange (NSE) with a view to examine the presence of seasonality in the Indian stock market. The selection of the companies is based on the continuous trading of these companies during the study period and the availability of closing prices. The present study selected a sample of companies, which were listed on the NSE for the period from November 1, 1994 through December 31, 1995.

The daily stock price data of companies were taken from CAPITALINE DATABASE (the online database maintained by the Capital Market Publishers India Private Limited) and from PROWESS (the online database maintained by the Center for Monitoring of Indian Economy (CMIE)), which contain the information of all the actively traded stocks at any given time on both BSE as well as NSE. In addition to these, web resources such as www.nseindia.com were also used.

For the purpose of analysis, daily stock prices were converted to daily returns. The present study employs the logarithmic difference for the first order as the logarithmic difference is symmetric between up and down movements and is expressed in percentage terms for ease of comparability with the idea of percentage change. While computing daily returns, multi-period returns were excluded to avoid any bias on account of the holiday effect. For instance, as Saturday and Sunday are non-trading days, the returns on Monday have been excluded. In the same way, if any other trading day was a holiday, the returns on next day to that holiday were excluded.

If P_t be the closing level of Sensex on date t and P_{t-1} be the same for the previous business day (omitting intervening weekend or stock exchange holidays), then the one day return on the market portfolio is calculated as:

$$R_t = \log(P_t / P_{t-1})$$

In any time series analysis, the test of stationarity plays an important role because in the presence of non-stationary series, the standard estimation procedures are not applicable. Thus, the analysis is started with testing of stationarity, that is, unit root testing. Generally, it is assumed that time series are stationary when the presence of mean and variance are constant and its covariance is time invariant (Leybourne, Kim, & Newbold, 2003). If a time series is integrated of order 1 (i.e., it is $I(1)$), its first differences are $I(0)$, that is, stationary. In the same way, if the time series is $I(2)$, its second difference is $I(0)$.

However, if a time series is not stationary, then there are methods to make it stationary. The formal procedures to detect unit roots in any given time series is graphical analysis, autocorrelation (ACF), and partial autocorrelation (PACF). For the purpose of the study, ADF and PP tests have been applied to determine unit roots that consist of regressing the first difference of the series against a constant, the series lagged one period and the differenced series at n lag lengths (Pindyck & Rubinfeld, 1998). The Table 3 shows the results of unit root of both statistical procedures (ADF and PP with intercept, with intercept and trend, and without intercept and trend) and documents the presence of movements of share prices in the Indian equity market. It is evident in the results of unit root that the share prices in the Indian stock market follow a systematic and predictable trend. The model used is as follows :

The model used in equation 1 is as follows:

$$Y_t = \alpha + \sum_{i=1}^m \beta_i \Delta Y_{t-i} + at + Y_{t-1} + \varepsilon_t \quad (1)$$

where,

Y_t = return for the period t ; defined as $(\log P_t - \log P_{t-1})$ is the trend variable by taking values 1, 2, and so on. Here, Y_t = stock price at time t ; Y_{t-1} = stock price at time $t-1$. I is the order of lagged returns which varies from 1 to n and r_{t-1} is the one period lagged value of the variable r .

The unit root testing is conducted by adding the lagged values of the dependent variable, that is, return ΔY_t .

$$Y_t = \log P_t - \log P_{t-1} \quad (2)$$

It also represents average growth of share price between two periods and thus, can be justified as the measure of return in the Indian share market. It consists of estimating the following regression equation in case of day-of-the-week effect. For testing the day-of-the-week effect, dummy variables have been used. I assigned values of 2, 3, 4, and 5 for Tuesday, Wednesday, Thursday, and Friday, respectively (leaving out 1 day for robustness of the regression results) as dummy variable values and designed the equation as below to test the weekend effect :

$$\Delta \log P_t = \beta_i + \phi \log P_{t-1} + \sum_{i=1}^m \alpha_i \Delta \log P_{t-i} + \partial_1 D_{Tue} + \partial_2 D_{Wed} + \partial_3 D_{Thurs} + \partial_4 D_{Fri} + \varepsilon_t$$

where,

$$D_i = \begin{cases} 1: i^{\text{th}} \text{ day} \\ ; i = \text{Tues, Wed, Thurs, Fri} \\ 0: \text{otherwise} \end{cases} \quad (3)$$

where,

R_t represents the daily returns at time t , D_i in equation (3) is a dummy variable that represents each day (i.e., Monday, Tuesday,....., Friday) for the weekend effect. If the average of return is statistically significant, then it

Table 2. Descriptive Statistics for Aggregated and Bifurcated Time Period

1994-06								
Variables	N	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque- Bera
Monday	586	-0.174	6.123	-11.991	1.935	-0.696	6.258	306.679*
Tuesday	579	-0.311	6.859	-7.866	1.474	-0.102	6.555	305.935*
Wednesday	574	0.565	7.027	-8.078	1.612	-0.189	6.013	220.659*
Thursday	583	-0.037	7.952	-5.960	1.449	0.332	5.164	124.553*
Friday	572	-0.047	8.221	-8.586	1.635	-0.408	6.881	374.993*
Total	2894	0.0413	8.221	-8.586	1.567	-0.077	6.000	868.247*
1994-95								
Monday	60	-0.649	4.006	-6.268	1.456	-0.370	6.762	36.768*
Tuesday	60	-0.493	2.049	-2.812	0.987	-0.344	3.290	1.394*
Wednesday	60	0.134	1.936	-3.053	1.030	-0.862	4.040	10.149*
Thursday	60	-0.178	3.696	-3.041	1.182	0.354	4.290	5.509*
Friday	61	0.090	4.183	-2.341	1.225	0.924	4.349	13.317*
Total	301	-0.218	4.180	-6.268	1.220	-0.104	5.622	87.056*
1996-01								
Monday	286	-0.470	6.123	-7.437	2.007	-0.185	4.644	33.862*
Tuesday	286	-0.539	4.004	-7.866	1.517	-0.694	5.863	120.676*
Wednesday	286	1.0618	7.027	-7.392	1.731	-0.149	5.095	53.403*
Thursday	286	-0.127	7.952	-3.832	1.510	0.814	5.592	111.717*
Friday	285	-0.269	8.221	-6.497	1.785	0.033	5.665	84.427*
Total	1429	-0.068	8.221	-7.866	1.814	-0.022	5.029	245.437*
2001-06								
Monday	240	0.297	4.516	-11.991	1.857	-1.593	10.630	683.893*
Tuesday	233	0.016	6.859	-4.558	1.469	0.688	6.515	138.418*
Wednesday	228	0.056	4.313	-8.078	1.378	-1.199	8.353	326.941*
Thursday	236	0.108	5.025	-5.960	1.429	-0.357	4.943	42.188*
Friday	226	0.194	5.545	-8.586	1.496	-1.295	10.399	578.762*
Total	1163	0.135	6.859	-11.991	1.539	-0.871	9.036	1912.879*

Significant at the 1% significance level.

can be concluded that the structural break is significant and the dummy representing the structural break is significantly causing seasonality.

Analysis and Results

According to EMH, security prices fully reflect all available information at any given time, which implies that price movements do not follow any pattern or trends, and expected daily returns on stocks are same for all trading days of the week. Furthermore, it indicates that the expected return on a security is same for Monday, as it is for Tuesday, as it is for Wednesday, and so on. Thus, it can be said that the trading returns on a stock over different trading days of the week should be evenly distributed. However, the pioneer work done by a number of researchers has documented different trading returns on different trading days of the week all over the world. The

Table 3. Unit Root Test Results of Daily Returns in NSE Listed Companies for Aggregated and Sub-periods

Criteria for Stationarity Variable	Augmented-Dickey- Fuller Test			Phillip-Perron Test		
	Intercept	With Intercept and Trend	Without Intercept and Trend	Intercept	With Intercept and Trend	Without Intercept and Trend
NSE Listed Companies	-19.842 (0.00)	-19.869 (0.00)	-19.728 (0.00)	-47.868 (0.00)	-47.869 (0.00)	-47.806 (0.00)

Table 4. Day-of-the-Week Effect in Stock Returns of NSE Listed Companies During Aggregate Period

Trading Days	Coefficient	Std. Error	t - Statistic	Prob.
Constant	0.031	0.025	1.246	0.212
Tuesday	0.006	0.006	0.932	0.351
Wednesday	0.002	0.006	0.352	0.724
Thursday	-0.008	0.006	-1.291	0.196
Friday	-0.002	0.006	-0.314	0.753
Return (-1)	-0.005	0.004	-1.202	0.229
D(RETURN(-1))	-0.206	0.019	-10.803	0.000
D(RETURN(-2))	-0.285	0.019	-14.936	0.000
D(RETURN(-3))	-0.145	0.019	-7.371	0.000
D(RETURN(-4))	0.034	0.019	1.713	0.086
D(RETURN(-5))	-0.127	0.019	-6.504	0.000
D(RETURN(-6))	-0.186	0.018	-9.862	0.000
D(RETURN(-7))	-0.139	0.018	-7.436	0.000
R- squared	0.177		F-statistic	50.060
Adjusted R- squared	0.173		Prob(F-statistic)	0.000
Durbin-Watson stat	1.948			

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

main objective of this section is to examine the behaviour considerations of investors in the Indian stock market with different trading days.

The Table 2 clearly reveals that the variability in weekly distribution of mean returns is evident during the Post-Liberalization period, where average trading returns are highest for Wednesday. Except Wednesday and Friday, trading returns are negative for all other days. Trading returns are negative for all the days except Wednesday during the Pre-Rolling Settlement period. The presence of a negative Tuesday effect combined with a positive Wednesday effect during the period of Pre-Rolling Settlement on NSE suggests that the anomalies are linked to the settlement cycles on the exchange.

The findings of highest Wednesday trading returns during these periods suggest that Wednesday has been a significant day historically, as NSE used to follow a trading cycle from Wednesday to Tuesday. Wednesday being the first day of the trading cycle must have reflected the action of market participants, who used to roll over their positions from Tuesday (closing day of the trading cycle) (Nath & Dalvi, 2004).

One important observation is that during the period of Post-Rolling Settlement (Table 2), the average trading returns for all the trading days are positive and the trading returns for Monday are the highest among them. The reason for highest Monday trading returns might be the presence of consistent bull run in the Indian stock market during the period.

The Table 3 examines the presence of day-of-the-week effect of the NSE by applying Augmented Dickey-

Table 5. Day-of-the-Week Effect in Stock Returns of NSE Listed Companies During the Post-Liberalization Period

Trading Days	Coefficient	Std. Error	t - Statistic	Prob.
Constant	0.887	0.324	2.736	0.006***
Tuesday	0.006	0.025	0.258	0.796
Wednesday	0.009	0.024	0.396	0.692
Thursday	-0.045	0.025	-1.790	0.074*
Friday	-0.015	0.024	-0.633	0.527
Return (-1)	-0.159	0.058	-2.739	0.006
D(RETURN(-1))	-0.713	0.077	-9.221	0.000
D(RETURN(-2))	-0.657	0.086	-7.596	0.000
D(RETURN(-3))	-0.591	0.090	-6.526	0.000
D(RETURN(-4))	-0.433	0.093	-4.655	0.000
D(RETURN(-5))	-0.452	0.086	-5.223	0.000
D(RETURN(-6))	-0.261	0.077	-3.370	0.000
D(RETURN(-7))	-0.111	0.059	-1.887	0.060
R-squared	0.476	F- statistic		19.603
Adjusted R-squared	0.452	Prob(F - statistic)		0.000
Durbin-Watson stat	2.033			

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 6. Day-of-the-Week Effect in Stock Returns of NSE Listed Companies During the Pre-Rolling Settlement Period

Trading Days	Coefficient	Std. Error	t - Statistic	Prob.
Constant	0.041	0.033	1.247	0.212
Tuesday	-0.001	0.004	-0.428	0.668
Wednesday	0.000	0.004	0.233	0.815
Thursday	-0.003	0.004	-0.783	0.433
Friday	-0.009	0.004	-2.099	0.036**
Return (-1)	-0.007	0.006	-1.205	0.228
D(RETURN(-1))	-0.546	0.027	-19.601	0.000
D(RETURN(-2))	-0.295	0.031	-9.362	0.000
D(RETURN(-3))	-0.192	0.032	-5.949	0.000
D(RETURN(-4))	-0.111	0.032	-3.409	0.000
D(RETURN(-5))	-0.094	0.032	-2.922	0.003
D(RETURN(-6))	-0.041	0.031	-1.314	0.188
D(RETURN(-7))	-0.017	0.027	-0.626	0.530
R - squared	0.241	F - statistic		35.232
Adjusted R - squared	0.234	Prob(F - statistic)		0.000
Durbin-Watson stat	2.004			

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 7. Day-of-the-Week Effect in Stock Returns of NSE Listed Companies During the Post-Rolling Settlement Period

Trading Days	Coefficient	Std. Error	t - Statistic	Prob.
Constant	0.016	0.034	0.463	0.642
Tuesday	0.018	0.012	1.466	0.142
Wednesday	0.002	0.012	0.165	0.068*
Thursday	-0.005	0.012	-0.401	0.687
Friday	0.007	0.012	0.596	0.551
Return (-1)	-0.003	0.006	-0.488	0.625
D(RETURN(-1))	-0.008	0.029	-0.282	0.777
D(RETURN(-2))	-0.326	0.028	-11.300	0.000
D(RETURN(-3))	-0.059	0.030	-1.970	0.049
D(RETURN(-4))	0.046	0.030	1.530	0.126
D(RETURN(-5))	-0.107	0.030	-3.550	0.000
D(RETURN(-6))	-0.225	0.028	-7.799	0.000
D(RETURN(-7))	-0.114	0.029	-3.875	0.000
R - squared	0.234	F- statistic		29.569
Adjusted R- squared	0.226	Prob(F - statistic)		0.000
Durbin-Watson stat	1.929			

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Fuller test for all the periods. It is evident that there is significant variation in returns across all the weekdays over the study period.

The data depicted in the Table 4 rejects the inference of the presence of day-of-the-week effect in NSE of India for the entire study period. The trifurcation of NSE data into three sub-periods also supports the argument regarding the absence of day-of-the-week effect.

The visualization of Tables 4-7 clearly reveals that the day-of-the-week effect is statistically significant during different sub-periods. The results document that a slight Friday effect has been observed during the period of Pre-Rolling Settlement in NSE in India. The coefficient for Friday is negative and observed to be reducing the returns by 0.09%. This Friday effect disappears during the third sub-period, that is, the Post-Rolling Settlement period. However, during the Post-Rolling Settlement period, a slight Wednesday effect has been observed, where the coefficient for Wednesday is significant at the 10% level of significance. Except these two feeble effects, no strong day-of-the-week effect has been observed during the entire period of the study.

Summarizing the results of NSE, there are different trading returns on different trading days in the aggregate period and sub-periods as well. The study covers the period from 1994 to 2006 and examines a set of 203 companies listed on the NSE. The results indicate that the day-of-the-week effect is not found for the aggregate period. However, the Monday effect is found for the post-liberalization period. During the Pre-Rolling Settlement period, the Friday effect is documented.

Implications

An investor is unable to consistently predict the stock market in advance and buy or sell mispriced assets at the right time (i.e. the investor prefers to buy underpriced securities and sell overpriced securities). Then, it becomes a matter of chance to beat the market some of the times. This study would help to detect the day-of-the-week effect,

and the investors should keep in mind the effects of these anomalies on the stock market, that is, whether to buy or sell the securities on a particular day of the week. The results emphasize the fact that the absence of day-of-the-week-effect is not prevailing for the Aggregate, and the Wednesday effect is found in the Post-Rolling Settlement period. This study also reveals that the Indian stock market is moving towards efficiency as the Monday effect is not observed.

Conclusion

The summary results of descriptive analysis of NSE demonstrate that Wednesday is causing the highest variability in the weekly distribution of mean returns during the Aggregate period. These results are consistent with the results of Post-Liberalization and Pre-Rolling Settlement period. However, average trading returns are highest for Monday for the Post-Rolling Settlement period.

The day-of-the-week effect of NSE indicates that none of the variables are found to be significant for the Aggregate period. The Monday effect is found during the Post-Liberalization period ; whereas, the Friday effect is evident during the Pre-Rolling Settlement period. Wednesday is the significant variable during the Post-Rolling Settlement period, a result which is consistent with the findings of Jaffe and Westerfield (1985), Mittal (1994), Poshakwale (1996), Tan and Tat (1998), Anshuman and Goswami (2000), Lian and Chen (2000), Amanulla and Thiripalraju (2001), Keef and McGuinness (2001), Gupta and Aggarwal (2004), Kaur (2004), Nath and Dalvi (2004), Mangala and Mittal (2005), and Sharma and Singh (2006).

From the above discussion, it is evident that the highest and lowest mean trading returns on different trading days provide an opportunity to the investor - with reference to different sub-periods - to exploit the market to the maximum benefit, so that they might earn super-normal profits by planning the purchase of securities on the day with lowest possible mean returns and sell them on a day with highest possible mean returns.

The results suggest that market inefficiency still exists, and the markets are yet to price the risk appropriately. Since the above results refute the weak form of efficiency hypothesis in the markets, it implies that skilled and big traders can make supernormal profits by making arbitrage and speculative moves in the market by considering the weekend phenomenon. This in turn helps them to plan out their trading strategies - whether to buy or sell a particular stock on a given day to earn super normal profits. However, the results of the study are subject to the consideration of transaction costs involved. Thus, the traders must be careful while exploiting the weekend anomaly, where liquidity may be a major problem for the traders to exploit the trading opportunities.

Limitations of the Study and Scope for Further Research

The present study has examined only the equity segment of the stock market and did not examine the debt and derivative segments of the Indian stock market due to time and resource constraints. The study is based on secondary data collected from a number of sources. The data were collected from authentic sources like the databases Prowess and Capitaline, but even then, the validity of the results is subject to the accuracy of the databases. The study considered only closing prices of securities whereas open, high, and low prices were not used to test the efficiency of the Indian securities market.

The intra-day stock prices can be examined to investigate the behaviour of share prices. In addition, the role of transaction costs to detect the day-of-the-week effect will contribute a lot in examining the Indian stock market. The inter-day stock price changes can be examined in order to obtain further information in the context of behavior of share prices. Moreover, dividend based anomalies might be examined for further research. However, a comparative examination for the presence of calendar anomalies can be done on an international level. Major indices on BSE and NSE can also be examined.

If stock returns document the presence of exploitable regularities, then it is seen that the smart traders earn super-normal profits by taking advantage of all those trading patterns. As a result, anomalies start to disappear as

those kind of smart traders use to arbitrage away the seasonal patterns in stock returns (Bohl et al., 2005). In an efficient market, an investment strategy concentrating simply on the overall risk and return characteristics of the portfolio will be more sensible. If, however, markets are not efficient, and excess returns can be made by correctly picking winners, then it will pay investors to spend time finding these undervalued securities.

Therefore, it is proved that the daily trading returns of a substantial number of stocks do not follow random walk hypothesis and hence, could be predicted as well in different trading categories on the basis of returns. Thus, there will be no undervalued securities offering higher than deserved expected returns. As research on seasonality in volatility of returns is still at a nascent stage, the above findings could possibly help in understanding and explaining such seasonality for the Indian capital markets. Therefore, there is a need to explore alternative explanations and refine the existing factors. In addition, the regulatory bodies of the markets, institutional practices, and public authorities have an important creative impact on the existence of seasonalities in stock markets.

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Appendix

Table 1. Companies Listed on National Stock Exchange (NSE) for Day-of-the- Week Effect

Sr. No.	Name of the Companies	Sr. No.	Name of the Companies
1.	A P PAPER LTD.	103.	KINETIC MOTOR CO. LTD.
2.	ABB LTD.	104.	KITPLY INDS LTD.
3.	ACC LTD.	105.	KOCHI REFINERIES LTD.
4.	ADITYA BIRLA NUV LTD.	106.	KOPRAN LTD.
5.	ADOR WELDING LTD.	107.	KOTAK MAH. BANK LTD.
6.	AGRO TECH FOODS LTD.	108.	LARSEN & TURBO LTD.
7.	ALFA LAVAL (I) LTD.	109.	LLOYD FINANCE LTD.
8.	APOLLO TYRES LTD.	110.	LLOYD STEEL INDS LTD.
9.	ARVIND MILLS LTD.	111.	LML LTD.
10.	ASHOK LEYLAND LTD.	112.	LUPIN LTD.
11.	ASIAN PAINTS LTD.	113.	M & M LTD.
12.	ATUL LTD.	114.	MICO LTD.
13.	AVENTIS PHARMA LTD.	115.	MTNL LTD.
14.	BATA INDIA LTD.	116.	MADRAS CEMENT LTD.
15.	BHARAT FORGE LTD.	117.	MAH. SCOOTERS LTD.
16.	BHEL LTD.	118.	MAH. SEAMLESS LTD.
17.	BIRLA CORP LTD.	119.	MANGALORE REF. LTD.
18.	BIRLA VXL LTD.	120.	MAX INDIA LTD.
19.	BLOW PLAST LTD.	121.	MERCK LTD.
20.	BOC INDIA LTD.	122.	MUKAND LTD.
21.	BOMBAY DYEING LTD.	123.	MYSORE CEMENT LTD.
22.	BONGAIGAON REF LTD.	124.	NAG FERT & CHEM LTD.
23.	BPCL LTD.	125.	NAHAR SPINNING LTD.
24.	BRITANNIA INDS LTD.	126.	NALWA SONS LTD.
25.	CAROL INFO SERV LTD.	127.	NATL ALUMINIUM LTD.
26.	CEAT LTD.	128.	NEPC INDIA LTD.
27.	CENTRAL IND POL. LTD.	129.	NICHOLAS PIRAMAL LTD.
28.	CENTURY ENKA LTD.	130.	NIIT LTD.
29.	CENTURY TEXTILES LTD.	131.	NIRMA LTD.
30.	CESC LTD.	132.	NOCIL LTD.
31.	CHAMBAL FERT LTD.	133.	OSWAL CHEM & FERT LTD.
32.	CHENNAI PETROLEU LTD.	134.	P & G HYGEINE LTD.
33.	CIPLA LTD.	135.	PANINSULA LAND LTD.
34.	CLARIANT INDIA LTD.	136.	PENTAMEDIA GRAPH LTD.
35.	COLGATE PALMOLIVE LTD.	137.	PFIZER LTD.
36.	CROMPTON GREAVES LTD.	138.	PIDLITE INDS LTD.
37.	CUMMINS INDIA LTD.	139.	POLYPLEX CORPN LTD.
38.	DABUR INDIA LTD.	140.	PRAKASH INDS LTD.
39.	DALMIA CEMENT LTD.	141.	PREMIER AUTO LTD.
40.	DCW LTD.	142.	PRIME SECURITIES LTD.

41.	DHAMPUR SUGARS LTD.	143.	PUDUMJEE PULP LTD.
42.	DR REDDY'S LAB LTD.	144.	PUNJAB TRACTORS LTD.
43.	EID PARRY LTD.	145.	RCF LTD.
44.	EIH LTD.	146.	RAJAS SPINNING LTD.
45.	ESCORTS LTD.	147.	RALLIS INDIA LTD.
46.	ESSAR STEEL LTD.	148.	RANBAXY LABS LTD.
47.	ESSEL PROPACK LTD.	149.	RAYMOND LTD.
48.	EVEREST INDS LTD.	150.	RELIANCE CAPITAL LTD.
49.	EXCEL INDS LTD.	151.	RELIANCE ENERGY LTD.
50.	FEDERAL BANK LTD.	152.	RELIANCE INDS LTD.
51.	FINOLEX CABLES LTD.	153.	ROLTA INDIA LTD.
52.	FINOLEX INDS LTD.	154.	RPG LIFE SCIENCE LTD.
53.	FLEX INDS LTD.	155.	SAIL LTD.
54.	FOSECO INDIA LTD.	156.	SPIC LTD.
55.	G S F C LTD.	157.	S R F LTD.
56.	GARDEN SILK MILL LTD.	158.	SAKTHI SUGARS LTD.
57.	GE SHIPPING COMPANY LTD.	159.	SAMTEL COLOR LTD.
58.	GILETTE INDIA LTD.	160.	SESA GOA LTD.
59.	GLAXOSMITH CHL LTD.	161.	SHIP CORP (I) LTD.
60.	GLAXOSMITHLINE LTD.	162.	SHRENUJ & CO. LTD.
61.	GNFC LTD.	163.	SIEMENS LTD.
62.	GODFREY PHILIPS LTD.	164.	SKF INDIA LTD.
63.	GRASIM INDS LTD.	165.	ST BANK OF INDIA LTD.
64.	GREAVES COTTON LTD.	166.	STANDARD INDS LTD.
65.	GUJ. ALKALIES LTD.	167.	STERLITE INDS LTD.
66.	GUJ. AMBUJA CEM LTD.	168.	SUNDARAM FINANCE LTD.
67.	GUJ. GAS COMPANY LTD.	169.	SUPREME INDS LTD.
contd....			
68.	GUJ. INDS POWER LTD.	170.	SUPREME PETROCH LTD.
69.	GUJ. LEASE FIN LTD.	171.	SU-RAJ DIAMONDS LTD.
70.	HPCL LTD.	172.	SURYA ROSHNI LTD.
71.	HARR. MALYALAM LTD.	173.	TISCO LTD.
72.	HB STOCKHOLDING LTD.	174.	T N PETRO PROD LTD.
73.	HCL INFOSYSTEMS LTD.	175.	TATA CHEMICALS LTD.
74.	HDFC BANK LTD.	176.	TATA INVEST CORP LTD.
75.	HEG LTD.	177.	TATA MOTORS LTD.
76.	HIMACHAL FUTURIS HIND, LEVER LTD.	178.	TATA POWER CO. LTD.
77.	HIND. MOTORS LTD.	179.	TATA SPONGR IRON LTD.
78.	HIND. OIL EXPLOR LTD.	180.	TATA INVEST CORP LTD.
79.	HINDALCO INDS LTD.	181.	TATA MOTORS LTD.
80.	HOTEL LEELA VEN LTD.	182.	TATA POWER CO. LTD.
81.	IPCL LTD.	183.	TATA SPONGR IRON LTD.
82.	IBP LTD.	184.	TATA TEA LTD.

83.	ICI (INDIA) LTD.	185.	THIRU AROOR SU LTD.
84.	IFB INDS LTD.	186.	TIMES GUATRANTEE LTD.
85.	IFCI LTD.	187.	TITAN INDS LTD.
86.	INDIA CEMENTS LTD.	188.	TORRENT PHARMA LTD.
87.	INDIAN HOTELS LTD.	189.	TORRENT POWER AEC LTD.
88.	INDO RAMA SYNTH LTD.	190.	TRENT LTD.
89.	INFOSYS TECH LTD.	191.	UNIPHOS ENTERP LTD.
90.	INGERSOLL-RAND LTD.	192.	UNIVERSAL CABLES LTD.
91.	IPCA LABS LTD.	193.	VARDHMAN SPG LTD.
92.	ITC LTD.	194.	VIDEOCON APPL LTD.
93.	ITI LTD.	195.	VINDHYA TELELINK LTD.
94.	JAIN IRRIGATION LTD.	196.	VIP INDS LTD.
95.	JAYPEE HOTELS LTD.	197.	VLS FINANCE LTD.
96.	JBF INDS LTD.	198.	VOLTAS LTD.
97.	JCT ELECTRONICS LTD.	199.	VSNL LTD.
98.	JINDAL PHOTO LTD.	200.	VST INDS LTD.
99.	JINDAL SAW LTD. LTD.	201.	WIPRO LTD.
100.	JK INDS LTD.	202.	WYETH LTD.
101.	JUBILANT ORGAN LTD.	203.	ZUARI INDS LTD.
102.	KEC INTL LTD.		
