



An Analysis of Day-of-the-Week Effect in Indian Stock Market

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Abstract

The present study examines the effect of trading days in the Indian stock market for the period from January 1, 2006 upto December 31, 2010. The study uses the daily closing prices of Sensex. The results exhibited that the average returns of all the trading days are not identical, which confirms the presence of Day-of-the-Week anomaly, which refutes the Efficient Market Hypothesis (EMH) consistent with Cross (1973), French (1980), Gibbons and Hess (1981), Rogalski (1984), Jaffe and Westerfield (1985) and Chaudhary (1991). The existence of calendar anomalies is a contradiction to the weak form of the EMH which states that the market is efficient in past price and volume information and stock movements cannot be predicted using this historic information. In recent years, the testing for market anomalies in stock returns has become an active field of research in empirical finance and has been receiving attention from not only in academic journals but also in the financial press. Thus, the investor should keep in mind the effect of the trading days while making an investment in the Indian stock market in order to exploit the gaining opportunities up to the full extent.

Key words: Efficient market hypothesis, Day-of-the-Week effect, Seasonality.

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To predict the behavior of stock market is considered as the most challenging task performed by the researchers and securities analysts over the world. There is a general agreement among researchers to the effect that mean returns are not equal for different days of the week. The Efficient Market Hypothesis (EMH) states that security prices fully reflect all available information at any particular time. This implies that price movements do not follow any patterns

or trends, but there are some empirical evidences, that refute the presence of EMH and found irregularities in the stock returns termed as “Anomalies”.

The present paper documents seasonality in BSE- Sensex in different trading days in the Indian stock market i.e. known as Day-of-the-Week effect. A number of explanations for the effect (based upon human nature) have also been put forward to explain the observed patterns. The human behavior of disclosing positive news quickly on the week days and waiting for the week-end to disclose the negative news, that allows the market to absorb the shock on week-end may be considered as the basis for the Day-of-the-Week effect (Gupta and Aggarwal 2004).

SECTION I

REVIEW OF LIRERATURE

Numerous empirical evidences have observed the seasonality in India as well as abroad. This section provides an overview of the studies, which have observed Day-of-the-Week effect in international as well as national context. The empirical evidences from literature shows that the Day-of-the-Week effect still exists in financial markets but no theoretical explanation has satisfied the researchers, in spite of number of efforts made by the academicians to explain the Day-of-the-Week effect.

Table 1: Empirical Evidences on Day-of-the-Week effect

Empirical evidences in International context				
Sr . n o.	Author	Market	Period of study	Observations
1.	Keim and Stambaugh 1984	S & P Composite Index (US)	1928- 1982	Friday returns were highest
2.	Rogalski	DJIA (US)	1974-	Monday effect

	1984		1984	occurred
3.	Cornell 1985	S & P 500 (US)	1982- 1984	DOW effect was found in cash market, but not in futures market.
4.	Jaffey and Wasterfield 1985	ND Index and S&P composite 500 stock price index (US)	1970- 1983	(-ve) Mon. return, (+ve) Fri. return.
5.	Kato 1990	Daily returns of TOPIX Intra- day returns of TOPIX (Tokyo)	1.1978- 1987 2.1982- 1987	Low Tues. return, High Wed. return.
6.	Lakonishok and Maberly 1990	NYSE odd lot sales and purchases and NYSE block transactions (US)	1962- 1986	Trading volume was lowest on Monday.
7.	Chang et.al., 1993	Intraday daily returns on 22 foreign indices and U.S. Index	1986- 1992	Mon. effect for two weeks out of a given month.
8.	Mittal 1994	BSE National Index	1990- 1993	(-ve) Tue. return, (+ve) Fri. return.
9.	Poshakwale 1996	BSE National Index	1987- 1994	(-ve) Mon. return, (+ve) Wed return.
10	Wang et al., 1997	NYSE- AMEX equally and value weighted returns indices. The Nasdaq equally and value	1.1962- 1993	(-ve) Mon. return for first three weeks of the given month.

		weighted returns indices. S&P Composite Index	2.1973-1993 3.1928-1993	
11	Anshuman and Goswami 2000	70 Frequently stocks traded on BSE	1991-1996	(-ve) Tue. return, (+ve) Fri. return.
12	Amanulla and Thiripalraju 2001	1. BSE Sensitive Index 2. BSE National Index 3. S&P CNX Nifty Index	1990-1999	(-ve) Tue. return, (+ve) Wed. return.
13	Brooks and Persand 2001	South Korea Stock Exchange Composite Index Kuala Lumpur Composite Price Index Bangkok Weighted Price Index Taiwan Weighted Price Index Philippines Stock Exchange Composite Price Index	1989-1996	Thailand and Malaysia exhibited positive returns and negative Tuesday return.
14	Kiyamaz and Berument 2001	TSE Composite Index (Canada) DAX Index (Germany)	1989-1997	Highest volatility on Monday was found for Canada, Germany and Japan and on Friday

		Nikkei 225 Index (Japan) FT- 100 Index (UK) NYSE Composite Index (US)		for UK and US.
15	Nath and Dalvi 2004	S&P CNX Nifty	1999-2003	(+ve) Wed. return, (+ve) Fri. return.
16	Draper and Paudyal 2005	S & P 500 (US)	1930-1999	Wednesday was four times larger than the typical pre-holiday returns and Monday effect was absent in pre-holiday returns.
17	Mangala and Mittal 2005	CNX Nifty Junior	1997-2003	(+ve) Wed. return, (-ve) Fri. return.
18	Boynton et al., 2006	Pacific Basin Capital Markets Research Center (Japan)	1975-2001	Monday exhibited losses and decrease in volume as well.
19	Hu et al ., 2006	TWSE (Taiwan)	1991-2004	Stronger Monday effect and highest positive Friday returns were found.

Where, AMEX BSE= Bombay Stock Exchange, DAX=Deutsche Aktien Indexe, DJIA = Dow Jones Industrial Average, FT=Financial Times, ND = Nikkei-Dow, NYSE= New York Stock Exchange, TOPIX= Tokyo Stock Price Index, TSE=Tokyo Stock Exchange, TWSE= Taiwan Stock Exchange, S & P = Standard and Poor.

The Week-End effect continued to persist even when market adjusted returns were considered for equities and treasury bills (Gibbons and Hess 1981). Anshuman and Goswami (2000) concluded that settlement procedures, badla trading and measurement error did not have any significant impact on Day-of-the-Week effect. However, Cornell (1985) found measurement error and transactions costs as a cause for the particular effect. There was reversal in Monday effect in Indian stock market after 2000, consistent with Amanulla and Thiripalraju (2001). Wednesday was documented with highest positive returns in the period after 2000 (Nath and Dalvi 2004; Mangala and Mittal 2005). Short seller's activities were considered as a cause for the effect in Taiwan stock market (Hu et al. 2006). Payment of dividend and information hypothesis was also considered responsible for Day of the week effect and further unanticipated changes in exchange rates, the term structure, default risk premiums and release of news information on certain trading days might be considered a cause of the effect (Draper and Paudyal 2005).

SECTION II

DATA BASE AND METHODOLOGY

The daily stock price data of the Sensex has been taken for the period of January 31, 2006 upto December, 31 2010. Daily closing share prices have been taken from PROWESS (the online database maintained by the Center for Monitoring of Indian Economy (CMIE)), which contains the information of all the actively traded stock at any given time on both BSE as well as NSE. In addition to the PROWESS, web resources such as www.bseindia.com have been used.

Daily stock prices have been 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 have been excluded to avoid any bias on account of 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 is holiday, the returns on next day to that holiday have been excluded. If P_t is the closing of Sensex on date t and P_{t-1} be the same for the previous business day, then the one day return on the market portfolio is calculated as:

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

In order to check the seasonality of daily returns ARMA (p,q) has been applied, where p denotes the order of autoregressive terms and q denotes the number of moving average terms (Gujarati 2003). To test the daily seasonality, dummy variables had been used. The value of unity has been assigned to dummy variable for a given day and a value of zero for all other trading months. The intercept term along with dummy variables has been specified for all the months except one. For example, the omitted day i.e. Monday is the benchmark day. Thus, the coefficient of each dummy variable measures the incremental effect of that day relative to the benchmark day. When at least one dummy variable is statistically significant, then the existence of seasonal effect will be confirmed. The model to test the seasonality is as:

$Y_t = \alpha_1 + \alpha_2 D_{\text{Tues}} + \alpha_3 D_{\text{Wed}} + \alpha_4 D_{\text{Thu}} + \alpha_5 D_{\text{Fri}} + \varepsilon_t \quad (II)$	show the
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average differences in return between Monday and other trading days of each week. If there is no seasonality, then the coefficients should be equal to zero and ε_t is the white noise error term. The problem with this approach is that the residuals may have serial correlation.

For the residual series μ_t , the ARIMA (Autoregressive Integrated Moving Average) model has been constructed. The model has been substituted for the explicit error term in the equation III.

$Y_t = \alpha_1 + \alpha_2 D_{\text{Tues}} + \alpha_3 D_{\text{Wed}} + \alpha_4 D_{\text{Thurs}} + \alpha_5 D_{\text{Fri}} + \phi^{-1}(B)\phi(B)n_t \quad (III)$
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SECTION III

RESULTS AND ANALYSIS

Table 2 represents the summary statistics for daily returns for Sensex by Day-of-the-Week.

Table 2: Descriptive statistics for Sensex

2006-10								
	N	Mean	Max	Min	Std Dev	Skew	Kurt	Jarqu-bera
Monday	216	0.5131	6.2423	-8.8460	2.1845	-	4.1219	13.8941*
Tuesday	232	0.7500	6.1918	-6.3741	1.7348	-	4.6850	27.7909*
Wednesday	217	0.0581	4.6821	-6.9326	1.7934	-	4.2530	23.0434*
Thursday	214	0.2185	5.1458	-7.2017	1.7891	-	4.2127	16.9151*
Friday	211	0.1299	7.1482	-7.3925	1.8537	-	4.6561	26.5140*
Total	1090	0.1972	7.1482	-8.8460	1.8801	-	4.4450	105.3538*

*Significant at 1% significance level.

The average trading returns for the period depict the presence of *highest Tuesday trading returns* and *lowest Wednesday trading returns*. Highest standard deviation could be seen on Monday. One most considerable point is that, the trading returns for all the trading days are positive, which may be due to consistent bull run in the market, indicates that the Indian stock market is leading towards efficiency, consistent with Sharma and Singh (2006). This clearly indicates that Friday being the last day of the week, traders would like to close their positions before the week ends, thus, exhibited that Indian stock market has become efficient enough after

introduction of rolling settlement, consistent with Nath and Dalvi (2004) and Sharma and Singh (2006).

Daily returns of markets have been found to be significantly skewed and kurtic, which rejects the null hypothesis that in an efficient capital market, returns are normally distributed. All variables depict significant trading returns, indicating “Monday effect” as the coefficient is significant at 1% level of significance.

Evidence presented in the analysis suggests that Indian stock market experience the Day-of-the-Week anomaly. Seasonality implies that stock markets are not informationally efficient generally (Pandey 2002), which provide investors the opportunities to frame their trading strategies well in advance and the anomaly suggests that market participants can predict the market well in advance and can be benefited from the market through timing their plans for investment and sale of securities.

Table 3: Day-of-the-Week effect for Sensex for 2001-06

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.3064	0.070419	-4.351940	00045
T	-0.866585	0.087690	9.882313	0.0000
W	0.270059	0.094892	2.845968	0.0000
TH	0.277333	0.094357	2.939198	0.0033
F	0.111189	0.088227	1.260262	0.2077
Total	0.381027	0.175445	2.171772	0.0300
AR(1)	0.351333	0.175445	2.171772	0.0300
AR(2)	0.351333	0.083717	4.196662	0.0000
MA(1)	-0.198854	0.173891	-1.143551	0.2529
MA(2)	-0.435695	0.078743	-5.533165	0.0000

$R^2 = -0.0660$

F value = 26.56

DW stat = 2.000

Prob. = 0.0000

As it is clear from table 3 that positive returns towards end of the week imply that stock prices tend to move upwards, starting from the beginning of the week (Yakob et al., 2005).

Tuesday's trading returns are negative (*Anshuman and Goswami 2000*) explains that the bad news of the week-end negatively influence some markets lagged by one day (*Nath and Dalvi (2004)*). The trading returns for Wednesday are positive (*Ranjan and Padhye (2000)* and *Amanulla and Thiripalraju (2001)*), reason being the optimistic attitude of the Indian investors to make their dealings on Wednesday most of the times. The investor can purchase the securities in the starting of the week, when prices are low and dispose them off before the week end to capitalize high profits for the period (Mangala and Mittal 2005) but, the strategy is suitable for short term period only. The most noteworthy explanation for Monday effect is that usually the most unfavorable news appears during the week-ends. The influence of these negative news cause the investors to sell on the following Monday.

Thus, it is clear from the above analysis that trading returns in the Indian stock market are not identical and independent across different trading days of the week. The trading returns in the period under-taken are highly seasonal, which provides the strong evidence of presence of Day-of-the-Week anomaly in the Indian stock market. The investor should be cautious enough while trading on stock market, as he should buy the securities on a day with lowest mean returns and sell them on the day with highest mean returns, so that he can exploit the opportunities.

Section IV

CONCLUSION

The present study observes that there is a significant relationship between the returns of different trading days of the week, which refutes the presence of EMH. The results indicate the presence of maximum average positive returns on Tuesday. The returns on other trading days also exhibit

the seasonal pattern of the Indian stock market. Above results refute the presence of EMH in the market, which implies that keeping the Day-of-the-Week phenomenon in mind; an investor can make supernormal profits, so that it may help the investors to plan their strategies accordingly.

The results of the study are subject to the consideration of transaction cost involved, thus, the above strategy can give fruitful results by altering the timing of already scheduled buy and sell transactions in the stock market (Mittal 1994). A number of explanations for the presence of this anomaly i.e. measurement error, settlement effect, impact of badla trading practices and window-dressing (Anshuman and Goswami, 2000; Draper and Paudyal 2002 and Draper and Paudyal 2005) has been given, but no explanations yet seems sufficient for this phenomenon. Even then above findings may help to understand the seasonal nature of the Indian capital market.

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