Weekend Effect of Stock Returns in the Indian Market

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Abstract. Many studies on the behavior of stock prices have been based on the belief that stock returns are not influenced by the day of the week. In this paper, we have argued that the measured daily returns should depend on the day of the week by taking the context of the Indian stock market. More specifically, we believe that the expected returns on Monday should be lower and returns on Friday should be higher than on other days by evidencing the existence of this 'weekend effect'. We have also offered a partial explanation to this anomalous behavior by considering a model for adjusted stock returns based on the delay between the trading and settlement period, complex effects of holidays on daily returns and effect of investor expectations.

Keywords: Weekend Effect, Day of the Week Effect, Monday Effect, Market Anomalies, Indian Stock Market, Stock Returns

In recent years, several studies have been undertaken to test the market for anomalies in the stock returns. The returns in stock market can be attributed to fundamental factors and non-fundamental factors. The effect of fundamental factors like P-E ratio, dividends, news about a merger etc. can be explained using current theories in economics. However, there are some non-fundamental factors whose effect on the stock market is difficult to be explained. Some of these non-fundamental factors that have an anomalous effect on the stock market are the size effect, the January effect, mid-day swoon and the weekend effect.

We have concentrated on investigating the weekend effect of stock returns in the Indian markets. According to this phenomenon, the average daily returns of the market are not the same for all days of the week, something we would expect in an efficient market. *Weekend effect* is used to describe the phenomenon in financial markets in which stock returns on Mondays are often significantly lower than those of the immediately preceding Friday. French (1980) first called attention to the weekend effect and since then a number of researchers have found evidence of this anomalous behavior and tried to uncover the reasons behind it. Keim and Stambaugh (1984) established that this phenomenon has been a regular feature in the financial markets for many years but uncovered no evidence about it being specific to firm size. Research done by Gibbons and Hess (1981), Rogalski (1984), Smirlock and Starks (1986), Flannery and Protopapadakis (1988), Kohers and Kohers (1995) also confirms that daily stock market returns tend to be lower on Mondays and higher on Fridays in countries like USA and Canada.

Lakonishok and Maberly (1990) attribute some of the Monday-Friday differential returns to the differential trading patterns of institutions and individuals. Damodaran (1989) explores whether a tendency of corporations to release bad news on Friday after the markets close could account for depressed Monday share prices; he reports evidence of only a weak connection.

For most of the western economies, the empirical results have shown that the markets experience statistically significant negative returns on Mondays, while on Fridays they tend to have statistically significant positive returns. If an anomaly exists in the market, the investors can take advantage of the same and adjust their buying and selling strategies accordingly to increase their returns with timing the market.

The day of the week effect in Indian market has been examined by Roger Ignatius (1992) and Golaka Nath and Manoj Dalvi (2004) for the periods of 1979-1990 and 1999-2003 respectively. Both of them confirmed the existence of a weak form of the weekend effect in the Indian market. However, none of them could give a concrete reason to explain the weekend effect in India. The most satisfactory explanation that has been given for the lesser returns on Mondays compared to Fridays is that usually the most unfavorable news appears during the weekends. These unfavorable news have a negative influence on the majority of the investors, causing them to sell on the following Monday.

In this paper, we offer a partial explanation for the puzzling discovery of different daily returns. We do this by accounting for the effect of settlement period on the stock market returns, the risk free rate, and market expectation on returns on Monday.

EFFECT OF SETTLEMENT PROCESS

Definitions

*Settlement date***:** It is the date by which an executed security trade must be settled. A security or a stock is said to be executed as soon as an order is given to buy it or sell it. A security or a stock is said to be settled as soon as a transaction to buy it or sell it is completed. That is, the settlement date is the date by which a buyer must pay for the stock or securities that are delivered by the seller.

Settlement period: **It is t**he period of time between the settlement date and the transaction date that is allotted to the parties of a transaction to satisfy the transaction's obligations. The buyer must make the payment within the settlement period, while the seller must deliver the purchased security within this period. Depending on the type of security traded, the exact duration of the settlement period will differ. The settlement period is often quoted as T+1, T+2 or T+3; which means the transaction date plus one, two or three days. For stocks traded in India, the settlement period is currently two days (T+2) after the transaction. This means that the buyer must transfer cash to the seller, and the seller must transfer ownership of the stock to the buyer within three days of trade.

Rolling settlement: Rolling settlement is a mechanism of settling trades done on a Stock Exchange on day 'T', i.e., trade day plus "X" trading days, where "X" could be 1,2,3,4 or 5 days. In other words, in T+5 environments, trades done on T day are settled on 5th working day excluding the T day. In India, until recently, the settlement of trades was done on Account Period basis, where trades done in a trading cycle of 5 days were consolidated, scrip-wise (stock wise) netted and settlement of such netted trades took place on a single day in the following week. Thus, it took anywhere between one to two weeks for the investor depending upon the day of his transaction to realize the money for shares sold or get delivery of securities purchased.

However, in the rolling settlements, trades done on each single day are settled separately from the trades done on earlier or subsequent trading days. The netting of trades is done only for the day and not for multiple days. In our markets, the trades in rolling settlements, to begin with, were settled after 5 trading days from the day of trading and w.e.f. April 1, 2003, the trades in all the scripts (stocks) listed and traded on the exchange are now settled on T+2 basis.

Indian Scenario: Settlement Cycle Effect

Earlier, trading of shares in India took place in physical share certificates. This changed by the year 1999 when SEBI (Securities and Exchange Board of India) introduced compulsory trading in dematerialized form (electronic trading of shares). By 2000, trading had switched to a rolling settlement mechanism as described above and the shares were settled on a T+5 basis. This was changed to T+3 by April 2002 and then finally to T+2 by April 2003. We have tried to partially explain what impact this system of rolling settlement might have on the average daily stock returns. We have considered data only after April 2003, after the introduction of T+2 rolling settlement for the sake of maintaining consistency in the data and having a longer time series (April 2003- April 2008). The analysis carried on henceforth will assume a T+2 settlement cycle unless mentioned otherwise.

In an ordinary week that does not contain any holidays, stocks purchased on a particular day will have to be paid by the end of next two trading days. So stocks purchased on business days other than Thursday and Friday give the buyer two calendar days before losing funds for stock purchases. These two days are the two business days meant for the settlement process. However, payment (final payment occurs during settlement) for stock purchased on a Thursday will not occur until Monday and payment for a stock purchased on Friday will not occur until Tuesday. These transactions take four days for settlement as there are two holidays (weekend days) in between the two business days.

Buyers should therefore be prepared to pay more on a Thursday or a Friday than on other days by the amount of two days interest which they can earn by parking their funds at the risk free rate for that extra period of two days. The sellers of stock would also require a higher price for their stocks sold on a Thursday or a Friday because of the two days extra delay before being paid for them. Hence, the equilibrium expected rate (averaged returns in long run) of return for stocks on Thursdays and Fridays should be higher than on other days. Similarly, the equilibrium expected rate of return on Mondays should be lower by two days of interest than the return expected from either a trading time or calendar time view (trading time view would calculate the daily expected returns from the annual returns using the actual number of trading days and calendar time view would calculate the daily expected returns from the annual returns using the number of calendar days i.e. 365 days).

The presence of holidays during a week will also affect the equilibrium expected returns in a complex fashion. The returns would start getting affected about a week in advance. As many as three daily returns in that or previous week may be affected with one holiday in a week. Given that about a fifth of the weeks contain a business holiday, the complication they introduce is not negligible. The effect of holidays with the current two-day settlement period can be illustrated with the following example.

Let us consider a holiday on the 20th of a month when this day falls on a Thursday. If a stock is purchased on that Wednesday (19th), the settlement for this transaction will take place two business days later which, because of Thursday being a holiday, will take place on Monday (24th). There are, therefore, five calendar days between the trade and the final settlement date, which is three days longer than the settlement period for a stock traded on Wednesday in normal

weeks. With Thursday (20th) a holiday, if the stock had traded on Wednesday (19th), settlement would have been made after two business days - Friday (21st) and Monday (24th). Likewise, a security traded on Tuesday (18th) with Thursday (20th) being a holiday will be settled on Friday, which is three calendar days. This is one day longer than the settlement period for a stock traded on Tuesday in normal weeks.

Holidays can affect returns for over a week in advance. In the previous example if Tuesday (18th) is a holiday then a stock purchased on Friday (14th) will have settlement due on Wednesday instead on Tuesday as it normally would have been in case of no holiday, increasing the settlement period by one day. The complete effect of delays in payments on expected measured rates of return because of holidays and normal weekends is presented in Table I. We denote the average equilibrium daily return on investment in stocks (based on trading calendar view) by x, the daily interest rate (bank rate of Reserve Bank of India) by y, and a holiday by 'H-day'. The table is presented under the assumption that equilibrium expected returns are proportional to trading time. The top row shows the effect of normal weekends where the two-day saving of interest by buying on Thursday makes prices rise on that day by $2y$. Thursday and Monday have both four days as settlement period. Therefore, the returns on Monday will be same as the expected equilibrium returns. The returns on Monday are corrected with $-2y$ as its settlement period is two days less than the previous trading day i.e. Friday. The value in brackets denotes the additional number of calendar days after which the payments for the traded stock will be settled.

Table 1

The Effect of Weekends and Holidays on Equilibrium Daily Returns[a]

Day	W	Th	F	M	T	W	Th	F	M	T
No Holiday	(2) x	(4) x+2y	(4) x	(2) x-2y	(2) x	(2) x	(4) x+2y	(4) x	(2) x-2y	(2) x
Monday Holiday	(2) x	(5) x+3y	(5) x	H	(2) x-3y	(2) x	(4) x+2y	(4) x	(2) x-2y	(2) x
Tuesday Holiday	(2) x	(4) x+2y	(5) x+y	(3) x-2y	H	(2) x-y	(4) x+2y	(4) x	(2) x-2y	(2) x
Wednesday Holiday	(2) x	(4) x+2y	(4) x	(3) x-y	(3) x	H	(4) x+y	(4) x	(2) x-2y	(2) x
Thursday Holiday	(2) x	(4) x+2y	(4) x	(2) x-2y	(3) x+y	(5) x+2y	H	(4) x-y	(2) x-2y	(2) x
Friday Holiday	(2) x	(4) x+2y	(4) x	(2) x-2y	(2) x	(5) x +3y	(5) x	H	(2) x-3y	(2) x

[a] *x - average daily equilibrium expected return on stocks based on trading time.*
y - daily rate of interest.
() - the value in brackets denotes the number of calendar days from that day when a traded stock will be settled

Table I also allows us to observe the effect of holidays on equilibrium expected returns. For example, a holiday on a Monday, as shown in the second row, will increase the expected return on the Thursday 3y (as opposed to 2y in the holiday free week) since the settlement period of Thursday will be five days. This is three days more than its previous trading day (Wednesday) which will have a settlement period of two days. In addition, the return on Tuesday will decrease relative to a non-holiday by three days interest (-3y) as its settlement period is five days. This is three days less than the settlement period of the previous trading day i.e. Friday with five days as settlement period. Similarly, the effects of other weekdays as holidays on the expected equilibrium stock returns are shown in Table I.

Effect of Investor Expectations

The stock market is highly influenced by investor sentiments. One can also gauge the influence of investor sentiment in contributing to the weekend effect. Assuming that there is no volatility in the stock market prices and that the market is efficient and moves at risk free rate, one would expect the Monday's returns to exceed Friday's returns so as to compensate for two days of additional interest. We denote the average equilibrium daily return on investment in stocks by x and the daily risk free interest rate by y.

Now ideally in an efficient market, all the information is available to the investors; so the investors would expect the Monday's returns to be 2y more than Friday i.e. x+2y. This would generate more open interest in the market to buy the stocks, since the investors know that the Monday's price will be greater than Friday. The increasing open interest will result in increasing the market price of the stocks and will eventually lead to Fridays returns tending to x+2y. Effectively, the investors would realize the interest due to them on the weekend, on Friday itself. The buyers would be willing to give a higher price as they know the price would sustain itself on Monday. The sellers would be happy to sell at a slightly higher price as it would increase their profit.

The effect of this model on the stock prices has been shown in Table II, where the expected returns on Friday increase by 2y. Holidays in a week will also affect the returns in the current or the previous week. For example if Wednesday 15th of a month is a holiday, then the expected returns on Tuesday 14th would increase by y. Similarly, the effect of holidays on the everyday returns in a week are shown in Table II

Table II [a]

The Effect of Investor Sentiment on Equilibrium Daily Returns

Day	W	Th	F	M	T	W	Th	F	M	T
No Holiday	x	x	x+2y	x	x	x	x	x+2y	x	x
Monday Holiday	x	x	x+3y	H	x	x	x	x+2y	x	x
Tuesday Holiday	x	x	x+2y	x+y	H	x	x	x+2y	x	x
Wednesday Holiday	x	x	x+2y	x	x+y	H	x	x+2y	x	x
Thursday Holiday	x	x	x+2y	x	x	x+y	H	x+2y	x	x
Friday Holiday	x	x	x+2y	x	x	x	x+y	H	x	x

[a] *x - average daily equilibrium expected return on stocks based on trading time.*
y - daily rate of interest.

Data, Adjustments and Transformations

Transforming to the combined model: Combining the effects of the settlement process and the investor sentiment, we have come up with a more comprehensive model that would show how the stock market returns adjust from evenly distributed returns for every day of the week. The adjustment factors for different days of the week, with and without a holiday are shown in Table III. For example to get the adjusted true returns on Monday/Friday in a week without any holidays, we will add/subtract a factor of 2y.

Table III

Combined Model with the Adjustment Factors

Day	W	Th	F	M	T	W	Th	F	M	T
No Holiday	x	x+2y	x+2y	x-2y	x	x	x+2y	x+2y	x-2y	x
Monday Holiday	x	x+3y	x+3y	H	x-3y	x	x+2y	x+2y	x-2y	x
Tuesday Holiday	x	x+2y	x+3y	x-y	H	x-y	x+2y	x+2y	x-2y	x
Wednesday Holiday	x	x+2y	x+2y	x-y	x+y	H	x+y	x+2y	x-2y	x
Thursday Holiday	x	x+2y	x+2y	x-2y	x+y	x+3y	H	x+y	x-2y	x
Friday Holiday	x	x+2y	x+2y	x-2y	x	x +3y	x+y	H	x-3y	x

Data

The data for this study have been taken from the Prowess Client Database. The data sets include the opening and closing prices of the three major operational indices in India; BSE Sensex, BSE 200 and the S&P Nifty. The daily returns are calculated for a period from April 2003 to April 2008 to maintain homogeneity in the data and have a longer time series as compared to T+5 and T+3 settlement periods. The returns are calculated on closing to closing prices as follows:

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

Where R_t are the lognormal returns for t^{th} day

P_t is the closing price on t^{th} day

P_{t-1} is the closing price on $t-1^{th}$ day

These daily returns are adjusted for the investor sentiment and settlement process as described in sections I and II. The adjustment factors for this transformation can be seen from Table III. We used 1253 observations, so we safely assume that the returns are normally distributed.

RESULTS

Tables IV, V and VI show the average means of the returns on each day of the week during this period for the BSE Sensex, BSE 200 and the S&P Nifty indices. It can be clearly seen that the three indices have similar results. Therefore, we will concentrate our interpretation of results of the returns obtained from BSE Sensex index.

Table IV. Adjusted and Unadjusted Returns for BSE Sensex

Day	Daily Returns		't'- stat		sig. level (one tailed)	Observations
	Raw	Adjusted	Raw	Adjusted	Raw	
Monday	0.020	0.053	-1.251	-0.772	0.105	251
Tuesday	0.154	0.154	0.291	0.381	0.37	251
Wednesday	0.138	0.134	0.098	0.150	0.461	251
Thursday	0.098	0.063	-0.353	-0.666	0.362	251
Friday	0.236	0.201	1.221	0.911	0.111	248
Total	0.129	0.121				1253

Table V. Adjusted and Unadjusted Returns for BSE 200 Index

Day	Daily Returns		't'- stat		sig. level (one tailed)	Observations
	Raw	Adjusted	Raw	Adjusted	Raw	
Monday	0.037	0.071	-0.913	-0.517	0.181	251
Tuesday	0.132	0.132	-0.013	0.074	0.495	251
Wednesday	0.125	0.121	-0.089	-0.040	0.469	251
Thursday	0.107	0.072	-0.286	-0.585	0.388	251
Friday	0.266	0.231	1.450	1.154	0.073	248
Total	0.133	0.125				1253

Table VI. Adjusted and Unadjusted Returns for S & P Nifty Index

Day	Daily Returns		't'- stat		sig. level (one tailed)	Observations
	Raw	Adjusted	Raw	Adjusted	Raw	
Monday	0.020	0.054	-0.992	-0.595	0.161	251
Tuesday	0.151	0.151	0.295	0.381	0.384	251
Wednesday	0.108	0.105	-0.174	-0.124	0.432	251
Thursday	0.108	0.073	-0.177	-0.475	0.43	251
Friday	0.235	0.200	1.203	0.907	0.114	248
Total	0.124	0.117				1253

It can be seen from Table IV that the mean return on Friday is 0.236 which is much higher compared to the average Monday return of 0.02. This is seen in all three indices.

The one tailed t-stat test has been used to test the following hypothesis for the daily returns:

Monday: H_0: Monday returns are significantly lower than average daily returns.

  H_1: Monday returns are not significantly lower than average daily returns.

Friday: H_0: Friday returns are significantly higher than average daily returns.

  H_1: Friday returns are not significantly higher than average daily returns.

The calculated t-statistics and the corresponding significance level of the one tailed t-test are also mentioned. Results confirm the hypothesis that the Monday returns will be significantly less than normal daily returns and that Friday returns will have significantly higher returns compared to any other day in the week. **This hypothesis is significant at .10 levels. Thus, there is conclusive evidence of the existence of weekend effect in India.**

A quick look at tables IV, V and VI confirms the fact that Fridays exhibit excess returns and Mondays exhibit lesser returns than other days at a 0.10 statistical significance level.

If we look at the adjusted returns from table IV, the abnormally low unadjusted Monday returns have increased from 0.02 to 0.053; an increase of 165 %. The average daily returns for this period are 0.129. The shortfall on Monday's returns compared to average daily returns was 0.109. After the adjustment, this reduced to 0.076, which is a reduction of 30%. **Therefore, one can conclude that the model specified above explains 30% of the abnormally low returns on Monday because of the weekend effect**.

The adjusted returns of Friday have decreased from 0.236 to 0.201, a reduction of around 15%. The excess returns of Friday compared to daily average returns for the period decreases from 0.127 to 0.092, a reduction of 28%. **Therefore, one can conclude that the model specified above explains 28% of the abnormally high returns on Friday compared to the rest of the week because of the weekend effect.** In an efficient market, the correctly adjusted returns should not depend on the day of the week. As we see from the results, the daily returns depend on the day of the week to some extent even after adjustment. This raises questions about market efficiency in the Indian markets and other unexplored factors that might be the cause of this weekend effect.

As an alternative test of the day of the week on daily returns, we also used dummy variables in the regression equation :

$$R_t = {}_1D_M + {}_2D_T + {}_3D_{W+} \; {}_4D_{Th} + {}_5D_F +$$

where R_t is the percentage rate of return and the dummy variables take on a value of one on the respective day of the week and zero otherwise. We obtained results very similar to those given in Table IV. Monday returns remained less than other days and Friday returns remained greater than other days even after interest adjustment.

Implications for Managers and Organisations

Different models explain the variation in the stock returns with the help of fundamental factors. But there still exists a component of unexplained variation that can be explained by trends in the fundamental factors, cyclical factors, macroeconomic news, investor expectation and sentiments, etc. In this paper we considered the effect of cyclical factors on stock returns in the form of weekend effect and found the effect to be significant. The pattern triggered by macroeconomic news can only partially subsume the weekend effects of stock returns. There are a number of factors besides investor expectations and settlement cycle that can be related to the seasonality in equity market returns, and why the performance of fund managers may vary across calendar days. For example, unfavorable news releases on the weekend and overreaction as a result of human psychology have an effect on both stock prices and mutual fund performance. In addition, the weekend patterns of returns and volumes are empirically found to be more pronounced for securities in which institutional investors play a greater role.

Our findings question the efficient market hypothesis which states that stock prices are random and that investors cannot make abnormal profits using historical prices. The day of the week effect patterns in return and volatility can enable investors to take advantage of relatively regular market shifts by designing and implementing trading strategies, which account for such predictable patterns. Specifically, our results indicate lower returns on Mondays and maximum returns on Fridays across different indices. So, the specific trading rule that could be conceived of is that one could consider buying the scripts on Mondays (buy low) and selling them on Fridays (sell high). However, this strategy needs to be exercised with caution. We further suggest that investors could experiment the above strategy, to start with, on small stocks and extend the same on blue-chips based on the risks and rewards. This gains further momentum as Indian markets are more transparent and are open to the global institutional investors and fund managers seeking profitable trade opportunities.

In the absence of transaction costs, weekend trading strategies, both simple and complex, can increase returns and moderate risk. The weekend effect for stock returns may not provide an operational trading strategy because of transaction costs. However, transaction costs may be avoided by trading mutual funds. It would be interesting to compare how these weekend trading strategies fare against traditional buy and hold strategies. The results of this study indicate that it might be possible for investors to obtain positive risk-adjusted returns and timing measures (indicated by higher Sharpe, Treynor, and Jensen measures) by following a weekend trading

LIMITATIONS OF THIS STUDY

This study considers the cyclic factors influencing the stock market returns rather than the fundamental factors. Amongst the cyclic factors, we have considered only weekly variation in the stock returns. There might be seasonal variations (January effect), monthly variations, or even intraday (mid-day swoon) variations in the returns, which can also be studied in combination with the weekend effect. This study also does not differentiate between institutional traders and others and their effect on the trades. In addition, the results presented in

the study are not adjusted for transaction costs. The implication of rejection of weak form efficiency for investors is that they cannot adopt a 'fair return for risk' strategy, by holding a well-diversified portfolio while investing in the Indian stock market. What will be the appropriate investment strategy for an international investor for investing in Indian market and how efficiency/inefficiency will influence their choice of investments are the issues worth researching.

CONCLUSION

Many studies on stock market prices have been based on the belief that returns are not influenced by the day of the week. However, we believe that the daily observed stock returns should depend on the day of the week and that there is requirement for adjustment for interest gains on certain days because of the effects of market sentiments and the settlement cycle. Our results suggest that future examinations of the stock market of the period from April 2003-April 2008 will have residual daily effects, even after the adjustments that are the unexplained part of the weekend effect. This could potentially influence conclusions and raise questions about market efficiency. Our results, however, are able to explain partially what might be some of the reasons for the weekend effect.

Whatever these tests show, they cannot ignore the institutional necessity of making adjustments for settlement lags and other effects when using data on daily returns, since it would be difficult to accept that investors would ignore two days of interest. And as we have demonstrated in this short paper, while not sufficient to explain the magnitude of the weekend effect, the required interest adjustment has a magnitude of some relevance.

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