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Day-of-the-Week Anomaly in Nifty Returns and Volatility : A Study on Impact of Rolling Settlement

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Abstract

The present paper examines the day-of-the-week anomaly on stock returns and volatility at Nifty index of NSE India during a period of twelve years and four months from January 1996 to April 2009. The paper makes an attempt to compare the anomaly during pre-rolling settlement period with the post-rolling settlement period depicted as Phase I (January 1996 to December 2001) and Phase II (January 2002 to April 2009) periods respectively. The data is analysed by using GARCH (1,1) model on returns and conditional variance (volatility) by introducing intercept in the dummy variables to avoid dummy variable trap. The study observes that day of the week anomaly is present in both returns and variance equations during pre-rolling settlement period and entire period. Whereas, the effect disappears during post-rolling settlement period, in both return and variance equation. Thus, Market has shown the signs of efficiency in the post- rolling settlement period.

Key Words : Day-of-the-week anomaly, Rolling settlement, Dummy variable, GARCH model.

INTRODUCTION

Since past, market anomalies in the stock return has been an active field of research. It has been examined through a large number of studies that whether it is possible to outperform the market because of seasonal variation in the returns. This has remained a point of controversy amongst researchers. Some statisticians continue to provide evidence in favour of the theory while some do not believe in the correctness of the theory and have identified certain situations where it may be possible for careful investors to earn abnormal returns.

One of the most prevalent anomalies relates to day-of-the-week effect which implies difference in returns across different days of the week, i.e., some days may give significantly more returns in comparison to other days of the week. Most of the economists believe that the stock price should rise higher on Monday as the time gap between the close of Friday and close of Monday is three days. Therefore, the Monday returns should be three times as that of any other week days. But the empirical findings indicate that usually Mondays are the worst performing day and Fridays are consistently good when measured over a long period of time (French, 1980; Hess, 1981; Keim and Stambaugh, 1984; Agarwal and Tandon, 1994). Similarly, the day-of-the-week also has an effect on conditional variance (volatility) of stock return. Here again, it is assumed that the variance of return over a period from Friday close to Monday close should be three times than between any other weekdays. The studies conducted by Fama (1965), Gibbons and Hess (1981), French and Roll (1986), and Foster and Viswanathan (1990) observed that the variance in stock returns is the highest on Mondays and the lowest on Fridays.

Many researches have been conducted using data from different countries and at different time periods. There is still a need to investigate different markets at different time periods to provide a support for or against the proposition that the anomaly is world-wide phenomenon.

India is an emerging economy and there are many structural changes going on in the capital market to improve its efficiency and enhance the confidence of investors. One of such changes relates to switching over from weekly settlement system to rolling settlement system. Settlement procedure is the time lag between trading and the payment. The compulsory rolling settlement was introduced in India on December 2001 on T+5 basis. The T+3 basis of settlement started in April 2002 and subsequently the T+2 basis of settlement was introduced from April 2003. Thus, trading has moved to a one day rolling settlement and the settlement cycle moved to T+2 from T+5. The present paper is an attempt to investigate the impact of rolling settlement system on day-of-the-week anomaly on stock returns and conditional variance (volatility) on S&P CNX Nifty index in National Stock Exchange (NSE) of India.

The paper has been organized into five sections. Section-II discusses the review relating to studies conducted by various economists on day-of-the-week effect on domestic and international stock markets. Section-III discusses the nature of data and research methodology applied to achieve the objective of the study. The results and findings are presented in Section-IV; and lastly, Section-V concludes the results of the study.

REVIEW OF LITERATURE

There is an extensive literature available on the day-of-the-week effect anomaly. Cross (1973), French (1980), Gibbons and Hess (1981), and Keim and Stambaugh (1984) documented significantly lower or negative stock return on Monday as compared to other days of the week. However, Jaffe and Westerfield (1985) studied stock market returns for the countries, namely, U.S., U.K., Japan, Canada and Australia and reported the lowest average return on Tuesday for Japanese and Australian stock markets. Miller (1988) also found that the returns tend to be negative from Friday close to Monday close. The possible reason was that the sell orders were more frequent on Mondays than buy orders and this pattern reversed later in the week. Lakonishok and Maberly (1990) documented the relative increase in trading activity by individuals on Monday. However, Kato (1990) found low Tuesday and high Wednesday returns in Japanese stock market for close-to-close returns. Chaudhury (1991) also reported a higher level of average negative returns on Tuesday in the Indian stock market. Agarwal and Tandon (1994) examined the stock markets of eighteen countries and found daily seasonality in nearly all countries but a weekend effect in only nine countries. Dubois and Louvet (1996) re-examined the day-of-the-week effect for eleven indices from nine countries during the period 1969-92. They found that the effect of anomaly was strong in European countries but has shown the signs of disappearance during most recent period in the USA. Poshakwale (1996) studied the day-of-the-week effect on Bombay Stock Exchange and confirmed that mean returns on Monday and Wednesday were negative. The weekend effect was evident as Fridays witnessed highest average return as compared to the rest of the days of the week. Wang et al. (1997) showed that the well-known Monday effect occurs primarily in the last two weeks of the month. According to Mishra (1999), Friday returns were found highest and significantly different from the mean returns of other days.

Choudhry (2000) examined the weekly pattern of stock return and volatility in seven emerging countries including India. He observed positive Friday effect in returns and positive Thursday effect in volatility for India. Berument and Kiymaz (2001) investigated the presence of the day-of-the-week effect on stock market returns and volatility by using the S&P 500 market index for the period January 1973-October1997. The study confirmed that the highest and the lowest returns were observed on Wednesday and Monday, whereas, the highest and the lowest volatility were observed on Friday and Wednesday respectively. Sharma (2004) examined seasonality across the days of week in Indian stock market using BSE indices-SENSEX, NATEX and BSE 200. The study found highest variance on Monday and confirmed the weekend effect. Nath and Dalvi (2004) examined this anomaly in Indian stock market with high frequency data for S&P CNX NIFTY during the period 1999-2003. The study found that before introduction of rolling settlement in January 2002, Monday and Friday were significant days. However, after the introduction of the rolling settlement, Friday became significant. Mondays were found to have higher standard deviations followed by Fridays. Chandra and Mehta (2007) documented lowest Friday returns in the pre-rolling settlement period as an evidence of weekend effect. In the post- rolling settlement period the anomaly disappears. Badhani and Kavidayal (2008) examined the presence of day-of-the-week effect on stock returns, trading volume and price volatility at the NSE during the period of 10 years from 1995-2005. Wednesday effect was found during earlier weekly settlement regime which later disappeared. Monday and Tuesday returns were consistently low but during recent sub period these were not significantly different from other days of week. Also, on Monday the average trading volume was significantly low and price volatility was high consistently across the entire sample period.

DATA AND METHODOLOGY

The study uses the data covering a period of twelve years and four months from January 1996 to April 2009.The raw data consists of daily closing values of S&P CNX Nifty which has been obtained from its website (www.nseindia.com). The data was also reported for certain weekly closing days, i.e., Saturdays and Sundays. These days have been excluded from the analysis. Nifty represents the large and liquid blue-chip stocks of fifty companies. To examine the effect of rolling settlement on the stock returns and volatility, the total period under study has been divided into two sub-samples, i.e. Phase-I, depicting the pre-rolling settlement period ranging from January 1996 to December 2001 and Phase-II representing the post-rolling settlement period ranging from January 2002 to April 2009.

The daily return data is the first difference of the log of stock prices. The following equation is used to determine the daily returns :

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

Where, R_t is daily return on the share price index for day t. Pt is the closing value of index for the day 't' and P_{t-1} is the closing value of the index for the preceding day.

Many earlier studies investigating the day-of-the-week effect in mean returns employ the conventional OLS methodology on defined dummy variables. However, use of the standard OLS methodology by regressing returns on five daily dummy variables has two drawbacks. First, error in the model may be autocorrelated resulting in misleading inferences. To address this drawback, we can include lagged values of the return variables in the model with the following stochastic equation :

$$R_t = \alpha_c + \alpha_M M_t + \alpha_T T_t + \alpha_W W_t + \alpha_F F_t + \sum_{i=1}^{n} \alpha_i R_{t-1} + \varepsilon_t \quad \text{.... (2)}$$

Where, R_t represents return on a selected index. Mt, Tt, Wt, and Ft are the dummy variables for Monday, Tuesday, Wednesday and Friday at time t. The dummy variable takes the value of unity for a given day and a value of zero for all other days. Where, M_t = 1 if day t is a Monday and 0 otherwise; T_t = 1 if t is a Tuesday and 0 otherwise and so on. We omit Thursday's dummy variable from the equation to avoid dummy variable trap. Here, we have chosen Thursday for elimination from the regression analysis as Monday and Friday are the first and last days of the trading week thereby carrying special significance from trading point of view. Tuesday and Wednesday were important days during pre-rolling settlement period as Wednesday and Tuesday were the first and last day of trading cycle at NSE. The lag order n, is specified by the final prediction error criterion (FPEC) in such a way that it eliminates autocorrelation in the residual.

The second drawback is that error variances may not be constant over time. To overcome this problem we allow variances of errors to be time dependent to include a conditional heteroskedasticity that captures time variation of variance in stock returns. The following GARCH (p,q) model proposed initially by Engle (1982) and further developed by Bollerslev (1986) is used in analyzing the behaviour of the time series over time:

$$h_t^2 = \alpha_0 + \sum_{i=1}^{p} \beta_i \varepsilon_{t-i}^2 + \sum_{i=1}^{q} \lambda h_{t-i}^2 \quad \text{.... (3)}$$

Thus, the error terms have a mean of zero and time changing variance. We consider two models to investigate the day-of-the-week effect in both return and volatility equations. The first model consists of the following two equations:

$$R_t = \alpha_0 + \alpha_M M_t + \alpha_T T_t + \alpha_W W_t + \alpha_F F_t + \sum_{i=1}^{n} \alpha_i R_{t-1} + \varepsilon_t \quad \text{.... (4)}$$

$$h_t^2 = \beta_0 + \beta_1 \varepsilon_{t-1}^2 + \beta_2 h_{t-1}^2 \quad \text{.... (5)}$$

In second model, we include some exogenous variables into the GARCH specification. Following Hsieh (1988), Karolyi (1995), and Kiymaz and Berument (2003), we model the conditional variability of stock returns by incorporating the day-of-the-week effect into the volatility equation. Thus, we allow the constant term of the conditional variance equation to vary for each day. Therefore, our second model is the M-GARCH (1,1) specification of the following form:

$$R_t = \alpha_0 + \alpha_M M_t + \alpha_T T_t + \alpha_W W_t + \alpha_F F_t + \sum_{i=1}^{n} \alpha_i R_{t-1} + \varepsilon_t \quad \text{.... (6)}$$

$$h_t^2 = \beta_c + \beta_M M_t + \beta_T T_t + \beta_W W_t + \beta_F F_t + \beta_1 \varepsilon_{t-1}^2 + \beta_2 h_{t-1}^2 \quad \ldots (7)$$

The parameters of the two different types of specifications for the return and volatility equations are estimated following the quasi-maximum likelihood (QML) estimation introduced by Bollerslev and Wooldridge (1992).

RESULTS AND FINDINGS

Table 1 presents the descriptive statistics of return series of Nifty during the Phase-I, Phase-II and entire period. The table clearly shows that the mean return has increased during Phase-II period (0.065) as compared to Phase-I period (0.010). Standard deviation which is the conventional measure of volatility in the returns does not present much difference during both Phase periods and entire sample period. It ranges between 1.729 and 1.773. Skewness provides an insight about the asymmetry in the distribution of the series. For normal distribution, the skewness should be zero. The table shows that the Phase-I period has positive skewness and Phase-II period along with entire sample period has the negative skewness. It indicates that stock return series are asymmetric during both the Phase periods and entire sample period. Further, the return series have kurtosis >3 which implies leptokurtic distribution, i.e., peaked tail relative to normal distribution. The Jarque-Bera test indicates that the returns are not normally distributed. Thus, descriptive statistics indicate that returns are not normally distributed and are characterized as leptokurtic and skewed.

Table 1

Basic Statistics of Average Daily Returns during Different Sample Periods

Days	Phase I (1996-2001)	Phase II (2002-2009)	Entire Sample (1996-2009)
Mean	0.0103	0.0652	0.0406
Median	0.0166	0.1560	0.1024
Maximum	10.3637	7.9691	10.3637
Minimum	- 8.8405	- 13.0539	-13.0539
Std. deviation	1.7733	1.7294	1.7493
Skewness	0.0893	- 0.7460	- 0.3566
Kurtosis	5.9324	8.8169	7.4276
Jarque-Bera	533.6689	2736.198	2769.564
Probability	0.0000	0.0000	0.0000
Observations	1484	1821	3305

The mean and standard deviation of Nifty return series for both the periods and entire sample period for each working day-of-the-week are presented in Table 2. It is clearly evident from the table that during pre-rolling settlement period (Phase-I), all the days are statistically different from zero except Thursday. The highest return is observed on Wednesday (0.674) which is the only positive return day during Phase-I period and the remaining days observe negative returns with lowest return on Mondays (-0.222). As regards to post-rolling settlement period (Phase-II), none of the day is statistically significant. However, all the days barring Monday,

Table 2

Mean Return and Volatility on Each Day of the Week during Different Sample Periods

Days	Phase-I (1996-2001)		Phase-II (2002-2009)		Entire Sample (1996-2009)	
	Return	**Std. Deviation**	**Return**	**Std. Deviation**	**Return**	**Std. Deviation**
Monday	-0.2227 (-1.823)***	2.1083	-0.0058 (-0.058)	1.9337	- 0.1030 (-1.318)	2.0152
Tuesday	- 0.2069 (-2.321)**	1.5391	0.0413 (0.500)	1.5768	-0.0703 (-1.157)	1.5637
Wednesday	0.6749 (6.571)*	1.7672	0.0848 (1.025)	1.5828	0.3487 (5.302)*	1.6921
Thursday	-0.0193 (-0.211)	1.5949	0.0529 (0.618)	1.6252	0.0199 (0.318)	1.6106
Friday	-0.1759 (-1.812)***	1.6449	0.1539 (1.543)	1.8980	0.0081 (0.114)	1.79664
F-Ratio	14.0919* [0.0000]		0.4260 [0.7899]		7.0502* [0.0000]	

Note : Figures in parentheses show the t-values and in brackets indicate p-values.

*, ** and ***denote significance at 1%, 5% and 10% level respectively.

present positive average return. The highest mean return is observed on Friday (0.154) and lowest on Monday (-0.006). The entire period shows Wednesday as the only significant days with highest mean return (0.348) and the lowest return can be seen on Monday (-0.103). Further, the F-ratio indicates the presence of day-of-the-week effect during Phase-I period and entire sample period. Thus, the null hypothesis that the average daily return of every working day of the week is not statistically different from zero can be rejected for Phase-I period and entire sample period, whereas it cannot be rejected for Phase-II period as the results do not favour the existence of day-of-the-week effect during this period.

The highest volatility in the returns (standard deviation) during Phase-I can be seen on Monday (2.108) followed by Wednesday (1.767). However, in the case of Phase-II, Monday (1.934) is again the most volatile day closely followed by Friday (1.898). The entire sample presents the results similar to Phase-II period. Thus, it is found that Monday and Tuesday are the most and least volatile days during both the phase periods and entire sample period. On comparing both Phase periods, it is found that during post-rolling settlement period (Phase-II), there is an increase in average return and slight decrease in the extent of volatility on most of the days over pre-rolling settlement period (Phase-I).

Tables 3 and 4, report day-of-the-week effect, in stock market returns and volatility (returns only and returns and volatility respectively). Table 3 displays the first estimates of return equation. The FPEC suggests that the order of return equation is two for both the periods and entire sample period. The table shows that during Phase-I the estimated coefficients of the Wednesday's dummy variable is positive and statistically significant suggesting that Wednesday's return is significantly larger than those of Thursdays. The Tuesday's estimated coefficient is lowest (-0.1953) but is statistically non-significant. Monday and Friday also observe negative coefficients but again are statistically non-significant. In the case of Phase-II, positive return coefficient (0.1243) is observed only on Friday and the estimated coefficients for all other dummy variables are negative with minimum return coefficient on Tuesday (-0.0266) similar to Phase-I period. The estimated coefficients of the dummy variables for all days during Phase-II are statistically insignificant. The results of entire sample are akin to Phase-I period.

The Wald test has been used to test the null hypothesis that the day-of-the-week dummy variables are jointly equal to zero. Using this index, the null hypothesis that the day-of-the-week effect is jointly equal to zero is rejected for Phase I period and of course for entire period. Hence, the day-of-the-week effect is present during the Phase-I period and the entire period. However, the null hypothesis is accepted for the Phase-II period indicating the absence of day effect. The table also reports the estimates of GARCH (1,1) coefficients. The estimated coefficient of the constant term for the conditional variance equation is β_0 while β_1 is the estimated coefficient of the lagged value of the squared residual term. β_2 represents the lagged value of the conditional variance. Each of these coefficients is statistically significant and positive for both the Phase periods and entire period. Moreover, the sum of β_1 and β_2 coefficients is less than one. Thus, the results suggest that conditional variance is always positive.

Table 3

Day-of-the-Week Effect on Stock Returns

Days	Phase-I (1996-2001)		Phase-II (2002-2009)		Entire Sample (1996-2009)	
Return Equation						
Constant	0.0126	(0.117)	0.1187***	(1.647)	0.0783	(1.207)
Monday	-0.1520	(-1.111)	-0.0001	(-0.001)	- 0.0430	(-0.511)
Tuesday	-0.1953	(-1.243)	-0.0266	(-0.253)	- 0.0910	(-0.980)
Wednesday	0.6684*	(4.539)	-0.0253	(-0.240)	0.2559*	(2.819)
Friday	-0.1362	(-0.908)	0.1243	(1.210)	0.0120	(0.131)
Wald Test	53.4509*	[0.000]	2.9124	[0.573]	18.3731*	[0.001]
Variance Equation						
β_0	0.9379*	(4.760)	0.4085*	(9.672)	0.5835*	(11.641)
β_1	0.1174*	(4.819)	0.2726*	(11.338)	0.2127*	(12.389)
β_2	0.5759*	(7.144)	0.6088*	(23.902)	0.6046*	(23.919)
Autocorrelation Q Statistics and ARCH-LM Tests for Various Lags						
Standardized Residuals						
5	5.6139	[0.132]	1.2875	[0.732]	2.0223	[0.568]
10	15.009	[0.059]	7.2675	[0.508]	14.070	[0.880]
15	33.374*	[0.001]	11.776	[0.546]	28.638*	[0.007]
20	35.522*	[0.008]	18.268	[0.438]	32.843**	[0.017]
Standardized Squared Residuals						
5	4.988	[0.173]	0.7699	[0.857]	1.9418	[0.585]
10	7.0432	[0.532]	2.6160	[0.956]	5.0056	[0.757]
15	10.38	[0.663]	12.090	[0.520]	10.968	[0.614]
20	13.083	[0.787]	12.901	[0.797]	13.097	[0.786]
ARCH-LM Test						
5	0.9567	[0.443]	0.2539	[0.990]	0.3792	[0.863]
10	0.6675	[0.755]	0.2539	[0.990]	0.4761	[0.906]
15	0.8472	[0.837]	0.7808	[0.700]	0.7065	[0.780]
20	0.6275	[0.895]	0.6125	[0.906]	0.6338	[0.890]

*, ** and *** denote significance at 1%, 5% and 10% level respectively. Figures in parentheses indicate t-values and in brackets indicate p-values.

Table 4

Day-of-the-Week Effect on Stock Returns and Volatility

Variable	Phase-I (1996-2001)		Phase-II (2002-2009)		Entire Sample (1996-2009)	
Return Equation						
Constant	0.0120	(0.127)	0.1180	(1.515)	0.0809	(1.347)
Monday	-0.1667	(-1.096)	-0.0012	(-0.012)	-0.0630	(-0.696)
Tuesday	-0.1951	(-1.389)	-0.0231	(-0.219)	-0.0924	(-1.065)
Wednesday	0.6643*	(4.694)	-0.0252	(-0.234)	0.2575*	(2.950)
Friday	-0.1358	(-1.003)	0.1249	(1.138)	0.0131	(0.152)
Variance Equation						
β_c	0.9201*	(3.897)	0.4342*	(6.929)	0.5820*	(8.844)
β_1	0.1044*	(4.054)	0.2669*	(10.620)	0.2113*	(11.709)
β_2	0.5269*	(5.347)	0.6057*	(21.188)	0.5752*	(19.813)
Monday	0.7239*	(3.665)	0.0692	(1.010)	0.3307*	(5.013)
Tuesday	0.0467	(0.465)	-0.0648	(-1.115)	0.0215	(0.437)
Wednesday	0.2084	(1.541)	-0.0490	(-0.872)	0.0541	(0.984)
Friday	0.0394	(0.369)	0.0082	(0.137)	0.0340	(0.650)
Wald Test	64.2112*	[0.000]	8.1687	[0.417]	48.3312*	[0.000]
Autocorrelation Q-Statistics and ARCH-LM Tests for Various Lags						
Standardized Residuals						
5	5.0339	[0.169]	1.2875	[0.732]	0.8778	[0.598]
10	1.4122	[0.079]	7.2675	[0.508]	13.719	[0.089]
15	31.938*	[0.002]	11.776	[0.546]	28.242*	[0.008]
20	33.674*	[0.014]	14.170	[0.718]	32.203**	[0.021]
Standardized Squared Residuals						
5	4.5197	[0.211]	0.7699	[0.857]	1.5103	[0.680]
10	8.6270	[0.373]	2.6160	[0.956]	4.9173	[0.766]
15	13.438	[0.415]	12.090	[0.520]	11.292	[0.586]
20	17.692	[0.476]	18.769	[0.406]	13.811	[0.741]
ARCH-LM Test						
5	0.8756	[0.497]	0.1567	[0.978]	0.2957	[0.915]
10	0.8306	[0.599]	0.2539	[0.990]	0.4690	[0.917]
15	0.8483	[0.626]	0.7808	[0.701]	0.7333	[0.752]
20	0.8827	[0.610]	0.6753	[0.853]	0.6776	[0.852]

*, and ** denote significance at 1%, and 5% level respectively. Figures in parentheses indicate t-values and in brackets indicate p-values.

We also report the Ljung-Box Q statistics for the normalized residuals at 5, 10, 15 and 20 lags of the estimated models based on entire sample and for both the phase periods. The table reveals that in the case of standardized square residuals, none of the coefficients are statistically significant during both the Phase periods and entire sample period. Therefore, we cannot reject the null hypothesis that residuals are not autocorrelated. Standardized residuals, however, displayed evidence of autocorrelation at lag 15 and 20 during Period-I and entire period. Further, ARCH-LM test does not indicate the presence of a significant ARCH effect during both the periods and also during entire period. These findings indicate that the residuals have constant variance and do not exhibit autocorrelation. Thus, the diagnostic tests provide strong support for the absence of autocorrelation.

The conditional variance of return is then allowed to change for each day of the week by modelling the conditional variance of return equation as a modified GARCH. This is done to detect the presence of day-of-the-week effect in volatility. Now we re-examine both the returns and conditional variance equation. We exclude the dummy variable for Thursday as mentioned earlier to avoid dummy variable trap and include four days-of-the-week dummy variables. The results are reported in Table 4. The day-of-the-week effect results, with respect to returns, are similar to the results presented in Table 3. During Phase-I, Wednesday is the only day that has positive (0.664) and statistically significant coefficient indicating that return of Wednesday is statistically higher than those observed on Thursday. The estimated coefficients on other days, i.e. Monday, Tuesday and Friday are negative but statistically non-significant. Tuesday is the least return day. The day-of-the-week effect results for Phase-II indicate that all the dummy variables except Friday have negative coefficients. Friday has the highest return coefficient (0.1249) and Wednesday (-0.0251) observes the lowest return coefficient. But none of the day is statistically significant. Similar to Phase-I, during entire period also the estimated coefficient on Wednesday is positive and statistically significant indicating that return of Wednesday is statistically higher than those observed on Thursday. The estimated coefficient on Friday is also positive but statistically non-significant.

The possible reason could be that during pre-rolling settlement period (Phase-I), market participants traded on one week's credit on Wednesday, being the first trading day of the settlement cycle and they used to roll over their positions on Tuesday being the last day of the settlement cycle. Therefore, there was a clear arbitrage opportunity for investors as they could buy on other days and sell on Wednesdays where the chance of making profit is higher. However, during post-rolling settlement period (Phase-II), the Wednesday effect is no more visible and none of the day is significantly different from zero. Hence, day-of-the-week anomaly in returns which was present during Phase-I shows its absence during Phase-II. Thus, we can say that settlement cycle bears significant impact on day-of-the-week anomaly. Similar results are also documented by Nath and Dalvi (2004) and Badhani and Kavidayal (2008).

Table 4 also presents the results for conditional variance equation. It is found that during both the periods and entire period as well, the highest volatility occurs on Monday which is statistically significant for Period-I and entire period. The lowest volatility occurs on Friday for Phase-I period and on Tuesday for Phase-II period and entire period. However, the coefficients are statistically non-significant. The results of Monday are consistent with similar national and international studies (Fama, 1965; Gibbons and Hess, 1981; Nath and Dalvi, 2004; Badhani and Kavidayal, 2008). However, the findings do not fit the risk return profile of investment as Monday observes low return with high volatility. The higher volatility on Monday could be due to the fact that market opens on Monday after a gap of two days and some market participants may possess private information which creates high price variance (Badhani and Kavidayal, 2008).

By using Wald test, we reject the null hypothesis that there is no day-of-the-week effect in the conditional variance equation for Period-I and entire period. Hence, it is confirmed that day-of-the-week effect is present in both the mean return and variance (volatility or risk) equations for the Period-I and entire period. On the other hand, the effect is not present in both the return and variance equation for Period-II.

Table 4 further reports the Ljung-Box Q-statistics and ARCH-LM tests for lags of 5, 10, 15 and 20 days. The Q-test indicates that there is no autocorrelation for the study period under consideration except at lags of 15 & 20 days for standardized residuals during Period-I and entire period. Therefore, we can not reject the null hypothesis that the residuals are not autocorrelated. ARCH-LM test statistics can reject the null hypothesis of no ARCH effect for both the periods and also for the entire period.

The estimated coefficient of the constant term (β_C), lagged value of the squared residual term (β_1) and lagged value of the conditional variance (β_2) are statistically significant and positive for both the Phase periods and entire period. Moreover, the sum of β_1 and β_2 coefficients is less than one. Thus, the results suggest that conditional variance is always positive.

CONCLUSION

The present study analyses the day-of-the-week anomaly on Nifty index of NSE India for a period of twelve years and four months from January 1996 to April 2009. The main objective of the paper is to compare the anomaly during pre-rolling settlement period (Phase-I) with the post- rolling settlement period (Phase-II). The data is analysed by using GARCH (1,1) model on returns and conditional variance (volatility) by introducing intercept in the dummy variables to avoid dummy variable trap.

The study observes strong Wednesday effect during Phase-I as the mean return is significantly different from zero and positive. The estimated coefficients of dummy variables for all other days are negative and not significantly different from zero. Tuesday observes the lowest returns. However, during Phase-II, the Wednesday effect is no more visible and none of the day is significantly different from zero. Hence, day-of-the-week anomaly in returns which was present during Phase-I shows its absence during Phase-II. Thus, we can say that settlement cycle bears significant impact on day-of-the-week anomaly. The entire period also displays results akin to Phase-I period. As regard to volatility, Monday imposes a significant effect during Phase-I and entire period. On the other hand, Phase-II does not observe any statistically significant day, and therefore, day-of-the-week effect does not show its presence in Indian stock market during this period.

It is clearly evident from the study that day-of-the-week anomaly is present in both returns and variance equations during pre-rolling settlement period and entire period. Whereas, during post-rolling settlement period, the effect disappears in both return and variance equation. Thus, Market has shown the signs of efficiency in the post-rolling settlement period. This may be attributed to structural changes that have been introduced in the capital market to improve the investment climate and also to enhance the faith of the investors.

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