DAY OF THE WEEK RETURNS EFFICIENCY OF THE BSE SENSEX

A. Shanker Prakash* Sonali Madan**

ashanker@smsvaranasi.com

ABSTRACT

According to economic laws, fluctuation in the stock market is inevitable, but it should basically be in synch with the situation of the economy. An "Efficient Market" is defined as a market where there are large number of rational profit makers actively competing with each trying to predict future market values of individual securities, and where important current information is almost freely available to all the participants. The present study tries to explore the way of investors approaching in the market based on the objective of day of the week effect. This study shows that the results are found to be consistent, that the weekend effect is driven by Institutional investors trading pattern. The paper further instigates the study of day of the week effect in the trading pattern for the period of three years (2011-14). To arrive at conclusion we used autocorrelation test and variance ratio test. The results showed that there exists inefficiency in the day of the week return.

Key Words: *Efficient Market, Day of the week effect, Autocorrelation test, Variance ratio test.*

INTRODUCTION

The stock market is witnessing heightened activities and is increasingly gaining importance. The Indian stock exchanges hold a place of prominence not only in Asia but also at the global stage. The Bombay Stock Exchange (BSE) is one of the oldest exchanges across the world, while the National Stock Exchange (NSE) is among the best in terms of sophistication and advancement of technology.

Indian stock market scene really picked up after the opening up of the economy in the early nineties. The whole of nineties were used to experiment and fine tune an efficient and effective system. The 'badla' system was stopped to control unnecessary volatility while the derivatives segment started as late as 2000. The Corporate governance rules were gradually put in place which initiated the process of bringing the listed companies at a uniform level.

On the global scale, the economic environment started taking paradigm shift with the 'dot com bubble burst', 9/11, and soaring oil prices. The slowdown in the US economy and interest rate tightening made the equation more complex. However after 2000 riding on a robust growth and a maturing economy and relaxed regulations, outside investors- institutional and others got more scope to operate.

This opening up of the system led to increased integration with heightened cross-border flow of capital, with India emerging as an investment 'hot spot' resulting in stock exchanges being impacted by global cues like never before.

According to economic laws, fluctuation in the stock market is inevitable, but it should basically be in synch with the situation of the economy. An "Efficient Market" is defined as a market where there are large number of rational profit makers actively competing with each trying to predict future market values of individual securities, and where important current information is almost freely available to all the participants. In case of developing countries like India the notion of an efficient capital market is crucial for some reasons, structural as well as institutional in character such as difficulty in detecting and discriminating among investment opportunities, dichotomy in financial activities between organized and unorganized market etc. The need of stock exchange is to become an efficient and transparent. The formidable share price of a company is assumed to be efficient if it impounds any sought of

* *Assistant Professor,* ** *PGDM Student, School of Management Sciences, Varanasi (Uttar Pradesh)*

information effectively and efficiently. Such information incorporates the share price and lays the foundation of efficient stock market.

REVIEW OF LITERATURE

Lintari J.M. (2011), concluded that there is low stock market efficiency in Uganda and that this is driven partly by lack of awareness among the investing public and also by low trust.

Sias and Starks (1995), the results are found to be consistent with the hypothesis that the weekend effect is driven by institutional investor trading patterns. Stocks with large institutional holdings exhibit significantly greater turnover seasonality than comparable-sized stocks held primarily by individual investors. Furthermore, stocks with higher institutional holdings exhibit significantly greater day-of-the week conditional return patterns than do stocks held primarily by individual investors. For weeks following positive Fridays, stocks with higher institutional holdings have significantly greater Monday returns than do stocks with lower institutional holdings. Conversely, for weeks following negative Friday returns, stocks with higher institutional holdings have significantly lower Monday returns than do stocks held primarily by individual investors.

Umesh Kumar (2012) investigated the existence of seasonality in National Stock Exchange. The study uses the monthly return data of the S&P CNX NIFTY Index. After examining the stationary of the returns series, the researcher used Paired T-test in order to check excess returns before 8 days (inclusive of Mahurat trading day) and after 7 days. The researcher also checked out of the sample data for 15 days and 20 days for checking the existence of excess return and came out with same results. Further, the researcher used EGarch model for checking the volatility of index during 15 days prior and post Mahurat Trading day (excluding Mahurat trading day). The study reveals evidence of excess returns during the period of 7 days post Mahurat Trading and greater volatility during the period of post Mahurat trading day as compared to pre Mahurat trading day. The evidence of seasonality implies that the National stock exchange market is not informationally efficient. Hence, investors may be able to time their share investments to improve returns.

Madhusoodanan T.P. (1998) applied the variance ratio tests under the null hypothesis of homoscedasticity and hetroscedasticity to the Indian stock market for the period from January 1987 to December 1995. The result of the analysis showed that random walk hypothesis cannot be accepted in the Indian stock market.

Mohanty P. (2001) found that during the sample period 1991-99, the return differential between small and large stocks is in excess of 70% on an annualized basis. Using Fama and French (1993, 1995 and 1996) Multifactor model the author found that size indeed is a proxy for risk. Moreover author could not conclude his analysis by saying that the conclusions are not conclusive as the sample belonged to large stock portfolio.

Poshakwale S. (1996) empirically studied weak form efficiency and the day of the week effect in Bombay Stock Exchange over a period of 1987-1994. The results provided an evidence of day of the week effect and that the stock market is not weak form efficient. The day of the week effect observed on the BSE poses interesting buy and hold strategy issues.

Lo and MacKinlay (1988) strongly rejected the random walk hypothesis for weekly stock market returns using the variance-ratio test for the entire sample period of 1962 to 1985.

RATIONALE OF THE STUDY

Transparency in the market is of utmost important because it gives the market a kind of stability and proper information about the constant recent trades. Automation enhances the transparency in the market because a large amount of information is available to the public. The efficient market hypothesis is concerned with the behavior of prices in asset markets. It suggests that profiting from predicting price movements is very difficult and unlikely. The main engine behind price changes is the arrival of new information. A market is said to be efficient if prices adjust quickly and on average without bias, to new information. As a result, the current prices of securities reflect all available information at any given point of time. Such information(s) are categorized into weak form efficiency, semi-strong form efficiency and strong form efficiency. The present study tries to explore the way of investors approaching in the market based on above three types of information.

Objective of the Study

- To examine the day of week effect from investors point of view.
- To examine whether 'the week day trading' is weak form efficient.

Research Methodology

To test the above objectives, the data have been collected through primary questionnaire technique and secondary data from the official websites of BSE. In conducting the above tests the data have been collected for the period of three years (2011-14). For the better response of structured questionnaire, the number of respondents is expected to be around 30. For testing the aforementioned objective of examining the day of week effect from investors point of view, we relied on basic statistical tools of measures of central tendency, where we used the popular method of mean model in our study with the help of excel sheet. For the second objective we relied on popularly used Autocorrelation (ACF) Test and Variance Ratio Test with the help of e-views to show whether the "day effect" prelude investors' mindset.

Empirical Result

Analysis-1:

To test the day of the week effect from investors' point of view the questionnaire is structured in such a manner so that each and every investor can easily find usually "which most favorable day for them is?" The responses of the investor are then compared with day of the week effect of SENSEX. The returns of the day viz. Monday, Tuesday, Wednesday, Thursday & Friday are clubbed together for a period of one year i.e. from 1st April 2011 to 31st March 2012, with respect to weekdays. To find the daily return of share price Viz. SENSEX, we used the daily opening price and closing price. The daily return can be estimated by using the following formula:

$$= \frac{\text{(Closing Price of SENSEX-Opening Price of Sensex) x 100}}{\text{(Opening Price of SENSEX)}}$$

After getting daily returns we clubbed daily return according to week days. The result of which is represented through the following table. The following table 1 is showing the returns of weekday:

Table 1: Analysis of returns of Week days

Day	(+ve return)	(-ve return)	Total weekday Return	Total % of +ve	Average Return
Monday	16	33	49	33%	-0.39747
Tuesday	25	25	50	50%	0.068121
Wednesday	21	30	51	41%	-0.06486
Thursday	19	26	45	42%	-0.27454
Friday	19	33	52	37%	-0.22276

From the above table, it is very clear that during a year only 33% positive return and least negative average return (-0.39747) from the market on Monday showing there exists Black Monday, followed by Thursday, Friday and Wednesday. In contrast to Black Monday, Tuesday was considered as best day of the week where there is 50-50 chance of positive and negative returns and highest average return of 0.68121. When we compare this study with the response sheet of investors we found that 58% of investors prefer Tuesday as most favorable day of the week.

Analysis-2

From analysis 1 it is quite evident that there is one important notable day i.e. Monday where market registers the negative returns. A fashion of registering negative tendency of market return reveals that there is day of the week effect is strong on this day, therefore to find whether there exist any significant correlation on Monday's return we had used two popularly used techniques of auto-correlation test and variance ratio test. The data used for the study are secondary in nature which has been abstracted from official website of BSE.

Autocorrelation Test

In support of presence of serial correlation (autocorrelation), we examined the ACF test to show whether there is existence of autocorrelation or not. The simple time series model for serial correlation is given as follows:

$$y_t = \rho y_{t-1} + \varepsilon_{t,} \qquad |\rho| < 1,\ \varepsilon_t \sim \text{iid } (0, \sigma^2)$$

The above model is the first-order autoregressive (AR (1)) model representing , t = 1, 2, 3 ...n, with mean 0 (which implies that the error term (ε_t), as the sample size increases it averages to zero) and the second assumption implying two things, first of all the variance is constant and cov (y_t , y_{t-1}) is serially independent and thus corresponding are also independent, the second thing which is required on the scalar parameter ? that is the stationary condition which stops from being an explosive process. The autocorrelation can be used to measure whether or not the returns and the lagged return in the same time series are correlated. A serial correlation coefficient that is not significantly different from zero implies that the returns and lagged returns are uncorrelated. Thus, the stochastic process of stock prices exhibits a random walk. Alternatively, a significant non-zero serial correlation coefficient indicates that the returns and the lagged returns are correlated. The stochastic process of stock prices does not follow a random walk. Therefore, the significant serial correlation coefficient between the returns in lead and lag is inconsistent with market efficiency.

For testing the autocorrelation, the null hypothesis states that the serial correlation coefficient is not significantly different from zero. When the absolute value of serial correlation coefficient is less than twice the standard error, the null hypothesis is accepted and the market can be concluded as weak-form efficient. When sample autocorrelation function is following standard normal distribution, the 95% confidence interval for any $\rho_k \pm 1.96$ (standard error) includes the value of zero, suggesting that we are 95% confident that the true ρ_k is not significantly different from zero. Otherwise, we reject the null hypothesis, in which case we conclude that market is not efficient in weak-form.

Further, Ljung and Box (1979) statistics is designed to test the joint null hypotheses where all the ρ_k up to certain lags are simultaneously equal to zero. The null hypothesis of no autocorrelation is tested by LB statistics by summing the serial correlations to detect departure from zero serial correlation. If LB statistics is larger than critical value of chi-squared distribution for given P lagged value of the residuals, the joint null hypothesis is rejected.

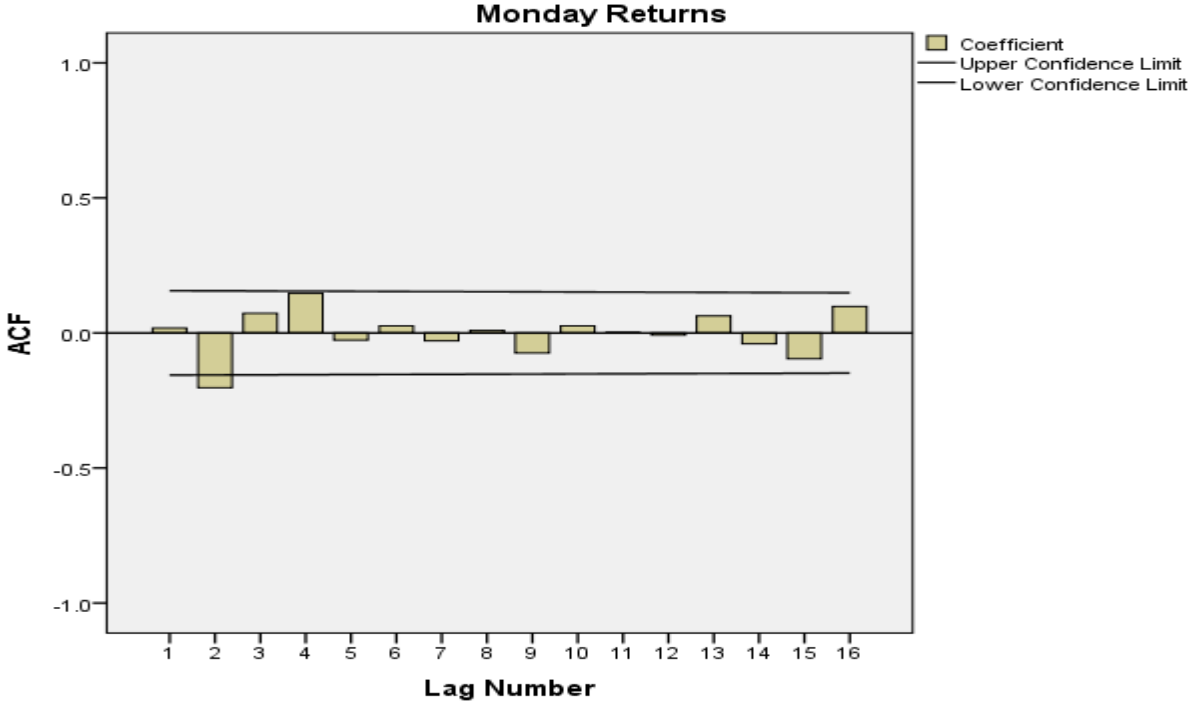

Figure 1: Autocorrelation results of Monday Returns

From the above figure 1, it is quite evident that autocorrelation bar is within limits of confidence limit except at lag 2 i.e. representing that there is only presence of autocorrelation at lag 2. The same figure can be represented in tabular form as provided in Table 2. In the following table, autocorrelation coefficient is taken up to the lag 16. The significance of auto-correlation coefficient can be examined through standard normal distribution, the 95% confidence interval for any $\rho_k \pm 1.96$ (standard error) includes the value of zero, suggesting that we are 95% confident that the true ρ_k is not significantly different from zero. The standard error is found to be 0.078 suggesting that there is evidence of presence of auto-correlation in the Monday Returns. Further, the significance of presence of autocorrelation coefficient can also be checked using significant Q-Statistics. The same is found to be true at lag 2 the Q-Statistics is significant at 5% level of significance. Except lag 2, autocorrelation coefficient at different lags up to lag 16 do not reject the null hypothesis i.e. serial correlation coefficients are not significantly different from zero.

Table 2: Results of Autocorrelation Function

	AC	Q-Stat	Prob
1	0.018	0.0514	0.821
2	-0.203	6.8637	0.032
3	0.073	7.7392	0.052
4	0.147	11.359	0.023
5	-0.026	11.477	0.043
6	0.026	11.592	0.072
7	-0.029	11.737	0.11
8	0.009	11.752	0.163
9	-0.074	12.702	0.177
10	0.026	12.818	0.234
11	0.001	12.819	0.305
12	-0.008	12.83	0.382
13	0.063	13.532	0.408
14	-0.04	13.824	0.463
15	-0.096	15.466	0.418
16	0.098	17.209	0.372

Variance ratio test

Variance ratio test is based on the fact that if a time series follows a RW, in a finite sample the increments in the variance are linear in the observation interval. That is, the variance of difference data should be proportional to the sample interval. Defining yt is the first difference of the log of prices and can be modeled as stochastic process having drift as follows,

$$yt = \mu + yt\text{-}1 + ?t$$

Where, μ is the drift parameter, expected value of error is zero and $E(\varepsilon_{t,} \varepsilon_{t-1}) = 0$. The restriction on the errors implies that the variance of the error will grow linearly with the time step. Following Lo and MacKinlay (1988) and Chow and Denning (1993), the variance of (yt - yt-1) is 1/n times the variance of (yt - yt-n). In another words, $\frac{\sqrt[n]{VAR(y_{t+n} - y_t)}}{VAR(y_{t+1} - y_t)} = 1$ will hold asymptotically even with possible heteroscadastic increments.

The random walk hypothesis requires that the variance ratio for all the chosen aggregation intervals, q, be equal to one. If variance ratio is less than one than the series is said to be mean reverting and if variance ratio is greater than one than the series is said to be persistent. Variance ratio tests for return can be applied directly unlike to volatility where we need to deal with intraday periodicity.

We set up the null hypothesis as H0 = VR(q) =1 and H1 = VR(q) ? 1. The test will be carried out ? = 0.05. If the absolute value of test statistics is less than the critical value, 1.96, we do not reject the null hypothesis at 5% significance level. Otherwise, we reject the null hypothesis which means that the returns are serially correlated.

The following Table 3 represents Variance Ratio test for the period of 2, 4, 8 & 16. The table clearly depicts that there is variance ratio coefficient as figured in second row shows that Variance Ratio Coefficient value is found to be less than 1 for the respective periods of 2, 4, 8 & 16. Moreover, the probability value for respective periods are found to be less than 0.05 which shows that the market is mean reverting and the returns are serially correlated.

Table 3: Result of Variance Ratio Test for Monday Returns

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.620176	0.102584	-3.70256	0.0002
4	0.222376	0.181175	-4.29211	0
8	0.130546	0.269811	-3.22246	0.0013
16	0.063834	0.395476	-2.36719	0.0179

FINDINGS AND CONCLUSIONS

The present study tries to explore the way of investors approaching in the market based on the objective of day of the week effect. This study shows that the results are found to be consistent, that the weekend effect is driven by Institutional investors trading pattern. Overall the result has shown that on Monday, the market has Statistically negative returns and on Tuesday there is positive result. From the above study we arrive at a conclusion that most favorable day of trading is Tuesday. The most satisfactory explanation for the negative return on Monday is that usually the most unfavourable news appeal on weekend. This unfavourable news influence the majority of investors respond negatively, causing them to sell on Monday.

In next part of the study we tested that do the Monday returns are random? For examining the randomness we relied on two popular tests, based on which we could arrive at the following findings. Variance Ratio test is much more powerful and reliable than the autocorrelation test of random walk models. A variance ratio of less than one implies that the returns of short intervals tend to have 'mean reversion' feature over a long interval. The result is found to be compatible with autocorrelation coefficient. The compatibility of the results of variance ratio test and autocorrelation test indicates that the non-random behavior of the market is not because of heteroscedasticity, but because of genuine autocorrelation. The implication of the study is that Monday is considerably very low returning day which somewhere hitting the psychological pressure of the investors, the test results provided that following next Monday is having correlation with its present.

REFERENCES

- Umesh Kumar (2012), "Is There Any Diwali Effect?" Indian Journal of Finance, Volume 6, Number 3, March 2012.
- Sias and Starks (1995), "The Day-of-the-Week Anomaly: The Role of Institutional Investors", Financial Analysts Journal, May-June 1995, Page 58-67.
- Lintari J.M. (2011), "Awareness, Trust and Stock Market Efficiency: The Case of Uganda Securities Market", a dissertation submitted to the school of graduate studies in partial fulfillment of the requirements for the award of degree of the Masters of Science in Accounting and Finance of Makerere University.
- A. Shanker Prakash (2014) "Market Efficiency of Indian Stock Market" Scholars World- A Division of Astral International [P] Ltd. New Delhi.
- Lo and MacKinlay, 1988, "Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test", *The Review of Financial Studies*, Vol. 1 No. 1, 41-66.
- Lo and Mackinlay, 2002, "A Non-Random Walk Down Wall Street" Princeton University Press, Princeton and Oxford.
- Madhusoodanan T.P. 1998, "Persistence in the Indian Stock Market Returns: An Application of Variance Ratio Test", *Vikalpa*, Vol. 23 No. 4, 61-73.
- Madhusoodnan T.P., 1997, "Risk and Return: A New Look at the Indian Stock Market", *Finance India*, Vol. XI No. 2, 285-304.
- Mahapatra R.P., 1995, "Relative Strength in Performance of Share Price in India: A Weak Form Test of Capital Market Efficiency", Decision, Vol. 22 No. 3, 177-189.
- Poshakwale S., 1996, "Evidence on Weak Form Efficiency on Day of the Weak Effect in the Indian Stock Market" *Finance India*, VOL. X, No. 3, 605-618.