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DAILY LAGGED PRICE EFFECT ON MARKET EFFICIENCY

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ABSTRACT
This paper examines the efficiency of the Bombay Stock Exchange (BSE) at the weak-level for 30 listed companies in the market by using daily observations of the BSE. Parametric and nonparametric tests for examining the randomness of the BSE stock prices were utilized. The parametric tests include serial correlation test and the nonparametric tests include runs test. The serial correlation tests and the runs tests both revealed that the daily returns are inefficient at the weak-form.

INTRODUCTION
Every Investor wants maximum return at lowest risk. Before taking investment decision, every investor has to use some technique for valuating securities. Two different approach in use for investor decision making, such as:-Fundamental analysis and technical analysis. In real life investment decision making is not guided by single tool just fundamental or Technical analysis requiring other qualitative factor for a lot of personal judgment. Thus, we study third theoretical approach- efficient Market Hypothesis. Efficient Market Hypothesis states that absolute price changes are independent in short run. Hypothesis is based on assumption that all securities are Efficient. Efficient capital market is based on following assumptions:

1. Information is free and quick to flow.
2. All investors have the same access to information.
3. Investors are rational and behave in a cost effective competitive manner for optimization of returns.

Fama suggested that Efficient Market Hypothesis can be divided into three categories are: - Weak Form: The weak form of the market is the oldest statement. The market is efficient in the weak form, prices reflect all past security market information; hence information on past prices and trading volumes cannot be used for profit. According to Adam Smith "Prices have no memory, yesterday has nothing to do with tomorrow." Semi-Strong Form: The semi-strong form of EMH says that market prices of stock not only reflect all historical information but also reflect all publicly available information such as: Quartly reports, changes in accounting information, dividends, stock split information, issue of bonus share, right issue merger and amalgamation information etc.
Strong Form: Strong form of EMH represents most extreme case of market efficiency. In strong form stock price fully reflect all available information public and private. In strong form no information that's available is it public or inside can be used to earn superior investment return. Security analysts and Portfolio manager who have access more quickly information than general investing public are able to use this information to earn more profit. The EMH has very important implication for both investors and authorities. This study aims at testing the weak-form EMH in the Indian stock market. The study is organized in four sections as follows: Section 2 provides brief literature review; Section 3 describes the Methodology adopted; Section 4 presents the analysis & results; Section 5 presents conclusions & remarks.

REVIEW OF LITERATURE
The review of literature section examines recent (or historically significant) research studies, company data or industrial reports that act as a basis for the purposed study. It emphasizes the important results and conclusions of other studies, the relevant data and trends from previous research and particular methods. As efficient market hypothesis is wide, a lot of work has been done in this field. Some of studies are summarized in Table 1.

Table: 1
Literature Review

Sr. No.	Study	Markets Under Study	Period of Study	Methodology Used	Results Found
1	Abeyratna, Power (1995)	Sri Lanka	1993	Serial correlation test, Run test.	The result shows need a further research.
2	Mittal (1995)	India	1991-1992	Serial Correlation, Run test.	Study concludes that share price follow a random behavior.
3	Sunil Poshakwale (1996)	India	1987-1994	Serial Correlation, Run test, KS test	Evidence concentrating on the weak form efficiency and the mean returns except for the Monday and Wednesday are positive.
4	Kumar , Madhusoodanan Deo (2006)	India	Jan. 1, 1997 to June 30, 2005	Statistics and Volatility.	The study suggests that there exists an inter-exchange arbitrage opportunity.
5	Mahapatra, Biswasroy (2007)	India	1st, April 2000 to 31st March 2002	Rank correlation	Study show that Indian stock market is more weakly efficient markets in long run and inefficient in short run.
6	Sharma, Mahendru (2009)	India	July 2007 to October 2007	serial Correlation tests filter rule test, cyclical tests, and volatility test.	The study shows that the current share prices already reflect the effect of pastshare prices.
7	Mittal, Mittal (2010)	India	2,july 2001-31st march 2009	Volatility	The result from the sample period shows that majority of the stock's return, trading volume and volatility for expiration days are similar.
8	Gupta (2010)	India	1st January, 2006 to 31st December	Kolmogorov Smirnov Test, Unit Root Test, Durbin Watson Statistics, Run test	The result of the study Indicates that the Indian stock markets are 'weak form efficient' and follow 'random walk'.
9	Sapate, Ansari (2011)	India	01/04/2000 to 31/03/2010	Autocorrelation Test & Ljung – Box Q (LBQ) Statistics, Run	The results obtained that Indian stock markets are weak form efficient.

				test.	
10	Khan, Ikram, Mehtab (2011)	India	1st April 2000 to 31st March 2010	Run test.	Study shows that Indian Capital Market is not weak form market efficient.
11	NAYAK (2012)	India	01-04-2001 – 31-03-2011	Run test	The result shows that random walk hypothesis is valid.
12	Ashish, Satish (2012)	India	1st Jan 2003 to 31st March 2011	Run Test	Its proved that Indian Capital market neither follow random walk model nor is a weak form efficient.
13	Ramkumar, Selvam, Vanitha, Gayathri, Karpagam	India	1st January 2005 to 31st December 2010.	Runs Test, Autocorrelation test.	It shows that these 8 Indices performed well.
14	Jana, and Meher (2012)	India	1st Jan. 2006 to 31st Dec. 2011.	Runs Test, serial correlation test.	Study shows that market will be inefficient.

The available literature indicates, mixed results about efficiency of market. The above literatures provide contradictory conclusion about stock returns at Indian market. This has motivated the researchers to take up the study.

METHODOLOGY

Objective of the Study:
The main objective of this research is to test the Weak form efficiency of the BSE.
The objectives of the study are specifically stated as:
To test the Weak form efficiency of BSE.
To test the Weak form efficiency of companies wise.
To test the Weak form efficiency of Lag wise.

HYPOTHESIS

For the present study the Hypothesis formulated examines whether the stock return follow a random walk (weak form efficiency) during the study period.
Null hypothesis (H_0):- The Indian stock market returns are random during the study period.
Null hypothesis (H_0):- The Indian stock market returns are not random during the study period.

DATA DESCRIPTION

The study based on 30 sample companies which are listed on 'A' list of shares of BSE sensitive Index (SENSEX). Companies are selected randomly. Sample companies data are collected by www.capitaline.com and p value are calculated by online www.graphpad.com. The Sample size is taken from BSE. In sample includes observations of daily opening and closing price of individual indices and period ranges from 1st April 2007 to 31st march 2012.
Market returns are computed as follows:-

$R_t = P_t - P_{t-1}/P_{t-1}$
R_t= Return at the time t
P_t= price at the time t
P_{t-1}= price at the time t-1

STATISTICAL TEST

In this study, we use two statistical methods, namely as Serial correlation and a Run test.

SERIAL CORRELATION TEST:-

As observed in a literature, a serial correlation test is the most commonly used for testing the efficiency of weak market. If security markets are weak form efficient, there should be no linear dependence in the lagged prices. Serial correlation coefficient provides the relationship between price changes in one period with price changes in other period. If such correlations are negligible, the price changes are considered to be serially independent. If the autocorrelation is negative it means prices changes are efficient and if the result is positive coefficients then it prices changes are not efficient. Serial correlation coefficients provide a measure of relationship between the value of a random variable in time (t) and its value (k) periods earlier. They will indicate whether price change at time (t) is influenced by the price changes occurring (k) periods earlier. The serial correlation of a time series is given by autocorrelation function of lag k. r_k is estimated by using
$R_k = C_k/C_0$

Where $C_k = \frac{1}{n}\sum_{t=1}^{n-k}(x_t - x)\bar{x}_{t+k} - x)$, k=0, 1, 2……n.

$x = \frac{1}{n}\sum_{t=1}^{n-k} x_t$ is mean of the whole series, C_0 the variance of x_t and n is the number of observations. The significance of serial correlation coefficients (r_k) was tested at 1per cent and 5 per cent levels by Z statistic computed by:

$Z = r_k\sqrt{n-k}$

RUN TEST

A run is defined as a consecutive sequence of price changes of same sign. There are three types of price changes (-), + and zero. For instance in a series ++,-, 0, + there are four run. In this test actual numbers of run are compared with expected number of run. If actual number of run is significantly different from the expected run, then the successive price changes are not considered to be independent. The expected number of runs (M) and the standard error is given as follows:

Expected number of runs (M) = $\frac{\left[N(N+1) - \sum_{i-1}^{3} n_i^2\right]}{N_1}$

Standard error $\sigma_m = \left[\frac{\sum_{i-1}^{3} n_i^2 \{= N(N+1)\} - 2N\sum_{i-1}^{3} n_i^3 - N^3}{N^2(N-1)}\right]^{\frac{1}{2}}$

Where N is the total number of price changes and n_i the number of price changes of each sign. The significance of the difference between the observed and expected number of runs can be tested by computing standardized variable Z as under:

$$Z=\frac{(R+0.5-M)}{\sigma_m}$$

Where

R = Total observed number of runs of all signs

0.5 = Continuity adjustment factor

In the present work, if the compared value of standardized variable Z is equal or more than the critical value at 5 per cent or 1 per cent levels of significance, it means that successive price changes do not follow a random walk approach.

RESULTS AND DISCUSSION

Our study investigates the weak form of market efficiency in the selected market of India. The sample size consisted of Daily prices of stock market under the study from 1st April 2007 to 31st march 2012. For our study we have applied test like are Run test and Serial correlation test and test the hypothesis whether market are efficient weak in form or not.

Table 2

Insignificant companies, lags based on correlation and Run test

year	No. of insignificant co. based on correlation test	No. of insignificant lag	Insignificant correlations out of 900 coefficients	No. of insignificant co. based on run test
1st April 2007 to 31st March 2012	-	2	801	22

(Source: - data computed on the basis of Appendices.)

Table shows that the serial correlation coefficients are not insignificant for all companies and lags, thus suggesting that the changes in the prices of shares traded of the Bombay stock exchange are dependent. Mostly lag of daily basis are not insignificant means mostly daily price changes are dependent of each other. Near 89 per cent correlation coefficients are independents in which price changes are not dependent each other. Thus the result rejects the null hypothesis. And results of run test strictly conform to the weak form efficient market hypothesis. As regards companies wise and lag wise market efficiency, the result of the serial correlation test conform market are not efficient individually but overall combined companies results are weak form efficient market and the result of run test conform market follows a random walk.

CONCLUSIONS

On the basis of above findings, the followings conclusions can be drawn:

Serial correlations test shows that maximum companies are significant means lag correlations of daily price changes are dependent and also conclude that maximum lag correlations are significant. According to serial correlation test of daily price changes are not follow strongly random walk.

In overall lag correlations serial correlations test conclude that 90 % correlations coefficients are independent means price changes are not dependent on each other.

Run test concludes that price changes are strictly confirming weak form efficient.

FURTHER RESEARCH

In our study, only weak-form of EMH is considered while the semi-strong and strong form of EMH would be concern of future research. The study can be further be extended using other advanced unit root test,

Variance ratio tests and model comparison test and also used all BSE companies at all Grades and used data for long period for daily and weekly with monthly and yearly.

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