Relevance of efficient market hypothesis: a study of present scenario in India

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Abstract

The Indian stock market has witnessed several peaks and troughs in the span of last few years. It has now become a serious concern among the economists, traders and policy developers to deal with such volatility. The stock market volatility impacts over the economic stability of the country. So it is necessary to understand the movement of stock market. Several researches in this field deals with different opinion amongst which random walk theory and efficient market theory is of great apprehension. In the world of speculation, is the market efficient enough to reflect the price movement? This paper is an attempt to test the market efficiency theoretically and empirically with respect to the publicly or privately available information and simultaneously effort has been made whether, the prices can be predicted through past data. The major finding using 14 years monthly average data of BSE Sensex ranging from January 2000 to May 2014, via autocorrelation test and student t test (whether public news have any impact over the stock price) after applying unit root test reveals that the stock prices are random in nature. The past data set has no reflection over the security prices in the capital market. Simultaneously the public news too has no significant impact over the security prices and thereby the market becomes inefficient in terms of available information.

Keywords: Efficient Market Hypothesis, Auto Correlation Test, Paired t-Test, Union Budget

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Introduction

In present globalized economic environment the financial stability of any country lies over the movement of the stock market. Similarly, the Indian stock market resembled by BSE Sensex is the indicator of Indian economy. Thus in order to bring financial stability, the study of stock movement is supreme required. The behavioural finance economist believes that the investment and financial decision can be made by the corporate in the stable economic environment. The primary role of the capital market is to transfer the surplus fund from the investors to the scarce, for the proper allocation of resources. The knowledge of price movement is chief required for the economists prior to develop strategies. The present research aims at determining the relevance of Efficient Market Hypothesis in present economic scenario in the Indian subcontinent. It is worth mentioning in this context that the stock movement follows a random walk. It has now become difficult to predict the movement of stock based on the past data or publicly available news. The steep volatility has been observed in the Indian stock market from the last few periods. The need of the hour is to identify the basis of price movement in the Indian capital market, other than the well-established, Efficient Market Hypothesis. For that the relevance of Efficient Market Hypothesis has checked out based on the empirical study. This paper will guide the investors, policy makers and behavioural finance economists etc. on their decision making process regarding the application of Efficient Market Hypothesis. Do they still rely over the hypothesis and will take the investment decision or any distinct approach is required to be defined. In today's speculative market environment the study will reveal the relevance of efficient market.

Conceptual Framework

Efficient Market Hypothesis: (F.Fama, 1970) developed the efficient market hypothesis, whereby he states that the market is efficient if the prices fully reflect the available information. Information is subsets into weak form, semi strong form and strong form. In weak form of efficient market, past prices are reflected in the market price of the shares. Whereas the public announcements of dividend, annual budget etc. are being reflected along with past prices, in the semi-strong form of efficient market. Finally strong form is resembled by the privately available information sets. The serial correlation test was conducted for the weak form, over thirty stocks of the Dow Jones industrial average for 5 years ranging from 1957-1962 with lag variable of one, four, nine and sixteen days. The estimated regression residual reflected abnormal behaviour during the event of stock split while testing semi-strong form empirically.

BSE Sensex: Established in 1875, BSE Ltd. (formerly known as Bombay Stock Exchange Ltd.), is Asia's first Stock Exchange and one of India's leading exchange groups. The calculation of S&P BSE SENSEX involves dividing the free-float market capitalization of 30 companies in the Index by a number called the Index Divisor. The Divisor is the only link to the original base period value of the S&P BSE SENSEX. It keeps the Index comparable over time and is the adjustment point for all Index adjustments arising out of corporate actions, replacement of scrips etc. During market hours, prices of the index scrips, at which latest trades are executed, are used by the trading system to calculate S&P BSE SENSEX on a continuous basis. (Source: www.bseindia.com)

Union Budget: The Union Budget of India, referred to as the Annual Financial Statement in Article 112 of the Constitution of India, is the annual budget of the Republic of India, presented each year on the last working day of February by the Finance Minister of India in Parliament. The Annual Financial Statement shows the receipts and payments of Government. The allocations of resources among the various sectors are discussed in the Budget. (Source: http://rbidocs.rbi.org.in)

Review of Literature

The updated literature on market efficiency has difference in opinion.

(Asma Mobareka, 2014) has examined the weak form efficient market in the equity markets of Brazil, Russia, India and China for the time period of September 1995-March 2010. The conclusion followed by Serial correlation test, Run test and Variance Ratio test states that these markets experienced significant positive autocorrelation in returns. Period results for the BRICs clearly provide support that these markets may have been approaching a state of being fairly weak-form efficient.

(Zafar, 2012) in his research attempted to measure the efficiency of BSE Sensex (whether there is any relationship between the future prices of stock and their past performance through efficient market hypothesis) during pre-rescission period from 4th Jan to 24th Dec. 2008 by implementing modern tool like Run test and Autocorrelation. *The study* concluded that the price movement of shares of the companies in BSE SENSEX are random that is nobody can be successful in predicting the future prices on the basis of historical data only. Moreover, results of correlation test also support the weak form of efficiency for BSE SENSEX. So, it can be concluded that the price movement of shares on BSE SENSEX are occurring by chance.

Stock market efficiency is an important concept, for understanding the working of the capital markets particularly in emerging stock market such as India. (Poshakwale, 1996) Provided empirical evidence on weak form efficiency and the day of the week effect in Bombay Stock Exchange over a period of 1987-1994. The results provide evidence of day of the week effect and that the stock market is not weak form efficient. The results of runs test and serial correlation coefficients tests indicate nonrandom nature of the series and, therefore, violation of weak form efficiency in the BSE.

(Mohd.Mubasher Hasan, 2013) has studied the six most significant indices of Indian stock market viz. Sensex 30,BSE 100,BSE 200,BSE 500,BSE Midcap and BSE Small cap. The behavior of these indices has been observed during the period (Jan 1991-August 2013). Results from the seven tests (i. Descriptive statistics; ii. Frequency distributions; iii. Kolmogorov – Smirnov Goodness of fit test; iv. Runs test; v. Serial test; vi. Auto correlation function: vii. Unit root test.) conducted so far in this research work to test the weak form of market efficiency reveal that there is no normal distribution in any of the time series for the given period under study and that trends can be observed in past prices of all the six indices which, clearly point towards the informational inefficiency of Indian capital market.

(A Q Khan, 2010) has tested the efficiency in relation to the impact of Foreign Institutional Investors (FII's) largely on the Indian Capital Market by considering two major stock indices viz; National Stock Exchange (NSE) and Bombay Stock Exchange (BSE). Monthly averages of NSE & BSE and Monthly FII's net investment have taken over the period 1st April 2000 to 30th April 2010 and analyzed through Karl-Pearsons' Product Moment Correlation Coefficient (Simple Correlation) and linear regression equations. The results suggest that the FII's do have significant impact on Indian Capital Market, which leads to the conclusion that Indian Capital Market is semi-strong form efficient.

(Malkiel, 2003) has concluded in his work that stock market is remarkably efficient in its utilization of information.

(Susan Thomas, 2002) Explored the interplay between the Budget and the stock market. The result has drawn by Event Study Methodology for the 45 trading days before and after the budget and concluded that the stock market appears to be fairly efficient at information processing about the Union Budget.

Research Objectives

- To identify the impact of past data in the stock prices.
- To identify the impact of annual budget news over the movement of stock prices.

Methodology

Data Collection: This study is based on secondary data. The required data related to BSE Sensex have been collected from various sources i.e. Bulletins of

Reserve Bank of India and Security Exchange Board of India websites. The BSE Sensex data is downloaded from the websites of bseindia. Daily closing index value are taken and averaged to get the index value for each month, which is considered as more representative figure of index. The present study considers 14 years data starting from January 2000 to May 2014.

Analytical Tools & Technique: The analysis of the above data has done with the help of statistical software i.e. EViews7. At the onset the available time series data are passed through stationary test using Unit Root test. The market efficiency has tested in subsets of weak form and semi-strong form. Autocorrelation test is applied to examine whether the past data have any relevance in the price movement. Annual budget announcement day is considered to test the impact of public news over stock prices, in order to test the semi strong form. Student T test has been applied on one month prior and post budget announcement day.

Unit Root Tests: (PHILLIPS & PERRON, 1987) Unit Root Test is a statistical test aimed for measuring the stationarity of the data. It becomes obligatory for the researcher to perform the stationarity test in the time series data. A time series data is stationary if its mean, variance and auto-covariance are independent of time or time invariant. In order to derive the meaningful result and draw acceptable inference, Stationarity of a data is a prerequisite in a time series analysis. Augmented Dickey Fuller (ADF) and Phillips–Perron (PP) unit root tests have been applied to test the stationarity of time series data.

Autocorrelation, also known as serial correlation, is the cross-correlation of a signal with itself. The repeating patterns of periodic signals are determined through the mathematical calculation using serial correlation test. In present paper it is required to determine whether the stock prices follow the weak form i.e. the present data is reflecting the past data. In order to carry out the Autocorrelation test LM test has done on the available data series.

A **t-test** is used to determine if two sets of data are significantly different from each other. The paper discusses the semi strong form of market efficiency whereby, the stock prices have significant impact of any events or news available publicly. The budget announcement day is taken as significant news available through public. Therefore, t test has implied between dataset of one month prior and post to budget announcement day, to identify the impact of budget news over the stock prices.

Data Analysis
Test of stationary using unit root test.

At the onset, it is requisite to pass the stationary test of any time series data, in order to frame it at model. Therefore, Unit Root test has been applied to test the stationary of the data.

Augmented Dickey-Fuller (ADF) Unit Root Test: Unit Root Test is a statistical test aimed for measuring the stationarity of the data. It becomes obligatory for the researcher to perform the stationarity test in the time series data.

Table 1: Unit Root Test

Research Hypothesis: BSESENSEX has a no unit root			
Exogenous: Constant			
Lag Length: 1 (Automatic based on SIC, MAXLAG=13)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.206076	
Test critical values:			
	1% level	-3.468749	
	5% level	-2.878311	
	10% level	-2.575791	0.9340

The above table presents the Unit Root test of BSE Sensex at the maximum lag length of 13. The probability value of Augmented Dickey-Fuller test statistic is 0.9340 which is greater than 0.05. Thus the above test, results to rejection of the research hypothesis i.e. BSESENSEX has no unit root. Such a process is non-stationary.

Data Materialization

Fig. BSE SENSEX

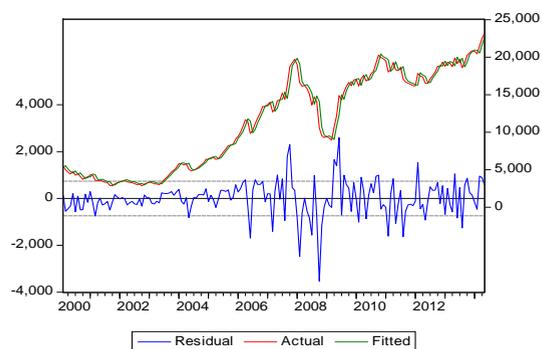**Autocorrelation Test:** The weak form of market reveals that the past data are been reflected in the share price of the capital market. Thus in order to find out the cross-correlation of a share price with itself Q statistics and LM test has carried out.

Correlogram Q statistics
Research Hypothesis: There is a serial correlation in the 14 years monthly average data of BSE Sensex

Table 2: Correlogram Q statistics

				AC	PAC	Q-Stat	Prob
				Date: 07/28/14 Time: 11:01			
				Sample: 2000M02 2014M05			
Included observations: 172							
Autocorrelation	**Partial Correlation**			**AC**	**PAC**	**Q-Stat**	**Prob**
.|* |	.|* |		1	0.193	0.193	6.5321	0.011
.|. |	.|. |		2	0.033	-0.005	6.7183	0.035
.|* |	.|* |		3	0.100	0.098	8.4933	0.037
.|. |	.|. |		4	-0.000	-0.040	8.4933	0.075
.|. |	.|. |		5	0.031	0.040	8.6639	0.123
.|. |	*|. |		6	-0.040	-0.067	8.9581	0.176
.|. |	.|. |		7	-0.055	-0.031	9.5017	0.219
.|. |	.|. |		8	-0.036	-0.028	9.7322	0.284
.|. |	.|. |		9	0.020	0.046	9.8057	0.366
.|. |	.|. |		10	0.007	-0.000	9.8159	0.457

Table 3: Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test: @ 4 Lags				
F-statistic	2.156168	Prob. F(4,166)		0.0762
Obs*R-squared	8.495039	Prob. Chi-Square(4)		0.0750
Test Equation:				
Dependent Variable: RESID				
Method: Least Squares				
Date: 07/28/14 Time: 11:18				
Sample: 2000M02 2014M05				
Included observations: 172				
Presample missing value lagged residuals set to zero.				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	36.35731	116.2961	0.312627	0.7550
BSESENSEX(-1)	-0.003064	0.008992	-0.340707	0.7338
RESID(-1)	0.201726	0.077866	2.590699	0.0104
RESID(-2)	-0.021077	0.079130	-0.266361	0.7903
RESID(-3)	0.110817	0.079410	1.395515	0.1647
RESID(-4)	-0.038288	0.078828	-0.485724	0.6278
R-squared	0.049390	Mean dependent var		-3.11E-13
Adjusted R-squared	0.020757	S.D. dependent var		735.4162
S.E. of regression	727.7437	Akaike info criterion		16.05204
Sum squared resid	87915414	Schwarz criterion		16.16183
Log likelihood	-1374.475	Hannan-Quinn criter.		16.09658
F-statistic	1.724934	Durbin-Watson stat		1.993765
Prob(F-statistic)	0.131526			
Breusch-Godfrey Serial Correlation LM Test: @ 6Lags				
F-statistic	1.593110	Prob. F(6,164)		0.1522
Obs*R-squared	9.472817	Prob. Chi-Square(6)		0.1487
Test Equation:				
Dependent Variable: RESID				
Method: Least Squares				
Date: 07/28/14 Time: 11:20				
Sample: 2000M02 2014M05				
Included observations: 172				
Presample missing value lagged residuals set to zero.				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	33.03115	117.7312	0.280564	0.7794
BSESENSEX(-1)	-0.002790	0.009116	-0.306047	0.7600
RESID(-1)	0.205745	0.078230	2.629986	0.0094

RESID(-2)	-0.029142	0.079907	-0.364698	0.7158
RESID(-3)	0.118898	0.080109	1.484206	0.1397
RESID(-4)	-0.048329	0.080404	-0.601078	0.5486
RESID(-5)	0.055110	0.080463	0.684905	0.4944
RESID(-6)	-0.065821	0.079220	-0.830862	0.4073
R-squared	0.055075	Mean dependent var		-3.11E-13
Adjusted R-squared	0.014742	S.D. dependent var		735.4162
S.E. of regression	729.9752	Akaike info criterion		16.06929
Sum squared resid	87389670	Schwarz criterion		16.21569
Log likelihood	-1373.959	Hannan-Quinn criter.		16.12869
F-statistic	1.365523	Durbin-Watson stat		2.000546
Prob(F-statistic)		0.223188		

Data Interpretation

The correlogram Q statistics reveals that at a lag variable of 10, rejects the research hypothesis and accepts the null hypothesis with the probability value more than 5%. Thus it is evident that there is no serial correlation. Further, serial correlation LM test at 4 and 6 lag variable reveals the acceptance of null hypothesis which states that there is no serial correlation in the available data series. Thus it can be interpreted from the above test that present price does not reflect the past data. The weak form of efficient market suggests that past prices are reflected in the present stock price movement in the capital market. But the available data sheet resembles that there is no such reflection. Hence it is difficult to forecast the stock movement based on past data.

Student T Test

Null Hypothesis: There is no mean difference between pre budget and post budget BSE Sensex. i.e. the budget news has no impact over the security prices in the capital market.

Table 4: Student T Test

t-Test: Paired Two Sample for Means		
	Pre Budget	**Post Budget**
Mean	11021.42857	10907.92857
Variance	41460580.73	43298603.3
Observations	14	14
Pearson Correlation	0.996194374	
Hypothesized Mean Difference	0	
Df	13	
t Stat	0.725741735	
P(T<=t) one-tail	0.240429578	
t Critical one-tail	1.770933383	
P(T<=t) two-tail	0.480859155	
t Critical two-tail	2.160368652	

The result drawn from the t- Test taken from BSE Sensex of last 14 years reveals that p=48% which is much higher than 5% significance level. Thus we accept the null hypothesis which states that there is no mean difference between pre budget and post budget BSE Sensex. i.e. the budget news has no impact over the security prices in the capital market. The security prices in India are not affected by the budget news.

Findings

The movement of the BSE Sensex of 172 months from January 2000 – May 2014 has analyzed through various statistical tools including Unit root test, Autocorrelation Test and Student t-Test. The result drawn from unit root test indicates that the BSE Sensex price has unit root. It is non stationary data or in other words it describes the extreme volatile nature. The random movements of the BSE Sensex price results into the matter of concern for the investors while taking investment decision. Similarly, while testing the weak form of efficient market the autocorrelation test derives that, the price of BSE Sensex does not reflect the past data. As such the autocorrelation test reveals the future movement of prices based on the past data. Hence, the forecasting of the future movement is almost impossible based on past data. It thus rejects the weak form of efficient market hypothesis.

In order to determine, whether the share prices reflect the publicly available information or not, the student t- test is carried out in between, one month prior and post Union Budget announcement day, to recognize the semi strong form of efficient market, which states that the news and events significantly impacts over the security prices in the capital market. Contrary to this the test result reveals that budget news has no impact over the security prices in the capital market in contemporary India. The security prices in India are not affected by the budget news. The security prices and budget news are independent to each other.

Conclusion & Suggestion

The Indian stock market plays predominant role in determining the economic stability of the country. Thus it is required to understand the movement of stock prices. In an attempt an effort has carried out to recognize the relevance of Efficient Market Hypothesis in the present economic scenario. The subsets of efficient market i.e. weak form and semi-strong form are tested using statistical tools reveals that there is

neither significant impact of past data nor the budget news affect the movement of stock price. Thus it has become a difficult task to forecast or develop hypothesis, about the Indian Stock Market. The study concludes that, the steep volatile movements of stock prices are difficult to predict on the basis of past trend or any news available through public sources. Till date efficient market hypothesis played dominant role in estimating the security prices in the capital market. But, in an era of speculation, all the prior developed theories have lost its worthiness.

Strong form, the subset of efficient market hypothesis, discusses about the market efficiency in public news as well as privately available information (insider trading etc.) along with the past data. It is an unwieldy approach to evaluate the efficient market based on private information. As privately available information is diverse for every individual. Every individual has their own source of information center, which may not be in the approach of others. Hence, due to lack of informational uniformity the concept cannot be evaluated. The empirical study reveals that weak form and semi-strong form of efficient market is of less use in the current speculative financial environment. The left over subset is the strong form which could be taken into consideration for efficient market analysis. Thus, the considerable role of Strong- Form of Efficient Market Hypothesis could not be denied.

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