Adaptive Market Hypothesis: A Case on National Stock Exchange (NSE)

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Abstract:

Testing the efficiency of capital market is a very important tool for understanding its functioning. It is very important for investors, stock brokers, financial institutions, government and other individuals connected with capital market to analysis the movement and developments of the market.The present paper tests the market efficiency of Indian Capital Market in its weak form based on 'Nifty' of National Stock Exchange (NSE). The efficiency of the Indian equity market has been measured by using the daily closing values of the Nifty over the period of 1st Jan 2001 to 31st August 2012 by employing Runs Test and auto correlation test, which is a nonparametric test. Based on the result of runs test and auto correlation test null hypothesis is rejected and it is proved that Indian equity market follow random walk model and is a weak form efficient. Present study isan attempt to test the efficiency of Indian stock market with respect to stock split, dividend and bonus announcement by companies using event study and analysis proves that markets are not efficient in its semi-strong form.

INTRODUCTION

The adaptive market hypothesis, as proposed byAndrew Lo is an attempt to reconcile economic theories based on the efficient market hypothesis(which implies that markets are efficient) with behavioral economics, by applying the principles of evolution to financial interactions: competition, adoption and natural selection. According to Lo, the adaptive market hypothesis can be viewed as a new version of the efficient market hypothesis, derived from evolutionary principles.Prices reflect as much information as dictated by the combination of environmental conditions and the number and nature of "species" in the economy.By species, he means distinct groups of market participants, each behaving in a common manner pension fund managers, retail investor, market makers, hedge fund managers, etc.

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EFFICIENT MARKET HYPOTHESIS:

Efficient Market Hypothesis (EMH) states that security prices fully reflect all available information. Efficient market is one where the market price is an unbiased estimate of the true value of the investment. The degree to which stock prices reflect all available, relevant information. Market efficiency was developed in 1970 by Economist Eugene Fama whose theory efficient market hypothesis (EMH), stated that it is not possible for an investor to outperform the market because all available information is already built into all stock prices.

The efficient market hypothesis (Fama, 1965) can be viewed as the cornerstone of modern finance.However, as Lo (2004) notes, there is no consensus among finance academics and practitioners as to whether stock market is efficient. Based on the three general types of information namely past prices, other public information and inside information, there are three forms of EMH. They are (a) weak form; (b) semi - strong form; and (c) strong form.

WEAK FORM (EMH): The weak form of EMH states that the current prices fully reflect the information implied by the past prices (historical sequence of prices). In weak-form efficiency, future prices cannot be predicted by analyzing prices from the past. This form has been designated as the random walk hypothesis (RWH).

Tests of weak form EMH are (1) Serial correlation tests (2) Runs test (3) Filters rules test

RANDOM WALK HYPOTHESIS: The random walk hypothesis is a financial theory stating that stock market prices evolve according to a random walk and thus the prices of the stock market cannot be predicted. The Random Walk Hypothesis of stock market prices is concerned with the question of whether one can predict future prices from past prices.

SEMI-STRONG FORM (EMH): The semi - strong form of the EMH states that the current stock prices reflect all publicly available information and the stock prices adjust rapidly to new information.

STRONG FORM (EMH): The strong form of EMH takes the notion of efficiency to its ultimate extreme. A market is said to be strongly efficient if security prices reflect fully not only published information but all relevant information including data not yet publicly available. In strong-form efficiency, share prices reflect all information, public and private, and no one can earn excess returns.

RESEARCH DESIGN

STATEMENT OF PROBLEM

Stock market, being a vital institution, facilitates economic development. It is true that so many parties are interested in knowing the efficiency of the stock market. The small and medium investors can be motivated to save and invest in the stock market only if their securities in the market are appropriately priced. That is how quickly and correctly security prices reflect these information show the efficiency of the stock market.

OBJECTIVE OF THE STUDY

1. To develop an understanding of the various forms of efficiency of the stock market.
2. To trace the trend of the movement of the stock market index over the study period.
3. To test whether the Indian Equity markets, especially NSE is weak form efficient or not.
4. To test whether the Indian Equity markets, especially NSE is semi-strong form efficient or not.

SCOPE OF THE STUDY

Testing the efficiency of the market is very important for the investors, stock brokers, financial institutions, government etc. for understanding the functioning of the capital markets. Stock market movement gives an idea to the investors for buying and selling shares in order to earn some profits.

TOOLS FOR ANALYSIS

To test the weak form of efficiency we have used Runs test and autocorrelation.

RUNS TEST

The runs test is a non-parametric statistical test that checks a randomness hypothesis for a two-valued data sequence. More precisely, it can be used to test the hypothesis that the elements of the sequence are mutually independent.

A "run" of a sequence is a maximal non-empty segment of the sequence consisting of adjacent equal elements. For example, the sequence "++++−−−+++−−++++++−−−−" consists of six runs, three of which consist of +'s and the others of −'s. The run test is based on the null hypothesis that the two elements + and - are independently drawn from the same distribution.

$$E(r) = 2n1n2 / (n1+ n+12)$$

Where, E (r) = Expected number of runs, n1 = number of positive runs and n2 = number of negative runs. The standard error of the expected number of runs of all signs may be obtained as-

$$S.E = 2n1n2\,(2n1n2-n1-n2) \;/\; (n1+n2)2\,(n1+n2-1)$$

Where, S.E = Standard Error The expected number of runs is now compared with the actual number of runs. The difference between actual number of runs and expected number of runs can be expressed by a standardized value 'Z' which is obtained as under-

$$Z = \frac{R + 0.5 - E(r)}{S.E}$$

Where, R = Actual number of runs, 0.5 = Continuity adjustment. In order to test the significant difference between the actual number of runs and expected number of

runs the test statistics employed will be 'Z'. The null hypothesis for this test is that the observed series are random. The null hypothesis is rejected if the calculated number of runs falls outside the 95% confidence interval (μ-1.96 s = k = μ + 1.96 s) and is accepted if the value lies in between ±1.96. The z-value is tested at 5% significant level, that is, one cannot reject the null hypothesis with 95% confidence level or in other words there are 5% chances of rejecting a null hypothesis when it is true.

SERIAL CORRELATION TESTS

One way to test the randomness in stock prices change to look at their serial correlations also called as auto correlations. Is the price change in one period correlated to the price change in some other period? If such auto correlations are negligible, the prices changes are considered to be serially independent.

TESTING THE SEMI-STRONG FORM

Semi-strong form of efficiency has been tested by event study.

a. Daily returns

The daily returns were calculated for both individual securities as well as Market Index.

$$r = \{(P_1 - P_0) / P_0\} * 100$$

b. Security Returns Variability

SRV model is used to know the reaction of the market.

$$[ER_{jt} = R_{jt} + b_j R_{mt} + e_t]$$

c. Average Security Returns Variability (ASRV)

The SRVi,tso calculated for all the stock split announcement are averaged to find the averagesecurityreturns variability (asrvt).

C. Average Abnormal Returns

$$[e_t = \text{Actual} - (a_t + b_t R_{mt})]$$

D. Cumulative Abnormal Returns (CAR)

The CAR is calculated as

Where,

- CAARk = Cumulative Average Abnormal Returns for the k th period. Hereafter, it is

Referred to as CAR,

- AARt = Average Abnormal Returns of sample stock split at time t which is calculated

by using the equation.

E. T-Test

i) The significance of reaction in security prices (ASRVt) is tested by using the T- statistics as

Follows: t ASRV n s stat = (−1) × / (1.4)

Where, n is the number of quarters in the sample and s is the Standard Deviation of abnormal returns.

ii) The significance of the AARtis tested using the t-test as follows; t AAR n s stat = t × / (1.6)

Where, AARt is the Average Abnormal Returns on time t, n is the number of stock split in sample and s is the Standard Deviation of Average Abnormal Returns.

LIMITATIONS OF THE STUDY

The following are the limitation of the present study

1) The present study is confined to only 5 indices of National stock exchange.

2) The present study is confined to only corporate actions i.e. Stock split, dividend and bonus with 3 companies of different sectors.

SOURCES OF DATA

The data used for this study is secondary data. The information regarding unadjusted share price, Stock split information, dates of stock split, dividend and bonus announcements, and values of NSE Indices were obtained from www.capitaline.com and www.nseindia.com .Other relevant information are also obtained from the books and journals.

DATA

The data used for this study are daily closing prices of 5 NSE indices from 1st January 2001 to 31st August 2012. The data for testing semi-strong form of efficient market hypothesis we have considered closing prices of 3 companies i.e. HDFC Bank, Titan Industries and Barthi Airtel for event study. 20 days post and pre prices on the day of corporate actions are used in the study.

Analysis and Interpretation

Analysis is carried out in this paper to test the forms of efficiency in Indian equity markets. Out of 3 form

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of efficiency we have tested weak form of EMH and semi-strong form of EMH. In this paper we have used Auto-correlation test and Runs test to test Weak form of efficient hypothesis. To test the Semi-Strong form we have used event study.

Auto-correlation test

S&P CNX NIFTY, CNX Mid-Cap, CNX Nifty Junior, S&P CNX DEFTY, CNX100

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Autocorrelations

TABLE 1 - Series:Close

Lag	Autocorrelation	Std. Error[a]	Box-Ljung Statistic		
			Value	df	Sig.[b]
1	.073	.020	13.020	1	.000
2	.014	.020	13.508	2	.001
3	-.020	.020	14.439	3	.002
4	-.023	.020	15.727	4	.003
5	-.047	.020	21.073	5	.001
6	-.047	.020	26.336	6	.000
7	.035	.020	29.368	7	.000
8	.053	.020	36.240	8	.000
9	.028	.020	38.124	9	.000
10	.018	.020	38.933	10	.000
11	-.053	.020	45.649	11	.000
12	.010	.020	45.874	12	.000
13	.018	.020	46.657	13	.000
14	.056	.020	54.159	14	.000
15	.025	.020	55.729	15	.000
16	.035	.020	58.645	16	.000

a. The underlying process assumed is independence (white oise).

b. Based on the asymptotic chi-square approximation.

There is insignificant relationship where r value is 0. Which shows randomness exist in the stock prices. It explains that markets are efficient in its weak form. The person who follows technical analysis is unable to beat the market return

RUNS TEST

A runs test is performed by comparing the actual number of runs with the expected number of runs on the assumption that price changes are independent. If the observed runs are not significantly different from the expected number of runs, we conclude that the successive price changes are independent. On the other hand if this difference is statistically significant, the series of price changes is considered as dependent.

H0: There is no significant difference in present day price and past prices.

We test the null hypothesis that price changes are independent. The results of six stocks indices are given in Table 1.

TABLE 2: Runs Analysis

Index	N	n1	n2	n3	N	R	M	S.D	Z
S&P CNX Nifty	2915	1573	1338	3	2914	1276	1447	26.79	-6.32
Nifty Junior	2915	1607	1305	2	2914	1186	1441	26.68	-9.55
CNX 100	2415	1339	1075	0	2414	990	1193	24.26	-8.37
CNX Mid cap	2915	1679	1234	1	2913	1168	1432	26.35	-9.67
S&P CNX Defty	2913	1577	1330	5	2912	1079	1444	26.75	-13.62

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Note:

n = Total number of observations; n1 = Ups; n2 = Downs; n3 = Zeros; N = n1 + n2 + n3

R = Total number of observed Runs; M = Total number of expected Runs;m s = Standard Error;

Z = Standardized Variable.

We have considered the index closes prices for ten years i.e. from 1st Jan 2001 to 31st Aug 2012 and have selected five indices from national stock exchange for the runs test.

The results show that all the indices of NSE are efficient in its weak form. The information regarding previous indices value are effectively absorbed by today's indices. The previous day's prices would have already been discounted to the prices available on that particular day. So the next day's prices are random. The investors who follows technical analysis will not be able earn a return which is more than that of a market. This indicates that the component stocks are efficient in absorbing information regarding prices. The inclusion of appropriate stocks in the NSE indices, efficient functioning and widening base of the stock exchange may be reasons behind this efficiency.

ANALYSIS OF SEMI STRONG FORM OF EFFICIENCY

Semi-Strong form of efficiency is tested by Event study taking corporate actions such as dividend, bonus and stock split.

Steps involved in Event Study:

1. Collect a sample of firms that had a surprise announcement (the event).
2. Determine the precise day of the announcement and designate this day as zero. Use daily data.
3. Define the period studied, e.g. 30 days (weeks, months) either side of the event.
4. For each firm compute the daily returns with market model approaches.

   [ERjt = Rjt + bjRmt + et]

5. For each firm, compute the Abnormal Return for each asset. [et = Actual - (at + btRmt)]
6. Compute for each day the average abnormal return (AR) over all assets.
7. Compute the Cumulative Abnormal Return (CAR).1

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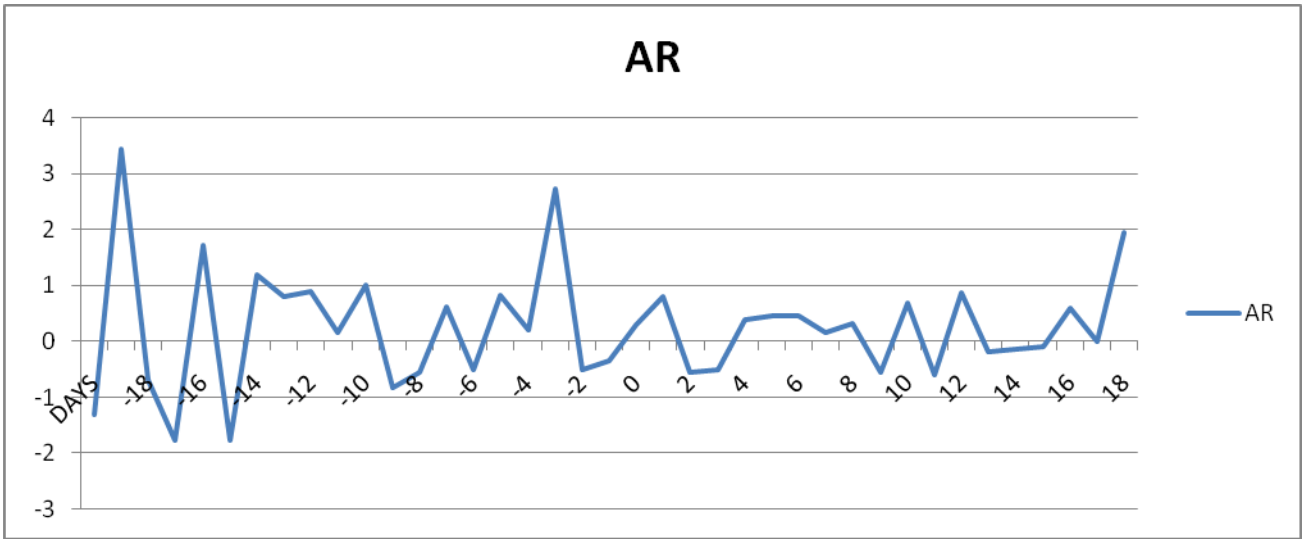
HDFC BANK

Figure – 1 Abnormal Returns of HDFC Bank



Markets are not efficient in its semi-strong form. The abnormal returns on the day of dividend declaration should have been high. But here we can see that the prices have been fluctuated and the investor who follows fundamental analysis can beat the market.

BHARTI AIRTEL

Figure – 2 Abnormal Returns of BHARTI AIRTEL

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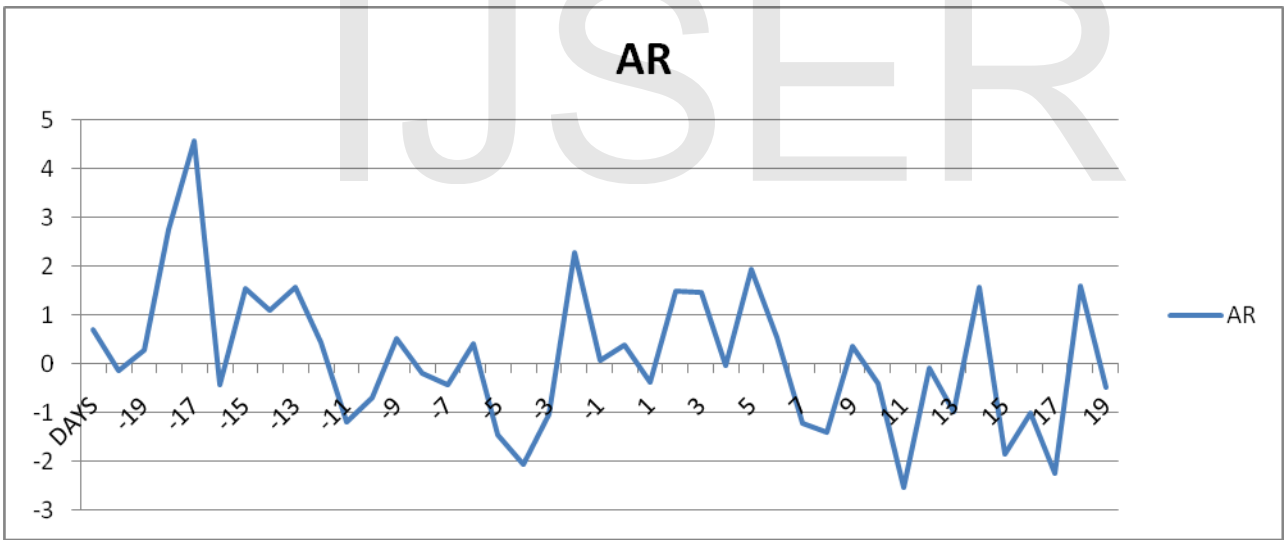
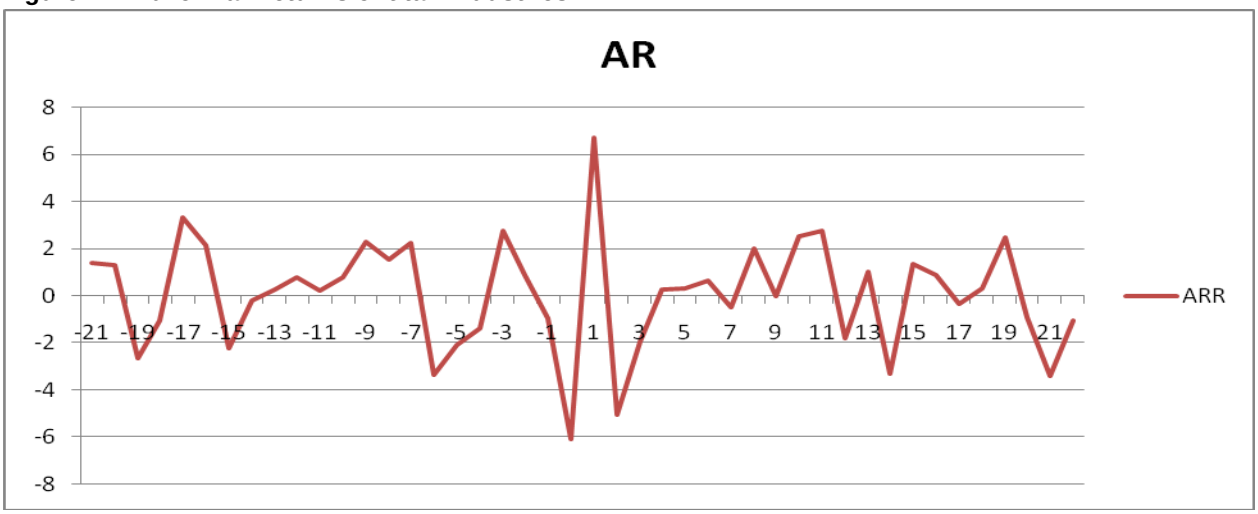


Markets are not efficient in its semi-strong form. The abnormal returns on the day of dividend declaration should have increased and further should have gone high. But here we can see that the prices have been fluctuated and the investor who follows fundamental analysis can beat the market.

TITAN INDUSTRIES

Figure – 2 Abnormal Returns of titan industries



Markets are not efficient in its semi-strong form. The abnormal returns on the day of corporate actions should have been high. Here the price does not reflect the information. But here we can see that the prices have been fluctuated and the investor who follows fundamental analysis can beat the market.

4. CONCLUSION

The assumption that the stock prices are random is basic to the Efficient Market Hypothesis and Capital Asset Pricing Models. The study carried out in this paper has presented evidence against the weak form of efficiency of the Indian stock market.

Runs test and autocorrelation analyses are used to test the efficiency of the market. From these tests we are able to conclude that the series of stock indices in the Indian stock market are biased random time series. The autocorrelation analysis indicates that the behavior of share prices does not confirm the applicability of the random walkmodel in the Indian stock market. Thus there are undervalued securities in the market and theinvestors can always make excess returns by correctly picking them.

Semi-strong form of efficiency has empirically examined the informational efficiency of Indian stock market with regards to stock split announcement, dividend declaration and bonus released by the companies. The result of the study showed the fact that the security prices reacted to the announcement of stock splits and dividend declaration. The reaction took place for a very few days surrounding day 0, remaining days it was extended up to +20. Thus one can conclude from the forgoing discussion that the Indian stock markets not perfectly efficient to the announcement of stock split and dividend declaration. This can be used by investors for making abnormal returns at any point of the announcement period.

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