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VALIDITY OF EFFICIENT MARKET HYPOTHESIS IN THE INDIAN STOCK MARKET

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ABSTRACT

The concept of EMH states that security prices reflect all information freely available. This information can be either the historical stock prices or publicly available information or even inside information related to the company. There exists conflicting views with regard to the impact of all the information available on the stock prices. Some are of the opinion that abnormal returns can be obtained in the long run by analyzing all kinds of information available while others argue it is not possible. So this research article is being conducted "To check whether historical share prices, publicly available information and inside information have an impact on the current and future market prices of securities. In short, to check the validity of Efficient Market Hypothesis in the present Indian scenario" The scope of this research is limited to companies listed on National Stock Exchange. Ten companies have been selected as a sample on a convenience sampling technique to test the weak and semi-strong form of hypothesis, whereas 300 companies and 35 mutual fund schemes have been taken as a sample for the purpose of testing strong form of hypothesis. Data has been collected mainly from secondary sources such as websites and journals for this purpose. The tests that have been conducted for the purpose of testing the hypothesis are run test and Auto correlation test (in case of weak form hypothesis), T-test (in case of semi-strong form hypothesis) and ANOVA (in case of strong form hypothesis). This concludes that abnormal returns cannot be earned by having only historical stock prices and publicly available information and abnormal return can be earned by having private information.

KEYWORDS

Efficient Market Hypothesis, Return, Semi-strong form hypothesis, Strong form hypothesis, Stock Market, Weak form hypothesis.

INTRODUCTION

The EMH was developed by Professor Eugene Fama at the University Of Chicago Booth School Of Business as an academic concept of study through his published Ph.D. thesis in the early 1960s at the same school. It was widely accepted up until the 1990s, when behavioral finance economists became mainstream. Empirical analysis have consistently found problems with the efficient markets hypothesis, the most consistent being that stocks with low price to earnings (and similarly, low price to cash-flow or book value) outperform other stocks. Alternative theories have proposed that cognitive biases cause these inefficiencies, leading investors to purchase overpriced growth stocks rather than value stocks. Although the efficient markets hypothesis has become controversial because substantial and lasting inefficiencies are observed, it remains a worthwhile starting point. Markets are said to be efficient if the market value of shares are an unbiased representation of their intrinsic values. Any deviation from the intrinsic value is said to be purely random. So, according to the concept of EMH, it is not possible to earn supernormal profits in the long-run as we cannot identify stocks which are consistently over-valued or under-valued. In a market that is essentially characterized by a large number of rational and profit seeking investors who compete with one another freely, the prices should reflect all the available and expected information. An efficient market is one that rapidly absorbs new information and adjusts the prices swiftly. Researchers and analysts who have worked on the efficiency of stock market have realized that no stock market is absolutely efficient. This paper deals with testing the validity of the Efficient Market Hypothesis (EMH) in the Indian stock market. The concept of EMH states that security prices reflect all information freely available. This information can be either the historical stock prices or publicly available information or even inside information related to the company.

ASSUMPTIONS OF EFFICIENT MARKET HYPOTHESIS

- Investors are rational.
- Markets are rational.
- There are no taxes – or, more specifically, taxes play no part in financial decision-making. There are no transaction costs.
- An investor is indifferent between a dollar in dividends and a dollar in capital gains.
- A company (and its investors) is indifferent between a Rupee of additional debt and a Rupee of additional equity.

OBJECTIVES OF THE STUDY

There exists conflicting views with regard to the impact of all the information available on the stock prices. Some are of the opinion that abnormal returns can be obtained in the long run by analyzing all kinds of information available while others argue it is not possible. Thus there exists a research gap. The objectives of this paper is as follows-

- To determine whether historical share prices have an impact on current and future market prices.
- To determine the impact of publicly available information on share prices.
- To analyze whether the availability of inside information helps in earning higher return in the long run.
- To check the validity of Random-walk theory in the Indian market.

SCOPE OF THE STUDY

- This study is restricted to only those stocks which are listed in NSE.
- Time frame of the study is 10 weeks.
- Sample size of 10 is considered for testing Weak form and Semi-strong form of hypothesis and Sample size of 300 stock returns and 75 mutual funds are considered for testing Strong form of hypothesis.

HYPOTHESIS

To check the validity of the market, following hypothesis is made.

For Weak form:

H_0 - Historical and future share prices are independent.

For Semi strong form:

H_0 - There is no significant difference between share prices before and after announcement of information.

For Strong form:

H_0 - Inside information has no impact on share prices.

SAMPLING DESIGN & DATA COLLECTION

Sampling unit - Companies listed on National Stock exchange (NSE). 10 companies for weak and semi-strong form hypothesis, 300 companies and 35 mutual fund schemes for strong form hypothesis are selected for the study. Convenience sampling technique is used.

Data collected for the purpose of testing all the above form of hypothesis are secondary data. The secondary data collected is from the website www.nseindia.com and other journals. Auto correlation test, T-Test, Run test, ANOVA has been used for the data analysis.

ANALYSIS & DESIGN

WEAK FORM 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. It has been described as 'jibing' with the efficient market hypothesis. Economists have historically accepted the random walk hypothesis. They have run several tests and continue to believe that stock prices are completely random because of the efficiency of the market. The first part of this research aims at finding out whether there is any relationship between historical share prices and future share prices. If there is no relationship, then technical analysis, which is a technique of ascertaining future share prices from past and present share prices using charts and graphs. For this purpose run test and Auto correlation tests have been used.

AUTO CORRELATION TEST

A number of researchers like Fama, Fischer, Jensen etc in the USA and many experts in India have conducted tests for auto correlation of the price changes. These tests are run to find correlation between present price changes and the price changes in past period, with a lag of one day to a few days. This test is used to test whether markets are efficient or not in the Weak form. This is also known as Auto Correlation.

This test is conducted by correlating the stock returns from the first day to nth day and from second day to n+1th day. If the correlation is very high, then it means that the stock returns for the coming period is predictable.

For this purpose, returns are calculated as follows:

$$\text{RETURN} = \frac{P_1 - P_0}{P_0} \times 100$$

After returns are calculated for all 365 days, returns from 1 to 364th day are correlated with returns from 2nd to 365th day.

If historical and future share prices are correlated, then the values will form almost a straight line, when plotted on a graph indicating that they move in the same direction. If there is no correlation or a very low correlation, then the values will be plotted on a random basis without having any significant pattern.

A sample of auto correlation is shown for one of the under the study companies, for 121 days, with a lag of one day along with the final results for all the ten companies is

COMPUTATION OF AUTO CORRELATION

COMPANY	AUTO CORRELATION
APOLLO	-0.11642
HERCULES	-0.1022
JM FINANCIAL	-0.00305
KARUR VYSYA	-0.1556
MOTILAL	-0.02004
STATE BANK OF INDIA	0.002656
TAKE SOLUTIONS	-0.01725
TANLA	-0.03707
TEXMA	0.055191
TRICOMA	0.022726

It has been observed that the stock movement predictability is very low for all the companies. In fact, for seven companies, negative auto correlation values which imply that future stock return changes move in the opposite direction of current stock return changes.

RUNS TEST

These tests are conducted by replacing absolute numbers by signs. These merely count the number of runs, namely consecutive price changes or signs in the same direction and their repetition at a later date.

$$Z_{cal} = \frac{|u - u_r|}{\sigma_{ur}} \quad \sigma_{ur} = \sqrt{\frac{2 n_1 n_2 (2 n_2 n_2 - n_1 - n_2)}{(n_1 + n_2)^2 \cdot (n_1 + n_2 - 1)}}$$

$$u_r = \frac{2 n_1 n_2}{n_1 + n_2} + 1$$

Where n₁ represents number of positive price changes

n₂ represents number of negative price changes

u_r represents mean of the sample

u represents number of runs

σ_{ur}

Represents standard deviation of the sample

Following is the summary of the results obtained after conducting run test for the ten companies under consideration for the financial year 2008-09:

Sl. No	COMPANY	RUNS	PLUS	MINUS	MEAN	STD.DEV
1	APOLLO	125	110	132	121	7.697604
2	HERCULES	111	103	138	118.9585	7.581845
3	JM FINANCIAL	104	91	151	114.562	7.282892
4	KARUR VYSYA	116	110	135	122.4425	7.728527
5	MOTILAL	115	116	126	121.7934	7.748711
6	STATE BANK OF INDIA	161	144	159	152.1287	8.667661
7	TAKE SOLUTIONS	113	99	143	118	7.504356
8	TANLA	108	100	142	118.3554	7.527247
9	TEXMA	114	106	136	120.1405	7.642238
10	TRICOMA	115	96	146	116.8374	7.429292

Using the above mean, standard deviation and number of runs values, run test is conducted to see if there is any relationship between historical and future share prices.

TESTING OF HYPOTHESIS

H_0 - Historical and future share prices are independent

H_A - Historical and future share prices are dependent

Sl. No	COMPANY	Z-Cal Values
1	APOLLO	0.519642
2	HERCULES	1.04968
3	JM FINANCIAL	1.450248
4	KARUR VYSYA	0.805391
5	MOTILAL	0.876712
6	STATE BANK OF INDIA	1.023493
7	TAKE SOLUTIONS	0.66628
8	TANLA	1.37572
9	TEXMA	0.803494
10	TRICOMA	0.246956

Z tabulated value is 1.645 which is higher than Z calculated value in all the cases. So, the null hypothesis is accepted. Hence, it can be concluded that historical share prices are not related to future share prices.

SEMI-STRONG HYPOTHESIS

The semi strong form of efficient market hypothesis says that the current market prices will reflect instantaneously all publicly available information about the corporations being studied. Furthermore, the semi-strong form says that efforts by analysts and investors to acquire and analyze public information will not yield consistently superior returns to the analyst. Examples of the type of public information are corporate reports, corporate announcements and information relating to corporate dividend policy, forthcoming stock splits, annual earnings per share, initial public offering, bonus issue of shares etc. Hence, according to the semi-strong form of hypothesis, analysts would have great difficulty trying to profit using fundamental analysis.

The tests that will be conducted in this section test whether in fact all the publicly available information and news announcements such as dividend declaration and information about stock splits. Furthermore, these tests attempt to analyze if an analyst using such data when they become available to him can successfully use this information to obtain superior investment returns. A great majority of the semi-strong efficient tests conducted provide strong empirical support for the hypothesis. However, there have been some notable exceptions to this support. Most of the reported results show that stock prices do adjust rapidly to announcement of new information. Further, some studies indicate that investors are unable to utilize this information to earn consistently above average returns.

EVENT STUDY: A scheme based upon trading on an information event is usually tested with an event study. Event studies are conducted to test whether it is possible to earn risk-adjusted returns by trading on information like earnings announcements, stock splits, bonus issues and acquisition announcements.

PORTFOLIO STUDY: A scheme based upon trading on an observable characteristic is usually tested with a portfolio study. Portfolio studies are conducted to test whether it is possible to earn risk-adjusted returns by trading on an observable characteristic of a firm like Price-earnings ratio, price-book value ratio and dividend yield.

TESTING OF HYPOTHESIS

H_0 - There is a no significant difference between share prices before and after declaration of dividend

H_A - There is a significant difference between share prices before and after declaration of dividend

COMPANY	T test Calculated Values
Godrej Consumer Product	0.010285
Havells India	0.385242
HCL Info systems	0.158371
Mastek	0.238641
Mphasis	0.285312
SAIL	0.225537
SBI	0.071409
Tata Investment Corp	0.202263
Educomp Solutions	0.348241
TVS Motors	0.176347

T tabulated value is 1.833 at 5% level of significance. It is found that calculated value of T to be lesser than 1.833 in all the above cases. So, Null Hypothesis is accepted. Hence it can be concluded that there is no significant difference between share prices before and after declaration of dividend.

STOCK SPLIT

A stock split or stock divide increases or decreases the number of shares in a public company. The price is adjusted such that the before and after market capitalization of the company remains the same and dilution does not occur. It is often claimed that stock splits, in and of themselves, lead to higher stock prices; research, however, does not bear this out. What is true is that stock splits are usually initiated after a large run up in share price. Momentum investing would suggest that such a trend would continue regardless of the stock split. In any case, stock splits do increase the liquidity of a stock; there are more buyers and sellers for 10 shares at Rs.100 than 1 share at Rs. 1000.

Other effects could be psychological. If many investors believe that a stock split will result in an increased share price and purchase the stock the share price will tend to increase. Others contend that the management of a company, by initiating a stock split, is implicitly signaling its confidence in the future prospects of the company.

In a market where there is a high minimum number of shares, or a penalty for trading in so-called odd lots (a non-multiple of some arbitrary number of shares), a reduced share price may attract more attention from small investors. Small investors such as these, however, will have negligible impact on the overall price.

Table showing details regarding the stock splits by the ten companies under consideration during the financial year 2008-09

SL. NO	COMPANY	DATE OF STOCK SPLIT	RATIO OF STOCK SPLIT
1	Bajaj Electric	28-01-2010	10:2
2	HBL Power	24-11-2009	10:1
3	Bharti Airtel	24-07-2009	10:5
4	Hind Nat Gls	12-11-2009	10:2
5	Educomp Sol	27-10-2009	10:2
6	Vishal Info	27-02-2009	10:1
7	GMR Infra	01-10-2009	2:1
8	Birla Cotsyn	23-10-2009	10:1
9	Gammon Infra	26-10-2009	10:2
10	Take Solutions	18-09-2008	10:1

TESTING OF HYPOTHESIS

H_0 - There is a no significant difference between share prices before and after announcement of stock split.

H_A - There is a significant difference between share prices before and after announcement of stock split.

COMPANY	T-test values
Bajaj Electric	0.209473
HBL Power	0.05081
Bharti Airtel	0.498327
Hind Nat Gls	0.243536
Educomp Solutions	0.372319
Vishal Information Systems	0.393453
GMR Infra	0.301717
Birla Cotsyn	0.154367
Gammon Infra	0.131549
Take Solutions	0.113235

T tabulated value is 1.833 at 5% level of significance. It has been found that calculated value of T to be lesser than 1.833 in all the above cases. So Null Hypothesis is accepted. Hence it can be concluded that there is no significant difference between share prices before and after announcement of stock split.

STRONG FORM HYPOTHESIS

The Strong form efficient market hypothesis holds that all available information, whether public or private, is reflected in the stock prices. Obviously, this represents an extreme hypothesis and it would be surprising if it were true.

To test the strong form efficient market hypothesis, many researchers analyzed the returns earned by certain groups (like corporate insiders, specialists on stock exchanges and mutual fund managers) who have access to information which is not publicly available and/or ostensibly possess greater resources and abilities to intensively analyze information which is in the public domain. Empirical evidence broadly suggests the following:

- Corporate insiders (who may benefit from access to inside information) and stock exchange specialists (who have monopolistic access to buy and sell order position) earn superior rates of return, after adjustment for risk.
- Mutual fund managers do not, on an average, earn superior rate of return. As Malkiel put it, "No scientific evidence has yet been assembled to indicate that the investment performance of professionally managed portfolios as a group has been any better than that of randomly selected portfolios".

To test for strong-form efficiency, a market needs to exist where investors cannot consistently earn excess returns over a long period of time. Even if some money managers are consistently observed to beat the market, no refutation even of strong-form efficiency follows: with hundreds of thousands of fund managers worldwide, even a normal distribution of returns (as efficiency predicts) should be expected to produce a few dozen "star" performers.

MUTUAL FUND

A mutual fund is a professionally managed type of collective investment scheme that pools money from many investors and invests it in stocks, bonds, short-term money market instruments, and/or other securities. The mutual fund will have a fund manager that trades the pooled money on a regular basis. As of early 2008, the worldwide value of all mutual funds totals more than \$26 trillion.

Mutual funds offer several advantages over investing in individual stocks. For example, the transaction costs are divided among all the mutual fund shareholders, which allows for cost-effective diversification. Investors may also benefit by having a third party (professional fund managers) apply expertise and dedicate time to manage and research investment options, although there is dispute over whether professional fund managers can, on average, outperform simple index funds that mimic public indexes. Yet, the Wall Street Journal reported that separately managed accounts (SMA or SMAs) performed better than mutual funds in 22 of 25 categories from 2006 to 2008.

The EMH theory propagates that the current market prices reflect the past market prices, freely available information and also insider information. Hence according to EMH it is not possible to earn excess returns even by carefully analyzing the historical prices and other information. So, this research is being conducted with the objective to test whether the returns provided by diversified equity funds of various mutual funds (which consider technical analysis, fundamental analysis and also insider information) exceed the returns offered by randomly constructed portfolios. For this purpose 30 mutual fund schemes have been randomly selected and their performance over the past financial year will be compared to that of randomly selected portfolios which consists of stocks of NSE listed companies.

The following table gives an extract of Annualized returns of selected 30 Mutual Fund Schemes for the year 07-03-2009 to 07-03-2010.

SL.NO	MUTUAL FUND SCHEME	%ANNUAL RETURN
1	Sundaram BNP Paribas CAPEX OppReg-D	103.5526
2	Tata Service Industries	150.8565
3	Birla Sun Life India Opportunities	150.2713
4	Franklin India High Growth Companies	150.2092
5	Morgan Stanley A.C.E.	149.2565
6	HDFC Equity	148.5887
7	Bharti AXA Tax Advantage Eco	148.2609
8	DSPBR Technology.com Reg	148.0922
9	Bharti AXA Tax Advantage Reg	147.7174
10	Sundaram BNP Paribas CAPEX OppReg-G	147.5904
11	Franklin Pharma	147.191
12	Tata Life Sciences & Tech	147.2233
13	UTI Transportation and Logistics	147.0219
14	Religare Banking	146.3415
15	Reliance Regular Savings Equity	146.087
16	L&T Opportunities	145.3999
17	Sundaram BNP Paribas Financial Services Opportunities Ret	145.2599
18	JP Morgan India Smaller Companies	144.4853
19	UTI Banking Sector Reg	143.5461
20	Kotak PSU Bank ETF	143.3772
21	ICICI Prudential Banking and Financial Services Ret	143.0442
22	IDFC Premier Equity Plan A	141.7032
23	JM Core 11 Series 1	139.8907
24	Templeton India Growth	139.6978
25	HDFC Mid-Cap Opportunities	139.2857
26	ING Dividend Yield	139.0453
27	HSBC Midcap Equity	138.8584
28	Birla Sun Life Tax Relief 96	126.062
29	HDFC Infrastructure	137.5271
30	Canara Robeco Equity Tax Saver	116.2963

Following is one of the samples out of the 10 random portfolios that were created containing 30 stocks each:

STOCK NAME	% ANNUAL RETURN
STATE BANK OF INDIA	118
SBM	114
ICICI BANK	235
AXIS BANK	274
BANK OF BARODA	208
PUNJAB NATIONAL BANK	199
HDFC BANK	122
ORIENTAL BANK OF COMMERCE	200
UNION BANK OF INDIA	127
BANK OF INDIA	75
ING VYSYA BANK	164
KARUR VYSYA BANK	120
J& K BANK	200
CANARA BANK	185
HSBC	369
VIJAYA BANK	140
ANDHRA BANK	160
BANK OF MAHARASTRA	170
BANK OF RAJASTHAN	108
ALLAHABAD BANK	262
CITY UNION BANK	156
DENA BANK	193
DEVELOPMENT CREDIT BANK	160
YES BANK	492
INDUSLAND BANK	462
KARNATAKA BANK	111
SYNDICATE BANK	120
STATE BANK OF BIKANER	158
STATE BANK OF TRAVANCORE	220
UCO BANK	160

Following is the average of annualized returns that were obtained from the 10 random portfolios created:

PORTFOLIOS	% AVERAGE ANNUAL RETURN
1	145.6452
2	166.6
3	194.1935
4	192.7333
5	147.267
6	176.2
7	167.2
8	500
9	185.4
10	141

Here single factor ANOVA is calculated using inbuilt function of Microsoft Excel. Level of Significance is taken at 5%.

H_0 : There is no significant difference in returns earned by mutual funds and random portfolios.

H_A : There is a significant difference in returns earned by mutual funds and random portfolios.

SUMMARY

Groups	Count	Sum	Average	Variance
Column 1	10	2016.239	201.6239	11360.81816
Column 2	30	4261.74	142.0579862	105.1005841

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	26610.74	1	26610.73565	9.603544917	0.003645612	4.098171731
Within Groups	105295.3	38	2770.928431			
Total	131906	39				

Since F_{cal} value is lesser than F_{tab} value i.e. $9.6035 < 4.09812$, we reject the null hypothesis. Therefore we can conclude that there is a significant difference in returns earned by mutual funds and random portfolios.

FINDINGS

FOR WEAK FORM HYPOTHESIS

- The stock movement predictability is very low for all the companies. In fact, for seven companies we find negative auto correlation values which imply that future stock return changes move in the opposite direction of current stock return changes.
- As stock predictability is low, there is a lot of risk and deviation involved if we try to predict future share prices using past data. Hence, it is not possible to earn abnormal returns consistently in the long run.
- From conducting Run test, it has been found that historical share prices are not related to future share prices.
- As past and current stock prices are not related to future stock prices, it can be concluded that the market discounts all past prices of shares.
- It can be concluded that Indian stock market is efficient in its weak form as we cannot earn superior returns using historical information of shares.

FOR SEMI-STRONG HYPOTHESIS

- There is no significant difference between share prices before and after declaration of dividend.
- Hence, Market readily discounts information regarding dividend announcement and these changes are reflected in the new market prices.
- There is no significant difference between share prices before and after announcement of stock split.
- Hence, it is not possible to take advantage of availability of information regarding stock split.
- Therefore it can be said that markets are efficient in the semi-strong form and hence it is not possible to earn abnormal returns in the long run using publicly available information, such as, company fundamentals etc.

FOR STRONG FORM HYPOTHESIS

- Mutual funds earn abnormal returns as compared to random portfolios.
- Therefore, there is a significant difference in returns earned by mutual funds and random portfolios.
- Therefore, it can be concluded that markets are efficient in the strong form.
- Investors can earn abnormally high return if they have access to insider information.
- There is a direct relationship between risk and return from the above analysis.

In a market that is essentially characterized by a large number of rational and profit seeking investors who compete with one another freely, the prices should reflect all the available and expected information. But in this report it has been observed that share prices readily discount all historical share prices and publicly available information. But it does not reflect insider information readily and therefore there is a possibility of making abnormal returns in such cases. It can be concluded that historical share prices are not a major determinant of future share prices. Also, announcement of various information relating to the companies are not much useful for making profits. The only way to earn superior returns on a consistent basis would be to either invest in mutual funds or transact with the help of insider information.

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