



A Study of Market Efficiency- Indian Stock Market

Chandra Shekhar, Pallavi Rai
Mahat Research and Advisory Private Limited

Correspondence Author e-mail: raju100002001@gmail.com

Abstract

In this study the observation is about the Indian stock market's strong form efficiency, however, is it volatile or the internal or external factors have an effect on the market or how it changes on insider information etc. In this study data used June -2020 quarterly results of BSE 200 based companies. And the second set of data contains the daily adjusted closing prices of sample companies which are listed in Bombay Stock Exchange. The study shows that market is not strongly efficient.

Keywords: Indian stock market, factors affecting the market, efficient market hypothesis (strong form).

1. Introduction

Introduction of researcher's work

A market is efficient if it does not offer systematic profits beyond those excepted from the risks taken. Profits are permitted with the risk taken these profits are expected on the observation of the market price of risk. Excess profits are only due to the chance of the risk taken. That is also when systematic excess returns that the null hypothesis of zero excess returns should be rejected with a high degree of confidence. (ICMA Centre Portfolio's note).

Maurice Kendall examined this preposition in 1953, found there are no predictable patterns in stock price, it is evolved randomly. The prices of particular are likely to go up, but gone down regardless of the past performance. The data provided no chance to predict price movement.

The efficient market hypothesis emerged as a prominent theoretic position in the mid-1960s. Paul Samuelson had considered Bachelier's work among economists. In 1964, Bachelier's dissertation along with the empirical studies mentioned above were published in an anthology edited by Paul Coontz. Eugene Fama published in dissertation in favor of the random walk hypothesis in 1965 and Samuelson had published a proof for a description of the EMH. Fama had circulated a review of the theory and the evidence for the hypothesis in 1970. The paper further extended and refined the theory, included the definitions for three forms of market efficiency: weak, semi-strong and strong.

2. Efficient Market Hypothesis

The efficient market hypothesis is commonly identified in three collective methods — weak form efficiency, semi-strong form efficiency, and strong-form efficiency, each method of efficient market hypothesis has different implications on markets.

2.1 Weak-form efficiency

Superfluous returns cannot be grossed by using investment strategies based on historical share prices.

Weak-form efficiency indicates that technical analysis techniques cannot capable to steadily earn excess returns, though other forms of fundamental analysis may still provide excess returns.

Current share prices are the best, unbiased, estimate of the value of the security in the weak-form efficient market. Theoretical in nature, weak-form efficiency advocates assert that fundamental analysis can be used to identify stocks that are undervalued and overvalued. Therefore, keen investors looking for profitable companies can earn profits by going through financial statements.

2.2 Semi-strong form efficiency

Semi-strong form efficiency indicates that share prices move drastically according to the information, and in an unbiased fashion, such that no superfluous returns can be made by trading on such information.

Semi-strong form efficiency specifies that Fundamental analysis techniques will not be able to consistently produce superfluous returns.

For testing the semi-strong form efficiency, the adjustments to previously unknown news must be of a reasonable size and must be instantaneous. Regular upward or downward adjustments after the initial change must be looked for is examined. If there are such adjustments it would be recommended that investors had interpreted the information in a biased fashion and hence in an inefficient manner.

2.3 Strong-form efficiency

Share prices reflect on the facts (news), which is available in any form, and no one can make superfluous returns.

Due to insider trading law, the legal barriers the private information to become public, strong-form efficiency is unmanageable, except in the case where the laws are universally ignored.

For testing the 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 tens of thousands of fund managers worldwide, even a normal distribution of revenues (as efficiency forecasts) should be probable to produce a few dozen "star" performers.

Some of the evidence is there that some of the time all three forms of efficiency may be broken. But the deviations from efficiency are worth more or less amount of time and efforts spent on detecting them and acting on the information. In other words, there is a general market equilibrium that takes into account research expenses, transaction costs, commissions, taxes, ... even risks of getting caught doing something illegal, within which investment bankers, equity analysts, chartists, brokers lawyers, regulators, etc., can keep their clients happy and make a reasonable profit. A wider measure of efficiency, would take into account, costs of all people working in the investment business, abnormal returns (alphas) exhibited by some assets and benefit of an efficient allocation of savings to the economy (very difficult to assess). Active competition and honesty, as promoted by strong legal, accounting and regulatory framework are the guarantors of market efficiency. Success in detecting inefficiencies (unless kept secret) is bound to be temporary as investors would learn from it. (ICMA Centre Portfolio's note).

3. Research done on Indian Market Efficiency by Indian market researchers

Three types of informational efficiency (weak, semi-strong and strong) have been well identified by researchers in the field of capital markets throughout the world.

3.1 Weak efficiency

Weak efficiency states that current prices fully reflect all the information contained in the history of past prices and denies the utility of charting and technical analysis. This issue has been researched in India over a long period and the overwhelming preponderance of evidence, for example, Barua (1980, 1987); Sharma (1983); Ramachandran (1985); Sharma and Kennedy (1977); Gupta (1985) is in favour of weak form efficiency. There have been only a few studies (Kulkarni (1978) and Chaudhury (1991a, b, c)) which did not support the weak efficiency hypothesis.

As per the above evidence, the outcomes of Bhat and Pandey (1987) appear paradoxical. On the basis of a questionnaire survey, they conclude that the users and preparers of accounting information in India do not believe that the market is efficient in any of its three forms.

Bhat (1988a) studies the relationship between the regional market indices in the Indian stock market over the period 1971-85 using monthly data. He finds that the regional price indicators respond immediately to the all-India index, but cautions that his study is not adequate to conclude the existence of an integrated national market.

3.2 Semi strong

Semi strong form of efficiency deals with the speed with which publicly available information is assimilated by the market and incorporated in market prices. The evidence on this issue is mixed.

Subramaniam (1989) found that in the case of political events, the market appeared to respond more efficiently to events whose impact on share values was characterized by low complexity and high clarity. The market seemed to have difficulty with ambiguous and complex events. Ramachandran (1985) and Srinivasan (1988) found that the market was by and large efficient in responding to the information content of bonus issues and rights issues respectively.

A closely related question is the extent to which share prices reflect (publicly known) fundamentals. Dixit (1986) shows that dividend is the most important determinant of share prices. This is consistent with standard theories of fundamental value. However, Barua and Raghunathan (1990a), Sundaram (1991) and Obaidullah (1991), Sinha (1992) cast doubts on whether the observed price earnings ratios are consistent with fundamental factors like dividend growth and payout ratios.

Another related question is whether the pricing in Indian markets is consistent with the risk return parity postulated by the Capital Asset Pricing Model (CAPM). While Varma (1988) and Yalawar (1988) provide evidence in favour of the CAPM, Srinivasan (1988) argues that the CAPM relationship holds only in the long run. The validity of the CAPM is important as many tests of the efficient market hypothesis implicitly assume the validity of the CAPM. More detailed tests of the CAPM and also of the competing Arbitrage Pricing Theory are important areas for future research.

Barua and Raghunathan (1986) provide evidence of the systematic mispricing of convertible securities in violation of the risk return parity and argue that this represents an arbitrage opportunity. Though this paper provoked a heated debate on whether the arbitrage opportunity was really risk-free, the mispricing of convertible securities remains an unexplained anomaly.

Regarding the behaviour of interest rates and fixed income securities, there is hardly any research yet. Interest rates have been progressively freed since 1991 but the transition to a total free market regime is likely to be

completed only by the mid-1990s. The study by Nachane (1988) of the few interest rates that have historically been subject to some extent to market forces assumes significance in this context. Nachane found that the market for lendable funds as reflected in the call market rate, bazaar bill rate, and the SBI Hundi rate is inefficient. The Fisherine hypothesis that interest rates reflect anticipated inflation is also rejected.

3.3 Strong From

The third form of market efficiency (strong from) asserts that even inside information which is not publicly available is reflected in market prices very rapidly. This hypothesis is usually tested by evaluating the performance of mutual funds whose managers can be expected to have some degree of inside information. The research in this field is discussed in a separate section of this review.

4. Area of study- Strong-form efficiency in Indian Stock Market

The economy is going ahead at 8 per cent per annum and the capital markets are going up by 800 per cent. There is a total discrepancy between the real and the financial economy here. All significant information, including insider information, is reflected in the share price. Here the focus is on insider trading, in which a few privileged individuals (for example directors) are able to trade in shares, as they know more than the normal investor in the market. In a strong-form efficient market even insiders are unable to make abnormal profits (note that the market is acknowledged as being inefficient at this level of definition). A Strong form Efficiency Test Example: It is well known that it is possible to trade shares on the basis of information not in the public domain and thereby make abnormal profits. In this respect stock markets are not strong form efficient. Trading on inside information is alleged to be a “bad thing” as per regulation. It makes those outside of the charmed circle feel cheated. A breakdown of the fair game perception will leave some investors feeling that the inside traders are making profits at their expense. If they start to believe that the market is less than a fair game they will be more reluctant to invest and society will suffer. To avoid the loss of confidence in the market most stock exchanges attempt to curb insider dealing and it is a criminal offence for most exchanges (if not all). Insider trading is considered to be, besides dealing for oneself, either counseling or procuring another individual to deal in the securities or communicating knowledge to any other person, while being aware that he or she (or someone else) will deal in those securities. The efficient market hypothesis has many implications for the investors and the companies. Investors-For the vast majority of people public information cannot be used to earn abnormal returns (that is, returns above the normal level for that systematic risk class).

Fundamental analysis are of no use, as long as efficiency is sustained by the average investor by selecting a suitably diversified-portfolio. Investors need to stress for a greater volume of timely information. Semi-strong efficiency depends on the quality and quantity of publicly available information, and so companies should be encouraged by investor pressure, accounting bodies, government rulings and stock market regulation to provide as much as is compatible with the necessity for some secrecy to prevent competitors gaining useful knowledge. More restrictions and preventions positioned on insider dealers to improve the perception of a fair game market.

The EMH also has a number of implications for companies such as Focus on substance, not on short-term appearance. Some managers behave as though they can fool shareholders. For example, creative accounting is used to show more impressive performance than actual. Most of the time these tricks are transparent to investors, who are able to interpret the real position, and security prices do not rise artificially. There are some circumstances when the drive for short-term boosts to reported earnings could be positively unsafe to shareholders. For example, one firm might tend to overvalue its stock to boost short-term profitability, another might not write off bad debts. These activities will consequence in additional, or at least earlier, taxation payments, which will be risky to shareholder wealth. Managers are alert that the analysts frequently pay an abundant arrangement to earn great rate of return, may, when facing a choice between a project with a higher NPV nevertheless reduced short-term ARR, or one with a lower NPV nevertheless higher short-term ARR, will choose the latter here. The timing of security issues does not have to be fine-tuned: Consider a team of managers contemplating a share issue who feel that their shares are currently underpriced because the market is low. They pick to deferral the sale, hoping that the market will rise to a more “normal level”. This defies the logic of the EMH – if the market is efficient the shares are already correctly priced and it is just as likely that the next move in prices will be down as up. The

historical price movements have nothing to say about future movements. The situation is somewhat different if the managers have private information that they know is not yet priced into the shares. In this case if the directors have good news, then they would be wise to wait until after an announcement and subsequent adjustment to the share price before selling the new shares. Bad news announcements are more tricky – to sell the shares to new investors while withholding bad news will benefit existing shareholders, but will result in loss for the new shareholders. The strongest version of market efficiency. It states all information in a market, whether public or private, is accounted for in a stock price. Even Insider information could not help an investor.

Insider trading cost to Investors and Illegal, insider trading costs investors millions of dollars a year by inflating the cost of mergers and acquisitions, according to a Harvard Business School study. Between 1974 and 1990, bidding companies paid an extra \$4 billion as a result of trading on information unavailable to the public. Insider trading is enormously overpriced for the bidding companies. It has brought into being that when insiders ran up the stock price of the company being acquired before the announcement, buyers ended up paying a 30 percent higher exceptional returns for the company, on average, than the otherwise would have. Insider trading could even drive up the stock price so much that the takeover would no longer be practical.

Indian Scenario-Securities and Exchange Board of India (SEBI) prohibits fraudulent and unfair trading practices, including insider trading and self-dealing. Insider trading is defined as, taking place when insiders or other persons who, by virtue of their position in office or otherwise, have access to unpublished price sensitive information linking to the matters of a company, and deal in the securities of such company or cause the trading of securities while in possession of such information, or communicate such information to third party, who can use it in connection with the buying or sale of securities.

Penalty for insider trading, if any insider who, -

- (i) either on his own behalf or on behalf of any other person, deals in securities of a body corporate listed on any stock exchange on the basis of any unpublished price sensitive information; or
- (ii) communicates any unpublished price sensitive information to any person, with or without his request for such information except as required in the ordinary course of business or under any law; or
- (iii) counsels or procures for any other person to deal in any securities of anybody corporate on the basis of unpublished price sensitive information,

However, implementation of the Act is problematic. Despite full-fledged electronic trading facilities at the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE), it is difficult to flag a trade as a possible case of insider trading. In the given market, the number of brokers and intermediaries who operate in the market, a person with insider information can create fire-walls between himself and the regulators. Multiple listing are additional factor making surveillance more difficult, which are common. The main surveillance accountability is with the principal stock exchange. Due to unavailability of sophisticated surveillance mechanism, monitoring compliance becomes almost impossible for the regional exchange. Despite this handicap, SEBI has initiated probes in several cases of insider trading.

The market movements are welcomed, as they are good from the Investors point of view. But market have to checked for movements which are detrimental to investors, especially if such movements are witnessed prior to certain announcements and are of abnormal nature or are at the cost of the other investors. To mention, the share price of Penta four Software moved from Rs. 144.75 on December 1, 1997 to Rs. 359.50 on March 6, 1998, on rumors of an impending takeover of the company. Following news reports of India Cements making a bid for Rassi Cement and the subsequent announcement by India Cements, the latter's share price moved up from Rs. 56.50 on December 1, 1997 to Rs. 239.10 on March 6, 1998. In 1998, 2007, 2009 and 2013, Indian financial markets were rocked by massive share price rigging fraud. It involved reputed industrial groups such as BPL, Sterlite and Videocon. In 1998 and 2007 No punitive action has been taken so far by SEBI against the main offenders.

The controversy is related to the rigging of share prices of a private bank, Global Trust Bank (GTB). It has been alleged that Ketan Parekh and his associates rigged the share prices of the GTB prior to its merger with the UTI Bank, in order to improve the swap ratio in favor of GTB. Parekh and his associates were the key traders, the

share price of GTB rose from Rs.70 in October 2000 to Rs.117 within three weeks. It is only now when the bank merger had already been announced that investigations have been launched to look into Ketan Parekh's role in alleged insider trading. The interim investigations carried out by India's regulatory authority, Securities and Exchange Board of India (SEBI) found evidence of a nexus. Between Ketan Parekh and Ramesh Gelli, promoter of GTB. Unfortunately, in most of the instances, the response of the regulatory agencies has been reactive rather than proactive. The regulatory agencies come into the picture when the loss had already been done, just like standard Indian movies. Despite of the fact that regulatory authorities have an armory of instruments at their disposal to prevent such frauds. As per Mr. L C Gupta, former member of SEBI Board, even when actions are taken, they are generally ad hoc in nature. Due to these reasons, there is a growing feeling that the regulatory authorities, particularly the SEBI, tend to protect the interests of big players rather than small investors.

5. Objectives and Hypotheses

This study examines the stock market reactions to insider information in strong form of EMH. We have framed following objectives and hypotheses after analysing the available literature on insider information.

5.1 Objectives of the study

This study intends to realize the following objectives:

1. To test whether Indian stock market follows strong form of EMH.
2. To test the stock market reactions to insider information.

5.2 Hypotheses

The following hypotheses are being tested

1. The investors cannot earn abnormal returns by trading in the stocks after the insider information.
2. The average abnormal return and cumulative average abnormal return are close to zero.
3. The average abnormal returns occur randomly.
4. There is no significant difference between the number of positive and negative average abnormal returns.

5.3 Sample, Data, and Methodology

5.3.1 Sample and Data

We have used June -2020 quarterly results of BSE 200 based companies. We used 160 companies' quarterly earnings announcement for this quarter. We have used three sets of data. The first set of data consists of media announcement dates of quarterly results of the sample companies.

The second set of data contains the daily adjusted closing prices of sample companies which are listed in Bombay Stock Exchange. Finally, the daily closing prices of BSE-200 index is used to find out the market return.

5.3.2 Methodology

The event study methodology is used to examine the information flow during quarterly earnings announcement. The dates on which quarterly earnings announcements are released by the sample companies are defined as the event dates ($t = 0$). The 61 days surrounding the announcement of earnings (i.e., $t = -30, \dots, 0, \dots, +30$) is designated as the "event" period or event window. The days before the event period (i.e., $-480, \dots, -31$) are designated as the "estimation" or "non-event" period. The ordinary least squares simple regression line is used to estimate expected returns of the sample companies for the event window. The estimated abnormal returns are averaged across securities to calculate average abnormal returns (AARs) and average abnormal returns are then cumulated over time in order to ascertain cumulative average abnormal returns (CAARs). The Sharpe Market Model (1964) is used to measure the returns of stock.

The abnormal returns of individual security are averaged for each day surrounding the event day i.e., 30 days before and 31 days after the event day. The ARR is the deviation of actual return of a security from the expected return.

The computed ARR is accumulated over a long period to find out Cumulated Average Abnormal Return (CAAR). The computed CARR should be close to zero.

Parametric Significance Test

Parametric t test is used to assess the Significance of AAR and CAAR. The 5% level of Significance with appropriate degree of freedom is used to test the null hypothesis that no Significant abnormal return after the event day. It is assumed that if the market is efficient, AAR and CAAR values should be close to zero.

Non Parametric Significance Test

In addition to t test, non -parametric tests like, Run and Sign test are used to test the hypothesis.

Run test

To analyze the randomness in the behavior of AAR, Run test is used. Run test has been conducted for AARs before and after the event day and also for the event window.

Sign test

In this test positive and negative Signs are used instead of quantitative values. The null hypothesis for this test is that there is no significant difference between the number of positive and negative AARs. We calculated Sign test before and after the event day and also for the event window.

6. Empirical Results

It has been examined the strong form of EMH by using above mentioned methodology and the empirical results are shown below.

Table 1-Day Event Period Results of AAR and CAAR

Days	Market Model With Raw Return		Market Model With Log Return	
	AAR	CAAR	AAR	CAAR
-30	-0.000130	-0.000130	-0.000034	-0.000034
-29	0.004426	0.004301	0.004462	0.004428
-28	-0.001130	0.003171	-0.000960	0.003469
-27	-0.000830	0.002345	-0.000760	0.002714
-26	0.001297	0.003642	0.001291	0.004004
-25	-0.004710	-0.001070	-0.004690	-0.000690
-24	-0.001210	-0.002270	-0.001250	-0.001940
-23	-0.006700	-0.008970	-0.006910	-0.008850
-22	-0.005280	-0.014250	-0.005390	-0.014230
-21	-0.004360	-0.018610	-0.004370	-0.018600
-20	-0.003360	-0.021970	-0.003300	-0.021890
-19	0.001255	-0.020720	0.000900	-0.020990
-18	-0.000290	-0.021010	-0.000410	-0.021400
-17	0.001746	-0.019260	0.001603	-0.019800
-16	-0.002320	-0.021580	-0.002220	-0.022020
-15	0.005488	-0.016090	0.005171	-0.016850
-14	0.003100	-0.012990	0.003072	-0.013780
-13	-0.001070	-0.014060	-0.000860	-0.014640

-12	0.001097	-0.012960	0.001099	-0.013540
-11	-0.002260	-0.015220	-0.002310	-0.015850
-10	-0.003780	-0.019000	-0.003850	-0.019700
-9	0.001952	-0.017050	0.001957	-0.017740
-8	0.001159	-0.015890	0.001304	-0.016440
-7	-0.001110	-0.017000	-0.001020	-0.017460
-6	0.000314	-0.016680	0.000142	-0.017320
-5	-0.001990	-0.018670	-0.001990	-0.019310
-4	0.002373	-0.016300	0.002477	-0.016830
-3	0.001991	-0.014310	0.001972	-0.014860
-2	0.005752	-0.008560	0.005681	-0.009180
-1	-0.002350	-0.010910	-0.002230	-0.011410
0	-0.000480	-0.011390	-0.000890	-0.012300
1	-0.005250	-0.016640	-0.005830	-0.018120
2	0.005423	-0.011220	0.005363	-0.012760
3	-0.002220	-0.013450	-0.002170	-0.014930
4	-0.000410	-0.013860	-0.000350	-0.015280
5	0.002227	-0.011630	0.002291	-0.012990
6	-0.002440	-0.014070	-0.002370	-0.015350
7	-0.001300	-0.015370	-0.001240	-0.016590
8	-0.001970	-0.017340	-0.001780	-0.018370
9	0.002029	-0.015310	0.002107	-0.016260
10	-0.000330	-0.015640	-0.000170	-0.016420
11	-0.000450	-0.016090	-0.000390	-0.016810
12	0.000095	-0.016000	0.000133	-0.016680
13	-0.001920	-0.017920	-0.001780	-0.018460
14	0.000482	-0.017440	0.000695	-0.017760
15	-0.000980	-0.018420	-0.000840	-0.018600
16	-0.001560	-0.019980	-0.001380	-0.019980
17	-0.001230	-0.021210	-0.001050	-0.021030
18	0.001749	-0.019460	0.001914	-0.019120
19	-0.003140	-0.022600	-0.002950	-0.022060
20	0.000903	-0.021700	0.001088	-0.020970
21	-0.000310	-0.022010	-0.000072	-0.021050
22	-0.001120	-0.023130	-0.000850	-0.021900
23	0.001480	-0.021650	0.001597	-0.020300
24	-0.000310	-0.021960	-0.000160	-0.020460
25	0.000012	-0.021940	0.000176	-0.020280
26	-0.000720	-0.022660	-0.000510	-0.020790
27	-0.000930	-0.023590	-0.000740	-0.021540
28	0.000341	-0.023250	0.000634	-0.020900
29	-0.000990	-0.024250	-0.000870	-0.021770
30	0.000553	-0.023690	0.000677	-0.021100

Table 1 presents the results of the share price response to quarterly earnings announcements for the event window (61-day event window). To examine two market model has been used, market model with raw return and log return for the analysis.

Under market model with raw, it is observed that AAR are negative for 17 days and positive for 13 days before the event day. The AAR is negative for 20 days and positive for 11 days after the event day. Whereas, the CAAR values are negative for 26 days and positive for 4 days before the event day. It is also observed that the CAAR is negative for all the days after the event day. When the entire event window is observed, AAR values are negative for 37 days and positive for 24 days and CAAR values are positive for 4 days and negative for 57 days.

However, market model with log return shows that AAR is negative for 17 days and positive for 13 days before the event day. It is also observed that AAR is negative for 20 days and positive for 11 days after the event day. Further, CAAR values are positive for 4 days and negative for 26 days before the event day and it is observed that CAAR values are negative for all the days after the event day. During the entire event window, AAR is positive for 37 days and negative for 24 days. At the same time CAAR is negative for 57 days and positive for 4 days during the event window of 61 days.

Further, the above table shows that both in the market model with raw return and market model with log return the CAAR value is continuously negative for 56 days. CAAR value is consecutively negative from 25th day prior to the event day till the last day of the event window. This suggests that the market expected negative information from the quarterly earnings announcement and bad news was conveyed to the market and negative response continued even 30 days after the announcement of insider information.

Notes:

- Before: Number of Runs, Run Statistics, and Sign Statistics before the event day.
- After: Number of Runs, Run Statistics, and Sign Statistics after the event day.
- Overall: Number of Runs, Run Statistics, and Sign Statistics for the event window (-30 through 30 days.)
- If the Run and Sign test statistics is greater than the critical value of ± 1.96 , the relevant AAR is statistically significant at 5% level of significance.

To analyze the randomness in the behavior of AAR, Run test is used. Sign test helps in analyzing the signs of AAR. It is clear from the above table that under both the model Run statistics are insignificant before event day, after event day and during the event window (i.e. calculated Run statistics is less than the critical value ± 1.96) and therefore we accept the null hypothesis that AAR occurred randomly for the entire event window.

Table 2: Run and Sign Statistics of AAR

Table 2. Run and Sign Test Statistics for June 2020 Quarter						
	Market Model With Raw Return			Market Model With Log Return		
	Runs	Run Statistics	Sign statistics	Runs	Run Statistics	Sign statistics
Before	16	0.0000	-1.6645	16	0.0000	-1.6645
After	20	1.7868	-0.7303	20	1.7868	-0.7303
Overall	35	0.9062	-1.6164	36	1.1645	-1.6164

Table 3: 't' Test Statistics on AAR and CAAR									
		Market Model With Raw Return				Market Model With Log Return			
		AAR	%	CAAR	%	AAR	%	CAAR	%
Before	S	7	23.33	22	73.33	6	20.00	22	73.33
	NS	23	76.67	8	26.67	24	80.00	8	26.67
After	S	1	3.23	31	100	1	3.23	31	100
	NS	30	96.77	0	0	30	96.77	0	0
Overall	S	8	13.11	53	86.89	7	11.48	53	86.89
	NS	53	86.89	8	13.11	54	88.52	8	13.11

Note: If the 't' test statistics are greater than ± 1.975 , the relevant values are statistically significant at 5% level

Sign test is calculated statistics to test whether there is any significant difference between the number of positive and negative AAR. The Sign test statistics shows that for both the models, the computed values are not significant 5% level of significance. So this confirms that there is no significant difference between the number of positive and negative AARs.

The above table shows the 't' value of AAR for both models. Under market model with raw return, out of 61 't' values, 8 't' values fall in the rejection region (i.e. calculated 't' value is greater than the critical value of ± 1.6552) and remaining 53 't' values fall within the acceptance region (i.e. calculated 't' value is less than the critical value of ± 1.6552). Whereas in market model with log return, 7 't' values are statistically significant and 54 't' values are statistically insignificant. From this we infer that AAR are approximately zero for almost 87.70% days and therefore no trader could earn a profit if he trades on a daily basis for majority of the days.

It has been observed, CAAR values under both the models, CAARs are statistically insignificant for 8 days during the event window i.e., 8 't' values (61) of the CAAR falls within the acceptance region (i.e., calculated 't' value is less than the critical value of ± 1.6552) and it was statistically significant for 53 days where, 53 't' values fall within the rejection region (i.e., calculated 't' value is greater than the critical value of ± 1.6552) under both the models. So we reject the null hypothesis that the CAAR values are close to zero. From this we infer that market gives opportunity to earn abnormal profit by using the buy-and-hold strategy.

7. Conclusion

This study was undertaken to test whether Indian stock market follows strong form of efficient market hypothesis and empirically investigate the adjustment of stock prices to earnings information. The hypotheses formulated and tested by using 't' test, Run and Sign test. The average abnormal return and cumulative average abnormal returns around announcement date were examined using event study methodology. The results of the Run test show that AAR occurs randomly throughout the window period. The Sign test results indicate that there is no significant difference between the number of positive and negative AARs. The 't' test statistics accept the null hypothesis that AAR values are close to zero. Excess of abnormal return is noticeable by observing the CAAR values. When 't' test statistics for CAAR for both the models, it is found that 86.88% (53 days) significant for the event window. It has been proved in this study that the null hypothesis is invalid i.e. CAAR tend to be zero. The results of the AARs and CAARs indicate that investors would be able to earn abnormal returns by analysing the quarterly earnings of June 2020 and by selling the stocks after the results are announced. The information adjustment continues until 30 days after the results announcements. Further, the CAARs show that there is a continuous decline in the values after the June 2018 quarterly results. The analysis specifies that the results had given negative signals to the market. Since the investors incur abnormal losses by buying the stocks and earn abnormal profits by going short on these stocks, we infer that the Indian market is slow in reacting to the publicly available information. This is a sign of market inefficiency. Therefore, it can conclude that Indian stock market is not efficient in the strong form. The results are consistent and stock market is not efficient in strong form and lower earnings direct to negative market reaction.

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