Market Reaction to Earnings Information: An Empirical Study

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This paper examines stock market reaction to earnings information by taking September 2001quarter earnings announcement as an event. The study is based on 149 companies, which are divided into good news, bad news and overall portfolios. We have used event study methodology to test the semi-strong form of efficient market hypothesis. We have used t-test, runs test and sign test. The behavior of AARs and CAARs are examined for 30 days before and 31 days after the announcement of quarterly earnings. The results revealed that market reaction is slow and provides an opportunity to earn abnormal returns.

Keywords: Efficient market hypothesis, earnings announcements, average abnormal returns, and cumulative average abnormal returns.

1. Introduction

In recent years the Securities and Exchange Board of India (SEBI) has initiated a number of reforms to make the Indian stock market at par with developed stock markets of the world. One of such reforms is compulsory quarterly earnings announcement (formerly half yearly earnings) from 1998 onwards. This reform is based on the experiences of regulatory bodies around the world as well as the compulsions of domestic markets. The compulsory announcement of quarterly earnings will have an impact on the stock market. Researchers around the world have studied some of these impacts and it is considered as an event study. Event studies focus on the impact of various announcements like bonus issue, right issue, stock splits, earnings, mergers and acquisitions, buyback of stocks, etc. Quarterly earnings announcements are one of the most important events and the studies on stock market reaction to earnings information are included in the semi-strong form of efficient market hypothesis (EMH). The semi-strong form of efficient market hypothesis states that stock prices reflects all the publicly available information instantaneously and accurately.

The paper is organized into six sections. Following this section, we review literature in Section 2. Section 3 deals with objectives and hypotheses of the study. In Section 4, we present sample, data and methodology. The empirical results are analyzed in Section 5. Section 6 presents summary and conclusions.

2. Review of Literature

In the developed countries of the world such as the USA, the UK, Australia, etc. a substantial amount of research has been carried out on efficient market hypothesis (EMH). A few important studies are reviewed in this paper. Fama, Fisher, Jensen and Roll [11] conducted the first study on semi-strong form of EMH. They examined the behavior of abnormal returns at the announcements of stock splits and found that there is a considerable market reaction prior to the stock split announcement. Jordan [16] assessed the behavior of security prices surrounding the quarterly earnings announcements and found that stock market is efficient in the semi-strong form. Ball and Brown [3] examined price changes surrounding the announcement of a firm's annual earnings and found that the stock market reacts quickly to annual earnings announcements. However, Watts [29], Foster et al. [11] found statistically significant abnormal returns after quarterly earnings announcements. Bernard and Thomas [4, 5], and Ball [1] documented significant delays in the adjustment of stock prices to quarterly earnings announcements.

The studies on semi-strong form of EMH in India yielded mixed results. Srinivasan [29] concluded that the Indian stock market is efficient in semi-strong form. Narayana Rao [27] examined the share price responses to announcement of dividend increase, bonus issue and equity rights and found that the Indian stock market is semi-strong form efficient. However, Obaidullah [23] examined market reaction to half yearly earnings announcement by companies and concluded that semi-strong form of EMH could not be accepted for Indian stock market. Chaturvedi [8] studied the behavior of stock returns both before and after the announcement of half yearly earnings. The results suggested the occurrence of abnormal returns during the pre and post earnings announcement periods. Chaturvedi [9] studied anomalies based on P/E ratios and found that low P/E stocks out perform the high P/E stocks and provided evidence for the market inefficiency. Manickaraj [21] found that the quarterly earnings announcements have information relevant for security valuation and the stock market uses this information and immediately reflects it in stock prices. Market reacts positively to positive information and negatively to negative information. Thus, he concluded that the Indian stock market is semi-strong form efficient. However, Mallikarjunappa and Iqbal [20], Mallikarjunappa [18, 19] and Iqbal [15] found that the Indian stock market does not react immediately to quarterly earnings announcements and provides an opportunity to earn abnormal returns. Therefore, they concluded that the Indian stock market is not efficient in the semi-strong form.

The review of studies shows that there is no conclusive evidence to accept that Indian stock market is semi-strong form efficient. Therefore, this paper focuses on the stock market reaction to quarterly earnings announcements in India in the light of the above inconclusive evidence.

3. Objectives and Hypotheses of the Study

3.1 Objectives of the Study

The objectives of the study are as follows:

1. To test whether the semi-strong form of efficient market hypothesis holds in the Indian stock market.
2. To test the stock market reaction to quarterly earnings announcements.

3.2 Hypotheses

Since this study empirically examines stock market reaction to quarterly earnings information the hypotheses being tested are:

1. The responses of stock prices to the quarterly earnings announcements are complete on the day of the announcement.
2. The investors cannot earn abnormal returns by trading in the stocks after the quarterly earnings announcements.
3. The average abnormal returns and the cumulative average abnormal returns are close to zero.
4. The average abnormal returns occur randomly.
5. There is no significant difference between the number of positive and negative average abnormal returns.

4. Sample, Data and Methodology

4.1 Sample

We have selected 149 companies based on the criteria of foreign holdings. All the companies that have 20 percent or above foreign holdings and are traded on the Stock Exchange, Mumbai (famously called BSE) for more than 40 percent of the trading days during the year, have been chosen as the sample for the study. Further, companies should have announced the quarterly earnings during the September 2001 quarter (quarter selected for this study). Companies that have any price sensitive information during the event window (-30 days to +30 days) are eliminated.

4.2 Classification of Companies into Portfolios

In this study two variables - net profit and net sales – are taken as a base for the construction of portfolio. The method used for the classification of companies into portfolio consists of dividing the companies on the basis of percentage changes in quarterly earnings (net profit) and net sales. The percentage changes in net earnings in the current quarter over corresponding quarter in the previous year are ascertained in the following way:

*(Current quarter net earnings – Corresponding quarter net earnings in the previous year) / (Corresponding quarter net earnings in the previous year) *100*

The percentage changes in net sales in the current quarter over corresponding quarter in the previous year are ascertained in the following way:

*(Current quarter net sales – Corresponding quarter net sales in the previous year)/ Corresponding quarter net sales in the previous year)*100*

Thus, on the above basis we classified companies into three portfolios. The first portfolio includes firms with positive percentage change in net earnings (net profit) and net sales, "good news" portfolio. The second portfolio contains firms with negative percentage change in net earnings (net profit) and net sales, "bad news" portfolio. The third is the overall portfolio, which includes all the firms selected as sample for the study. In case a particular firm's percentage changes in net profit is

positive and net sales is negative and vice versa, in that situation the sign of percentage change in the net profit is considered as a criterion to include that firm in the portfolio. The good news portfolio consists of 66 companies, 83 companies are included in the bad news portfolio and all the 149 companies are included in the overall portfolio.

4.3 Data

We have used three sets of data in this study. The first set of data consists of quarterly earnings announcement made by the sample companies. This includes the dates on which the Board of Directors meets and approves quarterly financial results of the company. The second set of data consists of daily-adjusted closing prices of the stocks selected for the study at the Bombay Stock Exchange for the period covered by this study. Daily-adjusted closing prices are used in the study as these are assumed to reflect the consensus of the market participants regarding price of the stock at the end of the trading. The third set consists of the BSE-200 index of ordinary share prices compiled and published by the Bombay Stock Exchange on daily basis with 1989-90 as the base year. Data collected from the Centre for Monitoring Indian Economy (CMIE), BSE website and Economic Times (financial daily).

4.4 Methodology

We have used a two-stage approach to test the stock price responses to quarterly earnings announcement. The first stage consists of estimation of parameters like alpha, beta based on the ex-post returns on stocks and market index, and expected returns on each of the stocks based on the market model. In the second stage these estimated parameters are used to calculate abnormal returns around the event day. In this study, the date of quarterly earnings announcement is defined as day 0 or event day. If event day is a non-trading day then the immediately following trading day is considered as an event day. Pre-announcement period includes 30 trading days prior to the earnings announcement date, i.e., days -30 to -1. Post announcement period includes 30 trading days after the earnings announcement i.e., days +1 to +30. Thus, we have taken the event window of 61 trading days (including day 0 as the event day). 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).

We have used the market model to measure the returns of stock that is related to market movement. Market model was developed and suggested by Sharpe [28]. Market model can be expressed mathematically as:

$$E\left(R_{it}\right)=\alpha_i+\beta_i R_{mt}+e_{it} \qquad \textit{for } i = 1 \ldots N$$

Where,

$E\ (R_{it})$ = Expected return on security 'i' during time period 't'
$\propto_i$ = Intercept of a straight - line or alpha coefficient of i^{th} security.
β_i = Slope of a straight - line or beta coefficient of i^{th} security
R_{mt} = Expected return on index (BSE 200 Index in this study) during period 't'
e_{it} = Error term with a mean zero and a standard deviation which is a constant during time period 't'.

We used both raw returns and log returns. We need the values of $\propto_i$ and β_i to estimate the expected returns. Therefore, the following simplified model of regression is used for estimating the returns on each security by taking the actual returns on market, R_{mt}.

$$Expected\ Return = E\ (R_{it}) = \propto_i + \beta_i R_{mt}$$

The abnormal returns are computed using the following model:

$$AR_{it} = e_{it} = R_{it} - E\ (R_{it})$$

Where,

R_{it} = Actual Returns

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 AAR is the average deviation of actual returns of a security from the expected returns.

The following model is used for computing the average abnormal returns (AARs):

$$AAR_{it} = \frac{\sum_{i=1}^{N} AR_{it}}{N}$$

Where,

i = the number of securities in the study;
N = total number of securities.
t = the days surrounding the event-day

Since the security's overall reaction to the quarterly earnings announcement or the event will not be captured instantaneously in the behavior of average abnormal return for one specific day, it is necessary to accumulate the abnormal returns over a long period. It gives an idea about average stock price behavior over time. Generally, if market is efficient, the CAAR should be close to zero ([Brown and Warner [6, 7], Fuller and Farrell, Jr., [14, p.105], Mallikarjunappa and Iqbal [20], Mallikarjunappa [18, 19] and Iqbal [15]). The model used to ascertain CAAR is:

$$CAAR_t = \sum_{t=-30}^{K} AAR_{it} \qquad Where\ t = -30,...0, ... +30.$$

Beta is calculated using following equation:

$$\beta_i = \frac{N\sum_{t=1}^{N} R_{mt}R_{it} - \left(\sum_{t=1}^{N} R_{mt}\right)\left(\sum_{t=1}^{N} R_{it}\right)}{N\left(\sum_{t=1}^{N} R_{mt}^2\right) - \left(\sum_{t=1}^{N} R_{mt}\right)^2}$$

Where,

β_i = Slope of a straight line or beta coefficient of security 'i'
N = Number of observations
R_{mt} = Return on market index 'm' during time period 't'
R_{it} = Return on security 'i' during time period 't'

4.4.1 Parametric Significance Test

The cumulative average abnormal return provides information about the average price behavior of securities during the event window. If markets are efficient, the AARs and CAARs should be close to zero. Parametric '*t* test' is used to assess significance of AARs and CAARs. The 5% level of significance with appropriate degree of freedom was used to test the null hypothesis of no significant abnormal returns after the event day. The conclusions are based on the results of *t* values on AARs and CAARs for the event window. The *t* test statistics for AAR for each day during the event window is calculated as:

$$t = \frac{AAR}{\sigma(AAR)}$$

Where,

AAR = Average abnormal return
σ (AAR) = Standard error of average abnormal return

The *t* statistics for CAAR for each day during the event window is calculated by using following formula:

$$t = \frac{CAAR}{\sigma(CAAR)}$$

Where,

CAAR = Cumulative average abnormal return
σ (CAAR) = Standard error of cumulative average abnormal return

The standard error is calculated by using the following formula:

$$S.E = \frac{\sigma}{\sqrt{n}}$$

Where,

S.E. = Standard Error
σ = Standard Deviation
n = Number of Observations

4.4.2 Non-Parametric Significance Test

To avoid the restricted assumption of a particular distribution, which a parametric test makes, we have used the non-parametric runs test and sign test in addition to *t* test.

4.4.2.1 Runs Test

Runs test has been used to analyze the randomness in the behavior of AARs. Runs test is performed to test the null hypothesis that AARs occur randomly. If the observed runs are not significantly different from the expected number of runs, then it is inferred that AARs occur randomly. On the other hand, if this difference were statistically significant, it would be regarded, as AARs do not occur randomly. We carried out runs test on AARs before and after the event day and also for the event window.

Mean number of runs to be computed using the following method:

$$\mu_r = \left(\frac{2n_1 n_2}{n_1 + n_2} \right) + 1$$

Where,

μ_r = Mean number of runs
n_1 = Number of positive AARs
n_2 = Number of negative AARs
r = Number of runs (actual sequence of counts)

The standard error of the expected number of runs can be computed by using following formula:

$$\sigma_r = \sqrt{\frac{2n_1 n_2 \left(2n_1 n_2 - n_1 - n_2\right)}{\left(n_1 + n_2\right)^2 \left(n_1 + n_2 - 1\right)}}$$

A standardized variable 'Z' as under can express the difference between actual and expected number of the runs:

$$Z = \frac{r - \mu_r}{\sigma_r}$$

4.4.2.2 Sign Test

In the sign test positive or negative signs are used instead of quantitative values. We carried out sign test on AARs to test the null hypothesis that there is no significant difference between the number of positive and negative AARs.

First we have to calculate the standard error of the proportion (σ_p):

$$\sigma_p = \sqrt{\frac{pq}{n}}$$

Where,

σ_p = Standard error of the proportion
P = Expected proportion of positive AARs = 0.5
q = Expected proportion of negative AARs = 0.5
n = Number of AARs
To compute the value of sign test we used the following equation:

$$Z = \frac{\bar{p} - p_{Ho}}{\sigma_p}$$

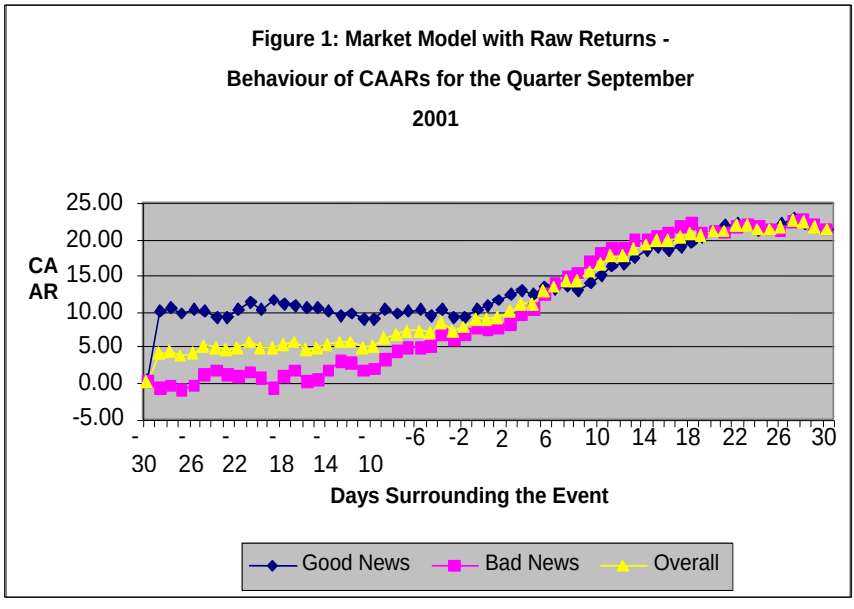
Where,

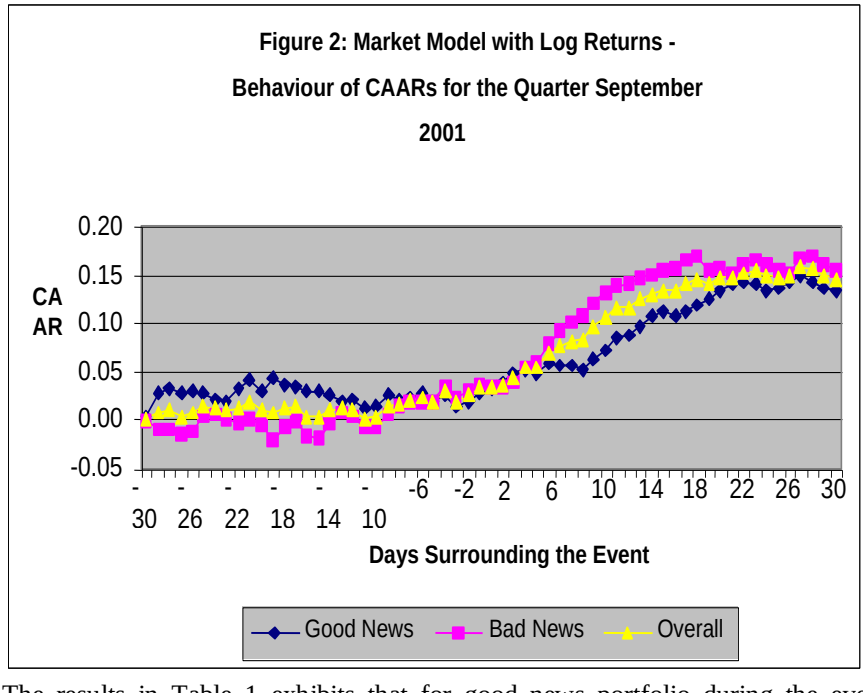
$\bar{P}$ = Actual proportion of AARs in the respective quarters having positive signs
P_{Ho} = Hypothesized proportion = 0.5

We calculated sign test statistics before and after the event day (that is during the event window).

5. The Results

The results of the study are presented in Tables 1, 2, 3 and Figures 1 and 2.





The results in Table 1 exhibits that for good news portfolio during the event window of 61 days, 23 days have negative and 38 days have positive AARs under both market model with raw and log returns. This means that about 37.70% of the days have negative AARs and 62.30% of the days have positive AARs.

In order to have more clarity, CAARs are presented in Table 1 and Figures 1 and 2. Under both the models, CAARs are positive for 100% of the days both before and after the event day. This suggests that CAARs are positive for all the 61 days. This result indicates that the market expected good news in the quarterly earnings announcement and the same is conveyed in the earnings.

In the case of bad news portfolio, under the market model with raw returns AARs are positive for more than 60% and 74% of days before and after the event day. Of the 61 days, AARs are negative for 19 days and positive for as high as 42 days. This means that AARs are negative for 31.15% of days and positive for remaining 68.85% of days. The results under market model with log returns for the event window of 61 days, AARs are negative for 23 days (37.70%) and positive for 38 days (62.30%). This implies that for the majority of the days AARs are positive.

The results in Table 1 and Figure 1 revealed that under market model with raw returns CAARs are negative for only 6 days (20.00%) and positive for 24 days (80.00%) before the event day. After the event day CAARs are positive for all the 31 days (100%) and none of the days it is negative. Of the 61 days, it is negative for as low as 6 days (9.84%) and positive for as high as 55 days (90.16%). Under market model with log returns 15 days each have negative and positive CAARs before the event day against positive for all the 31 days (100%) after the event day. On the whole, of the 61 days, CAARs are negative for 15 days (24.59%) and positive for 46 days (75.41%). This shows that the numbers of positive AARs are thrice the numbers of negative AARs. A close look at Table 1 reveals unexpected results. Both AARs and CAARs are positive for the majority of the days before and after the event day for bad news portfolio.

In the case of overall portfolio, under market model with raw returns out of 61 days, AARs are negative for 16 days and positive for as high as 45 days. This shows that AARs are positive for more than 73% of days and for the remaining days it is negative. Under market model with log returns out of the 61 days, AARs are negative for 18 days (29.51%) and positive for as high as 43 days (70.49%).

In the case of CAARs, the results presented in Table 1 and Figures 1 and 2 indicate that the results are same under both the models. CAARs are positive for 61 days and provide an opportunity to earn abnormal returns on the basis of quarterly earnings announcements.

Table 2 presents the data relating to nonparametric runs test and sign test. For all the three portfolios under both the models computed runs values are not significant at 5% level during the event windows. Therefore, we accept null hypothesis that AARs occur randomly.

The sign test statistics shows that for good news portfolio under both the models, and bad news portfolio under market model with log returns the computed values are not significant at 5% level. Thus, the sign test for the good news and bad news portfolio under both the models accepts the null hypothesis. On the other hand, in the case of overall portfolio under both the models and bad news portfolio under market model with raw returns computed sign test values are significant at 5% level. Therefore, on the basis of sign test statistics we reject the null hypothesis that there is no significant difference between the number of positive and negative AARs.

Table 1 *AARs and CAARs surrounding the event for September 2001 quarter*

Days	Market Model with Raw Returns						Market Model with Log Returns					
	Good News Portfolio		Bad News Portfolio		Overall Portfolio		Good News Portfolio		Bad News Portfolio		Overall Portfolio	
	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR
-30	0.30798	0.30798	-0.04974	-0.04974	0.10871	0.10871	0.00262	0.00262	-0.00182	-0.00182	0.00015	0.00015
-29	9.43736	9.74534	-0.65655	-0.70629	3.81458	3.92329	0.02427	0.02689	-0.00772	-0.00953	0.00645	0.00660
-28	0.56105	10.30639	0.15073	-0.55556	0.33248	4.25577	0.00535	0.03224	-0.00024	-0.00977	0.00224	0.00884
-27	-0.57817	9.72822	-0.43105	-0.98661	-0.49621	3.75956	-0.00564	0.02661	-0.00594	-0.01571	-0.00580	0.00304
-26	0.34530	10.07352	0.43465	-0.55195	0.39507	4.15463	0.00380	0.03040	0.00324	-0.01247	0.00349	0.00652
-25	-0.31849	9.75503	1.74932	1.19736	0.83337	4.98801	-0.00370	0.02671	0.01595	0.00349	0.00725	0.01377
-24	-0.60334	9.15169	0.34942	1.54678	-0.07261	4.91540	-0.00606	0.02065	0.00262	0.00611	-0.00122	0.01255
-23	-0.08448	9.06720	-0.46719	1.07959	-0.29767	4.61773	-0.00118	0.01947	-0.00582	0.00030	-0.00376	0.00879
-22	1.16560	10.23280	-0.32349	0.75610	0.33611	4.95384	0.01132	0.03079	-0.00401	-0.00371	0.00278	0.01157
-21	0.92863	11.16144	0.58211	1.33821	0.73560	5.68944	0.00882	0.03960	0.00443	0.00072	0.00637	0.01794
-20	-0.94875	10.21269	-0.66621	0.67200	-0.79136	4.89808	-0.00977	0.02984	-0.00748	-0.00677	-0.00850	0.00945
-19	1.25305	11.46574	-1.34865	-0.67665	-0.19622	4.70186	0.01204	0.04188	-0.01454	-0.02131	-0.00277	0.00668
-18	-0.56751	10.89823	1.52577	0.84912	0.59855	5.30041	-0.00578	0.03610	0.01387	-0.00743	0.00517	0.01185
-17	-0.25911	10.63912	0.73152	1.58064	0.29272	5.59312	-0.00244	0.03366	0.00588	-0.00156	0.00219	0.01404
-16	-0.31830	10.32082	-1.45581	0.12483	-0.95195	4.64118	-0.00439	0.02926	-0.01588	-0.01744	-0.01079	0.00325
-15	0.04771	10.36853	0.05763	0.18246	0.05324	4.69441	0.00056	0.02982	-0.00080	-0.01824	-0.00020	0.00305
-14	-0.38839	9.98013	1.37644	1.55891	0.59470	5.28912	-0.00434	0.02548	0.01378	-0.00446	0.00575	0.00880
-13	-0.72718	9.25296	1.39360	2.95251	0.45419	5.74331	-0.00738	0.01809	0.01281	0.00835	0.00386	0.01267
-12	0.24364	9.49660	-0.34458	2.60793	-0.08402	5.65928	0.00233	0.02042	-0.00527	0.00309	-0.00190	0.01076
-11	-0.77349	8.72311	-1.08121	1.52672	-0.94491	4.71438	-0.00835	0.01206	-0.01182	-0.00873	-0.01028	0.00048
-10	0.15711	8.88022	0.34850	1.87522	0.26373	4.97810	0.00179	0.01385	0.00172	-0.00701	0.00175	0.00223
-9	1.23413	10.11434	1.25191	3.12713	1.24403	6.22214	0.01171	0.02556	0.01147	0.00447	0.01158	0.01381
-8	-0.57344	9.54091	1.05482	4.18196	0.33358	6.55572	-0.00545	0.02011	0.00928	0.01374	0.00275	0.01656
-7	0.35348	9.89438	0.72554	4.90750	0.56073	7.11645	0.00359	0.02370	0.00560	0.01934	0.00471	0.02127
-6	0.30857	10.20295	0.00349	4.91099	0.13863	7.25508	0.00348	0.02718	-0.00156	0.01778	0.00067	0.02194
-5	-0.77162	9.43133	0.15339	5.06439	-0.25634	6.99874	-0.00763	0.01956	0.00028	0.01806	-0.00322	0.01872
-4	0.62386	10.05519	1.67031	6.73470	1.20678	8.20552	0.00585	0.02541	0.01565	0.03371	0.01131	0.03003
-3	-1.03453	9.02066	-0.95060	5.78410	-0.98778	7.21774	-0.01044	0.01497	-0.01083	0.02288	-0.01066	0.01938
-2	0.17081	9.19147	0.87167	6.65577	0.56122	7.77896	0.00255	0.01751	0.00760	0.03049	0.00536	0.02474
-1	1.05667	10.24814	0.80783	7.46360	0.91805	8.69702	0.01100	0.02851	0.00645	0.03694	0.00846	0.03320
0	0.36371	10.61184	-0.17767	7.28592	0.06213	8.75915	0.00310	0.03161	-0.00212	0.03482	0.00019	0.03340
1	0.72449	11.33633	0.07079	7.35671	0.36035	9.11950	0.00685	0.03845	-0.00061	0.03421	0.00270	0.03609
2	0.84518	12.18151	0.58650	7.94321	0.70108	9.82058	0.00857	0.04703	0.00487	0.03909	0.00651	0.04260
3	0.55648	12.73798	1.50805	9.45126	1.08655	10.90713	0.00569	0.05271	0.01424	0.05333	0.01045	0.05306
4	-0.53606	12.20192	0.64801	10.09927	0.12352	11.03065	-0.00531	0.04740	0.00555	0.05888	0.00074	0.05380
5	1.06623	13.26815	2.10698	12.20625	1.64597	12.67662	0.00996	0.05737	0.01970	0.07858	0.01538	0.06918
6	-0.10584	13.16231	1.26957	13.47582	0.66033	13.33695	-0.00087	0.05649	0.01211	0.09069	0.00636	0.07554
7	0.06884	13.23115	1.12983	14.60565	0.65986	13.99681	0.00012	0.05661	0.01006	0.10075	0.00566	0.08120
8	-0.40602	12.82513	0.61039	15.21604	0.16017	14.15698	-0.00410	0.05251	0.00566	0.10640	0.00134	0.08253
9	0.98521	13.81034	1.55875	16.77478	1.30470	15.46167	0.00977	0.06229	0.01459	0.12099	0.01246	0.09499
10	0.97672	14.78706	0.97517	17.74996	0.97586	16.43753	0.00954	0.07183	0.00963	0.13062	0.00959	0.10458
11	1.40760	16.19466	0.79236	18.54231	1.06488	17.50242	0.01396	0.08579	0.00748	0.13811	0.01035	0.11493
12	0.23460	16.42927	0.14082	18.68313	0.18236	17.68477	0.00236	0.08814	0.00121	0.13932	0.00172	0.11665
13	0.90826	17.33753	0.89480	19.57793	0.90076	18.58554	0.00893	0.09707	0.00772	0.14703	0.00825	0.12490
14	1.00522	18.34274	0.19452	19.77246	0.55362	19.13916	0.00983	0.10691	0.00186	0.14890	0.00539	0.13030
15	0.53564	18.87838	0.49436	20.26681	0.51264	19.65180	0.00526	0.11217	0.00360	0.15250	0.00434	0.13463
16	-0.43264	18.44575	0.38997	20.65678	0.02560	19.67740	-0.00443	0.10774	0.00286	0.15536	-0.00037	0.13427
17	0.45154	18.89729	0.85426	21.51104	0.67588	20.35328	0.00468	0.11242	0.00839	0.16375	0.00675	0.14101
18	0.53675	19.43404	0.49632	22.00737	0.51423	20.86751	0.00518	0.11760	0.00421	0.16796	0.00464	0.14565
19	0.71521	20.14925	-1.32778	20.67959	-0.42283	20.44468	0.00712	0.12472	-0.01401	0.15395	-0.00465	0.14100
20	0.83986	20.98911	0.37703	21.05662	0.58204	21.02672	0.00800	0.13271	0.00262	0.15657	0.00500	0.14600
21	0.77260	21.76171	-0.40736	20.64926	0.11531	21.14203	0.00732	0.14003	-0.00435	0.15222	0.00082	0.14682
22	0.23493	21.99665	0.78206	21.43133	0.53971	21.68174	0.00234	0.14238	0.00713	0.15935	0.00501	0.15183
23	-0.28175	21.71490	0.48128	21.91261	0.14329	21.82503	-0.00253	0.13985	0.00430	0.16364	0.00127	0.15310
24	-0.69994	21.01496	-0.25598	21.65662	-0.45264	21.37239	-0.00731	0.13254	-0.00330	0.16035	-0.00507	0.14803
25	0.27929	21.29425	-0.47993	21.17669	-0.14363	21.22876	0.00248	0.13502	-0.00573	0.15461	-0.00210	0.14593
26	0.82933	22.12358	-0.19589	20.98080	0.25824	21.48700	0.00781	0.14283	-0.00228	0.15233	0.00219	0.14813
27	0.66157	22.78515	1.38549	22.36629	1.06483	22.55183	0.00627	0.14911	0.01352	0.16585	0.01031	0.15844
28	-0.61651	22.16864	0.28809	22.65438	-0.11261	22.43922	-0.00646	0.14265	0.00223	0.16809	-0.00162	0.15682
29	-0.59767	21.57097	-0.90160	21.75278	-0.76697	21.67225	-0.00585	0.13680	-0.00876	0.15932	-0.00747	0.14934
30	-0.21329	21.35769	-0.39667	21.35611	-0.31544	21.35681	-0.00231	0.13448	-0.00478	0.15454	-0.00369	0.14566

Notes:
1. Good News Portfolio: The firms with positive percentage change in net earnings and net sales.
2. Bad News Portfolio: The firms with negative percentage change in net earnings and net sales.
3. Overall Portfolio: All the firms selected as samples for the study.
4. AARs show the values of average abnormal returns.
5. CAARs show the cumulative average abnormal returns, which are computed for days -30 through 30.
6. Day -30 to -1: The days before the quarterly earnings announcement.
7. Day 0: The day of the quarterly earnings announcement.
8. Day 1 to 30: The days after the quarterly earnings announcement.

Table 2 *Runs and Sign Test Statistics for Quarter September 2001*

	Market Model with Raw Returns			Market Model with Log Returns		
	Runs	Runs Statistics	Sign Statistics	Runs	Runs Statistics	Sign Statistics
Good News Portfolio						
Before	19	1.14488	0.36515	19	1.14488	0.36515
After	12	-0.79237	2.33487	12	-0.79237	2.33487
Overall	31	0.36988	1.92055	31	0.36988	1.92055
Bad News Portfolio						
Before	14	-0.37441	1.46059	14	-0.72177	0.36515
After	9	-1.86639	2.69408	9	-2.13220	2.33487
Overall	23	-1.25701	2.94485	23	-1.83136	1.92055
Overall Portfolio						
Before	15	0.2800	1.8257	15	0.0267	1.4606
After	6	-2.7957	3.4125	8	-2.0360	3.0533
Overall	21	-1.2093	3.7131	23	-1.0517	3.2009

Notes:
1. Before: Number of runs, runs test statistics and sign test statistics before the event day.
2. After: Number of runs, runs test statistics and sign test statistics after the event day.
3. Overall: Number of runs, runs test statistics and sign test statistics for the event window(-30 through 30 days)
4. If the runs and sign test statistics are greater than the critical value of ±1.96, the relevant average abnormal return is statistically non-zero at the 5% significance level.

Table 3 presents the data relating to *t*-test for three portfolios. The *t*-test values on AAR for three portfolios shows that under both market model with raw and log

returns they are significant at 5% level for less than 22% of days during the event window and remaining days they are not significant. This rejects the existence of abnormal returns on daily basis for majority of the days.

The *t*-values on CAARs indicate that for all the portfolios under market model with raw and log returns they are significant for more than 90% of days. Thus, the *t*-test on CAARs totally accepts the existence of abnormal returns throughout the event window. This provides an opportunity to beat the market and to earn abnormal returns.

Table 3 *t-Test Statistics on AARs and CAARs for the quarter September 2001*

	Market Model with Raw Returns				Market Model with Log Returns			
	AAR	%	CAAR	%	AAR	%	CAAR	%
Good News Portfolio								
Bef-RT	4	80.00	29	100.00	3	100.00	28	100.00
Bef-LT	1	20.00	0	0.00	0	0.00	0	0.00
Aft-RT	1	100.00	31	100.00	1	100.00	31	100.00
Aft-LT	0	0.00	0	0.00	0	0.00	0	0.00
Tot-RT	5	83.33	60	100.00	4	100.00	59	100.00
Tot-LT	1	16.67	0	0.00	0	0.00	0	0.00
Bad News Portfolio								
Bef-RT	5	71.43	22	91.67	3	60.00	12	50.00
Bef-LT	2	28.57	2	8.33	2	40.00	12	50.00
Aft-RT	5	83.33	31	100.00	5	83.33	31	100.00
Aft-LT	1	16.67	0	0.00	1	16.67	0	0.00
Tot-RT	10	76.92	53	96.36	8	72.73	43	78.18
Tot-LT	3	23.08	2	3.64	3	27.27	12	21.82
Overall Portfolio								
Bef-RT	3	50.00	29	100.00	3	42.86	24	100.00
Bef-LT	3	50.00	0	0.00	4	57.14	0	0.00
Aft-RT	7	87.50	31	100.00	7	87.50	31	100.00
Aft-LT	1	12.50	0	0.00	1	12.50	0	0.00
Tot-RT	10	71.43	60	100.00	10	66.67	55	100.00
Tot-LT	4	28.57	0	0.00	5	33.33	0	0.00

Notes:

1. Bef-RT, Bef-LT, Aft-RT, Aft-LT indicates the number of *t*-values that form in the right (RT) and left tail (LT) of the rejection region when *t*-values, which are statistically significant at 5% significance level, are counted separately for the periods before and after the event day.
2. Tot-RT, Tot-LT indicates the number of *t*-values that fall in the right (RT) and left tail (LT) of the rejection region for the event window.

6. Summary and Conclusion

Market reaction to quarterly earnings information is empirically tested in this study by taking September 2001 quarterly earnings announcements of 149 companies listed on the Bombay Stock Exchange. The event study methodology of residual analysis is used. The results of the study reveal that for good news portfolio during

the event window of 61 days, AARs are positive for the majority of the days and CAARs are positive for all the 61 days under market model with raw and log returns. In the case of bad news portfolio, under market model with raw returns and log returns AARs and CAARs are positive for the majority of the days. For overall portfolio, under market model with raw and log returns AARs are positive for the majority of the days and CAARs are positive for the event window of 61 days.

For all the three portfolios under market model with raw and log returns computed runs values are not significant at 5% level during the event window. Therefore, we accept the null hypothesis that AARs occur randomly. The sign test statistics shows that for good news portfolio under both the models, and bad news portfolio under market model with log returns, the computed values are not significant at 5% level. Thus, on the basis of sign test statistics for the good news portfolio under both the models and bad news portfolios under market model with log returns we accept the null hypothesis that there is no significant difference between the number of positive and negative AARs. On the other hand, in the case of overall portfolio under both the models and for bad news portfolio under market model with raw returns computed sign test values are significant at 5% level. Therefore, on the basis of sign test statistics we reject the null hypothesis that there is no significant difference between the number of positive and negative AARs.

The *t*-test values on AARs for all three portfolios shows that under both market model with raw and log returns they are significant at 5% level for less than 22% of days during the event window and remaining days they are not significant. This rejects the existence of abnormal returns on daily basis for the majority of the days. The *t*-values on CAARs are significant for more than 90% of days for all the three portfolios under market model with raw and log returns. Therefore, on the basis of *t*-test statistics on CAARs we reject the null hypothesis that CAARs are close to zero. This provides an opportunity to beat the market and to earn abnormal returns. Therefore, Indian stock market is not efficient in the semi-strong form.

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