

## **Bourses Reaction to Mergers and Acquisitions Announcements: Evidence from India**

Rajesh Khurana\* and D. P. Warne\*\*

### **Abstract**

*This study tests the semi-strong form of market efficiency by investigating the reaction of stock prices to Mergers and Acquisitions announcements. This study belongs to event study methodology. The focus of present study lies in the sample period from 2006 to 2015 for finding out significant changes in the abnormal stock returns pre and post Mergers and Acquisitions announcement by 350 sample events from 18 different sectors which are listed at NSE 100. In line with the evidence of developed stock markets, the results indicate insignificant positive abnormal returns as observed from the day five (t+5) of mergers and acquisitions announcement. On the announcement day there is negative AAR of 0.07% which is very low and insignificant (z value = 0.001). None out of 18 sectors has shown significant positive abnormal returns (AARs) on the announcement day. The results provide stronger evidence of semi-strong efficiency of the Indian stock market.*

**Keywords:** AAR, CAAR, mergers and acquisitions; semi-strong form

\* Research Scholar, Chaudhary Devi Lal University Sirsa, Haryana, India: rajeshkhurana147@gmail.com

\*\* Associate Professor, Department Of Commerce, Chaudhary Devi Lal University Sirsa, Haryana, India: dpwarne9@gmail.com

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### **1. INTRODUCTION**

Scouting for merger and acquisition opportunities is an imperative part of corporate strategy for most companies. Large companies use this as a catalyst to be more competitive and cost effective and the relatively smaller ones to survive. Mergers and Acquisitions are a big part of corporate finance world. This process is extensively used for restructuring the business organization. In India, the concept of mergers and Acquisitions was initiated by the government bodies. The Indian economic reform since 1991 had opened up a whole lot of challenges both in the domestic and international spheres. The trends of mergers and Acquisitions in India have changed over the years. The immediate effects of the mergers and Acquisitions have also been diverse across the various sectors of the Indian economy. Every day, investment bankers arrange M&A transactions, which bring separate companies together to form larger ones. When they're not creating big companies from smaller ones, corporate finance deals do the reverse and break up companies through spin-offs, split off or equity carve-outs. The scenario of M&A has been changed. Now it is not for those companies who are in losses and merge with other to secure their business. Today M&A is done only for to cover the global market as much as possible and a source of corporate finance. Now 'India has emerged as the second most targeted nation among the BRIC region, after China, for merger and acquisition'

### **2. MERGERS AND ACQUISITIONS**

Kato & Loewenstein (1995) share their resources

to achieve common objectives. According to them the shareholders of the combining firms often remain as joint owners of the combined entity. According to Gaughan (2002), a merger is a process in which two corporations combines and only one survives and the merged corporation ceases to exist. Sometimes there is a combination of two companies where both the companies cease to exist and an entirely new company is created. An acquisition on the other hand, is the purchase of an asset such as a plant, a division or an entire company. Bhattacharya (1979) defines acquisition as an 'arms-length deal'. The term 'takeover' is sometimes used to refer a hostile situation. But according to Bhattacharya (1979), a takeover is similar to an acquisition and also implies that the acquirer is much larger than the acquired.

'In line with common practice', Ghosh (2001) uses 'mergers', 'acquisitions' and 'takeovers' synonymously.

Cross border mergers and Acquisitions includes that mergers and Acquisitions which are done outside the boundaries. The rise of globalization had exponentially increased the market for cross border M&A. In 1996 alone there were over 2000 cross border transactions worth a total of approximately \$256 billion. In the past, the market's lack of significance and a more strictly national mindset prevented the vast majority of small and mid-sized companies from considering cross border intermediation as an option which left M&A firms inexperienced in this field. This same reason also prevented the development of any extensive academic works on the subject.

### 3. REVIEW OF LITERATURE

At the time of Merger and Acquisitions the study can be done by using four different methodologies i.e. Event Study, Accounting Study, Survey of Executives, Clinical Study.

A brief resume from the past studies are as under:

Frank, Harris & Titman (1991) in their paper conducted a research to find the effect of acquisitions on shareholder. They took a sample consisting 399 mergers in the United States from 1975 - 1981. They found that target firms shareholders gained from the announcement averaging 28%. Acquirer's shareholders don't experience such gains but they don't suffer any losses as well. They have taken first media announcement date as the event date. It was found that the target gained more in a cash deal as compared to a deal closed with equity or mixture of securities. Berkovitch & Narayanan (1993) conducted a research on the motives behind mergers and if these motives had any positive gains. Synergy, Agency and Hubris have always been said to be the main reasons for takeovers but the existing evidence then did not clearly distinguished the different motives. They used correlation among target, acquirer and total gains to distinguish motives. Their sample consisted of 330 successful tender deals between periods of 1963 - 1988. They have taken first media announcement date as the event date. Examining 941 acquisitions spanning across the period of 1970-89, Loughran & Vijh (1997) show abnormal returns to shareholders post acquisition. The samples are differentiated by Loughran & Vijh (1997) on two bases, (i) on the basis of the acquisition, i.e., merger/ tender/ ambiguous; and (ii) on the basis of the method of

payment, i.e., stock/ cash. The research finds out that the returns are higher where the payment is made in cash. Binder (1998) employed the event study methodology to test different benchmarks for the normal rate of return. Binder (1998) modeled abnormal returns as coefficients in the multivariate regression methodology. Andrade, Mitchell & Stafford (2001) try to estimate the reasons for mergers and their long term effects. In their research, they use all the relevant data over a period of 25 years on M&A's to come to a conclusion. Measuring value creation or destruction post merger was central to their research. They have taken first media announcement date as the event date. The event window they used in their study was 3 days for a short period and 20 days for a longer period, surrounding the announcement of the merger. In their study they found that target firms shareholders benefit from a merger as there is an increase in their abnormal return from 16% to 20% in longer window period. Fridolfsson & Stennek (1999) examined that the pre mergers value of the firm is low; as compare to post mergers. After the mergers management focused on increasing the value of shareholder or maximizes their wealth rather than maximize the profit maximizing. Fridolfsson & Stennek (2000) examined that the mergers protect the firm from competition. It was necessary to the control on mergers once it was taken. Reasonable policies can prove worse if mergers are not controllable by firms. They gave an importance to control over the mergers and Acquisitions. If any company did not control over the mergers it became worst, and did not prove profitable and at last it became failed. Bárcena-Ruiz & Garzón (2000) examined that the when two firms merge, the increase in the bargaining strength of the multiproduct firm arising from the mergers

when negotiating uniform wages with the workers was one of the reasons that account for corporate mergers. Pautler (2001) they studies of one or several mergers using a mixture of stock market returns, executive interviews, financial ratios, and pre-merger and post-merger accounting analysis to determine the effects of the mergers (particularly on shareholders). They have taken first media announcement date as the event date. Ghosh (2001) examined that operating performance improves following corporate acquisitions relative to industry-median firms. Such performance results are likely to be biased because acquiring firms undertake acquisitions following a period of superior performance and they are generally larger than industry-median firms. Using firms matched on performance and size as a benchmark, he found no evidence that operating performance improves following acquisitions. Gugler et al. (2003) examined the effects of mergers around the world over the past 15 years. The effects of the mergers were examined by comparing the performance of the merging firms with control groups of no merging firms. The comparisons are made on profitability and sales. The results showed that mergers on average do result in significant increases in profits, but reduced the sales of the merging firms. Interestingly, these post merger patterns look similar across countries. Frey, Rainer & Hussinger (2006) examined that the technological change was main drivers of merger activities. It analyzed the technological relatedness of the M&A partners reduced uncertainty and the expected risk of failure associated with cross-border acquisitions significantly. With the help of technology transfer cost was reduced and products were upgraded and firms able to earn high profits at lower cost. Prabhudesai (2007) points south that Indian business is moving

ahead very fast and giving strong competition to other developed countries like U.S.A, U.K. Indian business has more efficiency than other countries business. Through M&A Indian business is covering whole over the world. Rizvi (2008) finds that the acquisition of Gillette added yet another feather in the cap of P&G (which already had close to 20 of them!). The deal created a win-win for all stakeholders and set a fine example in today's dynamic business environment preparing HR professionals for challenges that they are likely to face in the future. Pantisa (2008) explores the impact of stock splits on stock price and various aspects of liquidity using daily and intraday data from the Stock Exchange of Thailand between the period 2002 - 2004. It provides evidence that reductions in trade frictions and increases in split-adjusted price levels are associated with the size of split factors and post-split trading range. Stocks with high split factors have better post-split adjusted price performance and lower trade bid-ask spreads and price impact. Dhar & Chhaochharia (2008) in consistency with the existing literature observe that the two events are associated with significantly positive announcement effect. They have taken first media announcement date as the event date. For bonus issues, the abnormal returns were about 1.8% and for stock splits, it was about 0.8%. On a whole, the paper finds evidence of semi-strong form efficiency in the Indian stock market. Shirur (2008) find that in both the cases i.e. issue of bonus shares as well as stock split, it has proved that the capital market is not inherently a semi-strong form of EMH and there is a possibility of investors overvaluing the shares of certain companies for an unduly long time. Estañol & Seldeslachts (2009) examined that the after mergers sometime they became failed due to some reasons. The main reason for

failure of mergers was non-integration of human resources of both the transferor and transferee company. There was failure of M&A when purchaser's plans & strategies were not clear to the employees of the acquired firm. Mishra, Pulak & Chandra; (2010), examined in the context of introduction of large-scale deregulatory policy measures in the 1990s in general and three important amendments made to the Indian Patent Act (1970) in 1999, 2002 and 2005 in particular, the present paper makes an attempt to examine the impact of MA on financial performance of Indian pharmaceutical companies. Prabhudesai (2010) they concluded that Telecom industry in India is growing very faster than that of other countries for example Tata Docomo. China also used M&A acquisition strategy in Indian and launched new mobile at very less cost Micromax, Zen, G Five, which is giving strong competition to Indian domestic companies. Telecom industry has largest share than other countries. Amuthan & Ayyappan, (2011) The study had thrown light on the positive trigger or upswing in the stock prices of the selected companies during the one day interval before and after the Bonus issue announcement date; during the 3 months Interval, the bonus share issue effect gave the negative trigger. This study had covered the names of bonus share issued companies up to October 2008. Khurana & Warne (2016) examined the bonus issue effect in Indian stock market (NSE 100). For analyzing the reaction during bonus issue announcement 34 companies from 11 sectors have been considered in the sample period from 2006 to 2012. They have taken first media announcement date as the event date. The results indicate that there are significant positive abnormal returns from eighth day prior to bonus issue announcement in line with evidence from developed stock market.

## 4. DATA AND METHODOLOGY

### 4.1 Data and Sample

The initial sample consisted of 100 companies (620 events) of merger and acquisition announcements (from 18 different sectors) listed on the NSE 100 in the sample period from 2006 to 2015. But only 76 companies (350 events) fulfilled the selection criteria for the study therefore this study is based on 76 companies with 350 events from 18 different sectors. The information regarding mergers and acquisitions announcements dates, daily price of companies as well as of NSE 100 are obtained from CMIE Prowess Database and from NSE websites. Many of the researchers used First media announcements date as Event date for analyzing various announcements effects; we also considered the same as the event date. This approach was taken on the assumption that the information was first known to the market on the event date only.

### 4.2 Selection Criteria

The following companies were excluded from the initial 100 sample companies with 620 events of mergers and acquisitions announcements listed under NSE 100 index:

- i. Companies didn't have the adjusted prices and therefore no information was available,
- ii. Companies didn't involve with the activity of mergers and acquisitions during the sample period,
- iii. Companies that are not traded regularly, and
- iv. Companies that were delisted during the sample period.

These criteria reduced the sample size to 76 companies with 350 events.

### 4.3 Announcement Effects

The study used the event study methodology to examine the market reaction to mergers and acquisitions announcement on stock prices by using daily adjusted prices for sample stocks for 115 days prior and 15 days after the event date. The respective media announcement dates of mergers and acquisitions are obtained from CMIE Prowess Database, along with the necessary share price data and the value of the NSE 100 index. The procedure adopted in using the Event Study Methodology is also discussed.

### 4.4 Estimation procedure

The purpose of our study is to determine whether there is any abnormal return around the event window and how fast the information is absorbed in the security prices. For the purpose of the study, we constructed null hypothesis (H0) as follows:

(H0) There are no significant average abnormal returns (AAR) around the mergers and acquisitions announcements date i.e.  $1/n \sum AR = 0$  Where n is the number of sample companies.

NSE 100 index is used as a proxy for the market portfolio. In order to carry out an event study, we determine the event window as  $t = -15$  to  $t = +15$  relative to the event day  $t = 0$  (date of mergers and acquisitions announcement). An estimation period of -115 to -16 days is used for computing expected returns using market model given in equation 3.

The daily returns for each sample company have been computed for the estimation window period and also for the event window period as:

$$R_{it} = (P_{it} - P_{it-1}) / P_{it-1} \quad \dots(1)$$

Where,  $P_{it}$  and  $P_{it-1}$  are respective daily prices for company i at time t and t-1 . Analogously, the actual returns for the market are also computed as:

$$R_{mt} = (I_t - I_{t-1}) / I_{t-1} \quad \dots(2)$$

Where,  $I_t$  and  $I_{t-1}$  are daily index values at time t and t-1 respectively.

The expected returns on a stock have been estimated using the market model given in the following equation:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad \dots(3)$$

Where  $R_{it}$  is the observed daily return for the share of a company i at time t,  $R_{mt}$  is the observed daily return for the market index at time t,

$\alpha_i$  is the estimate of the intercept for share of company i,

$\beta_i$  is the estimate for beta of share of company i, and

$\varepsilon_{it}$  is the independently and identically distributed residual error term.

In the next step we compute the "abnormal" returns for each of the sample company for the window period. Abnormal return is defined as the actual return minus the expected return. The abnormal return for company i on day t calculated as:

$$AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt} \quad \dots(4)$$

In order to eliminate the effect of any one or group of securities on the abnormal returns, the ARs are averaged over the number of companies. The ARs of individual companies are averaged for each day surrounding the event-day (i.e., -15 to +15 days) using the following model:

$$(AAR_t) = \sum_{i=1}^N AR_{it} / N \quad \dots (5)$$

With a view to know the cumulative effect of AARs on days surrounding the event the Cumulative Average Abnormal Return (CAAR) are calculated for event days  $t_1$  through  $t_2$  by summing the average abnormal returns for these days, that is:

$$(CAAR_d) = \sum_{t=t_1}^{t_2} AAR_t \quad \dots (6)$$

#### 4.5 Significant Test

Standard deviation of abnormal returns for

the estimation period -115 days to -16 days is computed first. Then the Standardized Abnormal Returns (SAR) for each company is obtained, by dividing abnormal returns of the event period (i.e., -15 to +15) by the standard deviation obtained. For event day  $t$ , the z-statistics for the Average Abnormal Returns (AARs) on  $N$  securities will be calculated as:

$$Z_t = \sum_{i=1}^N SAR_{it} / \sqrt{N}$$

For testing cumulative excess returns for  $N$  securities over  $T$  days (event days  $t_1$  through  $t_2$ ) the Z-statistic is:

$$Z_T = \sum_{i=t_1}^{t_2} SAR_{it} / \sqrt{T * N}$$

**Table 1: Sample descriptive characteristics**

Sr. No.	Industry Classification	No. of Events	% age
1	AUTOMOBILE	35	10
2	BANKING	62	17.7
3	CEMENT	10	2.86
4	COMMUNICATIONS & NETWORK	10	2.86
5	SERVICES	3	0.86
6	AUTOMATION	5	1.43
7	ELECTRONICS	5	1.43
8	ENERGY	16	4.57
9	ENTERTAINMENT	4	1.14
10	FINANCIAL SERVICES	11	3.14
11	FMCG	21	6
12	INDUSTURY	46	13.1
13	INFORMATION TECH	19	5.43
14	METAL	16	4.57
15	PAINT AND CHEMICAL	10	2.86
16	PETROLIUM AND GAS	32	9.14
17	PHARMACUTICAL	40	11.4
18	REALTY	5	1.43
Total	18	350	100

Source: Information extracted from CMIE Prowess Database

**Table 2: Sector-wise abnormality returns: auto and banking sectors**

EVENT DAY	Auto				Banking			
	%AAR	Z VALUE	%CAAR	Z VALUE	%AAR	Z VALUE	%CAAR	Z VALUE
-15	0.074848	0.006514	0.074848	0.006514	0.259498	0.018371	0.259498	0.018371
-14	0.116431	0.012893	0.191279	0.013723	0.181814	0.013236	0.441212	0.022349
-13	-0.13733	-0.010701	0.053945	0.005026	0.319427	0.028034	0.760639	0.034433
-12	0.158755	0.013855	0.2127	0.01128	0.118746	0.009737	0.879385	0.034688
-11	0.005552	0.000466	0.218251	0.010298	-0.10821	-0.00537	0.771186	0.028626
-10	-0.14095	-0.013585	0.077306	0.003855	0.053628	0.003049	0.824804	0.027376
-9	0.720451	0.077731	0.797757	0.032948	-0.24979	-0.01914	0.575014	0.01811
-8	-0.22188	-0.025027	0.575976	0.021972	0.340772	0.018951	0.915785	0.023287
-7	-0.67183	-0.061682	-0.095853	0.000154	-0.37799	-0.03032	0.537797	0.011848
-6	-0.32267	-0.033598	-0.418519	-0.010478	0.096221	0.005063	0.634018	0.012841
-5	-0.12284	-0.007527	-0.541356	-0.01226	-0.15477	-0.0089	0.479245	0.009559
-4	-0.15676	-0.015067	-0.698114	-0.016088	0.082835	0.005159	0.56208	0.010641
-3	0.297319	0.028848	-0.400794	-0.007455	-0.39328	-0.02406	0.168804	0.003551
-2	-0.19989	-0.021492	-0.600687	-0.012928	0.256431	0.016757	0.425236	0.007901
-1	-0.14289	-0.013073	-0.743575	-0.015865	0.302648	0.01849	0.727884	0.012149
0	0.192713	0.018438	-0.550862	-0.011002	-0.27126	-0.00844	0.456624	0.009653
1	0.216187	0.012104	-0.334675	-0.007738	0.323558	0.01335	0.780182	0.012602
2	-0.13433	-0.008686	-0.469006	-0.009567	0.063184	0.004327	0.843356	0.013267
3	0.06181	0.00549	-0.407297	-0.008052	0.582521	0.036198	1.425877	0.021218
4	-0.2782	-0.03063	-0.685499	-0.014697	-0.40981	-0.03207	1.016065	0.013509
5	-0.71532	-0.06344	-1.400815	-0.028187	-0.20362	-0.0141	0.812443	0.010107
6	-0.01831	-0.00169	-1.41912	-0.027899	0.029895	0.002381	0.842338	0.010382
7	-0.25106	-0.024252	-1.670182	-0.032343	-0.27044	-0.02038	0.571894	0.005904
8	0.203188	0.015799	-1.467004	-0.028437	-0.05562	-0.00453	0.516273	0.004856
9	-0.28976	-0.020647	-1.756764	-0.031992	-0.07659	-0.00589	0.439687	0.003581
10	-0.01523	-0.001496	-1.771996	-0.031664	0.01429	0.000886	0.453977	0.003685
11	-0.28013	-0.034918	-2.052125	-0.037792	0.033404	0.002183	0.487381	0.004036
12	-0.15161	-0.011313	-2.203731	-0.039249	0.165052	0.008773	0.652433	0.005621
13	-0.34683	-0.031288	-2.550561	-0.044376	0.192935	0.009856	0.845369	0.007354
14	0.18531	0.018247	-2.37525	-0.040481	-0.11244	-0.00728	0.732925	0.005901
15	0.218387	0.019774	-2.157863	-0.036272	0.784987	0.040685	1.518913	0.013112

As per Table 2, the AAR on the event day for Auto and Banking sectors are 0.19% (insignificant positive AAR as Z value= 0.02) and -0.27% (very low and insignificant negative AAR as Z value = 0.06) respectively can be observed. In case of Auto sector after a steep fall on the previous day i.e. t-1 there was a rise on the t0 observed which shows the favourable trend. But the market lose

its gain on the day t+2 and a steep downfall can be observed on the day t+5. In case of Banking sector the position is vice versa. On the day t0 i.e. event day the market lost its gain. But the market shows an upward trend from the day t+1 and t+3 which indicating the acceptance of null hypothesis and the evidence of semi strong efficiency of the market.

**Table 3: Sector-wise abnormality returns: cement and communication sectors**

EVENT DAY	Cement				Communication			
	%AAR	Z VALUE	%CAAR	Z VALUE	%AAR	Z VALUE	%CAAR	Z VALUE
-15	1.092028	0.116556	1.092028	0.116556	1.047918	0.159687	1.047918	0.159687
-14	0.093547	0.024641	1.185575	0.099842	-0.27623	-0.06613	0.771692	0.066154
-13	-0.18163	-0.02729	1.01395	0.065763	-0.56428	-0.10185	0.207408	-0.00473
-12	0.463404	0.068559	1.477354	0.091232	-1.20739	-0.15992	-0.99998	-0.08406
-11	-0.24984	-0.0403	1.227518	0.063577	-1.56384	-0.13794	-2.56383	-0.13687
-10	-0.08399	-0.01642	1.143524	0.051333	-1.89931	-0.1848	-4.46313	-0.20039
-9	-0.34001	-0.04459	0.803516	0.03067	1.382084	0.140921	-3.08105	-0.13226
-8	-0.21523	-0.03166	0.588283	0.018495	-0.52896	-0.10328	-3.61001	-0.16023
-7	-0.2045	-0.03816	0.383785	0.003776	1.060079	0.13431	-2.54993	-0.1063
-6	-0.09747	-0.015	0.286316	-0.00116	-0.95357	-0.12354	-3.5035	-0.13991
-5	0.425718	0.08474	0.712033	0.024442	0.586119	0.105099	-2.91838	-0.10181
-4	-0.41004	-0.05181	0.301988	0.008474	-0.99271	-0.07623	-3.91009	-0.11939
-3	-0.55122	-0.12463	-0.24923	-0.02643	-0.2805	-0.0614	-4.19059	-0.13184
-2	0.738549	0.081086	0.48932	-0.00379	-0.22584	-0.04854	-4.41643	-0.13992
-1	-1.02722	-0.10682	-0.5379	-0.03125	-0.62162	-0.12129	-5.03804	-0.16649
0	-0.3481	-0.03709	-0.886	-0.03953	0.413777	0.043869	-4.62427	-0.15024
1	-1.37643	-0.0896	-2.26243	-0.06008	-0.18687	-0.03313	-4.80114	-0.15378
2	0.21827	0.032563	-2.04516	-0.05071	-0.08397	-0.00576	-4.88511	-0.15081
3	-2.09572	-0.23138	-4.14088	-0.10244	-1.26118	-0.18676	-6.14629	-0.18734
4	-0.90219	-0.11414	-5.04308	-0.12537	1.969826	0.285706	-4.18646	-0.11871
5	-0.02281	-0.00226	-5.06588	-0.12284	-0.27101	-0.10018	-4.44747	-0.13771
6	-0.23098	-0.03198	-5.29686	-0.12683	-0.62331	-0.08375	-5.07078	-0.1524
7	0.098045	0.009458	-5.19882	-0.12207	-0.41643	-0.03461	-5.4872	-0.15627
8	-0.96343	-0.0943	-6.16224	-0.13875	-0.32843	-0.04074	-5.81563	-0.16129
9	1.707108	0.167975	-4.45513	-0.10235	1.45775	0.150914	-4.35788	-0.12785
10	-0.24008	-0.04883	-4.69521	-0.10994	-0.85888	-0.12908	-5.21676	-0.15068
11	-0.33665	-0.045	-5.03186	-0.11655	0.720699	0.050924	-4.49606	-0.13807
12	0.32015	0.089229	-4.71181	-0.09758	-0.68924	-0.05519	-5.1853	-0.14601
13	0.041912	0.005903	-4.6698	-0.09479	0.434201	0.080946	-4.7511	-0.12844
14	0.28542	0.0341	-4.38438	-0.08697	-0.93567	-0.1331	-5.68677	-0.15058
15	0.752827	0.108592	-3.63155	-0.06605	0.195374	0.031069	-5.4914	-0.14255

As per Table 3, the AAR on the event day for Cement and Communication & Networking sectors are -0.35% (insignificant negative AAR as Z value= 0.04) and 0.42% (insignificant positive AAR as Z value = 0.04) respectively can be observed. In case of cement sector after a steep fall on the previous day to the event day i.e. t-1 but a rise can be observed on the event day i.e.

t0. But this rise is for a day only because on the day t+1 the market shows negative returns and fluctuating thereafter. In case of communication sector market shows positive trends on the day t-1 and continue till the event day but afterward it shows a downward trend indicating the acceptance of null hypothesis and the evidence of semi strong efficiency of the market.

**Table 4: Sector-wise abnormality returns: electronics and energy sectors**

EVENT DAY	Electronics				Energy			
	%AAR	Z VALUE	%CAAR	Z VALUE	%AAR	Z VALUE	%CAAR	Z VALUE
-15	1.542471	0.12559	1.542471	0.12559	0.298703	0.049516	0.253598	0.049516
-14	1.431137	0.178177	2.973608	0.214795	-0.05023	-0.03635	0.033229	0.009309
-13	0.644607	0.189089	3.618215	0.28455	0.335274	0.070095	0.319724	0.04807
-12	-1.14073	-0.37368	2.477482	0.059586	0.303474	0.043773	0.494632	0.063517
-11	0.026329	0.00417	2.503812	0.05516	0.354958	-0.00208	0.483879	0.055881
-10	0.079459	0.010856	2.583271	0.054786	-0.52741	-0.0755	-0.10279	0.020189
-9	0.819859	0.222593	3.40313	0.134854	0.1171	0.058986	0.209137	0.040986
-8	1.194345	0.219229	4.597475	0.203653	-0.77246	-0.08573	-0.24519	0.008031
-7	0.04478	0.008873	4.642254	0.194964	0.717068	0.059667	0.270018	0.02746
-6	-0.37445	-0.08658	4.267804	0.157579	0.574706	0.091737	0.784509	0.055061
-5	1.476352	0.189851	5.744156	0.207488	-0.21729	-0.04446	0.475133	0.039093
-4	2.18147	0.240177	7.925626	0.267988	0.577213	0.035173	0.709399	0.047582
-3	0.651867	0.140899	8.577493	0.296553	0.578837	0.062357	1.210531	0.06301
-2	-1.77069	-0.55641	6.806804	0.137059	0.159032	0.013089	1.304507	0.064216
-1	-0.14637	-0.04907	6.660438	0.119742	-0.76663	-0.09888	0.673921	0.036509
0	1.142985	0.171153	7.803423	0.158728	0.839447	0.098548	1.449041	0.059987
1	-3.90399	-0.25166	3.899432	0.092953	-1.00484	-0.1082	0.490402	0.031954
2	-1.11569	-0.18418	2.78374	0.046923	-0.12701	0.001927	0.507003	0.031508
3	-0.24422	-0.08333	2.539521	0.026555	0.395559	0.045347	0.695129	0.041071
4	-1.89274	-0.29863	0.646779	-0.04089	-0.42766	-0.04945	0.357145	0.028974
5	1.414258	0.205457	2.061038	0.004926	0.331515	0.050616	0.743231	0.039321
6	-2.1554	-0.48337	-0.09436	-0.09824	-0.35143	-0.00969	0.629873	0.036351
7	-0.30337	-0.12803	-0.39773	-0.12278	1.062015	0.098546	1.322981	0.0561
8	-0.07917	-0.05901	-0.4769	-0.13224	0.124126	0.047288	1.566474	0.064571
9	-0.05799	-0.02398	-0.53488	-0.13437	0.383754	0.083872	1.990907	0.080041
10	2.745025	0.23764	2.210141	-0.08515	0.103806	0.005798	2.014909	0.079624
11	2.397424	0.253603	4.607564	-0.03475	-0.1685	0.001003	2.020073	0.078329
12	-0.22443	-0.03792	4.383138	-0.0413	-0.4202	-0.0451	1.747669	0.068394
13	0.484864	0.151405	4.868002	-0.01246	0.093067	0.007639	1.792195	0.068623
14	0.578306	0.094242	5.446308	0.004954	0.235039	0.029782	2.02698	0.072907
15	0.576953	0.121771	6.023262	0.026744	0.262034	0.051248	2.419054	0.080926

As per Table 4, the AAR on the event day for Electronics and Energy sectors are 1.14 % (insignificant positive AAR as Z value= 0.17) and 0.84% (insignificant positive AAR as Z value = 0.1) respectively can be observed. The market shows a downward trend from the day t-4 and correction observed on the day t-1 and the same as on the event day. Again unfavourable trend

observed on the very next day to the event day i.e. t+1. On the other hand in case of Energy sector a correction can be observed on the day t0 and again shows unfavourable trend on the next day. Again positive returns observed from the day t+1 indicating the acceptance of null hypothesis and the evidence of semi strong efficiency of the market.

**Table 5: Sector-wise abnormality returns: financial services and FMCG Sectors**

EVENT DAY	Financial Services				FMCG			
	%AAR	Z VALUE	%CAAR	Z VALUE	%AAR	Z VALUE	%CAAR	Z VALUE
-15	0.336239	0.072953	0.336239	0.072953	-0.16596	-0.01885	-0.16596	-0.01885
-14	-0.066929	-0.01205	0.26931	0.043067	-0.2382	-0.05041	-0.40415	-0.04827
-13	0.497804	0.103364	0.767114	0.094841	0.373624	0.041595	-0.03053	-0.01539
-12	-0.514981	-0.09789	0.252134	0.033188	0.003983	0.000794	-0.02655	-0.01293
-11	0.112444	0.021512	0.364578	0.039305	-0.08847	-0.01602	-0.11502	-0.01873
-10	-0.111606	-0.0194	0.252972	0.027961	-0.05055	-0.00839	-0.16557	-0.02053
-9	0.604076	0.075729	0.857048	0.05451	0.029732	0.006001	-0.13584	-0.01673
-8	-0.467586	-0.04861	0.389462	0.033805	0.027683	0.002973	-0.10815	-0.0146
-7	0.325655	0.054732	0.715118	0.050115	-0.8593	-0.09242	-0.96745	-0.04457
-6	-0.645048	-0.08185	0.070069	0.02166	0.490551	0.072431	-0.4769	-0.01938
-5	-0.799501	-0.09786	-0.72943	-0.00885	-0.18456	-0.0218	-0.65146	-0.02505
-4	-0.651666	-0.1081	-1.3811	-0.03968	-0.2186	-0.02245	-0.87005	-0.03047
-3	-0.754221	-0.06805	-2.13532	-0.057	-0.11876	-0.01509	-0.98781	-0.03346
-2	-0.366225	-0.0776	-2.50154	-0.07566	0.037293	0.004568	-0.95052	-0.03102
-1	0.068518	0.013165	-2.43303	-0.0697	-0.01371	-0.00157	-0.96423	-0.03037
0	0.992431	0.143289	-1.4406	-0.03166	0.187648	0.01845	-0.78658	-0.02505
1	-0.528273	-0.07061	-1.96887	-0.04784	0.032248	0.002402	-0.75433	-0.02372
2	0.313218	0.048963	-1.65565	-0.03496	-0.74018	-0.09735	-1.49451	-0.04599
3	-0.031125	-0.008	-1.68678	-0.03586	0.148878	0.021668	-1.34563	-0.03979
4	-0.161028	-0.03435	-1.8478	-0.04263	-1.23651	-0.19118	-2.58214	-0.08154
5	-0.161853	-0.03385	-2.00966	-0.04899	-1.26832	-0.13221	-3.85046	-0.10842
6	-0.234225	-0.05705	-2.24388	-0.06002	-0.14409	-0.01599	-3.99455	-0.10934
7	0.241389	0.045128	-2.00249	-0.04929	-0.18144	-0.02546	-4.16598	-0.11224
8	0.670441	0.110955	-1.33205	-0.02561	0.311518	0.03492	-3.85447	-0.10275
9	0.149141	0.018444	-1.18291	-0.0216	0.713688	0.104675	-3.14078	-0.07974
10	-1.231884	-0.25257	-2.41479	-0.07072	-0.11149	-0.01187	-3.25226	-0.0805
11	0.52373	0.103675	-1.89106	-0.04944	-0.40251	-0.06146	-3.65477	-0.09082
12	0.138865	0.029791	-1.7522	-0.04292	-0.18753	-0.01852	-3.8423	-0.09269
13	0.075847	0.01206	-1.67635	-0.03994	-0.1629	-0.02657	-4.0052	-0.09601
14	-0.418697	-0.06643	-2.09405	-0.05139	0.648187	0.098765	-3.35701	-0.07636
15	0.835437	0.095513	-1.25861	-0.0334	0.002907	0.000489	-3.3541	-0.07503

As per Table 5, the AAR on the event day for Financial Services and FMCG sectors are 0.99% (insignificant positive AAR as Z value=0.14) and 0.18% (very low and insignificant positive AAR as Z value = 0.02) respectively can be observed. In case of Financial Services the market shows an upward trend from the day t-5 and leads the same till the event day i.e. t0 but on the day t+1

the market showed a steep fall. On the other hand in case of FMCG an upward trend observed from the day t-5 and continue till the day t+1 after that on the next day i.e. t+2 and again t+4 a steep downfall can be observed, indicating the acceptance of null hypothesis and the evidence of semi strong efficiency of the market.

**Table 6: Sector-wise abnormality returns: industrial and IT sectors**

EVENT DAY	Industrial				IT			
	%AAR	Z VALUE	%CAAR	Z VALUE	%AAR	Z VALUE	%CAAR	Z VALUE
-15	-0.6106	-0.04122	-0.6106	-0.04122	0.45705	0.067485	0.45705	0.067485
-14	0.34504	0.024737	-0.26556	-0.01166	-0.38777	-0.03663	0.069276	0.02182
-13	0.01479	0.000996	-0.25077	-0.00894	0.003789	0.000831	0.073065	0.018296
-12	0.461497	0.037613	0.21073	0.011062	-0.04039	-0.00698	0.03268	0.012357
-11	-0.26894	-0.02286	-0.05821	-0.00033	0.306338	0.0451	0.339018	0.031222
-10	0.235539	0.016264	0.177329	0.00634	0.002172	0.000319	0.34119	0.028632
-9	-0.06104	-0.00404	0.116288	0.004343	-0.0735	-0.01171	0.267688	0.02208
-8	-0.86905	-0.06459	-0.75277	-0.01877	0.303872	0.041571	0.57156	0.035351
-7	0.414782	0.0333	-0.33798	-0.0066	-0.55788	-0.07541	0.013681	0.008192
-6	0.03279	0.002781	-0.30519	-0.00538	-0.41468	-0.06435	-0.401	-0.01258
-5	-0.11717	-0.00806	-0.42236	-0.00756	-0.20186	-0.03203	-0.60286	-0.02165
-4	0.075354	0.005264	-0.34701	-0.00572	0.358343	0.041844	-0.24452	-0.00865
-3	0.057585	0.004294	-0.28943	-0.00431	0.021659	0.002289	-0.22286	-0.00768
-2	-0.12009	-0.00993	-0.40952	-0.0068	0.087719	0.010244	-0.13514	-0.00466
-1	-0.19599	-0.01146	-0.60551	-0.00953	0.240173	0.02669	0.105034	0.002391
0	-1.06811	-0.04348	-1.67362	-0.0201	0.897161	0.065005	1.002196	0.018566
1	-1.05254	-0.05558	-2.72616	-0.03298	1.199176	0.089624	2.201372	0.039749
2	-0.87577	-0.04036	-3.60192	-0.04156	-0.57026	-0.10478	1.631113	0.013932
3	-0.51974	-0.03071	-4.12166	-0.0475	-0.41949	-0.0562	1.211627	0.000668
4	-0.33402	-0.02329	-4.45568	-0.0515	-0.24673	-0.03769	0.964902	-0.00778
5	0.266556	0.017605	-4.18912	-0.04642	0.182186	0.022622	1.147088	-0.00265
6	0.389909	0.032822	-3.79921	-0.03836	0.598121	0.054003	1.745209	0.008921
7	0.341936	0.020516	-3.45728	-0.03324	-0.21667	-0.03383	1.528542	0.001671
8	-0.4713	-0.03259	-3.92858	-0.03919	-0.33978	-0.05584	1.188757	-0.00976
9	0.084913	0.00586	-3.84367	-0.03722	0.446767	0.059955	1.635524	0.002426
10	0.177926	0.016508	-3.66574	-0.03326	-0.71188	-0.07971	0.923644	-0.01325
11	-0.17618	-0.01717	-3.84192	-0.03595	-0.17728	-0.01771	0.746362	-0.01641
12	-0.31283	-0.02116	-4.15476	-0.0393	0.582513	0.081534	1.328876	-0.00071
13	-0.50265	-0.03356	-4.65741	-0.04485	0.051035	0.009706	1.379911	0.001104
14	-0.4033	-0.0289	-5.06071	-0.04937	-0.01676	-0.00263	1.363149	0.000606
15	0.440352	0.034165	-4.62036	-0.04243	0.142092	0.033004	1.50524	0.006524

As per Table 6, the AAR on the event day for Industrial and IT sectors are -1.06% (insignificant negative AAR as Z value= 0.04) and 0.89% (significant positive AAR as Z value = 0.07) respectively can be observed. In case of Industrial sector the market shows a negative trend from the day t-4 and leads the same till the day t+2

on the other hand a vice versa trend observed in case of IT sector as it showed an upward trend on the day t-3 and this lead reached at a high pace on the event day (t0) but soon after that a correction observed in the market, indicating the acceptance of null hypothesis and the evidence of semi strong efficiency of the market.

**Table 7: Sector-wise abnormality returns: oil & gas and paint & chemical sectors**

EVENT DAY	Oil & Gas				Paint & Chemical			
	%AAR	Z VALUE	%CAAR	Z VALUE	%AAR	Z VALUE	%CAAR	Z VALUE
-15	-0.58196	-0.0655	-0.58196	-0.0655	-1.14057	-0.195	-1.14057	-0.195
-14	0.041161	0.003537	-0.5408	-0.04381	-0.57458	-0.06863	-1.71515	-0.18642
-13	-0.29593	-0.03759	-0.83673	-0.05747	-0.52779	-0.09795	-2.24294	-0.20876
-12	0.756463	0.050276	-0.08027	-0.02464	-1.34936	-0.15145	-3.5923	-0.25652
-11	-0.0232	-0.00213	-0.10347	-0.02299	-1.04635	-0.14572	-4.63865	-0.2946
-10	0.313974	0.026291	0.210503	-0.01025	-0.93944	-0.08998	-5.57808	-0.30567
-9	-0.85683	-0.09158	-0.64633	-0.04411	-0.53321	-0.08332	-6.11129	-0.31448
-8	-0.29921	-0.03274	-0.94554	-0.05283	2.746915	0.320492	-3.36438	-0.18086
-7	0.193405	0.021936	-0.75213	-0.0425	0.569884	0.057006	-2.79449	-0.15152
-6	-0.13406	-0.01567	-0.88619	-0.04527	-0.23322	-0.03086	-3.02771	-0.1535
-5	0.151019	0.015853	-0.73517	-0.03839	0.36459	0.064277	-2.66312	-0.12698
-4	0.198248	0.019317	-0.53693	-0.03118	0.16208	0.021728	-2.50104	-0.1153
-3	-0.05012	-0.0052	-0.58704	-0.03139	0.129229	0.019769	-2.37181	-0.10529
-2	-0.16678	-0.01886	-0.75382	-0.03529	-1.05128	-0.10485	-3.42309	-0.12948
-1	-0.86491	-0.07094	-1.61873	-0.05241	-0.08825	-0.01603	-3.51135	-0.12923
0	-0.37392	-0.02901	-1.99265	-0.058	1.661404	0.243857	-1.84994	-0.06416
1	-0.42522	-0.03282	-2.41787	-0.06423	1.460292	0.107505	-0.38965	-0.03617
2	-0.24493	-0.0318	-2.6628	-0.06992	-0.38697	-0.0563	-0.77662	-0.04842
3	-0.23155	-0.02279	-2.89434	-0.07328	-1.05172	-0.14131	-1.82834	-0.07955
4	-0.07175	-0.00481	-2.96609	-0.0725	-0.33048	-0.04909	-2.15882	-0.08851
5	0.040245	0.004444	-2.92585	-0.06978	0.568797	0.088052	-1.59003	-0.06717
6	-0.48536	-0.04604	-3.4112	-0.078	-0.45245	-0.04932	-2.04248	-0.07614
7	-0.41584	-0.04591	-3.82704	-0.08585	-0.22845	-0.03657	-2.27093	-0.08209
8	-0.10231	-0.00992	-3.92935	-0.08607	0.879355	0.089537	-1.39157	-0.06208
9	-0.5006	-0.05847	-4.42995	-0.09602	-0.15129	-0.01882	-1.54286	-0.06459
10	-0.27853	-0.02943	-4.70848	-0.09993	-0.61249	-0.0468	-2.15536	-0.07252
11	0.246385	0.020168	-4.4621	-0.09418	-0.32514	-0.06533	-2.48049	-0.08374
12	0.026393	0.00291	-4.43571	-0.09194	0.128322	0.028521	-2.35217	-0.07684
13	0.207205	0.020283	-4.2285	-0.08657	-0.24085	-0.03683	-2.59302	-0.08234
14	-0.54942	-0.05551	-4.77792	-0.09525	0.069573	0.010847	-2.52345	-0.07898
15	-0.01553	-0.0014	-4.79345	-0.09395	-0.50329	-0.05393	-3.02674	-0.08738

As per Table 7, the AAR on the event day for Oil & Gas and Paint & Chemical sectors are -0.37% (insignificant negative AAR as Z value= 0.03) and 1.66% (insignificant positive AAR as Z value = 0.24) respectively can be observed. The market showed a negative returns since the day t-4 and this trend showed a back gear as the correction observed on the day before the event day (t-1)

and a positive reaction observed in the market. Paint and Chemical sector followed the same trend. Correction in the market can be observed on the day previous to the event day i.e. (t-1) that leads to the peak on the event day, indicating the acceptance of null hypothesis and the evidence of semi strong efficiency of the market.

**Table 8: Sector-wise abnormality returns: pharma and realty sectors**

EVENT DAY	Pharma				Realty			
	%AAR	Z VALUE	%CAAR	Z VALUE	%AAR	Z VALUE	%CAAR	Z VALUE
-15	-0.18799	-0.01652	-0.18799	-0.01652	-1.39706	-0.67234	-1.39706	-0.67234
-14	-0.08204	-0.00818	-0.27003	-0.01746	-1.7299	-0.30232	-3.12696	-0.68919
-13	0.260219	0.022167	-0.00981	-0.00146	-0.79051	-0.23127	-3.91747	-0.69624
-12	-0.16828	-0.01529	-0.1781	-0.00891	-1.05899	-0.27692	-4.97646	-0.74143
-11	-0.0289	-0.00185	-0.207	-0.0088	0.509213	0.09874	-4.46725	-0.61899
-10	0.180205	0.01674	-0.02679	-0.0012	1.066582	0.354493	-3.40067	-0.42034
-9	-0.49348	-0.04328	-0.52027	-0.01747	-1.34093	-0.11821	-4.74159	-0.43384
-8	0.228435	0.019861	-0.29184	-0.00932	0.415395	0.052014	-4.3262	-0.38743
-7	0.084758	0.009638	-0.20708	-0.00557	-2.39112	-0.19836	-6.71732	-0.43139
-6	-0.05698	-0.00556	-0.26406	-0.00704	0.392999	0.115327	-6.32432	-0.37278
-5	-0.43549	-0.03355	-0.69955	-0.01683	1.547851	0.415793	-4.77647	-0.23007
-4	0.108843	0.011061	-0.5907	-0.01292	0.824744	1.003504	-3.95172	0.069414
-3	0.034272	0.003088	-0.55643	-0.01156	0.634577	0.284047	-3.31715	0.145471
-2	-0.08504	-0.00707	-0.64147	-0.01303	-0.33131	-0.14827	-3.64846	0.100553
-1	-0.51959	-0.02767	-1.16105	-0.01973	-1.59927	-0.26882	-5.24773	0.027734
0	-0.60005	-0.04972	-1.7611	-0.03153	-0.73674	-0.14065	-5.98447	-0.00831
1	-0.25776	-0.01654	-2.01886	-0.0346	1.365017	0.361902	-4.61945	0.079714
2	-0.14416	-0.01206	-2.16303	-0.03647	3.576356	0.357482	-1.0431	0.161727
3	-0.38007	-0.04031	-2.5431	-0.04475	-0.30951	-0.08228	-1.3526	0.138537
4	0.345707	0.027814	-2.19739	-0.03739	0.380866	0.075585	-0.97174	0.151931
5	0.625491	0.024924	-1.5719	-0.03105	0.664104	0.231348	-0.30763	0.198754
6	0.35311	0.030524	-1.21879	-0.02383	-0.0993	-0.00995	-0.40694	0.192064
7	0.107335	0.008916	-1.11146	-0.02145	-0.31178	-0.05826	-0.71872	0.175694
8	-0.00966	-0.00074	-1.12112	-0.02115	0.678144	0.076759	-0.04057	0.187663
9	-0.35076	-0.03138	-1.47188	-0.027	0.715724	0.231399	0.675152	0.230152
10	0.09646	0.009311	-1.37542	-0.02465	0.699449	0.465477	1.374601	0.31697
11	-0.21523	-0.02308	-1.59065	-0.02863	-0.38175	-0.10541	0.992855	0.290758
12	0.146058	0.011179	-1.44459	-0.026	0.470624	0.120645	1.46348	0.308319
13	0.485431	0.033662	-0.95916	-0.0193	-0.55947	-0.2577	0.904009	0.255103
14	-0.27603	-0.03665	-1.23519	-0.02566	0.35217	0.079434	1.25618	0.265318
15	0.304767	0.027932	-0.93042	-0.02023	1.139603	0.160912	2.395783	0.289904

As per Table 8, the AAR on the event day for Pharmaceutical and Realty sectors are 0.60% (insignificant positive AAR as Z value= 0.05) and -0.74% (insignificant negative AAR as Z value = -0.14) respectively can be observed. After a continue fall in the market since t-8 correction can be observed on the day  $t_4$  but soon a negative returns observed in the market on the

next day and continue till the day  $t_{+1}$ . Correction can be seen from the day  $t_{+4}$  in case of Realty the same trend observed but soon the correction is observed from the day  $t_0$  and leads the same on the day  $t_{+1}$ , indicating the acceptance of null hypothesis and the evidence of semi strong efficiency of the market.

**Table 9: Metal and automation sectors**

EVENT DAY	Metal				Automation			
	%AAR	Z VALUE	%CAAR	Z VALUE	%AAR	Z VALUE	%CAAR	Z VALUE
-15	-0.12239	-0.00857	-0.12239	-0.00857	5.981891	0.291478	5.981891	0.291478
-14	0.261486	0.026808	0.139098	0.012896	-0.18707	-0.04069	5.794724	0.187335
-13	-0.13552	-0.01889	0.003578	-0.00038	5.79745	0.282349	11.59218	0.307808
-12	-0.21412	-0.02832	-0.21054	-0.01448	-1.58225	-0.24909	10.00992	0.142024
-11	-0.05438	-0.00896	-0.26492	-0.01696	-2.46428	-0.37033	7.545638	-0.03859
-10	-0.43391	-0.05667	-0.69883	-0.03862	-1.0105	-0.83852	6.535137	-0.37755
-9	0.741036	0.115597	0.042206	0.007936	-1.93054	-0.66685	4.604593	-0.60159
-8	-0.28483	-0.06753	-0.24262	-0.01645	-1.77035	-0.49973	2.834239	-0.73942
-7	-0.26904	-0.04726	-0.51167	-0.03126	-1.4398	-0.24596	1.394435	-0.77912
-6	0.588983	0.081971	0.077318	-0.00374	0.214105	0.051854	1.608541	-0.72274
-5	-0.48795	-0.13488	-0.41063	-0.04423	2.272005	0.272725	3.880545	-0.60687
-4	0.590374	0.091422	0.189743	-0.01596	-0.81888	-0.16154	3.06166	-0.62767
-3	-0.77407	-0.12781	-0.59433	-0.05078	-2.43366	-0.19184	0.628003	-0.65622
-2	0.044581	0.006029	-0.54974	-0.04732	2.787859	0.227228	3.415863	-0.57162
-1	-0.66262	-0.08536	-1.21237	-0.06776	1.987308	0.570222	5.40318	-0.40501
0	-0.5977	-0.0574	-1.81007	-0.07995	4.864129	0.336521	10.2673	-0.30802
1	0.061374	0.005375	-1.7487	-0.07626	2.275639	0.387707	12.54294	-0.20479
2	-0.94123	-0.16937	-2.68993	-0.11403	-3.69162	-0.41267	8.851322	-0.29629
3	0.939246	0.10101	-1.75068	-0.08782	-3.66227	-0.69108	5.189056	-0.44693
4	-0.19083	-0.02824	-1.94151	-0.09191	-0.85042	-0.29469	4.338633	-0.50151
5	-0.36789	-0.03097	-2.3094	-0.09645	0.937582	0.152714	5.276216	-0.4561
6	-0.72381	-0.10318	-3.03321	-0.11623	-1.52662	-0.59082	3.749599	-0.57157
7	-0.34299	-0.04341	-3.3762	-0.12273	1.441852	0.148107	5.191451	-0.52813
8	0.427945	0.058141	-2.94825	-0.10828	1.466658	0.204898	6.65811	-0.47518
9	0.12049	0.014083	-2.82776	-0.10327	-2.09366	-0.69844	4.564452	-0.60527
10	-0.08941	-0.00946	-2.91818	-0.10312	-0.41264	-0.13184	4.151816	-0.61937
11	0.362457	0.046908	-2.55471	-0.09218	-0.63225	-0.65283	3.519566	-0.73343
12	-0.03727	-0.00488	-2.59199	-0.09143	5.884606	0.271559	9.404182	-0.6689
13	0.305601	0.029644	-2.28639	-0.08434	-3.57004	-0.27057	5.83413	-0.70751
14	-0.28765	-0.02831	-2.57404	-0.08809	4.421148	0.300459	10.25528	-0.64076
15	0.189518	0.01627	-2.39452	-0.08373	-0.0731	-0.12863	10.18218	-0.65344

As per Table 9, the AAR on the event day for Metal and Automation sectors are -0.60% (insignificant negative AAR as Z value=0.06) and 4.87% (insignificant positive AAR as Z value = 0.34) respectively can be observed. A fluctuation can be observed since the day t-10 and the same continue till the event day (t<sub>0</sub>). On the event day favourable returns can be observed in the market

and afterwards again fluctuation was going on. In case of Automation sector favourable correction can be observed two days before the event day and again unfavorable returns can be observed from the day t+1, indicating the acceptance of null hypothesis and the evidence of semi strong efficiency of the market.

**Table 10: Sector-wise abnormality returns: entertainment and service sectors**

EVENT DAY	Entertainment				Service			
	%AAR	Z VALUE	%CAAR	Z VALUE	%AAR	Z VALUE	%CAAR	Z VALUE
-15	-1.2345	-0.45548	-1.2345	-0.45548	-0.05142	-0.02592	-0.05142	-0.02592
-14	3.052277	0.270936	1.81878	-0.13049	-1.52985	-0.5398	-1.58127	-0.40003
-13	0.952165	0.182543	2.769945	-0.00116	1.290127	0.658264	-0.29114	0.053428
-12	0.093933	0.013996	2.863879	0.005997	0.578454	0.081318	0.287311	0.086929
-11	1.371284	0.439766	4.235163	0.202033	1.50536	0.200694	1.792671	0.167505
-10	0.939631	0.228894	5.184794	0.277876	0.164575	0.028337	1.957246	0.164479
-9	-0.20507	-0.06261	4.969722	0.233599	-0.64063	-0.25268	1.316618	0.056772
-8	0.224818	0.039511	5.194538	0.232481	-2.35318	-0.60766	-1.03656	-0.16184
-7	-0.4493	-0.0969	4.745242	0.186885	0.076999	0.094189	-0.95956	-0.12109
-6	1.522318	0.576108	6.267558	0.359476	-0.20673	-0.10876	-1.16629	-0.14927
-5	-0.07551	-0.02076	6.192051	0.336489	-0.00047	-0.00012	-1.16676	-0.14236
-4	0.435545	0.13089	6.627596	0.359949	0.454835	0.135662	-0.71192	-0.09714
-3	-1.43749	-0.40844	5.190102	0.232545	-4.15453	-0.4709	-4.86645	-0.22393
-2	-0.61182	-0.21312	4.578379	0.167129	0.055361	0.025744	-4.81109	-0.20891
-1	0.851183	0.934932	5.429562	0.40286	-1.0029	-0.22156	-5.81399	-0.25903
0	-4.27941	-0.37759	1.150148	0.295671	1.489554	0.156828	-4.32443	-0.2116
1	2.975895	0.295105	4.126043	0.358416	-4.38133	-3.16084	-8.70576	-0.97189
2	-2.0015	-0.28813	2.124542	0.280404	-0.00251	-0.00126	-8.70826	-0.94481
3	0.650067	0.10924	2.774609	0.297987	4.642065	0.39345	-4.0662	-0.82935
4	0.242602	0.077503	3.018211	0.307772	0.270666	0.07072	-3.79553	-0.79253
5	0.340866	0.091318	3.358077	0.320282	-1.22499	-0.4392	-5.02052	-0.86927
6	1.832348	0.266449	5.190425	0.369725	-1.84804	-1.46319	-6.86856	-1.16124
7	-0.03811	-0.00686	5.152319	0.360167	1.34649	0.462921	-5.52207	-1.03919
8	-1.12282	-0.30721	4.029495	0.289875	0.60144	0.187909	-4.92063	-0.97895
9	0.880634	0.24113	4.910129	0.332244	1.529361	1.634883	-3.39127	-0.6322
10	1.716647	0.512385	6.626775	0.426279	-0.39976	-0.11877	-3.79103	-0.64302
11	-0.21049	-0.05718	6.416282	0.407306	3.429516	0.523427	-0.36151	-0.53026
12	1.8559	0.339661	8.272183	0.464156	-0.33185	-0.18303	-0.69336	-0.55341
13	0.690396	0.119874	8.962579	0.478343	0.357762	0.264399	-0.3356	-0.49468
14	0.044838	0.022776	9.007418	0.474462	0.462135	0.508592	0.126536	-0.39351
15	1.460871	0.582121	10.46829	0.571298	-0.58243	-0.46725	-0.4559	-0.47104

As per Table 10, the AAR on the event day for Entertainment and Services sectors are -4.28% (insignificant negative AAR as Z value= 1.49) and 0.38% (insignificant positive AAR as Z value = 0.16) respectively can be observed. In case of Entertainment sector a steep downfall can be observed on the event day whereas fluctuation can be seen before and after the announcement

day. The market showed a favourable return on the day  $t_{+1}$ . In case of Service sector correction can be observed on the day  $t_{-1}$  and market reacted negatively on the event day ( $t_0$ ) but on the next day ( $t_{+1}$ ) favourable returns can be observed till the day  $t_{+3}$ , indicating the acceptance of null hypothesis and the evidence of semi strong efficiency of the market.

**Table 11: CAAR across the event window**

Sector→	Auto		Banking		Cement		Communication	
Days↓	Mean CAAR	Variance	Mean CAAR	Variance	Mean CAAR	Variance	Mean CAAR	Variance
t-15 to t-2	-0.03952	0.445187	0.588192	0.225451	0.746854	0.475141	-2.44135	1.920621
t-1 to t0	-0.64722	0.136269	0.592254	0.19181	-0.71195	0.246145	-4.83116	0.292585
t0 to t+1	-0.44277	0.152867	0.618403	0.22879	-1.57422	0.973281	-4.7127	0.125069
t+2 to t+15	-1.59909	0.683422	0.796995	0.335772	-4.60947	0.946784	-5.08673	0.597152
Sector→	Electronics		Energy		Financial Services		FMCG	
t-15 to t-2	4.404543	2.148218	0.44288	0.447158	-0.17667	1.083332	-0.43257	0.379041
t-1 to t0	7.23193	0.808212	1.061481	0.548093	-1.93681	0.701755	-0.8754	0.125616
t0 to t+1	5.851427	2.760538	0.969721	0.67786	-1.70473	0.373545	-0.77045	0.022803
t+2 to t+15	2.433259	2.347182	1.416687	0.6936	-1.78916	0.361564	-3.27816	0.893644
Sector→	Industrial		IT		Oil & Gas		Paint & Chemical	
Days↓	Mean CAAR	Variance	Mean CAAR	Variance	Mean CAAR	Variance	Mean CAAR	Variance
t-15 to t-2	-0.25322	0.280884	0.039917	0.337368	-0.55542	0.337217	-3.22605	1.398917
t-1 to t0	-1.13956	0.755269	0.553615	0.634389	-1.80569	0.264398	-2.68064	1.17479
t0 to t+1	-2.19989	0.744255	1.601784	0.847945	-2.20526	0.300677	-1.1198	1.032582
t+2 to t+15	-4.09986	0.459455	1.307139	0.294734	-3.88948	0.775643	-2.05235	0.581399
Sector→	Pharmaceutical		Realty		Metal		Automation	
Days↓	Mean CAAR	Variance	Mean CAAR	Variance	Mean CAAR	Variance	Mean CAAR	Variance
t-15 to t-2	-0.33222	0.22639	-4.22065	1.331032	-0.22598	0.29182	4.920519	3.221123
t-1 to t0	-1.46108	0.424299	-5.616097	0.520956	-1.51122	0.42264	7.835235	3.439459
t0 to t+1	-1.88998	0.182265	-5.30196	0.965213	-1.77938	0.043398	11.40512	1.60912
t+2 to t+15	-1.49529	0.488886	0.301483	1.142726	-2.58541	0.434278	6.226141	2.423442
Sector→	Entertainment		Service					
Days	Mean CAAR	Variance	Mean CAAR	Variance				
t-15 to t-2	4.242304	2.095857	-0.80633	2.045605				
t-1 to t0	3.289855	3.026002	-5.069209	1.053274				
t0 to t+1	2.638096	2.104275	-6.515095	3.098066				
t+2 to t+15	5.736452	2.635371	-3.414564	2.737959				

Source: Information extracted from CMIE Prowess Database

**Table 12: Sector wise AAR pattern**

Sr.No	Significant +ve	Significant -ve	Insignificant +ve	Insignificant -ve
1	-	-	Auto	Banking
2	-	-	Communication	Cement
3	-	-	Electronics	Industries
4	-	-	Energy	Oil & Gas
5	-	-	Financial Services	Realty
6	-	-	FMCG	Metal
7	-	-	IT	Entertainment

Sr.No	Significant +ve	Significant -ve	Insignificant +ve	Insignificant -ve
8	-	-	Paint & Chemical	-
9	-	-	-	Pharmaceutical
10	-	-	Automation	-
11	-	-	Services	-
Total	-	-	10	8

#### 4.6 Analysis of sector wise effect of announcement

However the researches in the past have documented a significantly positive abnormal return on the event day i.e. on mergers and acquisitions announcement day. But this study showed a reverse reaction (As per Table: 12) as none out of 18 sectors has shown significant positive abnormal returns on the announcement day. Ten sectors i.e. Auto, Communication, Electronics, Energy, financial Services, FMCG, IT, Paint & chemical, Automation and Services showed insignificant positive abnormal returns whereas eight sectors i.e. Banking,

Cement, Industries, Oil & Gas, Realty, Metal, entertainment and Pharmaceutical showed insignificant negative abnormal returns. It depicts that investors didn't earn an abnormal returns from the market immediately after the mergers and acquisitions announcement because there will be no any information to which market react abnormally. From the above analysis it can also be said that the market react to mergers and acquisitions announcement for a short period of time and afterwards it behave normally indicating the acceptance of our Null Hypothesis (H0) that there is no significant abnormal returns (AAR) around the mergers and acquisitions announcement date.

**Table 13: Average abnormal returns (AARs) and cumulative average abnormal (CAARs) returns around merger and acquisition announcement dates**

Pre-announcement Period	%AAR	Z value	%CAAR	Z value
-15	0.050264791	0.001117094	0.050264791	0.001117094
-14	0.076207971	0.001986468	0.126472762	0.00219455
-13	0.139494684	0.003530522	0.265967446	0.00383019
-12	-0.00301782	-8.09575E-05	0.262949626	0.003276563
-11	-0.121952059	-0.003066413	0.140997566	0.001559306
-10	-0.04404008	-0.001145063	0.096957487	0.000955975
-9	-0.088337343	-0.002446726	0.008620144	-3.97148E-05
-8	-0.077610214	-0.002005927	-0.06899007	-0.000746352
-7	-0.137538704	-0.003816547	-0.206528774	-0.00197585
-6	-0.007134542	-0.000205226	-0.213663316	-0.001939354
-5	-0.065770604	-0.00168692	-0.27943392	-0.002357727
-4	0.094954185	0.002624175	-0.184479735	-0.001499817
-3	-0.171675202	-0.0044187	-0.356154936	-0.002666505
-2	-0.001940216	-5.01922E-05	-0.358095152	-0.002582923
-1	-0.200372913	-0.0048168	-0.558468065	-0.003739033
<b>Announcement day</b>	<b>%AAR</b>	<b>Z value</b>	<b>%CAAR</b>	<b>Z value</b>
0	-0.07169234	-0.001219842	-0.630160405	-0.003925264

Post-announcement Period	%AAR	Z value	%CAAR	Z value
1	-0.104947841	-0.001812611	-0.735108246	-0.004247688
2	-0.304066632	-0.006794906	-1.039174878	-0.005729586
3	-0.117531142	-0.002877604	-1.15670602	-0.006236937
4	-0.214214302	-0.005810019	-1.370920322	-0.007378174
5	-0.054104652	-0.00123924	-1.425024975	-0.007470785
6	-0.072369902	-0.001906457	-1.497394877	-0.007705478
7	-0.048005994	-0.001265202	-1.545400871	-0.007799919
8	-0.002806259	-7.45288E-05	-1.54820713	-0.007650905
9	0.098044748	0.002735045	-1.450162382	-0.006949316
10	-0.061027239	-0.001639307	-1.511189622	-0.007135859
11	0.022849372	0.0006244	-1.48834025	-0.006882301
12	0.072157113	0.001630823	-1.416183136	-0.006450089
13	-0.045134223	-0.00107472	-1.461317359	-0.006537476
14	-0.05421312	-0.001418452	-1.51553048	-0.006686567
15	0.342191894	0.008996214	-1.173338586	-0.004962068

Note: \*Significant at 1% level , \*\*Significant at 5% level of significance

Figure 1: Average abnormal returns of sample events

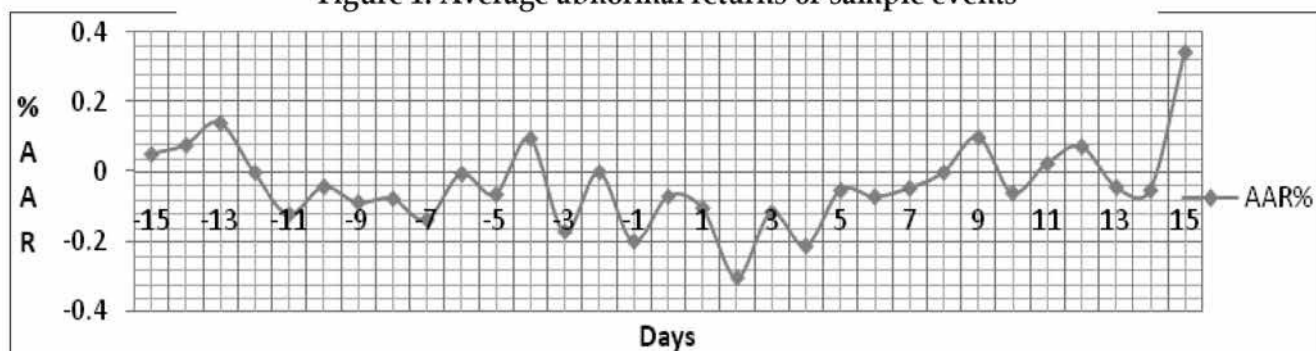
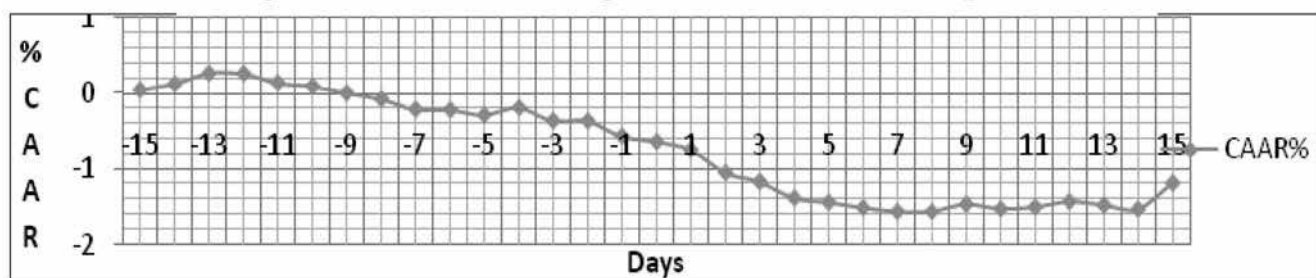


Figure 2: Cumulative Average abnormal returns of sample events



#### 4.7 Analysis of AAR of group events

In an efficient market, if there is some information content associated with mergers and acquisitions announcement, then the same should be incorporated in the stock price on the announcement day. As per Table: 13, the result

of the event study concerning the announcement dates of mergers and acquisitions are presented in Table 13. However the researches in the past have documented a significantly positive abnormal return on the event day i.e. on mergers and acquisitions announcement day. But this study documents dissimilar results. On the

announcement day there is negative AAR of 0.07% which is very low and insignificant at 1%, and 5% level ( $z$  value = 0.001). On the day t+1 and t+2 the market earns an insignificant negative AAR as observed,  $z$  values have not exceeded the critical values. Whereas, on the day t+3 market earns a insignificant positive AAR, it continues to build up to five days i.e. t+5, t+6, t+7, t+8 and t+9. There are insignificant positive excess returns before run up to the mergers and acquisitions announcement date during the days t-13, t-10, t-8, t-6, t-4, and t-2. It is surprise that there are insignificant -ve AAR is observed 9 times prior the announcement date and moreover there is not any single day around the event window when significant abnormal returns observed. In spite of positive AAR on the day t-1 but due to insignificant returns at 1% and 5% level depicts that there was not any substantial leakage of information before the event.

#### 4.8 Analysis of CAAR of group events.

We observed a randomly trend in the prior event period i.e. from the day t-15 to t-2 the mean CAAR is -0.05 and during this period fluctuation can be seen. From the day t-12 to t-1 the CAAR gradually drift down to -0.28%, but correction is not observed on the day t0 as expected because, CAAR drop down to -0.63% which continue till the day t+7 (CAAR = -1.54%). But from the day t+8 the market reacts positively and goes with the flow of the announcement till the day t+12. However during the period under consideration investor initially appear to respond negatively to announcement of mergers and acquisitions offering, but the CAAR shows an upward trend shortly thereafter. A radical downfall to -0.63% can be observed on the event day i.e. t0.

The CAAR of -0.73% on the day t+1 decline to -1.54% by t+7 indicating the acceptance of our Null Hypothesis ( $H_0$ ) that there is no significant abnormal returns (AAR) around the mergers and acquisitions announcement date.

## 5. CONCLUSION

This study documents the market behavior around the mergers and acquisitions announcement date for 76 stocks (with 350 events) listed on the NSE 100 index over the period 2006 to 2015. An event study was conducted using a 30 days event window. It was found that on an average the stocks start showing negative abnormal returns from the day t-15. On the announcement day (t0) there is negative AAR of 0.07% which is very low and insignificant ( $z$  value = 0.001). In this study it is observed that the generally stocks doesn't reacts immediately but gradually from the third or fourth day of the announcement. Out of 18 sectors none of them observed significant positive abnormal returns (AARs) on the announcement day whereas 10 sectors observed insignificant positive abnormal returns (AARs) on the day (t0). Thus there appears to be no announcement effect associated with mergers and acquisitions announcement in India. In general the behavior of AARs and CAARs are found to be in accordance with expectation, thereby lending support to the hypothesis that the Indian Stock market is Semi Strong Efficient.

## 6. LIMITATIONS OF THE STUDY

The only limitation of the study is the less number of sample events. If the number of sample events increases, the results may be different and more accurate.

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