Differences in Impact of Stock Splits with Differences in Stock Split Ratios (Ex-Split Day)

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Abstract:
Ex-split Day is the effective day on which share starts trading in the stock market at new face value after stock split. Stock split is a numeric change in face value of shares and it does not affect equity ownership of the investors. After analyzing AARs for three split ratios it can be noted that impact on AAR is more in case of higher split ratio as compared to lower split ratio in the ex-split window. An interesting observation has been noted for the ex-split window. There is significant impact of stock splits present in the shortest event window irrespective of the split factor. In relation to impact of stock splits in ex-split window for different split factors, it can be inferred that more positive response is present for higher split factor.

Keywords: *Ex-split Day, Stock split, stock market*

1. Introduction

In Indian stock market 'Stock split' is also termed as subdivision of shares. With boom in share prices of giants like Wipro, Zee and Infosys there was an increase in number of stock splits and an era of stock splits started. This popularity was further enhanced because of the changes in legal framework in relation to stock splits.

Before 1999, stock splits were an occasional feature in Indian capital market. It was mandatory for equity share to be of denomination of Rs.10 or Rs.100 on or before December 31, 19831.This concept of fixed par value was changed by Securities Exchange Board of India (SEBI) in 19992. As a result companies were able to split their shares into shares of any denomination other than fraction of a rupee.

Information technology companies were among the first to split their shares after this legal change. Dematerialization of shares acted as added facilitators for stock splits. The companies are now permitted to issue shares in any denomination other than in decimal of a rupee.

After circular of 1999 it was observed that many companies resorted to consolidation and splitting quite often. Such frequent changes in face value can confuse investors in relation to share prices, while calculation of return/payment from the company. Also it becomes difficult to compare share price movement of companies which have split with other companies of similar sector. In India many times dividend is declared as a percentage of face value of shares of the company. Frequent changes in face value through split or consolidation may mislead investors and investors may assume a higher dividend rate in relation to the company.

1 Ministry of Finance, vide Circular No.1/7/SE/81 dated January 22, 1983 had restricted change of face value at denomination lower than Rs.10 keeping them fixed at Rs.10 or Rs.100.

2 SMDRP/ Policy/ Cir-16/ 99 dated June 14, 1999 provided companies freedom to issue shares in any denomination to be determined by them as long as it is not fractional by amending their Memorandum and Articles of Associations.

It is a puzzle why there are ARs around **ex-split** day because this date is predictable and there is no information content on ex-split day. Lakonishok and Vermalen (1986) reported substantial positive ARs for a sample of 2,558 share dividends and stock splits. They considered each of the five days prior to ex-split, ex-split itself and two days subsequent to it and found that the largest AR was present on ex-split itself.

Grinblatt et al. (1984) considered ex-split day of stock splits and found AARs of 1.1%.They suggested that if an investor bought shares of company on day before its ex-split day and sold them on day after ex-split day, then on an average, investors would make ARs of roughly 1% for stock splits. Such an observation appears to violate notion of efficient markets because it suggests that an investor can make ARs by trading shares by simply using publicly available information. This finding is also interpreted as confirmation of signalling hypothesis.

Kuse and Yamamato (2004) found that companies with a large split factor had higher return immediately after stock splits. Pavabutru and Sirodom (2008) explored impact of splits on share price and various aspects of liquidity using daily and intraday data from Stock Exchange of Thailand from 2002-2004.They observed that shares with high split factors had better post-split adjusted price performance, lower trade bid-ask spreads, and lower price impact.

Xiao and Xuan (2013) in China found significant positive ARs four to six days before ex-split day. Significant negative ARs were noted around ex-split day. Chakraborty (2012) analysed 234 stock splits from March 1999 to December 2008 and found significant positive ARs on ex-split day. There were high negative ARs in post split period which wiped out much more than positive gain on ex-split day. Joshi and Pandya (2013) analysed 180 companies which announced stock splits during year 2007 to 2012.They found no positive ARs on ex-split day. However just two days before ex-split day, there were significant positive ARs.They suggested that stock splits do not have any positive impact on wealth of share holders.

One of the objectives of the present study is to examine the differences in effect of stock splits on share prices with differences in split ratios. The chapter begins with mention of hypotheses tested and presents findings relating to impact of stock splits on share prices and ARs on and around ex-split day in a period starting from 1999 to June 2013.The research hypothesis tested in the chapter is :

HYP: Stock split ratios have different impact on share prices.

2. Research Methodology

The research papers and studies in the past are primarily used as basis to decide appropriate methodology used for analysing the impact of stock splits on share prices. The use of event study methods for analysis is well documented and evaluated in previous work. The event study is a methodology used to study share price behaviour around specific events and share price reaction to such events as stated by Binder (1998). The methodology starts with the hypothesis whether a particular event affects company value or not. It helps in determining whether an event generates abnormal returns after a company makes a financial decision in relation to an asset or whether an event affects value of that asset.

The sample comprises of stock splits announced by companies listed on Bombay Stock Exchange (BSE) which became effective during period starting from 1st January 1999 and till 30th June 2013.

The closing share prices data for the sample along with values of BSE Sensitive Index3 is collected from Prowess 19.1, a database of Centre for Monitoring Indian Economy (CMIE)4.

The stock split announcement dates are not directly published in any of the leading business dailies. The dates of announcement day are taken from Prowess database, Capital line and press reports of Economic Times. Additional information is obtained from bseindia.com (official website of BSE).

The companies are grouped on the basis of three most popular 5 stock split ratios -10:1(67 companies), 10:2 (86 companies) and 10:5 (32 companies) in India. Presence or absence of differences in effect of stock splits with differences in split ratios are analysed by calculating AARs and CAARs for each group with different split ratio.

Impact of stock splits on share prices is analysed through stock returns. The study tries to find effect around Ex-split day and same is discussed below.

Impact of stock splits around6 ex-split day is studied through abnormal returns (ARs) calculated using market model as a part of Event Study. Abnormal return is defined as actual return (R_{it}) minus normal return (NR_{it}).

$$AR_{it} = R_{it} - NR_{it} \quad (1)$$

Normal Return is calculated using Market model which is –

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}$$

And,

$$NR_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \quad (2)$$

R_{mt} is return on market index for day t.α_i measures mean returns not explained by market. β_i measures sensitivity of return (company i) to market return and ε_{it} is the statistical error whose expectation is assumed to be zero.

Using Eq.(1) and Eq.(2), abnormal returns are defined as residuals or prediction errors of model which is as under:

$$AR_{it} = R_{it} - NR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \quad (3)$$

Where, $\hat{\alpha}$ and $\hat{\beta}$ are OLS estimators of regression coefficient estimated over estimation window.

3. Impact on Average abnormal returns (AARs) –ex-split day

The un-weighted cross-sectional average abnormal returns in period *t* are calculated using:

$$AAR_{it} = \frac{\sum_{i=1}^{N} AR_{it}}{N} \quad (4)$$

Where, N is number of shares for which ARs are present on an event day in the event window. The

3 BSE Sensitive index is a robust representative of Indian stock market and used as proxy for market portfolio because it is value weighted index which uses free float market capital as value weights and appropriate for such type of analysis same is suggested by Womack et al. (1996) and Fama (1998).

4 CMIE is an independent private sector economic research organization.It has built largest database on Indian economy and companies in form of databases and research reports.It is widely used by academics and industries in India.

5 Most popular stock split ratios are the one in which majority of companies in the period of study have split their shares.

6 Around - here and in rest of chapters 5, 6, 7 and 8 means event window and includes event day.

event window is from t_{-20} to t_{+20}.The null hypothesis tested is:

$$H_o : E(AAR_{it}) = 0$$

Z-test is used to test statistical significance of AARs on an event day. It assumes that AARs are independently and identically distributed, have same mean and variances and are cross-sectionally uncorrelated.σ is unknown and estimator of σ can be constructed from cross-sectional variance of ARs in period t_i. The *Z*-statistics is calculated as under:

$$Z = \sqrt{N}\left(\frac{AAR_{it}}{s_t}\right) \approx N(0,1) \quad (5)$$

If AARs are not zero and statistically significant it indicates that share prices behave positively or negatively to stock splits and affect wealth of shareholders.

.We try to analyse cumulative effect of AARs using Cumulative average abnormal returns (CAARs).CAAR is obtained by aggregating AARs for event day t_1 through t_2 using:

$$CAAR_{it} = \sum_{t=t1}^{t2} AAR_{it} \quad (6)$$

The null hypothesis tested is that CAAR at the end of period over which AARs are aggregated is zero. If CAAR is greater than zero; with significant *Z*-values it implies that there is significant impact of stock splits on ARs.

For testing statistical significance of CAARs for N number of companies over *t* days (t_1 through t_2), Z_{cs} -statistic is calculated at 5% level of significance using following:

$$Z_{cs} = \frac{1}{\sqrt{N*T}}\left(\sum_{i=t_{1i}}^{t_{2i}} SAR_{it}\right) \quad (7)$$

4. Impact on AARs

First ARs are calculated using equation (1), (2) and (3). The AARs are calculated using equation (4).To test significance of AARs *Z*-test is done using equation (5).The null hypothesis tested is that AAR on an event day is zero.

Table 1 shows that AAR is positive for 10:1 ratio on ex-split day. There are positive AARs with significant *Z*-values present on day - t_{-7}, t_{-1} and t_{+1}.There are negative AARs with significant *Z*-values present on day - t_{+7}, t_{+9},t_{+12} and t_{+15}.

Proportion test is done to test the null hypothesis that proportion of positive and negative ARs is same. The proportion of positive ARs is more and null hypothesis is rejected at 5% level of significance on days - t_{-6}, t_0 and t_{+1}.The proportion of negative ARs is more and null hypothesis is rejected at 5%level of significance on days -t_{+7}, t_{+9} t_{+16}, t_{+17}, t_{+19} and t_{+20}.

Table 1: AARs and *Z*-values - ex-split day (split ratio 10:1)

Event day	AARs (%)	Standard deviation (%)	*Z*-values*	Number of positive ARs	Number of negative ARs	*p*-values for Test of Proportion*
-20	-0.11%	3.44%	-0.26	28	39	.222
-19	-0.19%	2.95%	-0.52	30	37	.464
-18	0.32%	3.22%	0.80	33	34	1.00
-17	0.36%	3.33%	0.87	35	32	.807
-16	0.26%	3.96%	0.54	37	30	.464
-15	0.00%	3.02%	0.01	33	34	1.00
-14	-0.01%	3.50%	-0.03	33	34	1.00

-13	-0.14%	3.73%	-0.32	36	31	.625
-12	0.31%	3.38%	0.76	32	35	.807
-11	-0.32%	4.45%	-0.60	27	40	.142
-10	-0.11%	3.60%	-0.24	33	34	1.00
-9	0.11%	4.77%	0.19	30	37	.464
-8	-0.35%	3.45%	-0.83	30	37	.464
-7	1.02%	4.00%	**2.09**	41	26	.086
-6	0.72%	3.38%	1.75	43	24	**.027**
-5	0.61%	3.76%	1.33	37	30	.464
-4	0.55%	3.87%	1.17	34	33	1.00
-3	-0.17%	4.50%	-0.30	36	31	.625
-2	-0.46%	3.85%	-0.99	30	37	.464
-1	0.92%	3.35%	**2.25**	38	29	.328
0	0.92%	10.01%	0.75	44	23	**.014**
+1	1.63%	4.77%	**2.79**	43	24	**.027**
+2	-0.20%	4.83%	-0.34	29	38	.328
+3	0.33%	4.65%	0.58	31	36	.625
+4	-0.90%	5.33%	-1.39	26	41	.086
+5	-0.35%	4.65%	-0.62	31	36	.625
+6	-0.90%	4.77%	-1.54	26	41	.086
+7	-1.95%	4.73%	**-3.37**	22	45	**.007**
+8	-0.86%	4.00%	-1.76	31	36	.625
+9	-1.50%	4.38%	**-2.81**	24	43	**.027**
+10	-0.66%	3.10%	-1.74	27	40	.142
+11	-0.84%	3.95%	-1.75	29	38	.328
+12	-1.78%	3.99%	**-3.65**	18	49	**.000**
+13	-0.21%	3.18%	-0.54	34	33	1.00
+14	-0.88%	4.01%	-1.79	27	40	.142
+15	-1.20%	3.71%	**-2.66**	26	41	.086
+16	-0.33%	4.43%	-0.61	23	44	**.014**
+17	-0.76%	4.81%	-1.29	23	44	**.014**
+18	0.99%	4.88%	1.65	36	31	.625
+19	-0.59%	3.83%	-1.26	28	39	.222
+20	-1.07%	4.85%	-1.80	24	43	**.027**
***** Values in bold are significant at 5% level of significance.						

Table 2 shows that AAR is negative on ex-split day for 10:2 ratio. Significance of AARs is tested using *Z*-test given in equation (5).Positive AARs with significant *Z*-values are present for 3 days –t_{-16},t_{-12} and t_{-2}.Negative AARs with significant *Z*-values are present for 5 days - t_{+3}, t_{+4}, t_{+6}, t_{+7} and t_{+10}. Proportion test is done to test the null hypothesis that proportion of positive and negative ARs is same. The proportion of positive ARs is more and null hypothesis is rejected at 5%level of significance on days- t_{-2} and t_0.The proportion of negative ARs is more and null hypothesis is rejected at 5%level of significance on days- t_{+3},t_{+4},t_{+6},t_{+7}, t_{+10},t_{+11},t_{+13} and t_{+15}.

Table 2: AARs and *Z*-values - ex-split day (split ratio 10:2)

Event day	AARs (%)	Standard deviation (%)	*Z*-values*	Number of positive ARs	Number of negative ARs	*p*-values for Test of Proportion*
-20	0.22%	2.74%	0.74	42	44	.914
-19	0.21%	2.59%	0.74	36	50	.161
-18	0.38%	3.26%	1.09	43	43	1.00
-17	0.08%	3.62%	0.20	43	43	1.00
-16	0.88%	3.71%	**2.20**	45	41	.747
-15	-0.39%	2.75%	-1.33	35	51	.105
-14	0.20%	2.54%	0.74	38	48	.332
-13	0.36%	3.30%	1.02	44	42	.914
-12	0.70%	3.18%	**2.03**	49	37	.235
-11	0.04%	2.67%	0.14	41	45	.747
-10	0.16%	3.19%	0.47	42	44	.914
-9	-0.25%	2.44%	-0.96	39	47	.451
-8	0.18%	3.13%	0.55	42	44	.914
-7	0.11%	3.03%	0.35	43	43	1.00
-6	0.34%	2.88%	1.11	45	41	.747
-5	0.24%	2.93%	0.76	43	43	1.00
-4	0.04%	3.73%	0.10	46	40	.590
-3	0.37%	2.88%	1.20	42	44	.914
-2	0.86%	3.01%	**2.64**	53	33	**.040**
-1	0.50%	3.61%	1.28	45	41	.747
0	-0.60%	14.35%	-0.39	54	32	**.023**
+1	0.62%	4.42%	1.30	48	38	.332
+2	-0.51%	3.91%	-1.22	36	50	.161
+3	-0.94%	3.70%	**-2.36**	32	54	**.023**
+4	-1.28%	4.18%	**-2.85**	25	61	**.000**
+5	-0.37%	4.88%	-0.71	44	42	.914
+6	-1.20%	4.01%	**-2.77**	33	53	**.040**
+7	-2.06%	3.94%	**-4.85**	22	64	**.000**
+8	-0.78%	4.11%	-1.77	36	50	.161
+9	-0.39%	4.27%	-0.84	35	51	.105
+10	-1.14%	3.70%	**-2.85**	28	58	**.002**
+11	-0.58%	3.48%	-1.54	31	55	**.013**
+12	0.24%	3.38%	0.65	42	44	.914
+13	-0.73%	3.59%	-1.87	30	56	**.007**
+14	0.10%	3.18%	0.30	38	48	.332
+15	-0.57%	3.58%	-1.47	32	54	**.023**
+16	-0.27%	2.67%	-0.93	35	51	.105
+17	0.39%	3.11%	1.15	42	44	.914
+18	-0.01%	3.24%	-0.04	37	49	.235
+19	0.28%	3.65%	0.72	37	49	.235
+20	0.32%	3.34%	0.89	45	41	.747

***** Values in bold are significant at 5% level of significance.

In relation to 32 companies with split ratio 10:5 **Table 3** shows that AAR is negative on ex-split day. Significance of AARs is tested using *Z*-test given in equation (5). Negative AARs with significant *Z*-values are present on 8 days – t_{-18}, t_{-11},t_{+6},t_{+8},t_{+9},t_{+17} ,t_{+18} and t_{+20}. Proportion test is done to test the null

hypothesis that proportion of positive and negative ARs is same. The proportion of negative ARs is more and null hypothesis is rejected at 5%level of significance on 11 days - t_{-18},t_{-11},t_{+2},t_{+5},t_{+6},t_{+7}, t_{+8},t_{+9},t_{+10}, t_{+16} and t_{+20}.

Table 3: AARs and *Z*-values - ex-split day (split ratio 10:5)

Event day	AARs (%)	Standard deviation (%)	*Z*-values*	Number of positive ARs	Number of negative ARs	*p*-values for Test of Proportion*
-20	-0.19%	3.22%	-0.34	15	17	.860
-19	0.50%	3.75%	0.76	18	14	.597
-18	-0.92%	2.38%	**-2.17**	10	22	**.050**
-17	0.33%	2.88%	0.64	15	17	.860
-16	0.61%	3.05%	1.14	19	13	.377
-15	-0.20%	2.45%	-0.47	18	14	.597
-14	-0.32%	3.58%	-0.50	13	19	.377
-13	-0.33%	3.34%	-0.56	15	17	.860
-12	-0.57%	2.91%	-1.11	14	18	.597
-11	-1.18%	2.33%	**-2.85**	7	25	**.002**
-10	-0.19%	3.23%	-0.34	16	16	1.00
-9	-0.31%	4.26%	-0.41	14	18	.597
-8	-0.65%	4.37%	-0.84	15	17	.860
-7	-0.21%	3.73%	-0.31	13	19	.377
-6	-0.08%	3.44%	-0.13	16	16	1.00
-5	0.28%	2.71%	0.58	17	15	.860
-4	-0.69%	3.34%	-1.18	14	18	.597
-3	0.47%	3.31%	0.81	16	16	1.00
-2	-0.43%	3.86%	-0.63	13	19	.377
-1	1.04%	3.86%	1.53	18	14	.597
0	-1.79%	18.42%	-0.55	21	11	.110
+1	-0.15%	3.93%	-0.22	17	15	.860
+2	-1.18%	3.45%	-1.94	10	22	**.050**
+3	0.32%	3.49%	0.52	15	17	.860
+4	-0.71%	3.92%	-1.02	11	21	.110
+5	-0.89%	3.17%	-1.58	10	22	**.050**
+6	-1.72%	3.20%	**-3.05**	8	24	**.007**
+7	-1.00%	3.11%	-1.81	10	22	**.050**
+8	-2.04%	4.87%	**-2.37**	10	22	**.050**
+9	-2.27%	4.72%	**-2.72**	8	24	**.007**
+10	-1.11%	4.07%	-1.54	9	23	**.020**
+11	-0.52%	3.38%	-0.87	13	19	.377
+12	-0.99%	3.87%	-1.45	16	16	1.00
+13	-0.49%	3.84%	-0.72	12	20	.215
+14	0.33%	3.11%	0.59	16	16	1.00
+15	0.45%	3.97%	0.64	18	14	.597
+16	-1.26%	3.90%	-1.83	10	22	**.050**
+17	-1.39%	3.92%	**-2.01**	13	19	.377
+18	-1.65%	3.61%	**-2.59**	11	21	.110
+19	-1.01%	6.09%	-0.94	12	20	.215
+20	-1.51%	4.29%	**-1.98**	9	23	**.020**

***** Values in bold are significant at 5% level of significance.

To further analyse AARs, ASARs are calculated using equation (6) and (7).To test the statistical

significance of ASARs Z_s-test is done using equation (8).The null hypothesis tested is that ASARs on an event day is equal to zero. It can be observed in **Table 4** that ASARs with significant Z_s-values at 5% level of significance are present for 10 days (split ratio 10:1), 13 days (split ratio 10:2) and 12 days (split ratio 10:5).

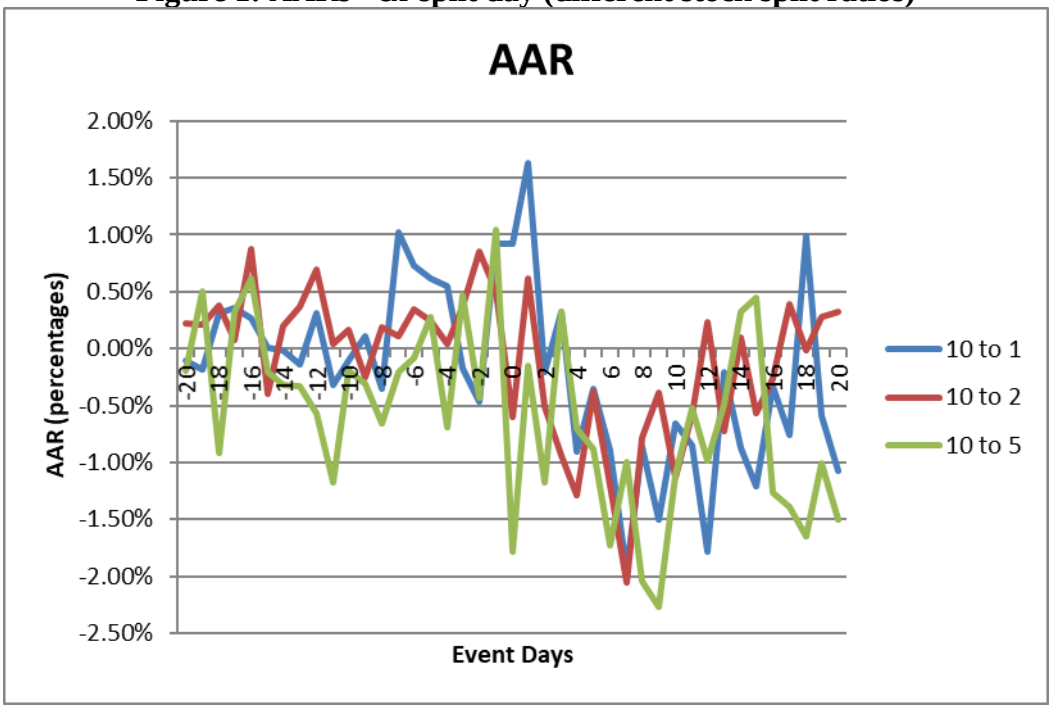
Table 4: AARs and Z_s values -ex-split day (different split ratios)

Event day	AAR (%) (10:1)	Z_s – values*	AAR (%) (10:2)	Z_s – values*	AAR (%) (10:5)	Z_s - values*
-20	-0.11%	-0.78	0.22%	0.96	-0.19%	0.03
-19	-0.19%	-1.14	0.21%	0.93	0.50%	1.41
-18	0.32%	0.57	0.38%	0.71	-0.92%	-1.37
-17	0.36%	0.87	0.08%	1.07	0.33%	0.54
-16	0.26%	0.13	0.88%	1.95	0.61%	0.77
-15	0.00%	-0.28	-0.39%	-1.06	-0.20%	-0.20
-14	-0.01%	-0.06	0.20%	0.52	-0.32%	-0.12
-13	-0.14%	-0.34	0.36%	0.42	-0.33%	-1.06
-12	0.31%	0.47	0.70%	**2.13**	-0.57%	-0.99
-11	-0.32%	-0.73	0.04%	0.53	-1.18%	**-2.18**
-10	-0.11%	-0.15	0.16%	1.11	-0.19%	0.16
-9	0.11%	0.96	-0.25%	-0.64	-0.31%	0.25
-8	-0.35%	-1.95	0.18%	1.21	-0.65%	-1.02
-7	1.02%	**2.06**	0.11%	0.12	-0.21%	-0.20
-6	0.72%	1.26	0.34%	0.88	-0.08%	0.11
-5	0.61%	0.98	0.24%	-0.12	0.28%	0.45
-4	0.55%	1.05	0.04%	-0.12	-0.69%	-1.35
-3	-0.17%	0.18	0.37%	1.18	0.47%	0.78
-2	-0.46%	-1.59	0.86%	**2.26**	-0.43%	-1.91
-1	0.92%	1.74	0.50%	0.62	1.04%	0.83
0	0.92%	1.24	-0.60%	**-6.62**	-1.79%	**-8.98**
+1	1.63%	**3.04**	0.62%	**2.58**	-0.15%	-0.36
+2	-0.20%	-1.05	-0.51%	**-2.19**	-1.18%	-1.72
+3	0.33%	0.09	-0.94%	**-2.77**	0.32%	0.73
+4	-0.90%	**-3.31**	-1.28%	**-3.51**	-0.71%	-1.66
+5	-0.35%	-1.32	-0.37%	-1.03	-0.89%	-1.79
+6	-0.90%	**-3.31**	-1.20%	**-4.91**	-1.72%	**-3.12**
+	-1.95%	**-4.61**	-2.06%	**-5.15**	-1.00%	**-2.58**
+8	-0.86%	**-2.71**	-0.78%	**-1.99**	-2.04%	**-4.08**
+9	-1.50%	**-2.38**	-0.39%	-1.11	-2.27%	**-3.80**
+10	-0.66%	-0.76	-1.14%	**-3.90**	-1.11%	**-2.06**
+11	-0.84%	-1.05	-0.58%	**-2.67**	-0.52%	-1.22
+12	-1.78%	**-3.65**	0.24%	1.19	-0.99%	-1.26
+13	-0.21%	-0.76	-0.73%	**-2.37**	-0.49%	-1.28
+14	-0.88%	**-2.81**	0.10%	0.77	0.33%	0.44
+15	-1.20%	**-2.46**	-0.57%	-0.18	0.45%	0.54
+16	-0.33%	-1.11	-0.27%	-0.57	-1.26%	**-2.19**
+17	-0.76%	-1.71	0.39%	1.45	-1.39%	**-2.08**
+18	0.99%	1.11	-0.01%	0.28	-1.65%	**-2.54**
+19	-0.59%	-1.50	0.28%	0.91	-1.01%	**-2.10**
+20	-1.07%	-1.19	0.32%	0.10	-1.51%	**-2.48**

***** Values in bold are significant at 5% level of significance.

The **Figure 1** shows AARs for three stock split ratios. On ex-split day AARs decreases and are negative significantly for split ratio 10:5.

Figure 1: AARs - ex-split day (different stock split ratios)



5. Impact on CAARs - ex-split day (different stock split ratios)

To study cumulative effect of stock splits on AARs cumulative average abnormal returns (CAARs) are calculated using equation (6).

Table 5 shows that CAARs are increasing and positive for all three stock split ratios. This positive increase continues for different time durations. This time duration of positive CAAR is least for split ratio 10:5 and maximum for split ratio 10:2.

To test statistical significance of CAARs Z_{cs}-test using equation (7) is done at 5% level of significance, using SCAARs. The null hypothesis tested is that SCAARs on an event day in the ex-split window is equal to zero.

Table 5 shows that CAARs are having significant Z_{cs}-values on 10 days from t_{+11} and till t_{+20} (split ratio 10:1).The CAARs are having significant Z_{cs}-values on 13 days- t_{-2} ,t_{-1} and from t_{+10} and till t_{+20} (split ratio 10:2).In respect of split ratio 10:5 there are significant Z_{cs}-values present in ex-split window for longest and continuous time period of 21 days starting from day t_0 and till t_{+20} day.

The comparative CAARs when plotted on a graph for all split ratios for ex-split window are given in **Figure 2.**The CAARs are negative from day t_{-15} (split ratio 10:5).It is negative from day t_{+7} (split ratio 10:2) and from day t_{+9} (split ratio 10:1).

Figure 2: CAARs -ex-split day (different stock split ratios)

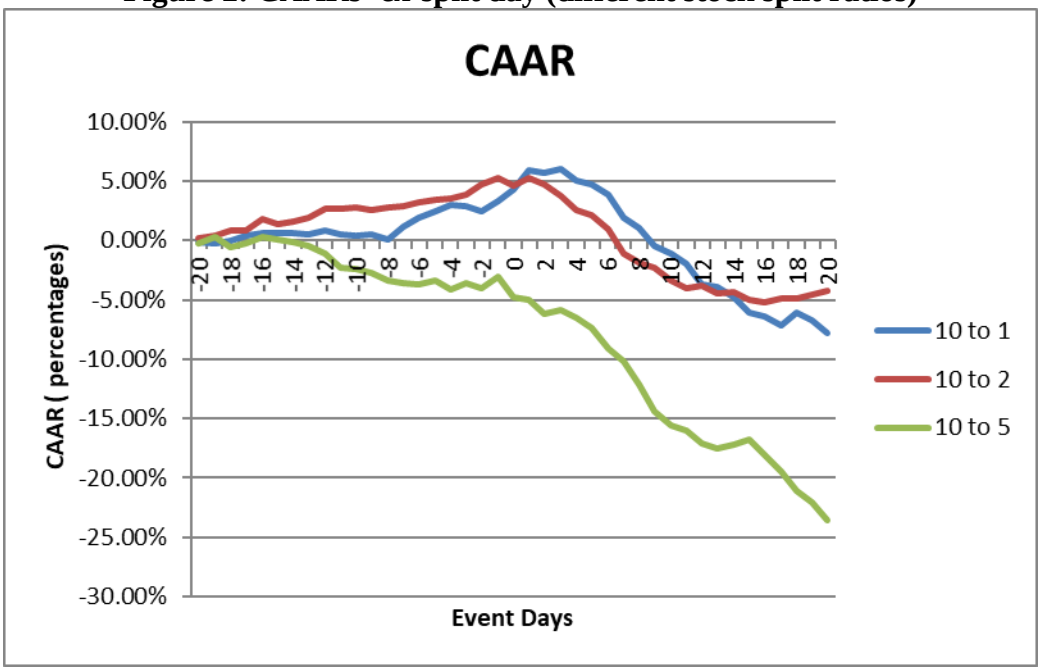


Table 5: CAARs and Z_{cs} values - ex-split day (different split ratios)

Event day	CAAR (%) 10:1	Z_{cs} values*	CAAR (%) 10:2	Z_{cs} values*	CAAR (%) 10:5	Z_{cs} values*
-20	-0.11%	-0.12	0.22%	0.15	-0.19%	0.00
-19	-0.30%	-0.30	0.42%	0.30	0.31%	0.22
-18	0.02%	-0.21	0.81%	0.41	-0.60%	0.01
-17	0.37%	-0.07	0.88%	0.57	-0.28%	0.10
-16	0.63%	-0.05	1.76%	0.88	0.34%	0.22
-15	0.64%	-0.10	1.37%	0.71	0.13%	0.18
-14	0.62%	-0.11	1.57%	0.79	-0.19%	0.16
-13	0.48%	-0.16	1.94%	0.86	-0.51%	0.00
-12	0.79%	-0.09	2.63%	1.19	-1.09%	-0.16
-11	0.47%	-0.20	2.67%	1.27	-2.26%	-0.50
-10	0.36%	-0.23	2.83%	1.45	-2.45%	-0.47
-9	0.48%	-0.08	2.58%	1.35	-2.76%	-0.43
-8	0.12%	-0.38	2.76%	1.54	-3.41%	-0.59
-7	1.15%	-0.06	2.88%	1.55	-3.62%	-0.62
-6	1.87%	0.14	3.22%	1.69	-3.70%	-0.61
-5	2.48%	0.29	3.46%	1.67	-3.43%	-0.54
-4	3.04%	0.46	3.50%	1.65	-4.12%	-0.75
-3	2.87%	0.48	3.88%	1.84	-3.65%	-0.63
-2	2.41%	0.24	4.73%	**2.19**	-4.08%	-0.93
-1	3.33%	0.51	5.23%	**2.29**	-3.03%	-0.80
0	4.24%	0.70	4.63%	1.25	-4.82%	**-2.20**
+1	5.87%	1.18	5.25%	1.66	-4.97%	**-2.25**
+2	5.67%	1.01	4.74%	1.31	-6.15%	**-2.52**
+3	6.00%	1.03	3.79%	0.88	-5.82%	**-2.41**
+4	5.09%	0.51	2.51%	0.33	-6.53%	**-2.67**
+5	4.74%	0.31	2.14%	0.17	-7.42%	**-2.95**
+6	3.85%	-0.21	0.94%	-0.59	-9.14%	**-3.43**

+7	1.90%	-0.93	-1.12%	-1.40	-10.14%	**-3.84**
+8	1.04%	-1.36	-1.90%	-1.71	-12.18%	**-4.47**
+9	-0.46%	-1.73	-2.29%	-1.88	-14.44%	**-5.07**
+10	-1.12%	-1.85	-3.43%	**-2.49**	-15.55%	**-5.39**
+11	-1.96%	**-2.01**	-4.00%	**-2.91**	-16.07%	**-5.58**
+12	-3.74%	**-2.58**	-3.77%	**-2.72**	-17.06%	**-5.78**
+13	-3.96%	**-2.70**	-4.49%	**-3.09**	-17.55%	**-5.98**
+14	-4.83%	**-3.14**	-4.39%	**-2.97**	-17.22%	**-5.91**
+15	-6.04%	**-3.52**	-4.96%	**-3.00**	-16.77%	**-5.82**
+16	-6.36%	**-3.69**	-5.22%	**-3.09**	-18.03%	**-6.17**
+17	-7.12%	**-3.96**	-4.84%	**-2.86**	-19.43%	**-6.49**
+18	-6.13%	**-3.79**	-4.85%	**-2.82**	-21.08%	**-6.89**
+19	-6.73%	**-4.02**	-4.57%	**-2.68**	-22.08%	**-7.22**
+20	-7.80%	**-4.21**	-4.25%	**-2.66**	-23.59%	**-7.60**
***** Values in bold are significant at 5% level of significance.						

The CAARs are aggregated for different time periods in event window of 41 days. The null hypothesis tested using Z_{cs}-test is that CAAR is zero at end of period over which cumulated**. Table 6** shows that null hypothesis is rejected and significant Z_{cs}-values are present for all event windows of different days in 41 day period for split ratio 10:5.The null hypothesis in relation to CAARs is rejected for event windows of longer duration in case of stock split ratio of 10:1 and 10:2 in ex-split windows.

Table 6: CAARs and Z_{cs} values -ex-split day (in event window of 41 days -different split ratios)

Event days	No. of days	CAAR (%) 10:1	Z_{cs} - values*	CAAR (%) 10:2	Z_{cs} - values*	CAAR (%) 10:5	Z_{cs} - values*
-20 to +20	41	-7.80%	**-4.21**	-4.25%	**-2.66**	-23.59%	**-7.60**
-10 to +10	21	-1.59%	**-2.30**	-6.10%	**-5.26**	-13.29%	**-6.84**
-5 to +5	11	2.87%	0.32	-1.09%	**-2.93**	-3.72%	**-4.52**
-2 to +2	5	2.80%	1.52	0.86%	-1.50	-2.50%	**-5.43**
-2 to 0	3	1.37%	0.81	0.75%	**-2.16**	-1.17%	**-5.80**
0 to +2	3	2.34%	1.87	-0.50%	**-3.60**	-3.12%	**-6.38**
-1 to +1	3	3.47%	**3.48**	0.52%	**-1.97**	-0.89%	**-4.91**
***** Values in bold are significant at 5% level of significance.							

6. Conclusion

After analyzing AARs for three split ratios it can be noted that AAR is positive on ex-split day only for split ratio 10:1.It can be inferred further that impact on AAR is more in case of higher split ratio as compared to lower split ratio in the ex-split window. This result supports views of Brennan and Copeland7 (1988).According to them this higher return for higher split factor is probably is due to the fact that financial analyst increase their earnings forecast when split factor is higher.

An interesting observation has been noted for the ex-split window. For split ratio 10:5 impact on ARs noted is just opposite of reaction observed in announcement window. The impact on AARs for split

7 Brennan and Copeland7 (1988) reported that increase in abnormal returns is more when there is higher split ratio or lower post split share prices.

ratios 10:1 and 10:2 in ex-split window is almost same as observed in announcement window. There is significant impact of stock splits present in the shortest event window irrespective of the split factor. However positive increase in AARs is observed only for split ratio 10:1.So in relation to impact of stock splits in ex-split window for different split factors, it can be inferred that more positive response is present for higher split factor.

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