Price and Liquidity Effects of Stock Split: Empirical Evidence From The Indian Stock Market

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INTRODUCTION

EMH argues that any event which doesn't contain any information should not affect price and as stock split seems to be only a cosmetic event, it should not lead to any abnormal return on or surrounding either announcement date or effective date. Still, sufficient evidence is available from U. S market that shows the presence of abnormal positive return on and around announcement as well as effective day and increase in variance following ex-day that means that some information content is present with stock split announcement. As semi strong form of EMH argues that even if any information content is present for stock split announcement, it should be reflected on the announcement itself and nothing should be observed on or around the effective day but there are studies which have shown the presence of price effect surrounding effective data of stock split and several hypothesis have been presented to explain effect surrounding split announcement. The signaling hypothesis (Asquith, Healy, and Palepu (1989), Rankine and Stice (1997)) and the liquidity hypothesis (Baker and Powell (1993), Muscarella and Vetsuypens (1996)) are quite popular. Apart from these, several studies find that the neglected firm hypothesis provides some explanations as well (Grinblatt, Masulis, and Titman (1984), Arbel and Swanson (1993), and Rankine and Stice (1997)).

LITERATURE REVIEW

As highlighted above, the following main hypothesis were presented and tested to measure price and liquidity effects of stock split as found in literature available.

OPTIMAL TRADING RANGE HYPOTHESIS/LIQUIDITY HYPOTHESIS

This hypothesis suggests that stock split changes price to a more optimal trading range and makes it affordable for more investors, which leads to increase in demand and thus generates abnormal positive return **(see Lekonishok and Lev (1987)).**

Although Lakonishok and Lev (1987) and Han (1995) provided some empirical evidence on the existence of an optimal trading range in the U.S., this hypothesis is in contrast to the decrease in trading activity after a split observed by Copeland (1979) and Conroy, Harris and Benet (1990). Focusing on an arguably signal-free sample of ADR splits, Muscarella and Vetsuypens (1996) showed that liquidity after the split improves which is accompanied by wealth gains to investors. Their findings support the model of Amihud and Mendelson (1986), which predicts a positive relation between equity value and liquidity. According to this model, rational investors discount illiquid securities heavier than liquid ones due to the higher transaction costs and greater trading frictions they face.

MARKET MAKER HYPOTHESIS

Stock split lead to favorable bid-ask spread for the market maker and hence makes the market maker more active in promoting stocks and that ultimately leads to positive stock market effect. **(Angel (1997) and Schultz (2000)).**

NEGLECTED FIRM'S HYPOTHESIS

Stock spilt is the way of catching attention of the market by a firm which feels that they are undervalued in the market due to negligence of market participants, which means if there is little known about a firm and its shares trade at a discount, firms use the split to draw attention of market participants and try to ensure that information about the company is wider recognized than before. **(Arbel and Swanson (1987))**

SIGNALING HYPOTHESIS Stock split is one of the ways to give signal about the future growth of the company. **(Grinblatt, Masulis, Titman (1984).**

MOTIVATION FOR THE STUDY

This study is motivated by the fact that stock split is quite a new phenomenon in Indian markets. Though split is not a new phenomenon in markets like US, many studies are conducted to study price and liquidity effects associated with stock split. The findings from the studies are giving confusing and mutually conflicting results. A little evidence is available from only a few Indian studies which is contrary to each other and also not conclusive at all. Budhraja (2003) found excess return of 5.1% and 4.5% on the announcement and effective day respectively taking 20 splits into consideration whereas Gupta & Gupta (2007) using sample size of 60 covered stock splits

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from Indian markets between 1999 to 2004 and found no significant excess return on announcement day but noted 2.5% of excess return on ex-split day with substantial improvement in liquidity. It has been observed that stock splits have picked up in a big way in India from the beginning of the 21st century. Many of the companies at different instances found it appropriate to go for stock split and to bring down the price back within the tradable range if they had gone up too high. However, this may not be the only objective to go for a stock split as suggested by neglected firm hypothesis and signaling hypothesis in literature review section.

OBJECTIVES OF THE STUDY

The following major objectives are set for the study.

1. To check for the presence of any abnormal returns on or surrounding split announcement and execution.
2. To check effect of split on trading volume. (trading volume is taken as surrogate to liquidity)

DATA AND METHODOLOGY

SAMPLE

To test the above objectives, the companies that went for split in the five years period from June 2002 to June 2007 have been taken from a sample frame of current constituents of S & P CNX 500. The reason behind selecting the S&P CNX 500 is that it is India's first broad-based benchmark of the Indian capital market. The S&P CNX 500 represents about 92.66% of total market capitalization and about 86.44% of the total turnover on the NSE and covers 72 industries. As the split announcement data is not published directly in any of the leading business dailies, to find out the announcement date and effective date of the stock split, data available on nseindia.com, Capital line and CMIE's Prowess database is used. Out of the total available list of 129 companies which went for split during this period, the following companies are omitted.

- The companies for which stock split coincide with other events like stock dividend, right issue, demerger announcement etc.
- Companies for which data on announcement date is not available with accuracy.
- The companies with entire or significant non -availability trading data within the windows for study either for price or volume.

After such elimination, 94 out of 129 companies remained for final analysis for which data was collected and analyzed.

METHODOLOGY

EFFECT ON PRICE

The approach used to achieve the above mentioned objective is known as "event study" which is a standard approach in the area of financial economics ever since it has been published by Fama et al (1969). An event study is designed to examine market reaction of any event under observation using abnormal return criteria.

For this study, we have divided data into various windows.

Window length selection has always been a debatable issue and different window lengths are used by different researchers for their studies. The researcher proposes the following different windows to test some of the above mentioned hypothesis.

1. Pre announcement window (AD-51 to AD): This window is selected to test neglected firm hypothesis and any information content associated with split announcement or leakage of split information before the formal announcement being made.

In case if any information content is associated with split announcement as suggested by neglected firm hypothesis, abnormal return should be present on announcement day but should not be present on effective day (semi-strong form of EMH). If any significant abnormal return is found in this window prior to announcement date, there is a case of insider information or leakage of sensitive information in the market place before the announcement.

2. Run up window: AD+1 to ED-1: If the market did not anticipate change (stock split), then abnormal return should not be present in the pre- announcement window but it may appear in run up window, specially if any positive wealth effect is associated with stock split announcement as it has been proposed by signaling hypothesis and the same is anticipated by the market. As number of days between AD and ED is different in each of the stocks splits, the length of this window may very from stock to stock.

3. Post effective window: ED to ED+51: As per tradable range hypothesis, small investors can only participate after spilt becomes effective, hence, we may see significant improvement in liquidity along with abnormal positive return due to substantial demand from number of small investors from ED to about ED+2 days as the

stock becomes more affordable but abnormal return starts reversing soon after. But if that abnormal return sustains through the length of the window, then it indicates long term positive wealth effect associated with liquidity premium and market maker hypothesis.

The first step in this process of determining price or wealth effect is to calculate abnormal return.

To perform the analysis, first, the equilibrium model for the normal stock return, that is the expected return if the event did not happen, must be specified. Second, we need to identify the event date and the event window that is the period over which the security returns will be examined. The model is estimated outside this window by choosing a period of AD-51 to AD-201 days which is the standard practice in most such studies. The forecast errors over the event window measure the abnormal performance of returns associated with the event. The normal model most widely used in the event-studies is the market model which can be expressed as:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \xi_{i,t}$$

Where

R_{it} is the return on security i on day t

R_{mt} is the return on a market index on day t

The NIFTY is used as market portfolio. The event dates are the announcement date (AD) on which split announcement takes place and the effective date (ED) on which stock goes ex-split. The coefficients- alpha and beta are estimated by using period of AD-51 days to AD-201 days as mentioned above. The event windows extend from days 10 to +10 around event dates (AD-10 to AD+10 and ED-10 to ED+10.). The AD and ED are identified as date 0 and for each of these event windows, abnormal return for each security on day t is estimated as

$$AR_{i,t} = R_{i,t} - \alpha_i - \beta_i R_{m,t}$$

In order to draw overall inferences for the event of interest, the abnormal return observations are aggregated along two dimensions-through time and across securities. The following measures of abnormal performance are used:

• **Cumulative Abnormal Return (CAR)**: Cumulative sum of stock i's prediction error (abnormal returns) over the window (t_1, t_2).

$$CAR_{i,t} = \sum_{T1}^{T2} AR_{i,t}$$

• **Mean Abnormal Return (MAR)**: An average of abnormal returns across the N firms on the day t.

$$MAR_t = \frac{1}{N} \sum_{i=1}^{N} AR_{i,t}$$

• **Mean Cumulative Abnormal Return (MCAR):** Average of the cumulative abnormal returns across observations (firms); it is a measure of the abnormal performance over the event period.

$$MCAR_t = \frac{1}{N} \sum_{i=1}^{N} CAR_{i,t}$$

• **Mean Average Abnormal Return (MAAR):** sample average of firm AARs. This measure of abnormal performance takes into account the fact that the number of days in the window (t_1, t_2) may be different across firms and therefore gives a greater weight to the ARs of firms for which this window is shorter. On the contrary, MCAR gives same weight to every ARs. This implies that MAAR is more powerful when the "abnormal behavior" of returns is concentrated in short window, while MCAR is more powerful in detecting abnormal performance over long window.

$$MAAR(t1,t2) = \frac{1}{N} \sum_{i=1}^{N} \frac{CAR_i(t1,t2)}{n(t1,t2)}$$

TESTING FOR STATISTICAL SIGNIFICANCE

The test statistics are calculated using and cross-sectional variance estimator along with non-parametric sing test. Though non- parametric test is generally not used in isolation but it is of good use when used to supplement parametric test.

The cross-sectional t-test using cross-sectional variance is calculated as $\frac{MAR_t}{S^2/\sqrt{N}}$ under the assumption that the

abnormal returns are cross sectional independent and identically normally distributed

Where $S^2 = \frac{1}{N}\sum_{i=1}^{N}\frac{(AR_{it} - MAR_t)^2}{N-1}$

The expressions of the cross-variance estimates and t-tests for MAR(t1,t2), MAR(t) and MAV(t) are analogous.
A nonparametric sign test based on sign of abnormal return is also employed. The hypothesis is abnormal returns that are independent across securities and that the expected proportion of positive abnormal returns under the null hypothesis is 0.5. The test statistic is computed as $\theta = [\frac{N^+}{N} - 0.5]\frac{\sqrt{N}}{0.5} \sim N(0,1)$ where N is the sample size and N^+ is the number of cases where the abnormal return is positive. This test is conducted to supplement the parametric test.

EFFECT ON TRADING VOLUME

To explore whether the trading activity changes when a stock split takes place, volumes adjusted for market volumes are examined around the event days. Past studies used different measures to examine abnormal trading volumes around the event dates. Lynch and Mendenhall (1987) used the market model approach, wherein turnover of trading values were used. **Beneish and Whaley (2002)** applied ratio of dollar trading volume to the average dollar volume across sixty days preceding the announcement day. While Elliott and Warr (2003) employed Harris and Gurel's (1986) metric that takes account of market volume and the individual security's volume. In this study, we adopt a mean and market adjusted volume measure similar to those of Harris and Gurel (1986), Liu (2000) and Elliott and Warr (2003) to examine abnormal volumes around the event days.

$$VR_{i,t} = \frac{V_{it} / v_i}{V_{mt} / V_m}$$

Where V_{it} and V_{mt} are daily share volume of the stock i and the market respectively and V_i and V_m are the mean trading volume of stock i and the NSE trading volume in the estimation period [AD-201, AD-51]. This volume ratio, which takes into account firm capitalization changes and market volume is expected to have value of 1 under the null hypothesis.

HYPOTHESIS TESTS OF STOCK SPLIT

There are several hypothesis presented by researchers to explain price and liquidity changes associated with stock split as discussed in the literature review section. To test each hypothesis, a window is designed and effect of split is measured.

H1: THERE IS NO EXCESS RETURN PRESENT IN PRE ANNOUNCEMENT WINDOW.

The presence of significant positive excess return in the pre-announcement window suggests the leakage of information in the market about the split by company before its official announcement and role of insiders in the market. However, if there is a significant positive excess return, it is associated only with announcement date and not the effective date which proves the case for neglected firm hypothesis. In our case, we have not found any significant positive excess return during preannouncement window.

H2: THERE IS NO EXCESS RETURN PRESENT ON ANNOUNCEMENT DAY.

If there is any information content associated with stock split, it should be reflected onto the price on the announcement day itself (if semi-strong form of market efficiency is present in Indian market). In the study, the researcher has found the presence of significant positive excess return on AD-1 and AD which provides reasonable support to neglected firm hypothesis even though this positive abnormal return is not lasting in post AD window.

H3: THERE IS NO EXCESS RETURN PRESENT IN BUILT UP WINDOW

If stock split announcement is considered as a positive announcement by the company as argued under signaling hypothesis ,significant positive excess return must be present in built up window which is taken as (AD+1 to ED-1).This window may have different number of days for different stocks as the duration between the announcement date and effective date may not be the same for all the stocks. In our study, there is no significant positive excess return found in this window.

H4: THERE IS NO EXCESS RETURN PRESENT ON EFFECTIVE DAY.

As per the tradable range, hypothesis as stock goes into split and it becomes affordable to small investors and it

generates a fresh demand from small deprived investors; those who earlier might have not been able to buy the stock because of its high per share price. This should lead to positive abnormal return on effective day and a few days after effective days and it should get reversed later. The hypothesis is tested for presence of excess return on and around effective day and it has been found that though significant excess return was present on effective day, it is getting reversed in less than a week's time.

H5: THERE IS NO EXCESS RETURN IN POST EVENT WINDOW.

If the market maker hypothesis is correct, then the positive abnormal return associated with stock split should sustain after the effective day forever due to favorable bid-ask spread for market maker and hence more incentive to promote stock in post split era. In other words, liquidity premium should be present in entire post effective window. We have tested the null hypothesis for presence of abnormal return in a longer (ED, ED+51) post effective day window and found no evidence for any such sustainable positive abnormal return.

H6: THERE IS NO EXCESS VOLUME ON ANNOUNCEMENT DAY.

As suggested by neglected firm hypothesis, the announcement of split may be used as an attention grabber measure and if that works, the activity in the stock should increase and volumes should improve considerably along with positive abnormal return. We have found evidence of increased volume on announcement day.

H7: THERE IS NO EXCESS VOLUME ON EFFECTIVE DAY.

Liquidity and bid ask spread should improve considerably as argued by liquidity and market maker hypothesis as soon as split comes into effect. In this case, the positive excess volume should sustain even after effective day as a result of permanent improvement in liquidity due to favorable bid ask spread for market maker and increase in affordability for small investors due to more affordable price in post split era. We have not only found evidence of significantly improved volume on effective day but also found improved volume sustaining throughout the effective window.

RESULTS & DISCUSSIONS

We will start our discussion by analyzing returns price effects surrounding announcement date of stock split. Table 3 reports the same and as it can be noticed that the MAR of 1.08% and MCAR of 4.33% is found on announcement day and both are significant at 5%. When tested with non parametric sign test, it is found that out of total 94 firms, only 53 have shown positive abnormal return on the announcement day which is not statistically significant and that actually dilutes the significance of the presence of positive abnormal return on announcement day a bit.

Though, ideally, in an efficient market, any information content associated with stock split should be absorbed in price movement on announcement day and it should not lead to any positive abnormal return on the effective day. But from Table 4, it can be observed that MAR on the effective day is 1.66% and MCAR of 4.89% and both are significant at 5% significance level. MAR remains significantly positive when tested for non- parametric sign test which provides enough evidence of positive price effect associated with stock split on effective day. It also provides support to liquidity and optimal trading range hypothesis. However, MAR is found significant on ED+5 with opposite sign which confirms reversal of the positive wealth effect soon after the effective day which is also supported by non- parametric sign test where around 70% of the stocks were having negative abnormal return on ED+5 day and remained statistically significant for the remaining period in this window (ED+5, ED+10).

As post effective window has shown interesting and immediate reversal of positive price effect seen on effective day with opposite sign (Negative abnormal return) by as early as ED+5th day and it has sustained till ED+10 days. The researcher decided to test and present the results for one of the longer term window (ED to ED+51) for MAR and MCAR along with MAAR which is generally used for all the all long duration windows because of presence of non-uniform trading days in built up window.

As it can be seen from Table 5 that significant negative abnormal return found from ED+5 remains significantly negative till ED+11 and from there on, it turns insignificant. MAR is not found statically significant for the entire remaining window length (ED+12, ED+51) baring few days on which negative MAR was found to be statically significant. That gives enough evidence not only for the fact that there is no positive abnormal return present in post effective split window but on the contrary, there is some evidence of significant negative wealth effect in long term post effective window. This in total contrast to what has been found and explained by market maker hypothesis which says that stock split leads to more attractive bid-ask spread and will make market maker more active in promoting stock and hence leads to positive stock market effect. **(Angel (1997) and Schultz (2000)).** The optimal trading range hypothesis which suggests that a stock split the stock price to a more optimal trading range which means that the stock is affordable even to small investors that in turn leads to increased demand for

the stock and further leads to positive abnormal return on effective day and for quite some time after the effective day. One of the reason for such different outcomes is order driven nature of Indian stock market as compared to many other markets which are quote driven in nature with significant role of market maker.

Table 6 shows MAAR to explain long term window statistics. Presence of statistically significant MAAR of 0.2% in pre announcement window (AD-51 to AD) provides an evidence for leakage of information about the split announcement to the informed traders. This is true to some extent in India due to possibility of a small time lag between the day on which board of directors inform stock exchange regarding their agenda to consider stock split in their meeting and the meeting day in which they approve the same. The leakage is further confirmed from the announcement window as statistically significant positive MAR is found on AD-1 and AD (though it is not supported by non- parametric sign test) but disappears from AD+1. In fact, MAR is significant with opposite sign on AD+4 which indicates reversal in wealth effect. This can also be seen from the fact that MCAR remains positive and significant from AD-9 to AD+6 in which MCAR is constantly increasing from AD-9 to AD+1 but from there on, it starts decreasing and it becomes statistically insignificant by AD+6.

The built up window which is from AD+1 to ED-1 which actually may differ in length from stock to stock that shows MAAR of -0.02 which is statistically insignificant and thus suggests that no significant price effect is associated with stock split announcement which provides an evidence about no excitement leading to the split and it suggests that split in most of the cases becomes predictable in market just after its announcement and any information content associated with announcement gets reflected on announcement day itself and provides evidence of semi- strong form of market efficiency from Indian markets.

The post effective window (ED to ED+51) is throwing quite interesting result with -0.08% of statistically significant MAAR and CMAR of -10.98% on ED+51 is also statistically significant. This provides unique evidence which is different form other markets and which shows that stock split in Indian markets leads to substantial improvement in liquidity of the stock but it does not contain any long term positive wealth effect.

As shown in Table 7, trading volume has shot up quite significantly surrounding announcement as well as effective day. In fact, huge volume ratios of 5.29 and 5.19 are found especially on announcement and effective days respectively. Not only that, volume ratios remain at considerable higher level on event days but remains significantly higher in AD to AD+10 and ED to ED+10 days periods in the event windows. This increase in liquidity is consistent with findings of Muscarella and Vetsuypens (1996), Amihud and Mendelson (1986), and Christian Wulff (2002).

CONCLUSION

From the above results and discussions it can be concluded that price effect associated with stock split is significant on and around announcement and effective day of stock split with significant positive abnormal return of 1.08% and 1.66% found on announcement and effective day respectively. However, it did not sustain and reversed in less than a week's time and hence positive price effect is only concentrated around event days and does not provide any evidence of long term positive wealth effect from Indian markets. Concentration of positive abnormal return on and around event days only provides reasonable evidence of semi strong form of market efficiency prevailing in India as it can be observed that any information content associated with stock split announcement is reflected in the price on announcement day itself and any positive price effect due to additional demand from small investor as explained by trading range hypothesis is reflected on effective day itself and not stretched further. However, there is a clear evidence of significant improvement in traded volume (turnover) associated with stock split surrounding both announcement and effective day and it sustains in post event days also. Hence we can safely conclude that stock split leads to short term positive price effect concentrated around event days without creating any long term positive wealth effect but leads to a very strong positive and more permanent positive liquidity effect with substantial increase in trading volumes.

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TABLES

Table 1: Summary of Important Studies Related To Major Hypothesis About Effect of Stock Split

Author	Hypothesis Supported	Price & Liquidity Effect
Lekonishok and Lev (1987))	Optimal Trading range hypothesis.	Positive price effect.
Muscarella and Vetsuypens (1996), Amihud and Mendelson (1986), and *Christian Wulff (1999)*	Liquidity Hypothesis.	Positive wealth effect associated with improved liquidity.
Angel (1997) and Schultz (2000)	Market maker .	Favorable in bid ask spread for the market makers make them more active in promoting stock and hence leads to positive wealth effect.
Arbel and Swanson (1987)	Neglected firm Hypothesis.	Stock split announcement draws market attention and leads to positive price and liquidity effect.
Grinblatt, Masulis, Titman (1984)	Signaling hypothesis	Positive price effects as a result of split announcement are used as signal of better future earnings.

Table 2: Sample Size Finally Used For The Study

Total companies announce stock split during study period	129
Eliminated due to other significant announcement (Stock Dividend, De-merger, FII limit increase, Right issue etc)	16
Data not found fully or partially	7
Announcement Date and other details not available.	12
Sample used for the study	94

Table 3 : Price Effects (Announcement day) Associated With Stock Split

The sample size is 94 and AD stands for Announcement Day. MAR mean abnormal return for the day and is the average of the sample firms abnormal returns on day t. MCAR is the mean cumulative abnormal returns across observations and measures the abnormal performance over the event period. T_{MAR} and T_{MCAR} use the cross sectional variance estimator as explained in methodology section. The cross sectional test statistics (T) are distributed Student's t with (N-1) degrees of freedom. N (Positive) stands for number of firms with positive abnormal returns and theta is the nonparametric test statistic that tests whether the number of positive returns is different from the number of negative returns. The test statistic is normally distributed and the test statistic computations are explained in the methodology section.

	MAR	TMAR	MCAR	TMCAR	N(positive)	Theta
-10	0.33	1.02	0.33	1.02	51.00	0.83
-9	0.41	1.63	0.74	**1.84**	50.00	0.62
-8	0.14	0.58	0.87	**1.77**	43.00	-0.83
-7	0.39	1.02	1.26	**2.04**	37.00	**-2.06**
-6	0.06	0.19	1.32	**1.80**	41.00	-1.24
-5	0.88	**2.53**	2.20	**2.56**	58.00	**2.27**
-4	0.39	1.49	2.59	**2.70**	47.00	0.00
-3	-0.05	-0.21	2.54	**2.60**	40.00	-1.44
-2	0.03	0.10	2.56	**2.67**	42.00	-1.03
-1	0.68	**2.01**	3.24	**3.30**	48.00	0.21
AD	1.08	**2.34**	4.33	**3.92**	53.00	1.24
1	0.05	0.16	4.37	**3.72**	45.00	-0.41
2	-0.17	-0.67	4.20	**3.55**	43.00	-0.83
3	-0.32	-1.38	3.88	**3.27**	35.00	**-2.48**
4	-0.71	**-3.83**	3.18	**2.56**	30.00	**-3.51**
5	-0.46	-1.49	2.72	**2.24**	36.00	**-2.27**
6	-0.50	**-2.22**	2.22	**1.89**	35.00	**-2.48**
7	-0.45	**-2.06**	1.76	1.45	36.00	**-2.27**
8	-0.45	**-2.25**	1.31	1.05	29.00	**-3.71**
9	-0.32	-1.42	0.99	0.78	33.00	**-2.89**
10	0.33	-0.46	0.89	0.70	45.00	-0.41

Note: Tstat in bold indicates significance at 5%

Table 4: Price Effects (Effective day5) Associated With Stock Split

The sample size is 94 and ED stands for Effective Day. MAR mean abnormal return for the day and is the average of the sample firms abnormal returns on day t. MCAR is the mean cumulative abnormal returns across observations and measures the abnormal performance over the event period. T_{MAR} and T_{MCAR} use the cross sectional variance estimator as explained in methodology section. The cross sectional test statistics (T) are distributed Student's *t* with (N-1) degrees of freedom. N (Positive) stand for number of firms with positive abnormal returns and theta is the non-parametric test statistic that tests whether the number of positive returns is different from the number of negative returns. The test statistic is normally distributed and the test statistic computations are explained in the methodology section.

	MAR	TMAR	MCAR	TMCAR	N(positive)	Theta
-10	0.01	0.05	0.01	0.05	43.00	-0.83
-9	0.36	1.49	0.37	0.90	51.00	0.83
-8	0.79	**2.46**	1.16	**2.15**	50.00	0.62
-7	0.28	0.93	1.44	**2.63**	48.00	0.21
-6	0.29	1.18	1.73	**2.76**	48.00	0.21
-5	0.18	0.72	1.91	**2.69**	51.00	0.83
-4	0.24	**0.84**	2.14	**2.62**	44.00	-0.62
-3	0.05	0.18	2.19	**2.48**	42.00	-1.03
-2	0.55	**2.05**	2.74	**2.86**	47.00	0.00
-1	0.48	**1.70**	3.23	**3.24**	47.00	0.00
ED	1.66	**3.35**	4.89	**4.28**	61.00	**2.89**
+1	0.54	1.44	5.43	**4.37**	55.00	**1.65**
+2	0.24	0.59	5.67	**4.36**	42.00	-1.03
+3	0.22	0.58	5.89	**4.25**	42.00	-1.03
+4	-0.53	-1.27	5.36	**3.58**	38.00	**-1.86**
+5	-1.24	**-3.50**	4.12	**2.70**	30.00	**-3.51**
+6	-0.63	**-2.07**	3.50	**2.32**	35.00	**-2.48**
+7	-1.20	**-3.68**	2.30	1.56	32.00	**-3.09**

+8	-1.75	**-5.73**	0.55	0.38	22.00	**-5.16**
+9	-0.82	**-2.52**	-0.27	-0.18	29.00	**-3.71**
+10	-0.70	**-2.58**	-0.96	-0.66	36.00	**-2.27**

Note: T stat in bold indicates significance at 5%

Table 5: Price Effect Associated With Post Effective Day Long Term Window (ED to ED+51)

	MAR	TMAR	MCAR	TMCAR	N(positive)	Theta
ED	1.66	**3.35**	1.66	**3.35**	61.00	**2.89**
1	0.54	1.44	2.21	**3.04**	55.00	**1.65**
2	0.24	0.59	2.44	**2.79**	42.00	-1.03
3	0.22	0.58	2.66	**2.64**	42.00	-1.03
4	-0.53	-1.27	2.13	**1.81**	38.00	**-1.86**
5	-1.24	**-3.50**	0.89	0.73	30.00	**-3.51**
6	-0.63	**-2.07**	0.27	0.22	35.00	**-2.48**
7	-1.20	**-3.68**	-0.93	-0.80	32.00	**-3.09**
8	-1.75	**-5.73**	-2.68	**-2.33**	22.00	**-5.16**
9	-0.82	**-2.52**	-3.50	**-3.04**	29.00	**-3.71**
10	-0.70	**-2.58**	-4.19	**-3.68**	36.00	**-2.27**
11	-0.61	**-2.30**	-4.80	**-4.13**	29.00	**-3.71**
12	0.35	1.14	-4.45	**-3.76**	49.00	0.41
13	-0.10	-0.36	-4.55	**-3.67**	41.00	-1.24
14	-0.16	-0.49	-4.71	**-3.75**	43.00	-0.83
15	-0.39	-1.53	-5.10	**-4.05**	35.00	**-2.48**
16	0.04	0.13	-5.05	**-3.92**	39.00	**-1.65**
17	-0.65	**-2.57**	-5.70	**-4.35**	36.00	**-2.27**
18	-0.17	-0.65	-5.87	**-4.35**	41.00	-1.24
19	-0.17	-0.56	-6.04	**-4.23**	35.00	**-2.48**
20	0.12	0.46	-5.92	**-4.06**	47.00	0.00
21	-0.39	-1.64	-6.31	**-4.32**	37.00	**-2.06**
22	-0.15	-0.60	-6.46	**-4.39**	38.00	**-1.86**
23	-0.58	-2.34	-7.04	**-4.68**	33.00	**-2.89**
24	-0.20	-0.69	-7.24	**-4.77**	34.00	**-2.68**
25	-0.10	-0.35	-7.34	**-4.76**	42.00	-1.03
26	0.10	0.39	-7.24	**-4.37**	47.00	0.00
27	-0.37	-1.18	-7.61	**-4.46**	38.00	**-1.86**
28	0.23	0.62	-7.38	**-4.42**	42.00	-1.03
29	-0.39	-1.22	-7.77	**-4.55**	37.00	**-2.06**
30	0.15	0.42	-7.63	**-4.19**	42.00	-1.03
31	-0.08	-0.31	-7.71	**-4.20**	41.00	-1.24
32	-0.23	-0.82	-7.94	**-4.32**	36.00	**-2.27**
33	-0.07	-0.25	-8.01	**-4.25**	42.00	-1.03
34	-0.03	-0.11	-8.04	**-4.15**	40.00	-1.44
35	-0.48	**-1.77**	-8.52	**-4.28**	36.00	**-2.27**
36	-0.12	-0.44	-8.64	**-4.29**	37.00	**-2.06**
37	-0.59	**-2.35**	-9.23	**-4.52**	27.00	**-4.13**
38	-0.59	**-2.61**	-9.82	**-4.76**	30.00	**-3.51**
39	-0.28	-1.06	-10.10	**-4.76**	37.00	**-2.06**
40	0.28	1.08	-9.82	**-4.55**	50.00	0.62
41	0.02	0.09	-9.79	**-4.57**	42.00	-1.03

42	-0.25	-1.02	-10.04	**-4.60**	39.00	**-1.65**
43	-0.08	-0.27	-10.12	**-4.53**	42.00	-1.03
44	-0.17	-0.63	-10.29	**-4.53**	41.00	-1.24
45	0.18	0.69	-10.11	**-4.33**	46.00	-0.21
46	0.14	0.47	-9.97	**-4.24**	44.00	-0.62
47	0.22	0.83	-9.75	**-4.05**	39.00	**-1.65**
48	-0.81	**-3.51**	-10.56	**-4.30**	31.00	**-3.30**
49	-0.18	-0.73	-10.74	**-4.35**	40.00	-1.44
50	-0.56	**-2.70**	-11.30	**-4.57**	36.00	**-2.27**
51	0.31	1.11	-10.98	**-4.43**	42.00	-1.03

Note: T stat figures in bold indicates significance at 5%

Table 6: Long Term Window Statistics

Build up window is from AD+1 to ED-1, Pre-announcement window is starting from AD-51 to AD-1, and Post effective window is from ED to ED+51. MAAR is defined as sample average of firm level average abnormal returns and the test statistic uses time series variance estimator and the statistics are distributed Student's *t* with (N-1) degrees of freedom.

	MAAR (%)	TMAAR
Pre Announcement Window	0.2	**2.15**
Build Up Window	-0.02	-0.38
Post Effective Window	-0.08	**-2.55**

Note: Tstat in bold indicates significance at 5%

Table 7: Trading Volume Effects For Stocks Stock Splits (surrounding announcement and effective day)

MVR stands for Mean volume ratio on each day and was calculated as the cross sectional average of volume ratios on the same day. The expected MVR is 1 under the null hypothesis of no volume effects. The test statistic T is calculated using the cross sectional variance estimator and the test statistics are distributed Student's *t* with (N-1) degrees of freedom.

	Announcement Window		Effective Window	
	MVR	TMVR	MVR	TMVR
-10	1.67	**2.03**	2.12	**2.28**
-9	1.43	1.37	1.82	**2.52**
-8	1.42	1.30	2.07	**3.05**
-7	1.80	**2.12**	2.93	**3.42**
-6	2.31	**2.71**	2.67	**3.19**
-5	2.69	**3.82**	2.63	**3.66**
-4	2.67	**3.00**	2.82	**3.77**
-3	2.42	**3.30**	2.93	**3.81**
-2	2.05	**2.97**	3.03	**4.57**
-1	2.43	**4.03**	4.8	**5.29**
0	5.29	**5.24**	5.19	**6.51**
1	2.97	**4.85**	4.26	**4.63**
2	2.38	**3.32**	4.5	**4.03**
3	2.31	**2.51**	4.58	**3.3**
4	1.72	**2.20**	4.77	**2.64**
5	1.51	**2.33**	3.82	**3.8**
6	1.57	**1.97**	2.57	**4.37**
7	1.60	**1.89**	2.28	**4.04**
8	1.45	**2.09**	2.24	**4.1**
9	1.67	**2.52**	2.7	**3.64**
10	1.75	**2.33**	2.7	**3.79**

Note: Tstat in bold indicates significance at 5%