Price and liquidity effects of stock split: An Empirical evidence from Indian stock market*

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Abstract

 In this paper I have studied price and liquidity effect associated with stock split surrounding its announcement and effective day by using standard event studies methodology which, measures significance of abnormal return and change in liquidity associated with an event. Interestingly my results are slightly different from the evidence found from US, Germany etc. where there is some significant positive abnormal return is observed to be associated with stock split. My results suggests that though there is some positive abnormal return associated surrounding announcement and effective day of the stock split but It reverses in just a few days after the event day and ultimately generates significant negative abnormal return in slightly longer post effective (ED to ED+51 days) window. However, there is a significant improvement seen in liquidity surrounding announcement and effective day of stock split. So my analysis suggests that stock split does not have any positive impact on wealth of the share holder at all but it improves liquidity of the stock very significantly.

JEL Classification: G14

1. Introduction

As per EMH any event which doesn't contain any information should not affect price and as stock split seems merely a cosmetic event it should not show any abnormal return on or surrounding either announcement date or effective date. Still sufficient evidence is available from U. S market shows presence of abnormal positive return on and around announcement as well as effective day and increase in variance following ex-day. Though these evidences are less consistent and more confusing, several hypotheses have been presented to explain effect surrounding split announcement. Some of them are, 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 explanation power as well (Grinblatt, Masulis, and Titman (1984), Arbel and Swanson (1993), and Rankine and Stice (1997)).

2. 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 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 leads to reduction in bid-ask spread and will make market maker more active in promoting stock and hence leads to positive stock market effect. **(see Angle (1997) and Schultz (2000))**

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

Signaling hypothesis: Stock split is one of the ways to give signal about the future growth of the company. **(see Greenbatts, Masulis, Titman (1984),**

3. Motivation of 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 and there are 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. It has been found that stock splits have picked up in a big way in India from the beginning of 21st century and especially from the beginning of year 2005 due to big upward move in Indian stock markets and price of some of the companies have gone far away from normal tradable range. Many of the companies at difference instance found it appropriate to go for stock split and to bring down the price back to the tradable range. 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.

Though there is some research in Indian context is available for event like stock dividend, index reorganization etc. no published research was available till the time of my submitting the proposal to NSE for funding a study of price and liquidity effect associated with stock split in Indian markets and that made me much more interested to at least contribute something to the first few benchmark studies in this area..

4. Objectives of the study::

The following major objectives are set for the study.

1. To check 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)

5. Data and Methodology:

a. Sample

To test the above objectives the companies that went for split in last 5 years (Split Date Between June 2002 to June 20070 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 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, following companies are omitted.

- The companies for which stock split coincide with other events like stock dividend, right issue, De-merger 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 out of 129 companies 94 companies remained under study for final analysis and the data collected and analyzed for these companies.

b. Methodology:

- **Effect on price**

The approach used to achieve 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.

It has always been always a debatable issue when it comes to choosing window length and different lengths are used by different researchers for the study. But here I propose to use 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 been made.

In case any information content is associated with split announcement as suggested by neglected firm hypothesis, an abnormal return should be present on announcement day but should not be present on effective day. 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 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 explained by market maker 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 later on abnormal return starts reversing from thereon. But in case if that abnormal return sustains through the window it indicates 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 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), which is the moment at which the split gets announced and the effective date of the change (ED). The coefficients alpha and beta are estimated by using period of Ed+51 days to Ed+201 as mentioned above. The event window extends from days –10 to +10 around each event. (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 a 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 that window (t_1, t_2) may be different across firms and gives therefore 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.

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

c. 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 $\dfrac{MAR_t}{S^2/\sqrt{N}}$ 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 MAAR(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 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 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.

6. Statistical Issues:

In this section we briefly discuss the important statistical issues that crop up in event studies and in this context we draw up on the results of Brown and Warner (1985), Strong (1992) and Corrado and Zivney (1992).

1. Non-synchronous trading: The market model requires that daily returns be measured over the same fixed time interval for all securities. If the last trades for different securities occur at different times estimates of market model parameters may be biased and inconsistent due to the first order serial correlation. Brown and Warner (1985) found that methodologies other than OLS though reduced biases in the estimates of beta but resulted in no improvement in either the specification or the power of event studies. Therefore using OLS estimates in this study may not necessarily imply misspecification.

2. Non-normality of returns: The daily stock returns of individual securities are fat tailed relative to normal distribution (Fama 1976, Pan and Duffie, 1997). But studies by Brown and Warner (1985) documents that mean excess returns in a cross-section of securities converge to normality as the sample size increases. And in this study the sample size is ninety four so there won't be a problem of non normality of returns.

7. Hypothesis tests of Stock Split:

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

H1: There are no excess returns present in pre announcement window.

The presence of significant positive excess return in preannouncement 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 is associated only with announcement date and not the effective date proves the case for neglected firm hypothesis. In our case we have not found any significant positive excess return during preannouncement window, however there is a presence of significant positive excess return on AD-1 and AD which provides a bit of support for neglected firm hypothesis but this positive abnormal return is not lasting in post AD window..

H2: There are no excess returns 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.

H3: There is no excess return present on Effective day.

As per tradable range hypothesis as stock goes into split it becomes affordable to small investors and it generates a fresh demand from small deprived investors those who earlier might not have been able to buy the stock because of its high 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.

H4; 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 for ever due to reduction in bid ask spread and reduced cost for market maker. In other words liquidity premium sustains throughout in post effective window. We have tested the null hypothesis for presence of abnormal return in a longer (ED, ED+51) post effective day window of stock split and found no evidence for any such sustainable positive abnormal return. One of the reasons behind non sustainability of wealth gains associated with stock split immediately after effective day is because in other markets one of the motives to go for stock split to attaining optimum tick size ratio by adjusting stock price using split as shown by Angle (1997) and Anshuman & Kalay (2002). But there is no such positive effect associated with optimum tick size ratio exists in India for the simple reason that tick size is very small in India which in most of the cases is five paisa only and is very low compared to normal trading range of stock price and that makes stock split little less relevant in Indian markets.

H5: 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..

H6: There is no excess volume on effective day.

On the effective day as per the liquidity and market maker hypothesis liquidity and bid ask spread should improve considerably as soon as split comes in to effect. In this case the positive excess volume should sustain even after effective day as a result of permanent improvement in liquidity due to lower bid ask spread for market maker and increase in affordability of small investors due to more affordable price in post split scenario.

8. Results & Discussions:

We will start our discussion by analyzing returns price effects surrounding announcement date of stock split. Table 3 Panel A reports the same and it can be noticed that the excess return of 1.08% is found and it is 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 does not make it statistically significant and that actually dilutes the significance of the presence of positive abnormal return on announcement day. Several authors (Grinblatt, Masulis and

Titman (1984), Asquith, Healy and Palepu (1989), Brennan and Copeland (1988), Brennan and Hughes (1991), Muscarella and Vetsuypens (1996), and Ikenberry, Rankine, and Stice (1996)) hypothesize that firms signal information about their future earnings through their split announcement decision have shown that there is a significantly positive abnormal return at the announcement of a stock split. One hypothesis for the positive abnormal return is that a split may be interpreted as a signal that the firm's managers are optimistic regarding its future prospects. A second hypothesis is that a split may improve the stock's liquidity and, in turn, lower its expected return. But results found in Indian contest during this study doesn't provide any conclusive evidence about positive abnormal return associated with announcement of stock split which also discards signaling hypothesis and neglected firm hypothesis presented in literature review section.

Though ideally as in 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 Panel B of Table 3 it can be observed that MAR on the effective day is 1.66% and it is statistically significant and around 65% of the sample firms have shown positive abnormal return which also makes it significant when tested with non parametric sign test to supplement the result derived from T-test. This provides enough evidence for the positive price effect associated with stock split on effective day. This can be associated with liquidity and optimal trading range hypothesis. But later as it can be seen that the MAR is significant on ED+5 with opposite sign confirms reversal of the positive wealth effect.. This reversal of wealth effect 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 become quite interesting because of reversal of positive abnormal return with opposite sign (Negative abnormal return) by as early as ED+5th day and it has sustained till ED+10 days I have decided to test and present the results of 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 4 that the negative abnormal return that has been found statistically significant from ED+5 is continuing till ED+11 which, from there on is neither positive nor negative. MAR is not found statically significant for the entire remaining window length (ED+12, ED+51) baring few instances where negative MAR is found statically significant. That gives

enough evidence not only for the fact that there is no positive abnormal return present in post effective split window onn the contrarily there is some evidence of some significant negative wealth effect is found in post effective window. This is exactly opposite to what has been found and explained by market maker hypothesis which says that stock split leads to reduction in bid-ask spread and will make market maker more active in promoting stock and hence leads to positive stock market effect. **(See Angle (1997) and Schultz (2000)).** and 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 to even 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.

Table 5 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 as in India there is 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 dat AD+1. In fact MAR is significant with opposite sign on AD+4 which indicates reversal in wealth effect. This also can be seen from the fact that MCAR remains statically significant from AD-9 to AD+6 in which MCAR is constantly increasing from AD-9 to AD+1 but from there on 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 suggest that there is 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 prior to its announcement and any information content left to formal announcement gets reflected in positive MAR on announcement day and there is no significant price effect found during the build up window.

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 positive wealth effect.

As shown in table 6, that 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 remains at considerable higher than one in the entire effective day window (ED-10, ED+10) and

This increase in liquidity is consistent with findings of Muscarella and Vetsuypens (1996), Amihud and Mendelson (1986), and *Christian Wulff (2002)* but still quite different because in all of these the increase in liquidity is associated with positive wealth effect where is in my research done for Indian market does not provide any empirical evidence to positive wealth effect associated with stock split.

To wrap up the analysis if we talk in terms of acceptance or rejection of the hypothesis we framed for the study we can say that H1 is rejected and hence shows the presence of significant excess return on announcement day but the this claim gets diluted as its not supplemented by non parametric sign test. H2 is also rejected and thus proves that there is some leakage of information about split announcement prior to the formal announcement. This is quite possible as there is a time lag between the information provided by the board of directors to the exchange about their considering split proposal and formally approving split which actually is the announcement day but market may react on agenda and not the outcome. H3 is rejected as there is a significant positive abnormal return found on the effective day. H4 is accepted as there is no significant positive return present in post effective long window. Any positive abnormal present gets reversed from ED+5 with opposite sign which confirms the reversal. H5 and H6 are rejected as there is a hugely significant abnormal volumes measured by MVR observed on both announcement and effective day of the stock split.

9. Conclusions: From the above results and discussions it can be concluded that price effect associated with stock split is not significant and though there is a significant positive abnormal return of 1.08% and 1.66% found on announcement and effective day

respectively it did not sustain and got reversed in less than a weeks time; hence there is no clear evidence about positive wealth effect associated with stock split available from Indian markets. However there is a clear evidence of significant improvement in traded volume (turnover) associated with stock split both surrounding announcement and effective day. Though this is inconsistent with the theory because if any liquidity gains are associated with stock split it should be reflected on announcement date itself as discounted value of any gains expected from effective date on account of improved liquidity expected but the positive wealth and liquidity effect seen here in this study on effective day may have something to do with the traders who were deprived of taking positions in such stock with high absolute price and on effective day and just few days after that they might see it as an opportunity to trade in the stock which now is more into their price zone. If is also worth noting that even after introduction of derivatives in many stocks in cash market about 50% of the volume is still associated with day traders as can be seen by NSE data and they are still affecting the price and volume of a security substantially. But this is still a puzzled and to be explored further. For now we can safely conclude that stock split leads to improvement in liquidity but does not carry any positive wealth effect.

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Table 1: Summery 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
Angle (1997) and Schultz (2000)	Market maker	Decrease in bid ask spread 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.
Greenbatts, Masulis, Titman (1984)	Signaling hypothesis	Positive price effects as a result of split announcement is used as signal of better future earnings.

Table 2: Sample Size finally used for 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-Panel A 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) stand 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 methodology section..

	MAR	T$_{MAR}$	MCAR	T$_{MCAR}$	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 3-Panel B: Price effects (Effective day) 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 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 methodology section

	MAR	T$_{MAR}$	MCAR	T$_{MCAR}$	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 4: 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 5: 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 (%)	T_{MAAR}
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 6: 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%