A study of Impact of Stock Splits on Liquidity for Different Stock Split Ratios with Reference to Ex-Split Day

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Abstract:
Stock split is a numeric change in face value of shares and it should not have any effect on share prices. The liquidity hypothesis is tested using measures like – average volume, average number of shares traded and average number of transactions.

Keywords: *Stock split, Liquidity, Share*

1. Introduction

A stock split is a decision by company's board of directors to increase number of outstanding shares of the company without changing shareholders equity but by changing face value of equity shares.

Companies decide to undertake stock splits for a number of reasons and advantages. The present study makes an attempt to examine the impact of stock splits on liquidity with differences in the split factor/split ratios.

2. Literature Review

A stock split is done to improve liquidity of the shares. There is an increase in number of shares as a result of stock splits which increases supply of equity shares and investors are willing to buy or sell (Angel, 1997; Lin, Singh, and Yu, 2009).

Stock splits may be undertaken to ensure wider distribution of shares by increasing proportion of small investors in total shareholding of the company. Splits result in decrease in market value per share, increase in volume of shares traded and increase in liquidity (Dolley, 1933).

Different researchers have taken different measures to evaluate impact of stock splits on liquidity. Many studies took trading volume as basis to measure liquidity. One group of researchers are of view that Liquidity improvement hypothesis is based on assumption that low-priced shares draw more investors and generate greater trading volume, enhancing marketability and reducing bid–ask spread.

The effects of stock splits on liquidity were examined by Copeland (1979). by taking help of finite time series model related to trading volume for a sample of randomly selected 25 NYSE stock splits. He concluded that relative liquidity calculated using variables like trading volume, brokerage revenues and bid-ask spread decreased after stock splits. Wulff (2002) reported considerable increase in trading volume subsequent to stock splits in Germany. Kunz and Majhensek (2002) carried out a review in Switzerland and reported that daily trading volume and liquidity was constant around stock splits. Leemakdej (2007) studied Stock Exchange of Thailand and observed a decrease in trading volume.

In India Mishra (2006) reported an increase in trading volume after ex-split day of stock splits. Gupta and Gupta (2007) in India examined changes in liquidity around ex-split day and found that average trading volume increased in case of 90% companies after ex-split day.Joshipura (2008) found

significant improvement in traded volume (turnover) as a result of stock splits both around announcement and ex-split day. He was of opinion that if stock splits alone are the reason for increase in volume than increase must be restricted to announcement day only, but an increase in volume around ex-split day was also noted by him.

Datta and Banerjee (2012) considered diversification tendency of investors according to which when share price is low there is a tendency for diversification by investors. As a result, there may be an increase in demand but there may be a change in supply also on account of change in attractiveness of offload. They studied change in volume of trade for shares split in Indian market before and after split to capture this effect. They found that impact of stock splits on large priced share and small priced share was different due to diversification tendency of investors. Suresha and Naidu (2013) found an increase in volume of shares traded and trading activity around stock splits.

The liquidity hypothesis is a variation of optimal trading range hypothesis. It is based on assumption that corporate liquidity is affected by share prices (Maloney and Mulherin, 1992; Muscarella and Vetsuypens, 1996).If share price is too high. Then liquidity may decline. A low share price attracts more individual investors (especially small investors). enhances trading liquidity and reduces trading costs. There are mixed reactions in support of this hypothesis. Lakonishok and Lev (1987) and Baker and Powell (1993) supports this hypothesis.

Lakonishok and Lev (1987) concluded that stock splits increase number of shares traded and transactions. Lamoureux and Poon (1987) analyzed stock splits that occurred between July 1962 and December 1985. They concluded that splits result in an increase in number of transactions along with number of shares traded, which in turn increases volatility of share prices. Liquidity was found to increase after split and reduce by reverse split.Desai et al.(1998) took number of transactions per day as basis to measure liquidity and found that it increased.

In India Gupta and Gupta (2007) found that investors base, market capitalization and daily number of transactions increases around ex-split day. Joshipura (2008) reported positive wealth and liquidity effect on ex-split day but not on announcement day. According to him it may be due to an increase in number of traders who get an opportunity to trade in shares which are split and attain lower price range. Singh and Supna (2013) examined stock splits in India in period 2006-07 to 2009-10 for sample of 219 splits using percentile method and paired t-test to examine their impact on liquidity. They found mixed results using percentile method they concluded that number of transactions increased only for few companies. But results of paired t-test contradicted and indicated a decrease.

3. Objectives of the study

The current study aims at examining the impact of splits on liquidity. In the light of above discussion, the research objective framed is:

1. To examine the effect of stock splits on liquidity.
2. To investigate differences in effect of stock splits on liquidity around ex-split day for different split factor companies.

4. Research issues

To achieve the objectives enumerated, following research issues are identified:

i.What is the effect of stock splits on liquidity?

ii.Is there a difference in effect of stock splits on liquidity with difference in split ratios?

5. Research hypotheses

Research hypotheses are developed:

- **HYP: 1**- Stock splits have impact on liquidity.

6. Research methodology

To test the hypothesis enumerated following research methodology has been designed.

7. Data and sampling period

The list of sample companies is drawn from a population comprising of all companies listed on Bombay Stock Exchange (BSE) that went for stock splits during the period starting from 1999 to June 2013.The fourteen-year period is chosen to ensure reasonable size of the sample. Non–availability of share prices data and other related limitations restricted the size of sample to 214 companies.

8. Sources of data

For secondary data collection Prowess 19.1, a CMIE database was accessed for- daily closing share prices data, and data for liquidity measures, for sample companies around announcement and ex-split day**.**

9. Research Measures

- In the current study to find impact on Liquidity of shares we use the measure – average volume, average number of shares traded and average number of transactions.
- The most popular **stock split ratios** are taken to be the one choosen by majority of companies deciding to split. To find such stock split ratios grouping of all stock splits announced in period of study, is done on the basis of split ratios. It is found that majority of stock splits are done in stock split ratios - 10:1, 10:2 and 10:5 and thus these three split ratios are regarded as the most popular split ratios in India.
- Event day is the day on which event takes place, or day around which effect of an event is distributed. The event day is assigned time t_0
- AD - Announcement Day is day earliest of date of board meeting and date when news of stock split announcement is made public for first time officially.
- ED – Ex-split Day is the effective day on which share starts trading in the stock market at new face value after stock split.
- Number of transactions- It is defined in terms of number and refers to number of transactions of the shares of sample companies undertaken on a day in the event window.
- Volume traded in rupees- It is defined in terms of millions of rupees and refers to traded volume of shares of sample companies on a day in event window.
- Daily number of shares traded - It is defined in terms of number and refers to number of shares traded of sample companies on a day in event window.

10. Analysis of liquidity measures using averages

Each measure of liquidity is aggregated across time for all sample companies on each day in the announcement and ex-split window. The aggregated value of each measure for all sample companies on each day in the announcement and ex-split window is averaged. Thus average daily number of transactions, average trading share volume in rupees, and average shares traded are obtained for each day in the event window.

11. Hypotheses testing

To test research hypotheses related to liquidity for averages of each measure of liquidity, two tailed t-test is conducted which compares averages of pre and post event periods of - 20 days, 10 days, 5 days and 2 days. Paired t-test is also conducted for averages of each liquidity measure for two consequent days.

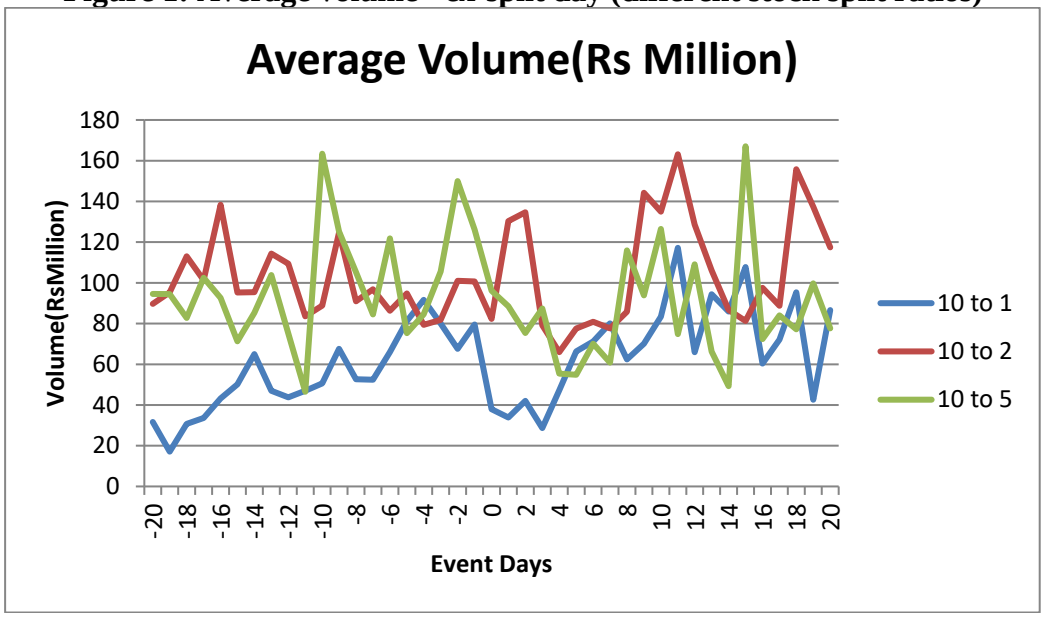
12. Empirical Results/Findings

12.1 Impact on average share volume (Rs.) - ex-split day (different stock split ratios)

The average volume of shares around ex-split day of stock splits for companies with different stock split ratios is calculated and same is shown in **Figure 1.** It shows that 10:5 and 10:2 are split ratios which

show more variations in volume.

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



The paired t-test is conducted to test the null hypothesis that there is no significant difference in averages volume of two consecutive days. The null hypothesis is rejected and significant p-values are present on day t_{-4} (increase) for split ratio 10:1 in ex-split window in **Table 1.1.**

Table 1.1: Average share volume (Rs.) - ex-split day (different stock split ratios)

Event Day	Average volume (Rs. Million) 10:1	p-values for paired t-test*	Average volume (Rs. Million) 10:2	p-values for paired t-test*	Average volume (Rs. Million) 10:5	p-values for paired t-test*
-20	31.69		89.66		94.60	
-19	17.11	0.439	95.31	0.839	94.46	0.996
-18	30.70	0.394	113.05	0.223	82.75	0.462
-17	33.64	0.307	101.30	0.381	102.47	0.301
-16	43.25	0.183	138.34	0.109	92.55	0.468
-15	50.15	0.515	95.24	0.118	71.29	0.388
-14	65.03	0.118	95.41	0.989	85.29	0.712
-13	47.01	0.232	114.39	0.209	103.84	0.124
-12	43.74	0.677	109.44	0.737	75.13	0.295
-11	47.00	0.662	83.56	0.161	46.51	0.359
-10	50.64	0.726	88.80	0.508	163.43	0.341
-9	67.63	0.116	124.65	0.288	125.23	0.187
-8	52.63	0.226	90.91	0.248	105.28	0.523
-7	52.43	0.940	96.87	0.628	84.53	0.528
-6	66.02	0.335	86.30	0.551	121.87	0.144
-5	81.28	0.372	94.77	0.577	75.28	0.054
-4	91.61	**0.023**	79.39	0.152	84.55	0.258
-3	80.03	0.271	81.80	0.805	105.53	0.349
-2	67.57	0.337	100.97	0.169	150.00	0.430
-1	79.51	0.261	100.69	0.964	126.17	0.656
0	37.93	0.239	82.28	0.421	96.15	0.091
+1	33.85	0.696	130.33	0.377	88.49	0.751
+2	42.01	0.336	134.68	0.671	75.35	0.199

Event Day	Average volume (Rs. Million) 10:1	p-values for paired t-test*	Average volume (Rs. Million) 10:2	p-values for paired t-test*	Average volume (Rs. Million) 10:5	p-values for paired t-test*
+3	28.68	0.380	79.12	0.262	87.41	0.577
+4	47.26	0.441	65.96	0.060	55.39	0.461
+5	66.32	0.285	77.58	0.486	54.88	0.967
+6	71.19	0.426	80.86	0.831	70.12	0.435
+7	80.12	0.317	77.66	0.545	60.86	0.476
+8	62.38	0.361	85.80	0.341	115.98	0.265
+9	70.07	0.416	144.26	0.106	93.87	0.299
+10	83.39	0.167	134.95	0.587	126.49	0.319
+11	117.20	0.358	163.15	0.171	74.82	0.143
+12	65.92	0.297	128.58	0.063	109.09	0.083
+13	94.42	0.292	106.15	0.159	66.24	0.300
+14	85.88	0.281	86.72	0.363	49.29	0.194
+15	107.80	0.298	81.25	0.542	167.07	0.297
+16	60.37	0.368	97.52	0.288	72.38	0.272
+17	72.13	0.482	88.73	0.508	83.99	0.358
+18	95.38	0.321	155.77	0.210	77.17	0.354
+19	42.60	0.347	137.44	0.582	99.72	0.428
+20	86.60	0.387	117.43	0.397	77.68	0.545
*Values in bold are significant at 5% level of significance.						

The two tailed t-test is conducted to test the null hypothesis that there is no significant difference in average volume before and after ex-split day. In **Table 1.2** it can be observed that null hypothesis is rejected at 5% level of significance for all split ratios for shortest event window starting from t_{-2} till t_{+2} days. The impact on volume is more long lasting for event window of longest duration t_{-20} to t_{+20} for companies with highest split factor.

Table1.2: t-test values for average share volume (Rs.) - ex-split day (different split ratios)

Event day	10:1			10:2			10:5		
	t-test	t-critical	p-value	t-test	t-critical	p-value	t-test	t-critical	p-value
-20 to +20	-2.27	2.03	**0.03**	-1.29	2.05	0.21	1.62	2.02	0.11
-10 to +10	1.38	2.12	0.19	-0.63	2.18	0.54	2.62	2.10	**0.02**
-5 to +5	4.82	2.45	**0.00**	-0.40	2.57	0.71	2.32	2.45	0.06
-2 to +2	4.92	4.30	**0.04**	-14.53	12.71	**0.04**	4.13	4.30	**0.05**
*Values in bold are significant at 5% level of significance.									

Thus, there is presence of liquidity changes in ex-split window, but this effect is stronger for stock split ratio 10:1 when volume is taken as measure of liquidity. The period from t_{-2} to t_{+2} day exhibits significant impact on volume irrespective of the split factor. Thus, results of present study are in line with observations of Brennan and Copeland (1988); and Mc Nicholas and Dravid 1(1990) and same is reflected in impact on volume for split ratio 10:1.

12.2 Impact on average number of shares traded - ex-split day (different stock split ratios)

Average number of shares traded in ex- split window for companies with different stock split ratios is

1 Brennan and Copeland (1988); and Mc Nicholas and Dravid (1990) reported that companies whose shares are less liquid tend to choose a higher split factor to ensure greater liquidity.

given in **Figure 2**. It shows an increase in shares traded on ex-split day for all stock split ratios.

Table 2.1 shows significant p-values for paired t–test when null hypothesis (there is no significant difference in average number of shares traded for two consecutive days) is rejected and there is significant increase in average number of shares traded on ex-split day (t_0) for split ratios 10:1 and 10:2.

Table 2.1: Average number of shares traded - ex-split day (different stock split ratios)

Event day	Average number of shares traded 10:1	p-values for paired t-test	Average number of shares traded 10:2	p-values for paired t-test	Average number of shares traded 10:5	p-values for paired t-test
-20	29,114		53,680		100,057	
-19	33,453	0.629	50,895	0.795	121,499	0.442
-18	31,464	0.833	49,561	0.818	88,994	0.406
-17	37,922	0.202	50,970	0.807	80,153	0.446
-16	49,367	0.262	73,182	0.066	84,973	0.734
-15	46,339	0.632	51,359	0.059	89,133	0.828
-14	51,623	0.477	51,968	0.922	72,629	0.294
-13	48,542	0.719	65,357	0.196	68,925	0.692
-12	58,755	0.478	83,181	0.348	65,082	0.486
-11	57,903	0.967	53,760	0.099	58,713	0.463
-10	43,553	0.414	54,079	0.973	71,869	0.326
-9	50,764	0.326	63,326	0.435	66,065	0.696
-8	48,501	0.724	54,252	0.354	56,470	0.404
-7	56,587	0.244	54,291	0.995	59,029	0.771
-6	68,167	0.178	54,344	0.995	117,525	0.158
-5	54,876	0.154	49,181	0.406	90,823	0.450
-4	78,786	0.131	50,628	0.794	56,120	0.158
-3	67,203	0.515	52,277	0.790	79,424	0.195
-2	79,295	0.272	61,159	0.215	80,148	0.962
-1	118,040	0.254	70,688	0.227	179,298	0.177
0	546,008	**0.008**	337,779	**0.000**	186,911	0.880
+1	337,438	0.058	408,951	0.551	129,499	0.247
+2	741,569	0.232	376,103	0.259	137,525	0.735
+3	375,424	0.284	224,217	0.122	94,464	0.097
+4	306,922	0.270	212,964	0.599	114,858	0.288
+5	365,677	0.131	220,867	0.777	140,557	0.342
+6	315,949	0.300	222,441	0.958	113,807	0.189
+7	507,699	0.330	210,680	0.491	168,044	0.226
+8	304,519	0.305	224,711	0.452	137,187	0.338
+9	295,325	0.738	325,072	0.098	166,719	0.558
+10	389,038	0.290	285,653	0.258	123,658	0.401
+11	634,360	0.182	381,551	0.159	211,521	0.319
+12	345,250	0.160	306,771	0.215	242,916	0.790
+13	381,480	0.567	251,962	0.099	166,979	0.245
+14	310,907	0.110	217,446	0.404	136,653	0.207
+15	408,682	0.319	196,100	0.360	170,899	0.316
+16	358,718	0.499	229,278	0.263	139,223	0.300
+17	391,114	0.586	220,096	0.785	104,052	0.399
+18	421,989	0.591	330,484	0.227	85,771	0.134

Event day	Average number of shares traded 10:1	p-values for paired t-test	Average number of shares traded 10:2	p-values for paired t-test	Average number of shares traded 10:5	p-values for paired t-test
+19	427,912	0.953	309,052	0.792	110,454	0.307
+20	286,490	0.134	265,287	0.433	99,246	0.570
*Values in bold are significant at 5% level of significance.						

Figure2: Average number of shares traded - ex-split day (different stock split ratios)

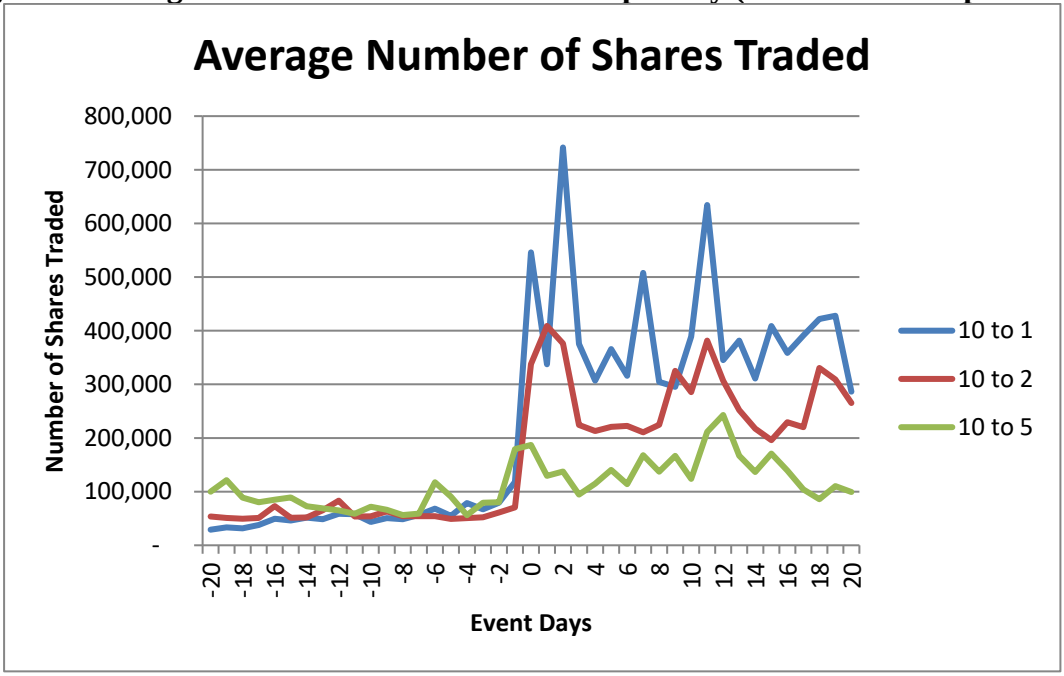


Table 2.2 shows the results when two tailed t-test is conducted to test the null hypothesis that there is no significant difference in average number of shares traded before and after ex-split day. It can be noted that null hypothesis is rejected at 5% level of significance for event windows of longer duration - t_{-20} to t_{+20} and t_{-10} to t_{+10} for all stock split ratios. The null hypothesis is rejected for event windows of shorter duration - t_{-5} to t_{+5} for split ratios - 10:1 and 10:2.The null hypothesis is rejected for event windows of shortest duration - t_{-2} to t_{+2} for split ratio - 10:2.

Table 2.2: t-test values for average number of shares traded – ex-split day (different stock split ratios)

Event day	10:1			10:2			10:5		
	t-test	t-critical	p-value	t-test	t-critical	p-value	t-test	t-critical	p-value
-20 to +20	-13.00	2.09	**0.00**	-14.47	2.09	**0.00**	-5.06	2.03	**0.00**
-10 to +10	-7.45	2.26	**0.00**	-9.13	2.26	**0.00**	-3.36	2.13	**0.00**
-5 to +5	-4.29	2.78	**0.01**	-5.40	2.78	**0.01**	-1.14	2.57	0.30
-2 to +2	-2.17	12.71	0.27	-19.10	12.71	**0.03**	-0.08	12.71	0.95
*Values in bold are significant at 5% level of significance.									

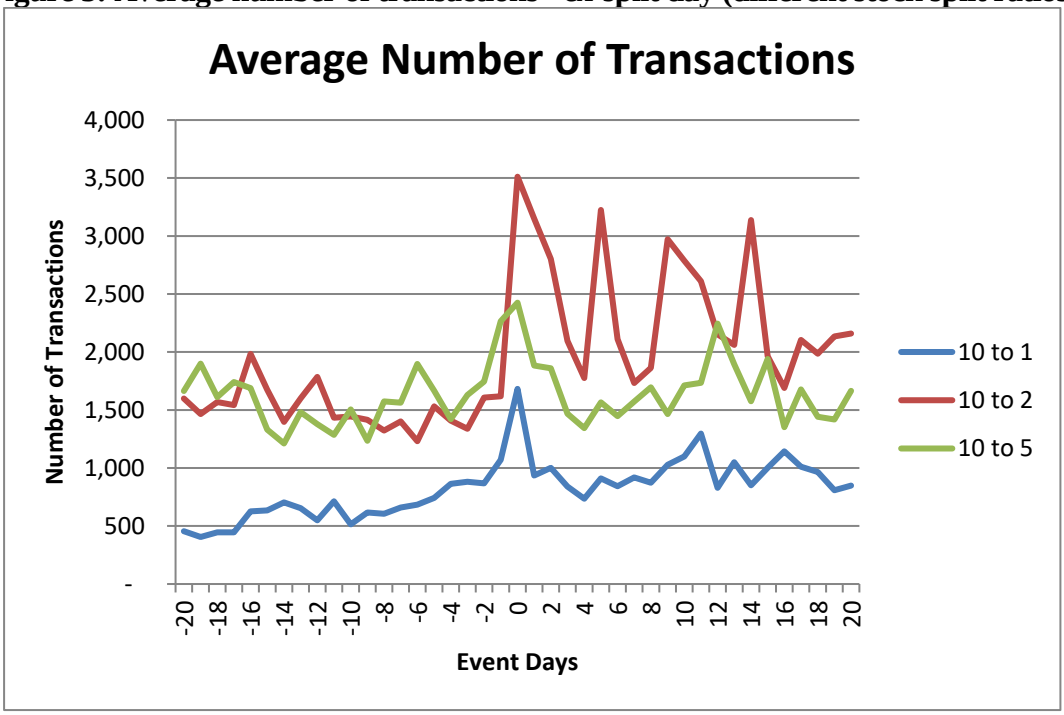
Thus it is noted that an increase in number of shares traded is present for split ratio 10:1 (highest split factor ratio).It implies that brokers in order to save transaction cost defer trade in shares until share prices do not drop to a low level that happens maximum for split ratio 10:1,in line with views of Anshuman and Kalay (2002).Significant increase in shares traded for all split ratios in long duration windows may be because of an increase in number of small traders who are noisy traders in line with view of Kryzanowski and Zhang (2002) res.3 ulting in more liquidity. Share prices reduce to new low

levels after ex-split day (maximum for split ratio 10:1).

12.3 Impact on average number of transactions - ex-split day (different stock split ratios)

Average number of transactions in ex-split window for companies with different stock split ratios is given in **Figure 3.** The average number of transactions has increased on ex-split for all stock split ratios.

Figure 3: Average number of transactions - ex-split day (different stock split ratios)



Paired t-test is conducted to test the null hypothesis that there is no significant difference in average number of transactions for two consecutive days. **Table 3.1** shows that the null hypothesis is rejected (significant p-value) and there is an increase in average number of transactions on day - t_{-9} for ratio 10:1 and there is decrease in average number of transactions on day - t_{+1} and t_{-10}.The null hypothesis is rejected (significant p-value) and there is an increase in average number of transactions on day - t_{-2} for ratio 10:2 and decrease on t_{+4} day. Null hypothesis is not rejected for ratio 10:5 in ex-split window.

Table 3.1: Average number of transactions -ex-split day (different stock split ratios)

Event day	Average number of transactions 10:1	p-values for paired t-test	Average number of transactions 10:2	p-values for paired t-test	Average number of transactions 10:5	p-values for paired t-test
-20	456		1,599		1,664	
-19	406	0.737	1,465	0.620	1,900	0.516
-18	445	0.748	1,569	0.554	1,612	0.324
-17	446	0.991	1,543	0.906	1,741	0.595
-16	626	0.261	1,985	0.294	1,689	0.734
-15	635	0.889	1,675	0.070	1,331	0.155
-14	703	0.428	1,398	0.213	1,211	0.692
-13	654	0.625	1,601	0.153	1,482	0.242
-12	549	0.402	1,785	0.479	1,379	0.586
-11	713	0.161	1,433	0.102	1,286	0.649
-10	515	**0.039**	1,445	0.933	1,505	0.637
-9	616	**0.048**	1,416	0.886	1,235	0.274
-8	605	0.834	1,323	0.625	1,574	0.287
-7	660	0.417	1,402	0.666	1,564	0.970

Event day	Average number of transactions 10:1	p-values for paired t-test	Average number of transactions 10:2	p-values for paired t-test	Average number of transactions 10:5	p-values for paired t-test
-6	684	0.752	1,231	0.341	1,898	0.508
-5	741	0.579	1,531	0.269	1,667	0.652
-4	864	0.066	1,408	0.364	1,422	0.284
-3	882	0.803	1,339	0.626	1,629	0.266
-2	867	0.904	1,608	**0.046**	1,745	0.657
-1	1,071	0.096	1,618	0.940	2,266	0.438
0	1,682	0.091	3,511	0.061	2,425	0.710
+1	936	**0.011**	3,150	0.678	1,883	0.301
+2	1,002	0.646	2,803	0.335	1,859	0.934
+3	840	0.216	2,096	0.068	1,468	0.185
+4	735	0.358	1,775	**0.040**	1,344	0.574
+5	911	0.193	3,224	0.152	1,566	0.475
+6	843	0.426	2,111	0.247	1,447	0.742
+7	918	0.505	1,733	0.058	1,573	0.690
+8	873	0.726	1,863	0.358	1,696	0.706
+9	1,028	0.460	2,972	0.125	1,465	0.142
+10	1,099	0.715	2,787	0.700	1,712	0.287
+11	1,297	0.348	2,611	0.512	1,734	0.954
+12	829	**0.037**	2,152	0.240	2,245	0.335
+13	1,049	0.255	2,062	0.758	1,894	0.383
+14	852	0.154	3,137	0.327	1,575	0.285
+15	1,001	0.152	1,964	0.234	1,940	0.569
+16	1,144	0.655	1,690	0.522	1,352	0.142
+17	1,011	0.615	2,104	0.288	1,677	0.178
+18	966	0.536	1,986	0.749	1,441	0.209
+19	808	0.552	2,134	0.517	1,419	0.917
+20	849	0.887	2,160	0.930	1,665	0.447
*Values in bold are significant at 5% level of significance.						

Two tailed t-test is conducted to test the null hypothesis that there is no significant difference present in average number of transactions before and after ex-split day. **Table 3.2** shows that null hypothesis is rejected at 5% level of significance for event windows of lengths t_{-20} to t_{+20} days,t_{-10} to t_{+10} and t_{-5} to t_{+5} days for split ratios 10:1 and 10:2. Null hypothesis is not rejected for split ratio 10:5.

Table 3.2: t-test Values for average number of shares transactions -ex-split day (different split ratios)

Event Day	10:1			10:2			10:5		
	t-test	t-critical	p-value	t-test	t-critical	p-value	t-test	t-critical	p-value
-20 to	-6.04	2.03	**0.00**	-6.72	2.07	**0.00**	-0.75	2.02	0.46
-10 to	-2.68	2.13	**0.02**	-5.33	2.23	**0.00**	0.47	2.13	0.65
-5 to +5	0.00	2.31	1.00	-3.77	2.78	**0.02**	0.69	2.36	0.51
-2 to +2	0.00	12.71	1.00	-7.86	12.71	0.08	0.52	12.71	0.70
*Values in bold are significant at 5% level of significance.									

An increase in average number of transaction is observed to be present for split ratio 10:1 (highest split factor ratio).This result is in line with views of Anshuman and Kalay (2002) relating to brokers and

Kryzanowski and Zhang (2002) relating to increase in presence of noisy traders leading to an increase in liquidity.

13. Summary

To conclude the research hypothesis is not rejected on ex-split day and impact is maximum and more long lasting for average number of transactions and average number of shares traded in comparison to volume. Along with an increase in number of transactions in ex-split window there is a decrease in average trade size noted on ex-split day. It implies that there is presence of small traders on ex-split day and post event period. It also implies that research hypothesis that optimal trading range hypothesis holds true in India is not rejected. Company by a stock split is able to attain an optimal trading range.

For the research hypothesis that neglected firm hypothesis holds true in India the impact on liquidity and increase in small traders should be present only in the announcement window as it will imply that attention is gained and objective attained. The results show impact around ex-split day also. Therefore, the research hypothesis that neglected firm hypothesis holds true in India is rejected.

The research hypothesis that there is difference in impact on liquidity with differences in stock split ratios is rejected.

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