A Study of the Liquidity Effects of Stock Splits in Indian Stock Markets

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Abstract

Stock splits are a new phenomenon in Indian markets, especially with the bull phase in Indian stock markets, with many companies' stock prices shooting far beyond the normal trading range.

The objective of the study is to analyze the overall impact of stock splits on returns. To do so, the returns in the period prior to the announcement are compared with the returns after the execution of the split, in terms of mean returns and variance of returns. The results of the study indicate strong evidence for an increase in the liquidity of the stock after the split.

Keywords: Stock-split, Liquidity, Mean returns, Variance of returns

1. Introduction

A stock split is a corporate action in which a company divides each of its shares in a fixed proportion, and simultaneously decreases the price of a share. Thus, stock splits merely increase the number of shares outstanding, and do not create or destroy value (in terms of market capitalization).

The literature on stock split behavior begins with the pioneering paper by Fama et al (1969), which examined the behavior of cumulative abnormal returns (CARs) surrounding the execution dates of stock splits. Subsequently, Bar-Yosef and Brown (1977) argued that the excess returns caused by stock splits were really due to a temporary increase in the systematic risk (beta coefficient) of the stock.

There are several hypotheses developed in the literature to explain stock split behavior. The simplest of these is the signaling hypothesis, which suggests that stock splits are used by managers to signal good performance and future growth of companies to the market (Brennan and Copeland, 1988). Another hypothesis is the trading range hypothesis (Copeland, 1979), which suggests that there is an optimal price range in which a stock should trade, so that when stock prices are too high, a split should be undertaken so that small investors can afford to buy the stock. A complementary hypothesis is the liquidity hypothesis (Dolly, 1933), which suggests that stock splits are undertaken to encourage liquidity, i.e. higher volume of trade, of the stock. Easley et al (2001) suggested that preference for a specific trading range may be due to higher liquidity in that price range. Taking a different point of view, the tax timing hypothesis (Lamoureux and Poon, 1987) suggests that the tax-option value of a stock and its trading volume will increase following a stock split. A more recent ("market-maker") theory (Harris (1996) and Angel (1997)) suggests that stock splits may be used to position a stock's price so that the tick size is optimal vis-à-vis the trade-off between higher costs to investors and lower costs to liquidity suppliers such as market makers and limit-order providers; an increase in the number of liquidity suppliers will then be reflected by higher liquidity for the stock. In particular, stock splits lead to reduction in bid-ask spread and make market makers more active in promoting stock, leading to a positive stock market effect. Another hypothesis explaining stock split behavior is the neglected firms hypothesis, which argues that a stock spilt is a way by which firms that perceive themselves to be undervalued because of the negligence of the market participants try to

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catch the attention of the market; thus, little-known firms' shares trade at a discount, and stock splits can be used to draw attention to the company (Arbel and Swanson, 1987).

Though stock splits do not change the market capitalization of a company's stock, several studies have reported abnormal returns around the announcement date as well as the execution date, and an increase in variance after the execution date. In fact, empirical evidence on the impact of stock splits on liquidity is mixed. For example, Copeland (1979) found that proportional bid-ask spreads increased, while Murray (1985) found that they stayed the same. With trading volume as a proxy for liquidity, several authors (Copeland (1979), Lamoureux and Poon (1987), and Conroy et al (1990)) found that there was a decrease in split-adjusted volume following a stock split, while Murray (1985) reported no change in volume. Several studies which have used share price volatility as a measure of liquidity have found an increase following a stock split (Ohlson and Penman (1985), Dravid (1987), Lamoureux and Poon (1987), Conroy et al (1990), Dubofsky (1991), Desai et al (1998) and Koski (1998)). The number of trades per day has been found to increase following stock splits (Muscarella and Vetsuypens (1996), Kryzanowski and Zhang (1996) and Desai et al (1998)). Moreover, Desai et al (1998) found that there was a significant decrease in the average number of shares per trade following a stock split, while Lakonishok and Lev (1987) found an increase in the number of shares traded as a percentage of the outstanding shares following stock splits.

The execution-date effect of stock splits has been explained by market microstructure anomalies, for example by the bid-ask spread and by price discreteness. Blume and Stambaugh (1983) found that the bid-ask spread causes an upward bias in rates of return. Amihud and Mendelson (1987) and Kaul and Nimalendran (1990) found that return variances were also biased upward by the bid-ask spread. Dravid (1989) and Conroy et al. (1990) found that bid-ask spreads increase in percentage terms subsequent to splits and impose a liquidity cost on investors. Desai and Jain (1997) studied long-run common stock returns following stock splits and reverse splits and suggested that the market under-reacts to the information conveyed in the stock split and reverse split announcements.

Muscarella and Vetsuypens (1996) found improved liquidity after a stock split, with wealth gains to investors. Their findings support the model of Amihud and Mendelson (1986), which predicted 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.

Regarding return variance effects of stock splits Ohlson and Penman (1985) and Dravid (1987) found that stock return volatility increases after stock splits. Klein and Peterson (1988) also found evidence of increased volatility and market inefficiency in call option prices around the announcement and ex-dates of large stock splits, in that call options do not reflect underlying stock price volatility increases until the ex-date. Desai et al. (1998) found a significant increase in volatility after stock splits even after controlling for microstructure biases. Koski (1998) found only some evidence that the bid-ask spread contributes to the volatility increase and that price discreteness (measurement effects) did not either generate the volatility increase.

Wulff (1999) investigated the market reaction to stock splits in the German stock exchange, and found effects similar to those in US markets. He argued that there was little evidence for the signally hypothesis. He also found a significant increase in liquidity after the split, though cross-sectional tests did not lend any support to the hypothesis that price changes are positively related to liquidity changes. He suggests that the announcement effect to German stock splits is best explained by a neglected firm effect.

Niini (2001) found statistically significant abnormal announcement returns at the Helsinki and Stockholm stock exchanges, and a statistically significant execution-date effect at the Stockholm Stock Exchange, but not at the Helsinki Stock Exchange. He also found an ex-date volatility shift in about half of the splitting stocks on both markets, though this was not found to be statistically significant.

Michayluk and Kofman (2001) studied the effect of stock splits on liquidity for NASDAQ stocks. They found a *decline* in most liquidity measures following a stock split. Further, they found a greater decline in liquidity for large stock splits than for small stock splits, though this did not persist over a longer period of time after the stock split.

Dennis (2003) studied liquidity effects of stock splits for the Nasdaq-100 Index Tracking Stock. He found that the frequency, share volume, and dollar-volume of small trades were all increased after the split, indicating that the split improved liquidity for small trade-sizes.

Joshipura (2008) studied the price and liquidity effects associated with stock split surrounding its announcement and execution dates in Indian stock exchanges. His results suggested that though there were some positive abnormal return associated surrounding announcement and execution dates of the stock split, but it reverses in just a few days after the event dates, and ultimately generates significant negative abnormal return in slightly longer post-execution window. He also found that there was a significant improvement seen in liquidity surrounding announcement and execution dates of stock split.

The literature has investigated several interesting effects associated with stock-splits. Most of the literature, however, is based on event study methodology, and the findings from the studies tend to be mixed, and often contradictory. Also, very few studies considered the longer-term effects of stock-splits.

Stock splits are a relatively new phenomenon in Indian markets, especially since early 2005 with the bull phase in Indian stock markets, with many companies' stock prices shooting far beyond the normal trading range. The objective of the study is to analyze the overall impact of stock splits on returns. To do so, the returns in the period prior to the announcement are compared with the returns after the execution of the split, in terms of mean returns and variance of returns.

2. Data and Methodology

The data used for the study was collected from twenty-four stock-splits for stocks listed on the National Stock Exchange (NSE), Mumbai, India which took place in the period Jan. 2006 - Aug. 2007. The sample stocks were all core NIFTY-50 stocks. To avoid abnormal returns due to the announcement and execution of the split, a fifteen-day window was taken prior to the announcement of the split and after the execution of the split.

The split ratios of the sample stock splits were found to vary widely, with 29.17% of the sample stocks having a split ratio in the range 2:1 - 3:1, 37.50% of the sample stocks having a split ratio of 5:1, and 33.33% of the sample stocks having a split ratio of 10:1. Preliminary analysis of the sample showed that there was high variability in the price and the trade volume of the sample stocks at the time of the split, and that there was no significant difference in the price and the trade volume at the time of the split between stock splits with different split ratios.

Several proxies for liquidity have been discussed in the literature, including proportional bid-ask spreads and trading volume (Copeland (1979) and others), and share price volatility (Ohlson and Penman (1985) and others). With preliminary results showing high variability in terms of price and trading volume, the study focused on share price volatility to study liquidity effects of the stock splits.

Share price volatility was estimated using the distribution of stock returns. The daily returns were calculated using the formula $r_t = \frac{S_t - S_{t-1}}{S_{t-1}}$ for the sixty-day period prior to the pre-announcement window and for the sixty-day period after the post-execution window. The sample mean and sample

variance/standard deviation of returns in the two periods were calculated as usual, and then compared using standard statistical hypothesis tests.

The lognormal model of stock prices was also used in this context to assess the impact of the stock-split on the underlying process (Hull, 1997). The drift and volatility parameters for the lognormal model in the two periods were estimated as follows (Marshall and Bansal, 1992):

$$\hat{\mu} = 2\log_e(1+\bar{r}) - \frac{1}{2}\log_e\left(s_r^{\,2} + (1+\bar{r}^2)\right)$$

$$\hat{\sigma}^2 = \log_e\left(1 + \frac{s_r^{\,2}}{1+\bar{r}^2}\right)$$

The estimated drift and volatility parameters in the two periods were then compared using standard hypothesis tests.

3. Analysis and Interpretation

The mean and variance of returns of the sample stocks in the forty-five-day period prior to the pre-announcement window and in the forty-five-day period after the post-execution window are compared in Table 1 below.

Table 1: Comparison of mean and standard deviation of daily returns before and after split

Stock	$E(r)_{before}$	$s(r)_{before}$	$E(r)_{after}$	$s(r)_{after}$	equality of mean returns		equality of variance of returns	
					t_{cal}	p-value	F_{cal}	p-value
BALAJI TELEFILMS	0.0036	0.0341	-0.0027	0.0266	0.7277	0.2352	0.6060	0.8865
DABUR	-0.0005	0.0278	-0.0067	0.0836	0.3565	0.3615	9.0302	0.0000*
GODREJ	0.0034	0.0412	-0.0337	0.1627	1.1065	0.1370	15.5845	0.0000*
LEELA	0.0007	0.0304	-0.0502	0.1913	1.3151	0.0974	39.5921	0.0000*
HCL	-0.0019	0.0533	-0.0061	0.0765	0.2248	0.4115	2.0598	0.0415*
HLL	0.0011	0.0312	-0.0091	0.0826	0.5810	0.2820	7.0323	0.0000*
ITC	0.0023	0.0160	0.0021	0.0158	0.0283	0.4888	0.9684	0.5311
POLARIS	0.0104	0.0607	-0.0081	0.0655	1.0304	0.1540	1.1630	0.3572
SATYAM	0.0015	0.0569	-0.0070	0.0850	0.4118	0.3412	2.2348	0.0272**
SIMPLEX	0.0018	0.0362	-0.0755	0.2158	1.7665	0.0418**	35.5682	0.0000*
SUN PHARMA	0.0005	0.0111	0.0011	0.0386	-0.0728	0.4711	12.0776	0.0000*
SUPER SPIN	0.0001	0.0327	-0.0458	0.1984	1.1416	0.1296	36.8637	0.0000*
UNITECH	0.0205	0.0391	-0.0034	0.1252	0.9124	0.1831	10.2561	0.0000*
WIPRO	-0.0001	0.0188	-0.0002	0.0453	0.0088	0.4965	5.7924	0.0000*
ITILX	0.0166	0.0530	-0.0083	0.0798	1.2979	0.1003	2.2662	0.0252**
TAJGVK	0.0058	0.0283	-0.0007	0.0742	0.4099	0.3419	6.8714	0.0000*
GAMMON	0.0081	0.0250	-0.0074	0.0848	0.8762	0.1926	11.5313	0.0000*
PRAJIND	0.0091	0.0301	-0.0089	0.0984	0.8749	0.1930	10.7061	0.0000*
COMP TECH	0.0130	0.0627	-0.0067	0.0716	1.0345	0.1531	1.3043	0.2601
BLUESTAR	0.0022	0.0247	-0.0997	0.2868	1.7692	0.0416**	135.0701	0.0000*
RADICO	0.0044	0.0206	-0.0040	0.0672	0.5988	0.2761	10.5938	0.0000*
RANBAXY	-0.0018	0.0138	-0.0031	0.0445	0.1446	0.4428	10.3641	0.0000*
ASHOK LEY	0.0028	0.0300	-0.0059	0.0821	0.5006	0.3095	7.4633	0.0000*
SONATA SOFT	-0.0039	0.0611	-0.0142	0.0932	0.4616	0.3232	2.3248	0.0219**

Note: * Significant @ 1%, ** Significant @ 5%

Table 2: Paired-samples t-tests of mean and standard deviation of daily returns before and after split

	Mean	Std. deviation	Correlation	p-value	t_{cal}	p-value
Mean daily returns before split	0.0042	0.0060	0.1851	0.3866	4.0401	0.0005*
Mean daily returns after split	-0.0168	0.0259				
SD of daily returns before split	0.0350	0.0155	0.0580	0.7877	-4.7686	0.0001*
SD of daily returns after split	0.0998	0.0657				

Note: * Significant @ 1%, ** Significant @ 5%

It was found that the mean returns decreased overall after the split (except for one of the sample stocks), but this decrease was found to be statistically significant for only 8.33% of the sample stocks. It was also found that the variance of returns increased overall after the split (except for two of the sample stocks), and this increase was found to be statistically significant for 83.33% of the sample stocks. Cross-sectional analysis using the paired-samples t-test also showed a significant decrease in mean returns and a significant increase in standard deviation of returns after the split (Table 2).

The drift and volatility parameters of the sample stocks in the forty-five-day period prior to the pre-announcement window and in the forty-five-day period after the post-execution window are compared in Table 3 below.

Table 3: Comparison of drift and volatility parameters before and after split

Stock	μ_{before}	σ_{before}	μ_{after}	σ_{after}	Equality of drift parameter		Equality of volatility parameter	
					t_{cal}	p-value	F_{cal}	p-value
BALAJI TELEFILMS	0.0066	0.0012	-0.0058	0.0007	45.3707	0.0000*	0.3674	0.9913
DABUR	-0.0013	0.0008	-0.0170	0.0070	11.2198	0.0000*	81.0332	0.0000*
GODREJ	0.0060	0.0017	-0.0822	0.0261	16.8606	0.0000*	236.4760	0.0000*
LEELA	0.0010	0.0009	-0.1222	0.0358	17.1796	0.0000*	1505.9780	0.0000*
HCL	-0.0053	0.0028	-0.0152	0.0058	7.6568	0.0000*	4.2299	0.0004*
HLL	0.0018	0.0010	-0.0218	0.0068	17.1414	0.0000*	49.1579	0.0000*
ITC	0.0044	0.0003	0.0041	0.0002	3.4938	0.0005*	0.9378	0.5619
POLARIS	0.0187	0.0037	-0.0183	0.0043	32.8101	0.0000*	1.3518	0.2329
SATYAM	0.0013	0.0032	-0.0176	0.0072	11.9800	0.0000*	4.9741	0.0001*
SIMPLEX	0.0029	0.0013	-0.1825	0.0453	20.4784	0.0000*	1196.8158	0.0000*
SUN PHARMA	0.0009	0.0001	0.0014	0.0015	-1.6259	0.0553	145.6699	0.0000*
SUPER SPIN	-0.0004	0.0011	-0.1142	0.0385	14.7610	0.0000*	1303.3427	0.0000*
UNITECH	0.0396	0.0015	-0.0147	0.0156	17.3654	0.0000*	103.8058	0.0000*
WIPRO	-0.0004	0.0004	-0.0014	0.0021	2.4526	0.0089*	33.4951	0.0000*
ITILX	0.0314	0.0028	-0.0198	0.0064	36.8681	0.0000*	5.1198	0.0001*
TAJGVK	0.0112	0.0008	-0.0042	0.0055	13.8003	0.0000*	46.9978	0.0000*
GAMMON	0.0157	0.0006	-0.0185	0.0072	23.8134	0.0000*	132.1075	0.0000*
PRAJIND	0.0176	0.0009	-0.0228	0.0096	20.8527	0.0000*	113.6240	0.0000*
COMP TECH	0.0238	0.0039	-0.0160	0.0051	30.8757	0.0000*	1.6996	0.1005
BLUESTAR	0.0040	0.0006	-0.2541	0.0783	16.4860	0.0000*	16541.5968	0.0000*
RADICO	0.0086	0.0004	-0.0102	0.0045	20.8531	0.0000*	111.7728	0.0000*
RANBAXY	-0.0037	0.0002	-0.0073	0.0020	9.0490	0.0000*	107.2214	0.0000*
ASHOK LEY	0.0052	0.0009	-0.0153	0.0067	15.0916	0.0000*	55.3754	0.0000*
SONATA SOFT	-0.0096	0.0037	-0.0329	0.0086	12.3816	0.0000*	5.3761	0.0001*

Note: * Significant @ 1%, ** Significant @ 5%

Table 4: Paired-samples t-tests of drift and volatility parameters before and after split

	Mean	Std. deviation	Correlation	p-value	t_{cal}	p-value
Drift parameter before split	0.0075	0.0117	0.1717	0.4226	3.8287	0.0009*
Drift parameter after split	-0.0420	0.0643				
Volatility parameter before split	0.0015	0.0012	-0.1299	0.5452	-3.2257	0.0037*
Volatility parameter after split	0.0138	0.0185				

Note: * Significant @ 1%, ** Significant @ 5%

It was found that the drift parameter decreased overall after the split (except for one of the sample stocks), and this decrease was found to be statistically significant for 95.83% of the sample stocks. It was also found that the volatility parameter increased overall after the split (except for two of the sample stocks), and this increase was found to be statistically significant for 83.33% of the sample stocks. Cross-sectional analysis using the paired-samples t-test also showed a significant decrease in mean drift parameter and a significant increase in volatility parameter after the split (Table 4).

As variance/volatility of returns is widely considered a measure of liquidity in the literature (Ohlson and Penman (1987), Klein and Peterson (1988), Desai et al (1998), Koski (1998)), it may be concluded that there is an increase in liquidity after the split.

4. Discussion and Conclusion

At the outset, two immediate observations can be made. Firstly, the sample stocks considered for the study were stocks of quite well-known companies; thus, the "neglected firm" hypothesis would not seem to apply in general. Secondly, the split ratio of the sample stocks was found to be very high. The "trading range" hypothesis would imply that stock splits would take place once the stock price exceeded the optimal trading range, so that the split ratio would be relatively low, say about 2:1. The observed split ratios in the sample suggest that the "trading range" hypothesis would not seem to apply.

The results of the study indicate strong evidence for an increase in the liquidity of the stock after the split. Though the decrease in mean returns was not found to be statistically significant, there was found to be a statistically significant increase in variance of returns; and in terms of the lognormal model, there was found to be a statistically significant decrease in the drift, and a statistically significant increase in the volatility. In fact, the results of the study match very closely with those of Joshipura (2008), who considered an overlapping period of study.

It would be interesting to examine the exceptions in the sample stock splits. Only one of the sample stocks has shown increasing mean returns (and increasing drift) after the split, viz. SUN PHARMA; the "neglected firm" hypothesis could apply in this case, with the stock being relatively thinly traded before the split. Further, two of the sample stocks have shown decreasing variance of returns (and decreasing volatility) after the split, viz. BALAJI TELEFILMS and ITC; the "signaling" hypothesis could apply in these cases.

There were two major limitations inherent in the study. The first limitation was that the sample size was very low, so that the results of the study were only indicative. Another limitation was due to the use of historical data. The results of the study may depend on the specific circumstances inherent in the study period, such as macro-economic trends, investor psychology, general market trends, and specific sector trends.

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