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DO STOCK SPLITS IMPROVE LIQUIDITY? EVIDENCE FROM VIENNA STOCK EXCHANGE

Abstract: The article deals with a puzzle phenomenon which are stock splits. The author examines the subsequent volume of the companies listed on the Vienna Stock Exchange after they concluded stock splits. The research aims to test the hypothesis that the liquidity of stocks that split the shares improves afterwards.

Keywords: stock split, liquidity, volume.

1. Introduction

Although stock splits seem to be only a cosmetic change they have been included into the group of *puzzling corporate phenomenon* and regularly there is provided some evidence on a significant relationship between the shares being split and other economic values depending on the issue under consideration. In general, through splitting the shares outstanding there occurs a greater number of shares without any change in the proportion in ownership structure.

In the literature one may find different studies on stock splits with one of the most prevalent statement that stock splits aim to enhance liquidity and marketability, which can result in an increase in the number of potential shareholders and a change in existing ownership structure. Even though various studies have been performed, from which one might draw diverse and even conflicting conclusions there have been developed three major theories that underlie current view on the rationale staying behind the stock splits.

The first one, signaling theory, that arose from the paper of E. Fama et al. [1969] indicates that managers decide to split with the purpose to provide the market with favorable private information on the company. Due to, inter alia, the expertise in operating and investment decision-making of the managers stock splits may be assumed to comprise a reliable signal for investors that the company is going to perform well [Ikenberry et al. 1995]. Furthermore, M.J. Brennan and T.E. Copeland [1988] report that stock splits can be costly as a result of a rise in pre-share trading costs of low-priced stocks caused by the fixed cost element of brokerage commissions.

According to trading range hypothesis, i.e. the second of the theories on stock splits mentioned above, stock splits aim to shift the stock price to *preferred price range* [McNickols, Dravid 1990] in order to build up liquidity. Moreover, the necessity of such a shift is very often attributable to a pre-split price runup [Lakonishok, Lev 1987]. From the aforementioned it may be deduced that the stock splits as opposed to what has been stressed in relation to the signaling theory concern more past performance rather than future outlook. In fact, it pertains not only to current stock price but also to the outlook for future performance. Plausibility of such an information conveyed is enhanced if the costs of conveying a false signal for entities without favorable information are relatively high.

The third hypothesis – self-selection hypothesis – lies between both hypotheses described above and to some extent constitutes a synthesis of them. Reversing the statement of a potential optimism supporting the decision of a stock split the self-selection hypothesis states that those managers who reflect a grim view on the company's future are less likely to split the shares and/or are induced by a concern of declining stock price below an acceptable level. This idea of explaining the stock splits motivations was analyzed by M.S. Grinblatt et al. [1984] as well as by M. McNickols and A. Dravid [1990]. Summarizing the features of the self-selection hypothesis, stock splits are accomplished in order to push the stock price into a favorable trading range and at the same time the decision hinges on the expectations on company's future performance.

The article is focused on the consequences of stock splits for liquidity for Austrian companies listed on the Vienna Stock Exchange. The author makes a hypothesis that splitting the shares leads to improved liquidity as the volume of shares being publicly traded, i.e. in the official market.

2. Review of the research studies on the impact of stock splits on liquidity

In the literature there exists a number of studies that have attempted to explain the rationale staying behind the decision on the stock split as well as potential consequences of such a decision. According to Y. Amihud et al. [2005] an increase in the trading turnover can occur in either of the two ways, i.e. through an increase in the information provided to investors as well as through a greater accessibility of the shares as a result of smaller odd-lots.

Some of studies, in particular those dealing with the impact on liquidity as well as marketability, provide readers with inconclusive evidence. For instance, C. Lamoureux and P. Poon [1987] reported after a stock split an increased number of shareholders as well as the number of trades but, on the other hand, one may find little evidence on enhanced liquidity perceived as improved trading volume in the same research or in the research conducted by e.g. J. Lakonishok and B. Lev [1987] or R. Conroy et al. [1990].

To the second group of authors – underlying deterioration of liquidity in the aftermath of stock splits – belong inter alia: T.E. Copeland [1979] and R. Conroy et al. [1990] who observed rising bid-ask spreads in the post-split period or J. Ohlson and S. Penman [1985]. R. Conroy et al. [1990] or J. Koski [1995] find an augmented return volatility of the splitting companies. Moreover, the differences in evidence on stock splits exist also when considering the ownership structure – H.K. Baker and P.L. Gallagher [1980] argue that stock splits are aimed to leverage up the ownership by individual investors. As opposed to them, S.H. Szewczyk et al. [1995] argue that the stake of institutional investors following a stock split grows.

H. Demsetz [1977] finds that higher volume is accompanied by lower bid-ask spreads. What is more, H. Demsetz in his paper as well as R.R. West and S.M. Tinic [1972] and Benston and Hagerman [1976] indicate inverse correlation between bid-ask spread as a percentage of value and the number of competing dealers. On the other hand, they find a positive correlation of the aforementioned measure of liquidity with price variance.

T.E. Copeland [1979] provides an evidence of 162 stock splits – he compared bid-ask spread as a percentage of bid price in pre- and post-split area. It turned out that bid-ask spread rose in 89.5%, 79% and 74,34% of the observations for three time periods: one, twenty and forty days, respectively. Moreover, average bid-ask spread went up in three time horizons in question: from 4.85% of the bid price one day before a split to 7.03% one day afterward, 4.73% of the bid price twenty days before a split to 6.54% afterwards, and from 4.95% to 6.79% for the longest time interval.

T.E. Copeland [1979] argues, basing on the research of 162 stock splits, that stock splits cause a permanent decrease in a relative liquidity. Therefore shareholders may interpret a stock split as a harbinger of deterioration of liquidity in the wake of the stock split. In the aforementioned paper of Copeland he asks a question about the rationale of agreeing on a split from the shareholders' view. He promptly responds that potential benefits coming from stock splits outweigh or at least should outweigh any associated costs. To some of the benefits one might include a relatively greater ability to diversify using the shares after the split due to smaller round-lot transaction costs as well as stock splits may be valuable because of perception thereof as a herald of growth in dividend in the near future.

There can exist different reasons for decreased liquidity subsequently a stock split. One of them has been proposed by T.E. Copeland [1976] – rate of information arrival. It should be higher before splitting the shares what can ensue from the fact that entities that split the shares perform relatively well compared to the peers and the market as a whole, and a lower value of this measure in post-split era can lead to a smaller volume thus deteriorating liquidity.

Additionally, T.E. Copeland [1976] indicates that one might tap other parameters influencing volume, e.g. he developed a finite time series model of trading volume for individual securities based on the assumption that trading in the current period

depends on messages occurring recently as well as at present. As a results of the research performed by T.E. Copeland [1976; 1979] and T.W. Epps [1975] the reader may find some other determinants of the volume, e.g. transaction costs, number of shares outstanding, total number of shareholders or even percentage of traders who deem the information optimistically.

More recently, T. Słoński and J. Rudnicki [2010] in their study on the impact of stock splits on the trading volume on the example of companies listed on the Warsaw Stock Exchange found that splitting the shares contributed significantly – at the 99% significance level – to an improved liquidity measured by trading volume observed in the event window of 40 days after splitting the shares.

3. Method and sample

The author has examined the sample of the stock splits performed by domestic companies listed on the Vienna Stock Exchange from 2000 until 2009 – i.e., it does not include those concluded in OTC market nor in semi-official one. It encompasses 71% of all of the stock splits that met the requirements mentioned above. In case of the other ones there is a lack of appropriate and sufficient data or the stock splits occurred in unregulated market. Moreover, the sample does not include the stock splits concluded by entities that are not listed on the Vienna Stock Exchange any more, it pertains also to foreign companies.

The author has used event study methodology that is composed of three methods: mean adjusted return method, market model method and market adjusted return method.

3.1. Mean adjusted return method

The *ex ante* expected return on a security is constant with respect to time but it can vary with respect to securities. This model is consistent with the assumptions of CAPM and it also posits systematic risk and stationary investment opportunity set for investors. The first step is to select the *clean period*. Afterwards there should be calculated the average daily return of this period for a specific company. The expected return for a firm for each day equals the mean daily return achieved in the clean period by a company, e.g. for a clean period [–241;–40]:

$$\hat{R}_{it} = \frac{1}{200} \sum_{t=-240}^{-41} R_{it},$$

and the excess return gained on a day from the event window is equal to:

$$r_{it} = R_{it} - \hat{R}_{it}.$$

3.2. Market model method

This method is most commonly used due to the fact that it factors into the mean returns and the risk that accompanies the market. At the very beginning of the estimation procedure within this model there should be selected a clean period and then the regression is performed for each day in the period. The equation of the market model is:

$$\hat{R}_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it},$$

where: $\hat{R}_{it}$ – the expected return on a security *i* at the moment *t*,
α_i – the mean return over the period not explained by the market,
β_i – the sensitivity of a company *i* to the market,
R_{mt} – the return on a market index on day *t*,
ε_{it} – he statistical error for which the following holds $\Sigma\, \varepsilon_{it} = 0$.

The statistical errors ε_{it} should sum up to zero in the *clean period*. As a result of the regression the parameters α_i and β_i are estimated. The predicted return for *i*-th company on the *t*-th day within the event period is equal to:

$$\hat{R}_{jt} = R_{it} - \hat{\alpha}_j - \hat{\beta}_j R_{mt},$$

where: R_{mt} – the return on a market index for the actual day in the event period.

3.3. Market adjusted return method

It can be deemed as the simplest method among the three considered by the author. The underlying assumption is that the *ex ante* expected return on a security is constant both with respect to other securities and time. This model is consistent with the assumptions of CAPM with $\beta_i = 1$ for all companies whereas $\alpha_i = 0$. The expected return for *i*-th company at the moment *t* in the event period is:

$$\hat{R}_{it} = R_{mt},$$

and the excess return gained on a day from the event window is equal to:

$$r_{it} = R_{it} - R_{mt},$$

where: R_{mt} – the return on a market index for the actual day in the event period.

3.4. Test statistics used to calculation of statistical significance of event returns

To check with a certain level of confidence whether the excess returns (residuals) differ significantly from zero there can be tapped the statistic which tests the null hypothesis that the 1-day residual for a given firm equals zero; if one makes an assumption that the returns for that firm are independently and identically normally distributed then one can say that

$$\frac{r_{jt}}{\hat{S}(r_j)}$$

can be described by means of a *t*-distribution where:

rit – the residual for *i*-th company at the moment *t*,

$\hat{S}(r_j)$ – the evaluated standard deviation of the residuals for *i*-th company utilizing data from the estimation interval: $\sqrt{\frac{1}{199}\sum_{t=-240}^{-41}(r_{jt}-\bar{r}_j)^2}$ with 199 degrees of freedom.

When there are more than 30 degrees of freedom then the *t*-statistic has a standard normal distribution. The procedure of rendering the results of this test is: the null hypothesis can be declined only when the ratio $\frac{r_{jt}}{\hat{S}(r_j)}$ is greater than the critical value, which means that the 1-day residual at the significance level of 5% differs from zero.

The procedure of testing the null hypothesis stated above can be extended onto a group of companies. The 1-day abnormal return averaged over firms is defined as: $AR_t = \frac{1}{N}\sum_{j=1}^{N} r_{jt}$ and consecutively the extended form of $\frac{r_{it}}{\hat{S}(r_i)}$ ratio is:

$$t = \frac{AR_t}{\hat{S}(AR)} = \frac{\frac{1}{N}\sum_{j=1}^{N} r_{jt}}{\sqrt{\frac{1}{199}\sum_{t=-240}^{-41}(AR_t - \overline{AR})^2}},$$

where: $\hat{S}(AR) = \left[\frac{1}{199}\sum_{t=-240}^{-41}(AR_t - \overline{AR})^2\right]^{\frac{1}{2}}$ is the standard deviation of the entire sample (the same for each day in the event period as a consequence of usage of the same estimation period for a sample ensuing from independent and identically distributed abnormal returns) and: $\overline{AR} = \frac{1}{200}\sum_{t=-240}^{-41}(AR_t)$.

The formula for the event window [– 40;+ 40] is as follows:

$$t = \frac{CAR}{\hat{S}(AR)} = \frac{\sum_{t=-40}^{+40} AR}{\sum_{t=-40}^{+40} \hat{S}(AR)},$$

whereas: *CAR* – sum of cumulated mean rates of return within the interval of [– 40; + 40].

4. Conclusions

The author found that in case of six companies the stock split has not enhanced their liquidity significantly, i.e., the trading volume of the shares was not different from zero on several of the trading sessions. The author supports this conclusion by the fact that during the period following a stock split, i.e. within 40 days after the *day zero* which is the day of splitting the shares, the number of stock exchange sessions during which one could observe any trading in the stock under consideration did not significantly exceed 50%. The results have been presented in Table 1.

Table 1. Companies with relatively small liquidity prior and following the stock split

Panel A. Number of trading sessions with any trading before the stock split [−40; −1]		
Name of the stock	No. of sessions with any trading	As a percentage of all sessions
UBM Realitätenentwicklung AG	3	8
ATB Austria Antriebstechnik AG	N/A[1]	N/A
Schlumberger AG	0	0
BKS Bank AG	3	8
BTV Bank AG	3	8
Volksbank AG	5	13
Panel B. Number of sessions with any trading after the stock split [+1; +40]		
Name of the stock	No. of sessions with any trading before the stock split [−40; −1]	As a percentage of all sessions before the stock split [+1; +40]
UBM Realitätenentwicklung AG	20	50
ATB Austria Antriebstechnik AG	22	55
Schlumberger AG	8	20
BKS Bank AG	3	8
BTV Bank AG	3	8
Volksbank AG	22	55

Source: own study.

For the remaining group of companies for which one could observe trading sessions in the period from day +1 until +41 with trading in the shares during each session the results can be divided into three parts with respect to time interval. And so, the author has reported that the trading volume on the *day zero* for splitting com-

[1] There is no data available on the volume of the stock considered in the period.

panies did not differ significantly from zero. This conclusion pertains to both cases, i.e. for individual stock splits as well as for all splitting entities as a whole group.

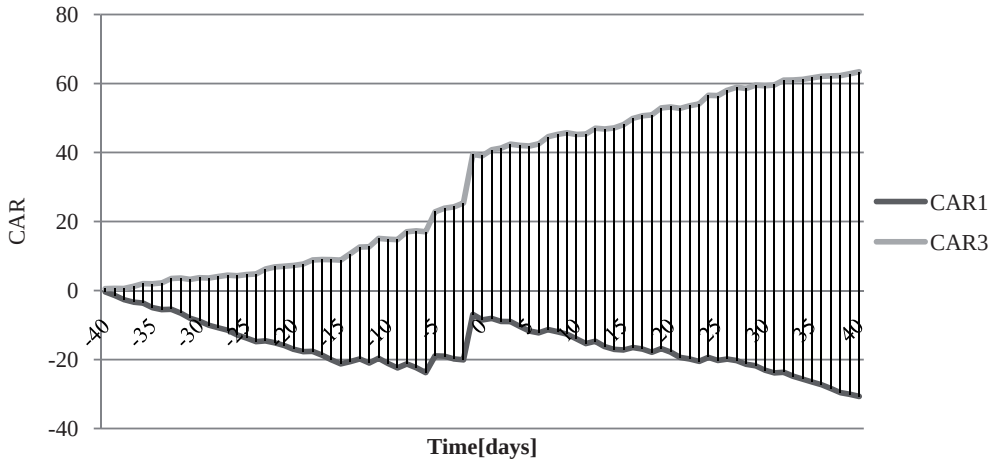

Figure 1. Cumulative Average Residuals for splitting companies

Source: own study.

On the other hand, for the companies considered in the time interval [– 40;+ 40] the author has found statistically significant results using two of three aforementioned methods, i.e. for the mean adjusted return method and the market adjusted return method. For the market model method more than a half of the sample researched yielded *t* statistics for the regression coefficient that do not allow to reject the null hypothesis. Interestingly, the statistically significant results, both at the 5% and 1% significance level, obtained with the use of two methods described above are dissenting, i.e. the first one – the mean adjusted return method – indicates a deterioration of the rate of a relative increase in the trading volume, while the second method – the market adjusted return method – supports the hypothesis of a growth in the trading volume after a splits has been performed. This ambivalence may be attributable to the fact that the first method is more sensitive to the past, i.e. strong deviations in the trading volume that occurred previously influence the results materially as opposed to the Market adjusted return method that reflects only the difference between the relative volume of the stock considered and its benchmark.

Summarizing, the stock splits analyzed for the companies listed on the Vienna Stock Exchange have provided mixed evidence on liquidity in the aftermath of such an operation. On the one hand, some of the companies examined have not experienced any material enhancement of the trading volume at all, which to some extent contradicts the idea of stock splits. On the other hand, when measured with the market adjusted return method the remaining companies reflected a boosted and statistically significant liquidity.

Moreover, one may infer that splitting the shares on the Vienna Stock Exchange has not led to a considerable improvement of the liquidity as opposed, for instance, to the evidence from the Warsaw Stock Exchange [Słoński, Rudnicki 2010].

The next research on the issue of stock splits for companies listed on the Vienna Stock Exchange can be set with respect to examining other measures of liquidity, e.g. bid-ask spreads or the change in ownership structure following a stock split.

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CZY PODZIAŁ KAPITAŁU AKCYJNEGO PRZYCZYNIA SIĘ DO ZWIĘKSZENIA PŁYNNOŚCI? PRZYKŁAD SPÓŁEK NOTOWANYCH NA WIEDEŃSKIEJ GIEŁDZIE PAPIERÓW WARTOŚCIOWYCH

Streszczenie: Artykuł porusza kwestię podziału kapitału akcyjnego, tzw. splitów. Autor poddaje analizie wolumen akcji będących w obrocie w odniesieniu do podmiotów notowanych na Wiedeńskiej Giełdzie Papierów Wartościowych, które przeprowadziły podział kapitału akcyjnego. Badanie testuje hipotezę, iż split zwiększa płynność akcji w okresie następującym po jego dokonaniu.