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Event study on stock splits

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Abstract

The main idea of this study is to test the effect in stock returns of the stock splits and reverse stock splits in US market. If the signaling hypothesis holds, abnormal returns should be detected around both stock splits announcement dates. Positive abnormal returns would imply that investors are regarding stock splits as favorable information about the company and vice versa. The study is also connected with efficient market hypothesis. It tries to identify whether the market reacts in time of announcement of the corporate action and adjusts the prices according to that specific action.

Keywords: Stock, Splits, Market, Efficiency, Returns, Corporate, NASDAQ etc.

JEL Classification Codes: G12, G14, G21, G24

1. Introduction

Stock split announcements have always been very common phenomena among firms and continue to be one of the least understood topics in finance. Before Fama and French(1969) did the first empirical study on the effect in the market price of the stock splits, theoretically it was claimed that the stock splits increase the price of the share. However, the research does not bear this out. What is true is that stock splits are usually initiated after large run up in share price.

Basically, stock splits are corporate actions which affect the number of shares outstanding of publicly traded companies and the range of their market price, but do not affect the market capitalization of the company or the wealth of the existing stock holders. Thus, by stock split companies increase the number of shares outstanding by a certain ratio and consequently the price per share drops at the ratio of increased number of shares. The most usual stock split is 2 for 1 (2:1), which means that the number of shares is doubled and the price per share is reduced for 50% so that the total market value of stock holders remains the same. Other common stock split ratios are 3:1 and 3:2, but it may be any sort of ratio.

Barker(1956) presented one of the most popular theories to explain stock split behavior. Barker findings failed to consider the split action itself. Barker's study concluded that price changes occurred because of the increase in cash dividends and not from the split action. To overcome this stagnancy, there are developed two popular hypothesis regarding stock splits which try to explain the reason behind such actions. The liquidity hypothesis claims that stock splits occur when the share price increases at a certain level that it reduces the market demand for the shares of that company, meaning that the shares of the company are less traded and the liquidity of those shares is lower. However, some companies have the opposite strategy: by refusing to split the stock and keeping the price high, they reduce trading volume and volatility. Berkshire Hathaway is a notable example for this. In the other hand, the signaling hypothesis argues that managers of companies use stock splits to encourage the private investors to gain confidence in the firm's future, by signaling that the company's share price is increasing and therefore the company is doing very well.

Another version of stock split is the reverse stock split. This is basically the opposite of stock split that was introduced up to now. Although reverse stock split is much rare in practice, there are still cases where companies take such actions. Reverse split actions are usually taken by the companies which face lower stock prices than what their target range is, and with such actions they try to increase the price at a certain level. Therefore, when the share price of a certain company is too low, the company reversely splits the shares at a certain ratio and consequently increases the market price for the reverse split ratio. Common reverse split ratio is 1 for 2 (1:2), meaning that the number of shares outstanding is reduced by 50% and the share price is doubled so that the total market value of the stock holder remains the same. Other reverse stock split ratios may be of any, such as 1:3, 1:10, 1:20, etc. The main reasons behind these actions are usually when companies want to gain more respectability in the market or to prevent the company from being delisted in the stock exchange (i.e. many stock exchanges will delist stocks if they fall below a certain price per share). As in this research, the second reason dominated all over sample.

Another issue which raises the interest of researchers is the market efficiency and how fast the market reacts to adjust the stock prices in line with the action occurred. Fama(1969) suggests that the stock market is "efficient",

meaning that stock prices adjust very fast to new information. The theory of market efficiency is concerned with whether prices reflect all the public available information or not. Efficiency implies that it is impossible for the investor to earn an above normal return from public information.

Since different actions in splits have different effects in the stock price and returns, this event study aims to analyze and compare the impact separately of two samples of stock split announcements, stock splits and reverse stock splits, on the firm's stock returns and to test market efficiency over this event. Specifically, how fast does the market price of the firms' stock react to the samples of regular stock split and reverse stock split announcements examined. The study tests also whether the investor can make an above normal return by relying on public information imbedded in a stock split announcement, as well as if stock price is affected by a stock split announcement.

Note: when referring to the samples during the study, ''stock split'' refers to usual stock split announcements sample or also known as forward stock splits announcements and ''reverse stock split'' announcements refer to the sample of reverse stock splits.

2. Research problem

The main idea of this study is to test the effect in stock returns of the stock splits and reverse stock splits in US market. If the signaling hypothesis holds, abnormal returns should be detected around both stock splits announcement dates. Positive abnormal returns would imply that investors are regarding stock splits as favorable information about the company and vice versa. The study is also connected with efficient market hypothesis. It tries to identify whether the market reacts in time of announcement of the corporate action and adjusts the prices according to that specific action. According to the efficient market hypothesis, a financial market is efficient when market prices reflect all available information about the economical value of assets. Semi-Strong form of efficient market hypothesis states that stock prices should react to financially relevant news quickly. If abnormal returns are found around the split announcement dates, it gives a clue about how efficiently the US stock market is working. So the main goal of this study is to determine, whether the stock splits by companies in samples during the examination period have caused statistically significant abnormal behavior in the stock returns around the announcement dates of the splits and which is the effect of such actions in after even period.

3. Literature review

The interest of researchers in stock split event studies is continuously increasing. Many researches are still being conducted over the world and they come basically to the two conclusions of the stock splits; those that argue that stock split has positive effect in the stock price and those that argue that stock splits have negative effect in stock price. Whereas the reverse stock split is much less researched in specific since it is considered the reverse to stock split. Therefore, this study compares the two split announcements effects in order to really see the effects of the events and test whether they witness reverse results in between.

Among those researchers that found positive effects in stock splits is Grinblatt (1984), who found that in the period from 1967 to 1976, his sample of stocks realized excess returns during the three days surrounding stock split announcements. Lakonishok and Lev (1987) found that a stock split changed the stock price to a more optimal trading range, which in turn increased the demand for stock, leading to a positive stock price effect. The findings of Desai and Jain(1997) pointed in the same direction, revealing that following stock splits there was an excess return after a holding period of one year. After a holding period of three years, there was an even higher excess return. Ikenberry, Rankine and Stice (1996) examined two-for-one stock splits by NYSE and ASE firms from 1975 to 1990 and obtained similar results. They observed excess returns in the first year after a stock split and better results in the first three years following a split. These gains were preceded by excess returns on the announcement date. The positive excess returns were also found in other markets such as Hong Kong Stock Exchange by Wu and Chang (1997), German Stock Exchange by Wulff (2002) and in Canada Stock Exchange by Elfakhani and Lung (2003). Also, according to Garsia de Andoain and Bacon (2009), investors see a stock split announcement as positive thing, whereas a reverse split does not convey favorable information.

In the other hand, among those that found negative effects in stock splits are Copeland(1979), Ohlson and Penman(1985), Lamoureux and Poon(1987), and Conroy(1990). They found declining trading volume after the split. In addition, bid-ask spread which was normally used to proxy stock's liquidity widened. In 2002 Bley examined 40 stock splits in the German stock market from 1994 to 1996. To avoid any size effects, the sample companies were divided into two groups according to their market capitalization. After stock splits, daily trading volume decreased significantly for the class of high market capitalization stocks. Following stock split announcements, Goyonke(2006) carried out a research on stock split and liquidity over an after-event window extending to six years and found that split firms initially experienced worse liquidity. He noted that there was worsening liquidity of split firms, which was temporary and was experienced within the first 9 to 12 months.

However, this study holds on more with the first group of researchers, which supports the arguments that stock splits have positive impact in the stock price of companies around the announcements date.

Regarding the reverse stock split, although it is less researched topic, there have been researches in these actions as well. One research is conducted by Desai and Jain (1997) who found negative abnormal returns following reverse stock splits. Similar conclusions are drawn by Kryzanowski and Zhang (1996) from a sample of firms on the Toronto Stock Exchange. Conversely, a post-reverse stock split period exhibits a decline in trading activity due to a decrease in the number of shares and the negative signal the market receives from reverse splits. Also, a study from Adjei and Bonie and Robert Van Ness found out that after the reverse stock split, the number of shares traded decreases, which consequently decreases the prices of shares.

In this study, reverse stock splits do support the previous studies, since it found also that after the announcement day the returns dropped sharply.
Moreover, regarding the market efficiency, this study holds with that what Fama(1969) has found, that market is efficient and reacts very fast to event information.

4. The empirical study

4.1. Data

4.1.1. Population and sample

The target population in this study is defined as the number of stock splits and reverse stock splits announced by NYSE and NASDAQ listing companies during the time period from 1994 to 2007. In order that the sample is helpful in estimating the effect of the event over the population, it was assured that these companies in both samples do not have any other event during the event window as well as during the period of estimation. Since the target population for the stock splits was very large, it was necessary to use a sampling procedure, and as criteria for sampling it is used the profitability of the companies. For this purpose the sample consists of 33 companies, which are the most profitable companies, from all those listed in NYSE and NASDAQ. The reason of using this sampling criterion is due to the highly traded number of stocks in these companies and by that is meant these companies are the most who reflect the market reactions in case of this study.
For the reverse stock split the only criteria was that data should be qualitative for the model used, since companies that do reverse stock split are usually those that are forced from stock exchanges to maintain the price at a certain range and consequently have very week correlation with stock indexes. Hence, from out of 49 companies with reverse stock splits in the study period, only 23 companies had qualitative data, the rest was with low qualitative data. Therefore, the final sample of reverse stock split consists of 23 companies.
In addition, as part of market index, it is used the S&P 500 index, NASDAQ Composite and NYSE index during the same period as the data for the samples.

4.1.2. Data description

The data of stock prices used in this study are acquired from http//finance.yahoo.com. The raw data consisted of closing price and adjusted closing price for each variable and the market index. However, since the closing price presents the price per share after the event and does not reflect appropriately the change in returns, in order to be able to observe the event effect, it is taken the adjusted closing price. From these data it is calculated the return which is used afterwards to calculate the abnormal returns. The total number of variables examined is 33 for the first sample and 23 for the second sample. Each variable is transformed into a return series of 161 stock adjusted closing prices. There was no missing data in these variables and the quality of data was satisfactory.
The frequency of data used is daily. It increases the power of test and properly isolates the possible effects of stock splits on daily returns. Monthly data would be too infrequent and intraday data would not provide any additional accuracy.

4.2. Methodology

4.2.1. Background

Over the past years, the event study methodology has become a widely used tool in econometric research. The methodology was created by Eugene Fama to test the efficient market hypothesis, which states that the whole market as well as individual securities instantaneously absorb and reflect new information as soon as it becomes available. In other words, the stocks returns should experience systematical abnormal behavior whenever markets learn relevant information, which will affect the company's future performance. In modern day econometric research event studies are used to examine the effect of a specific corporate event on the company's stock price. Event studies usually examine the abnormal return behavior for a sample of companies experiencing a similar corporate event. The results of the studies provide a general estimate of the impact of a certain corporate event on the wealth of the firm's claimholders. The impact of the event is measured as the magnitude of the abnormal performance of the stock returns at the time of the event. This study uses the event study methodology to examine whether the announcements of stock splits have caused abnormal behavior in the stock returns on the announcement dates.

4.2.2. Steps in research

The data used in this study are data of companies' stock returns as well as stock indexes' returns; S&P's 500, NASDAQ and NYSE. The announcement date is the day that the stock splits are announced by the companies. These announcement dates are acquired from www.highbeem.com, a research page of all first available information in the market. Every stock return from the companies is compared with each stock index in order to find which index explains best the returns of the certain company and then, the best explaining index is used for each stock.
The Event Study proceeds as following:

i. Historical prices for both the firms and stock indexes were collected from day -130 to day +30, being the event period -30 to +30 and Day 0 the announcement day. The estimation period is from day -130 to -30.
ii. Daily returns were calculated for all the companies as well as for indexes on the event period (-130 to +30). Daily returns were obtained from the following formula:

$$DR_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

Where,

DR_t = Daily return at time t

P_t = Adjusted closing price at time t

P_{t-1} = Adjusted closing price one day before time t

iii. After calculating the daily returns for each firm as well as for indexes, normal returns are calculated. Normal returns are simply the estimates of the stock returns in absence of the event. Normal returns can be estimated by several different methods, including mean return model, market model and capital asset pricing model. However, the most widely used method in event studies is the single index market model, which

estimates the normal return parameters by regressing the firm return in the sample stock against the stock index over an estimation period (from day -130 to -30). The Ordinary Least Squares (OLS) method is commonly used to estimate the parameters. It has been concluded by Brown & Warner(1985) that event researches based on the OLS method provide reliable results under a variety of conditions. Therefore in this research, the model used to estimate the normal returns for each observation is the single-index market model as presented below:

$$NR_{it} = \alpha_i - \beta_i R_{mt}$$

Where,

NR_{it} = Normal Return on the stock i at time t

R_{mt} = Return on the market stock index at time t

α_i *and* β_i = The Ordinary Least Squares estimators of the market model

iv. While there are different ways to estimate normal returns, there is always a single way to calculate abnormal returns. Abnormal returns are a direct measure of the change in the stockholder's wealth which is associated with the event. Abnormal returns are calculated as the difference between the actual returns and the estimated normal returns for each stock in the event window. Other way to think of abnormal returns is the component of returns which are unexpected. In econometric models, abnormal returns are the error terms that represent the variation in the dependent variable which is unknown and not caused by the independent variable. The abnormal returns are calculated using the equation below for all of the firms in the sample and then combined together.

$$AR_{it} = R_{it} - NR_{it}$$

Where,

AR_{it} = Abnormal Return on the stock i at time t

R_{it} = Actual Return on stock i at time t

NR_{it} = Normal Return on the stock i at time t

For details on samples and the OLS parameters used in the model for the study see Appendix 1 and Appendix 2.

v. Average Abnormal Returns (AAR) are calculated in cross-section data. So in order to measure the effect of the event for the whole sample, it is calculated AAR for each day in the event window (period). AAR are calculated as:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it}$$

Where,

AAR_t = Average Abnormal Returns on the stocks at time t

AR_{it} = Abnormal Return on stock i at time t

N = Number of stocks in sample

vi. Cumulative Average Abnormal Return (CAAR), as the final step in calculating the abnormal returns, for the event period (Day -30 to Day +30) was calculated first by calculating Cumulative Abnormal Return (CAR) for each variable and then by finding the average of CARs in cross-section through all variables in a certain day. CAR for each variable was calculated as:

$$CAR_i = AR_{i,t_1} + \ldots + AR_{i,t_2} = \sum_{t=t_1}^{t_2} AR_{it}$$

After calculating CAR, the CAAR was calculated as follows:

$$CAAR = \frac{1}{N}\sum_{i=1}^{N} CAR_i \quad \text{or} \quad CAAR = \sum_{t=t_1}^{t_2} AAR_t$$

For detailed results in AAR and CAAR of the study, see Appendix 3.

4.3. Hypothesis testing for statistical significance

4.3.1. Test statistics

The aim of an event study is simply to investigate whether normal cross-sectional distribution of returns differ from the actual returns around the event window. In other words, the abnormal returns across the securities in the sample have to be averaged in common event time and then checked if the mean of abnormal returns differs from zero. In statistical terms, the null hypothesis of the test is that the mean of abnormal returns is zero. The alternative hypothesis is that the mean of abnormal returns differ from zero. Pre-event abnormal returns would indicate that the event is partially anticipated and post-event abnormal returns indicate the information is not instantaneously absorbed. The null hypothesis is rejected if the test statistics corresponds to the critical value, which usually is specified as 10%, 5% or 1% tail region. The parametric student's t test statistic used in this study is given by the equation below.

$$t - statistic = \frac{AAR_t}{\sigma(AAR_t)}$$

Where,

AAR_t = Average abnormal at time t

$\sigma(AAR_t)$ = Standard deviation of AAR at time t

The cross-sectional t-statistic described in equation above makes the important assumption that the abnormal returns are independent and normally distributed. It has been widely noted in previous researches that the stock returns are non-normal. However, the central limit theorem states that any distribution converges to the normal distribution when taken large enough sample size. In case of small sample sizes, the normality assumption is threatened, thus increasing the risk of misspecification. In this study from such threat is intimidated the sample of reverse stock splits which consists of 23 observations, but however it is neglected that fact since the use of this sample is more to compare the reverse stock splits as an action towards the stock splits, whether the market reacts reversely as many researchers say.

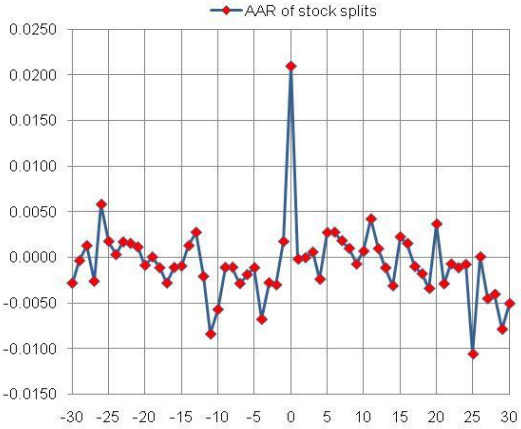
For the calculated t-statistics of the samples in the study, see Appendix 3.

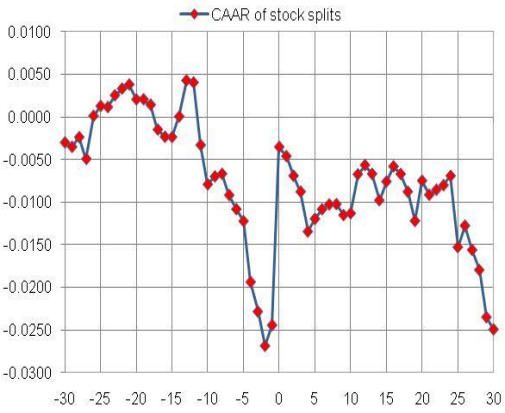
4.4. Analysis of results

Did the market react to the announcements of stock splits and reverse stock splits? Was the information surrounding the event significant? A'priori, one would expect there to be a significant difference in the actual daily returns (Day -30 to Day +30) and the normal daily returns (Day -30 to Day +30) if the information surrounding the event impounds new significant information on the market price of the firms' stocks. If a significant difference is observed, then we

support our hypothesis that this type of information did in fact significantly either increase or decrease stock price.

First, by looking at the effects of the events in stock split sample, we can distinguish that stock split events have had a positive effect in the stock returns in the announcement day. Although after the announcement day the returns have dropped again, if we compare prior-event days (down to -25) and post-event days (up to 25), we can clearly notice that stock splits have helped to stabilize the prior-event day drop in returns. But again 25 days after the event, the drop in returns has continued to the prior event day range. So, the study shows that signaling hypothesis does not hold significantly since quite a few days after the event the returns continue to drop. Moreover, in average terms the stock split event did not have any effect when comparing the AAR of prior-event day (-30 to -1) and post-event day (1 to 30), since we can see the same average abnormal return of -0.0010 in both periods and with an AAR of 0.0209 in the event day of the event window. And also, in cumulative terms, when comparing both periods of the event window, we can see that CAAR in prior-event period (-30 to -1) returns are -0.0244 and in post-event period (1 to 30) returns are -0.0249. Appendix 3 shows the detailed figures on AAR and CAAR over the window, which are also presented in the graphs below.

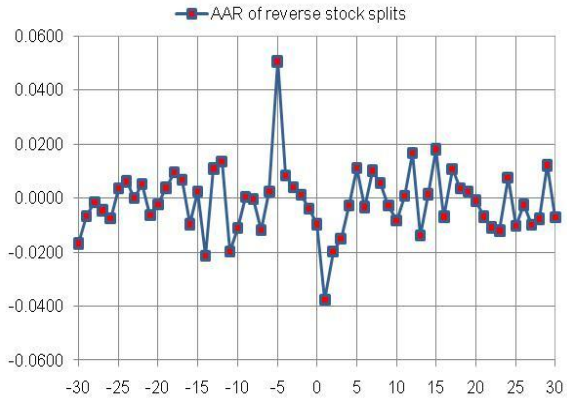


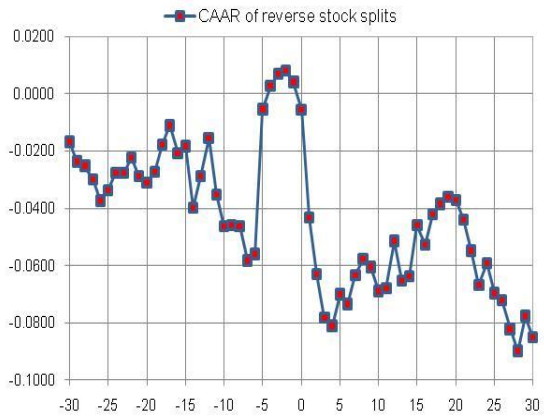


In addition, considering the other sample of the study (i.e. reveres stock split), we can distinguish that stock split events have had a negative effect in the stock returns in the announcement day. Although in the announcement day the returns have not dropped significantly, the days after the event are followed with sharp decrease in returns until the fifth day after the event and afterwards is continued with increase until the twentieth day when again it starts to drop.

If we compare prior-event days (down to -5) and post-event days (up to 5), we can clearly notice that reverse stock splits are followed with decrease in returns. So, the study proves what many researchers say that reverse stock splits are considered as negative news to the market. Moreover, in average terms the reverse stock split event did have effect in decreasing returns when comparing the AAR of prior-event day (-30 to -1) and post-event day (1 to 30), since we can see that average abnormal return in prior-event day period is 0.0001 and in post-event day period is -0.0026. The event day AR is 0.0097. In cumulative terms, when comparing both periods of the event window, we can see that CAAR in prior-event period is 0.0042 and in post-event period is -0.0849.

Appendix 3 shows the detailed figures on AAR and CAAR over the window, which are also presented in the graphs below.





To statistically test for the abnormal returns over the event period day -30 to day +30, it is conducted a simple t-test statistic for both samples at 10%, 5% and 1% level of significance. The table below presents the results for both samples in AAR and CAAR for three levels of significance. As it can bee seen, there was found no statistical significance of abnormal returns. Although the table below presents only the significance level of the announcement day (event day), in the appendix 3, there can be found the abnormal returns over the whole event window and the t-statistic for each day in the event window. Neither day in the event window was found to be statistical significant for both samples. So, the results support the null hypothesis that abnormal returns are not different from zero and that efficient market theory holds that the market is semi-strong efficient and investors can not earn abnormal returns.

The two tailed significance tests

Significance level	10%	5%	1%	10%	5%	1%
	stock splits			reverse stock splits		
Average Abnormal Returns (AAR)						
t-critical value	1,3090	1,6940	2,4490	1,3210	1,7170	2,5080
t-statistic in day 0	0,7543	0,7543	0,7543	-0,1984	-0,1984	-0,1984
	Insignificance	Insignificance	Insignificance	Insignificance	Insignificance	Insignificance
Comulative Average Abnormal Returns (CAAR)						
t-critical value	1,3090	1,6940	2,4490	1,3210	1,7170	2,5080
t-statistic in day 0	-0,0370	-0,0370	-0,0370	-0,0226	-0,0226	-0,0226
	Insignificance	Insignificance	Insignificance	Insignificance	Insignificance	Insignificance

5. Conclusion

The aim of the whole journey was to find out the answers of three basic questions: first, what is the effect of stock splits and reverse stock splits in US stock market?; second, is there any chance to find abnormal returns around the event which could help signaling hypothesis hold?; and third, is the market efficient in absorbing the new released information?

First, the stock splits have witnessed a positive effect around the event but it does not hold during the whole post-event period. Thus, it makes the positive effect to be insignificant and almost neutralized during the post-event day period. This we saw also from the results that CAAR in prior- and post event day is almost the same. In the other hand, reverse stock splits result with the negative effect around the event day. The results showed that in prior-event day we had slightly positive returns but after the event day the returns went down to around -8%.

Second, we saw from the data that abnormal returns are statistically insignificant during the whole even window, including the event day. This shows that there is no chance of getting any abnormal return, whether positive or negative and this makes the signaling hypothesis not to hold as we also saw that the positive effect in stock splits was neutralized during the post-event period. This gives explanation also to the third question where we can see a semi-strong form of efficient market, since market reacts swiftly to the new released information and eliminates possibilities of having abnormal returns in both cases of stock splits and reverse stock splits.

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