The pattern of stock splits

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ABSTRACT

Stock splits are cosmetic events that do not impact the underlying cash flows of the firm. The current literatures tend to explain the motivation of stock splits into two categories: signaling the firm's future profitability and increasing the stock's liquidity. In this paper, principal component analysis is used to examine the cumulative abnormal returns and trading volumes before and after split. The tests show the signaling and liquidity motivation count for 93.87% of the total variance. This result would question the most current literatures which model the stock splits using a single motivation model. In addition, the study finds that industry factor may have an impact on firms' stock split decisions: companies in similar industries tend to show similarity in splits.

Keywords: stock split, signal, liquidity, principal component analysis

INTRODUCTION

According to Fama et al (1969), a stock split is an exchange of shares. In their recent book, Brigham and Ehrhardt (2019), stock splits mean that current stockholders are given some number (or fraction) of shares for each stock share they own. In a regular split, for example, 2-for-1 split, shareholder would receive two new shares for each old share. While in a reverse split, for example, 1-for-2 split, shareholder would receive one new share for each two old shares. Regardless of the type of split, the total value of the stocks remain unchanged. The market efficiency hypothesis (EMH) is the central issue of the research field on capital markets. Fama (1970) explains that a market is efficient if the prices of securities or assets reflect all the available information. There are three forms of efficient market. The weak-form efficient market is a market where securities prices reflect only all available past information. The semi-strong efficient market refers to a market where securities prices reflect all the public information, including the past and current information. A strong-form efficient market is a market where securities prices reflect all the public and private information, including the past and current. In semi-strong form, the capital markets should render only nonsystematic gain and loss opportunities to investors. Thus, investors should be able to assess the information conveyed by stock splits in an efficient market, since stock splits are cosmetic events that do not impact the underlying cash flows of the firm (Kadapakkam et al 2005). An investor therefore cannot earn superior returns on using information which is publicly available (Fama 1991).

However, the present literatures have shown the various evidences on the reaction of the efficient capital markets to the stock splits, especially the abnormal post-split returns found by Ikenberry, Ranine, and Stice (IRS) (1996). IRS (1996) report abnormal return (AR) of 7.93% in the 12 months following stock splits, indicating the inefficiency of the capital markets. As mentioned above, because stock splits are cosmetic events that do not affect the underlying cash flows, the AR should not occur if the capital markets are efficient.

On the other hand, other studies argue that the capital markets are efficient in a long-run view using different sample during different periods. Fama et al. (1969) find no abnormal performance subsequent to stock splits, and Byun and Rozeff (2003) don't find any significant abnormal returns using the sample of 12,747 stock splits from 1927 to 1996.

Several popular hypotheses have been proposed to explain why the companies want to split their stocks and the AR occurs:

(I) Signaling Hypothesis. This hypothesis argues that companies split their stocks to convey some "good information" of company when their managers are confident that earnings momentum will continue to push their stock's price upward (Grinlatt, Masulis, and Titman (1984), and Lamoureux and Poon (1987)).

(II) Trading Range Hypothesis. This hypothesis argues that firms prefer to keep their stock price within a particular (lower) price range to attract a specific clientele or increase their stocks' liquidity (Barker (1956), and Stovall (1995)). They find that after a split, an enlarged ownership base, an increase in the number of small traders, and particularly small buy orders submitted by individuals, because small investors are also benefit from market stability.

(III) Optimal tick size hypothesis. Since the absolute tick size is fixed by regulation or tradition, the tick size relative to the stock price will be close to optimal only within a certain price range, which a company can maintain through its stock split decisions. Muscarella and Vetsuypens (1996) and Angel (1997) show the supportive evidence to this hypothesis.

(IV) Broker promotion hypothesis. Angel (1997) and Schultz (2000) argue that the higher spread resulting after a split provides an incentive for brokers to promote the post-split

stock to small investors. Kadapakkam, Srinivasan, and Tse (2005) support this hypothesis by showing the pattern change of trading activities of splitting stocks before and after the decimalization.

In general, all hypotheses on the stock splits can be classified into two groups: (1) signaling the firm's future profitability and (2) increasing the stock's liquidity. I.e. all stock splits can be explained as signal-based or liquidity-based.

The signal-based stock splits are highly related to the firms' fundamentals such as future profitability, whereas those liquidity-based have more substantial links to the ownership distributions than the performances of firms. However, to understand why company choose split, it is important to analyze what are considered by the decision makers in the companies.

Based on the present literature, investors generally believe that the stock split can provide higher stock return and more liquidity. CEOs, who own stocks or stock options, would get more returns after the split by increasing the stock price, if they believe the company will continue to do well after the split. Either they have private insider information about the future revenues, or they have subjective expectations (Davidson (1991)), which is different from objective expectations. The common shareholders would also benefit from the increased liquidity. In both scenarios, the split is a good choice. Then, if the split is signal-based, the managers will have private information, while if the split is liquidity-based, the managers will not have private information, which implies that the increase of future return is not guaranteed.

There is evidence that splitting firms show different patterns of profitability following the splits. Some firms are found to continue the good profitability during the post-split periods while others cannot maintain high level performance. Thus, if the capital markets are essentially efficient, the investors will react to the different motivated stock splits in different ways based on the information on the firm's fundamentals. It is possible to differentiate the signal-based splitting firms from the liquidity-based splitting ones based on the variables like stock return and trade volume after the split (Lasmanah and Bagja (2014)). In addition, the set of measurements of the firm's fundamental such as earnings, growth rate, payment of dividends, debt ratio, and etc., may also help for the comparison (Nekrasov and Shroff (2009)).

However, some studies (Grinblatt et al (1984), Conrad and Conroy (1994)) take all the splitting firms as one group and try to explain the stock-split phenomena using a unique motivation. In other studies, the split stocks are assumed to made split decision based on the same underlining motivation, such motivation could be either the signal or liquidity based (Grinlatt et al (1984), Lamoureux and Poon (1987), Barker (1956), Stovall (1995), Muscarella and Vetsuypens (1996) and Angel (1997), Angel (1997) and Schultz (2000), Kadapakkam, Srinivasan, and Tse (2005)). It would be natural to assume that different companies may split their stocks based on different motivations. If the multi-motivation is the case, the splitting firms can be classified into different groups according to a set of variables and find what the split pattern is under a more realized assumption.

The reminder of the paper is organized as follows. Section 2 describes data and the empirical results. Section 3 reports the tests for the split timing. Section 4 concludes that our study supports both the signaling theory and liquidity theory contributed to the explanation of the variances.

DATA AND TESTS

As argued by IRS (1996), this study also focuses on a single distribution size of the split factor. Two-for-one split are selected since they are the most commonly used and widely

discussed. The sample is formed from all NYSE, ASE and NASDAQ listing companies, which declared two-for-one splits between 1984 and 2004. The selection is based on the variable of Factor to Adjust Shares Outstanding variable (FACSHR) on CRSP. FACSHR is set to be equal to 0.5. The resulting sample consists of 3170 two-for-one splits.

The cumulative abnormal return for 12-month before (ABB) and after split month (ABA) are calculated:

$$AB_i = \sum_{j=1}^{12} (R_i - R_m)$$

where i=the stock split, R_m is the equally-weight market return.

The reason the study does not use more complicate CAPM models is to avoid the error by estimating coefficients, since Brennan and Copeland (1998) argued the Beta changes around stock split. The advantage of the calculation is that it simulates the general investor's behaviors pattern since they usually only compare the nominal return of the stock with the market return.

The mean ratio of trading volume under the total outstanding for 12-month before (VOLB) and after split month (VOLA) are calculated, then the difference of VOLA and VOLB are calculated to indicate the volume change. VOL= VOLB-VOLA.

$$\text{VOLB} = \frac{1}{12} \sum_{j=1}^{12} \frac{trade\ volume}{total\ outstanding}$$

The simple statistics of ABB, ABA, and VOL is reported in Table 1 (Appendix). It is found that both positive abnormal returns before and after the split month. Especially, in the 12 month before-split period, the stock experiences a substantial increase. However, the cumulative abnormal return is relatively small for the 12-month holding period after the split. The difference of trading volume ratio is 3.75% comparing the holding period 12 month after the split and 12-month before split. The first impression from the report is that the split stock commonly experiences long tern increase before the split; the market tends to treat the stock to normal after one year from the split; and the trading volume increase after the split which implies the increase in liquidity.

A multivariate technique, principal component analysis (PCA), is used to exam relationships among ABA, ABB, and VOL. PCA can be used for dimensionality reduction in a data set by retaining those characteristics of the data set that contribute most to its variance, by keeping lower-order principal components and ignoring higher-order ones. Such low-order components often contain the "most important" aspects of the data. Therefore, the main target of this test is to detect the most important component of the data, and to identify the pattern of the contribution of the variables.

The results are shown in Table 2 (Appendix): the eigenvalues indicate that two components provide a good summary of the data, two components accounting for 93.87% of the total variance. The first component (Prin1) has high positive loadings on the variable ABB and VOL and high negative loadings on ABA. The second eigenvector (Prin2) has high positive loadings on the variables ABB and ABA, and low positive loadings on VOL. The interpretation of the third component is not obvious. To examine the principal components in more detail, a scatter plot of the first two components is presented in Figure 1 (Appendix).

The testes show that ABB has high positive loadings in both of the components, ABA has high negative loadings in the component one and high positive loadings in the component two, and VOL has positive loadings in both of the components with high in the one and small in the second. So, it can be interpreted that the component one (Prin1) as a measure of liquidity-based split. This component could explain the scenarios when CEOs do not have

private information, however, the market overestimate the performance of the company following the split. The return of the stock after the split will reverse or low than the estimation, but at the same time, the trading volume will increase, as in the component one (Prin1) that ABB and ABA are negative correlated, and VOL are positive correlated. On the other hand, the component two (Prin2) can be regarded as a measure of the signal-based split. Since both ABB and ABA have high positive loading, this could explain the scenario that after split, the company performs well as estimated so that the stock has both high abnormal return before and after split, while the trading volume change is not very obvious. From table two, it can be found that except very few samples, most samples are scatter around the central point of the two components.

Since two components can explain most of the sample, the study shows that liquidity and signal are the main reasons for stock split. Therefore, the stock-split phenomena cannot be fully explained by using a unique motivation. Rather, when companies make split decision, both liquidity and signaling motivations could be possible. However, it cannot be identified which motivation is the dominance.

SPLIT TIMING

After finding why the company chooses the split, it would be interesting to know when the company would like to make the split. One of the exogenous factors would be the bull market. When the market as a whole is doing well, people are more optimism about the future. For the company to split, this is a good time, because after the split, the bull market tends to facilitate the stock to have high return or more liquidity.

Figure 2 (Appendix) shows the number of two-for-one splits in each calendar year and summarized the total equally weighted market returns of that year from 1970 to 2006. Generally speaking, more splits are observed following bull markets. In addition, the intra-industry returns should be accounted for when analyzing the ARs following the stock splits. In other words, AR may result from the industry level rather than the firm level.

To detect the industry effect, clustering test is employed. Cluster analysis is to accomplish the task of partitioning a set of objects into relatively homogeneous subsets based on the inter-object similarities. In other words, if the companies in similar industries show similar pattern of split, they are supposed to be clustered into the same group. The data set comes from the above principal component test. The test clusters the stock split companies by two digits SIC code. The mean of ABB, ABA, VOLB, and VOLA for the companies are calculated with same two digits SIC code. The clustering method is shown with the corresponding tree. The method suggests split stock into five or six groups. E.g., if SIC code from 13 down to 79 is treated as one cluster, most manufactory industries are included; from 49 down to 70, most financial industries are included. Therefore, Figure 3 in Appendix shows that industry effect is one of the factors to detect the stock split.

CONCLUSION

Stock splits are still a puzzling phenomenon to researchers. According to EMH, splits should be cosmetic in nature. However, people find stock splits are normally associated with positive return before and after announcement, and liquidity is also increased after splits. Financial economists try to explain the puzzle by two classes of model: signaling-based and liquidity-based.

Theoretically, if it were found that liquidity increase after the split, the two classes of model could be distinguished by finding whether the managers have private information. If they have private information, the return after the splits will still increase. If they do not have,

according to EMH, the return will turn to normal when market makes correct reaction to the split.

According to the principal component test, two patterns of split are detected: one has negative loading of abnormal return after the split and high positive loading of trading volume increase; and the other has high positive loading of ABA and small loading of VOL. If managers do not have private information, the splits could lead to the component one. If they do have, then the splits lean to the component two. These two components can explain most of the splits. However, it cannot be identified which pattern is dominant. The results have shown the co-existing of two motivations for the stock split: signaling and liquidity motives. Therefore, the previous single motivation model must be expended to two motivations model. This is a potential area for future research.

The other two tests performed are to find the timing factors for the splits. From historical data, the tests show companies will more likely choose splits in bull market. The cluster analysis also finds that the splits decision is related to industry. Companies in similar industries tend to show similarity in splits.

REFERENCES

Angel J.J. 1997. Tick size, share price, and stock splits. *The Journal of Finance* 52, 655-681.

Barker, C.A. 1956. Effective stock splits. *Harvard Business Review* 34, 101-106.

Brennan M.J. and T.E. Copeland. 1988. Beta changes around stock splits: a note. *The Journal of Finance* 43, 1009-1013.

Brigham, Eugene F., and Michael C. Ehrhardt. Financial Management: Theory & Practice. Mason, Ohio. Cengage Learning. 2019.

Conrad, J.S. and R.M. Conroy. 1994. Market microstructure and the ex-date return. *The Journal of Finance* 49, 1507-1509.

Davidson, P. 1982. Rational Expectations: A Fallacious Foundation for Studying Crucial Decision-Making Processes. *Journal of Post Keynesian Economics* 5 (2), 182-198.

Fama, E. F., L. Fisher, M. C. Jensen, and R. Roll. 1969. The adjustment of stock prices to new information. *International Economic Review* 10(1), 1-21.

Fama, E F. 1965. The Behavior of Stock-Market Prices. *Journal of Business* 38(1), 34-105.

Fama, E F. 1970. Efficient Capital Markets: a Review of Theory and Empirical Work. *Journal of Finance* 25 (2), 383-417.

Fama, E.F. 1991. Efficient Capital Markets: II. *Journal of Finance* 46 (5), 1575-1617.

Grinblatt, M., R. Masulis, and S. Titman. 1984. The valuation effects of stock splits and stock dividends. *Journal of Financial Economics* 13, 461-490.

Ikenberry, D., Graeme Rankine, and Earl K. Stice. 1996. What Do Stock Splits Really Signal? *The Journal of Financial and Quantitative Analysis* 31 (3), 357-375.

Jinho B., M. S. Rozeff. 2003. Long-run performance after stock splits: 1927 to 1996**.** *Journal of Finance* 58*,* 1063-1086.

Krishnamurthy S., P.R. Kadapakkam, and Y. Tse. 2005. Stock splits, broker promotion, and decimalization. *Journal of Financial and Quantitative Analysis* 40, 873-895.

Lamoureux C. G. and P. Poon. 1987. The market reaction to stock splits. *The Journal of Finance* 42, 1347-1370.

Lasmanah and Bambang Bagja. 2014. Abnormal Return and Stock Trading Volume Analysis on the Company Taking Stock Split at Indonesia Stock Exchange Period 2010-2013. *International Journal of Science and Research (IJSR)* 2 (4), 566-571.

Muscarella, C and M. Vetsuypens. 1996. Stock splits: signaling or liquidity? The case of ADR 'solo-splits'. *Journal of Financial Economics* 42, 3-26.

Nekrasov, Alexander and Pervin K. Shroff. 2009. Fundamentals-Based Risk Measurement in Valuation. The Accounting Review 84 (6), 1983-2011.

Schultz, P. 2000. Stock splits, tick size, and sponsorship. *The Journal of Finance* 55, 429-450.

Stovall, R.H. 1995. Stock split candidates. *Financial World* 164, 86.

APPENDIX

Table 1
Summary Statistics

	ABB	ABA	VOL
Mean	0.455	0.018	0.0375
Standard Deviation	0.527	0.4655	0.0745

Table 2
Principal Component Analysis
(Eigenvalues of the Correlation Matrix)

Eigenvalue	Difference	Proportion	Cumulative
1.7714	0.7268	0.5905	0.5905
1.0446	0.8608	0.3482	0.9387
0.1838		0.0613	1
Eigenvectors			
	Prin1	Prin2	Prin3
ABB	0.4789	0.7245	-0.4955
ABA	-0.5064	0.6891	0.5181
VOL	0.7169	0.0028	0.697

Figure 1
Scatter Plot of Two Components

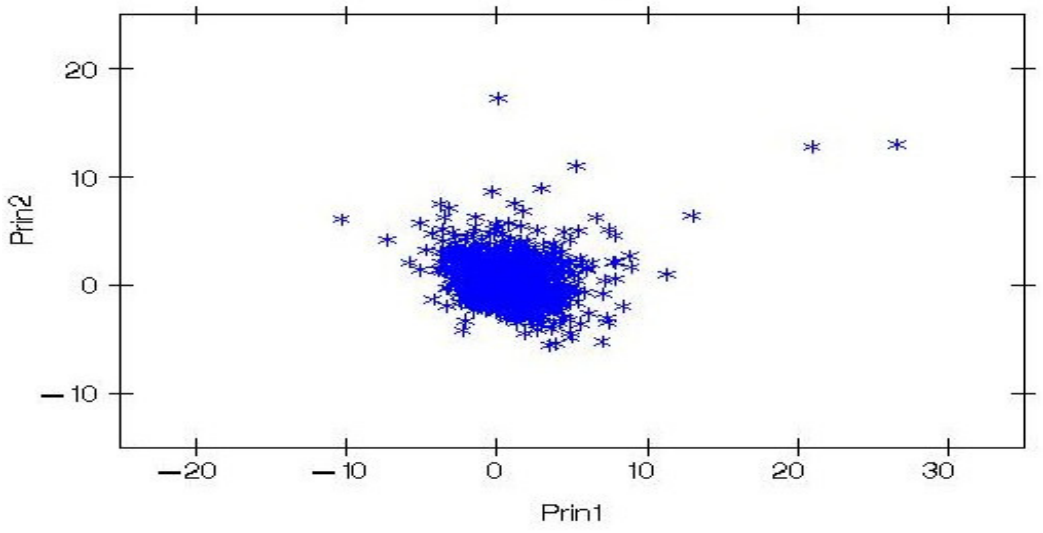

Figure 2
Summaries of Number of Split and Market Return

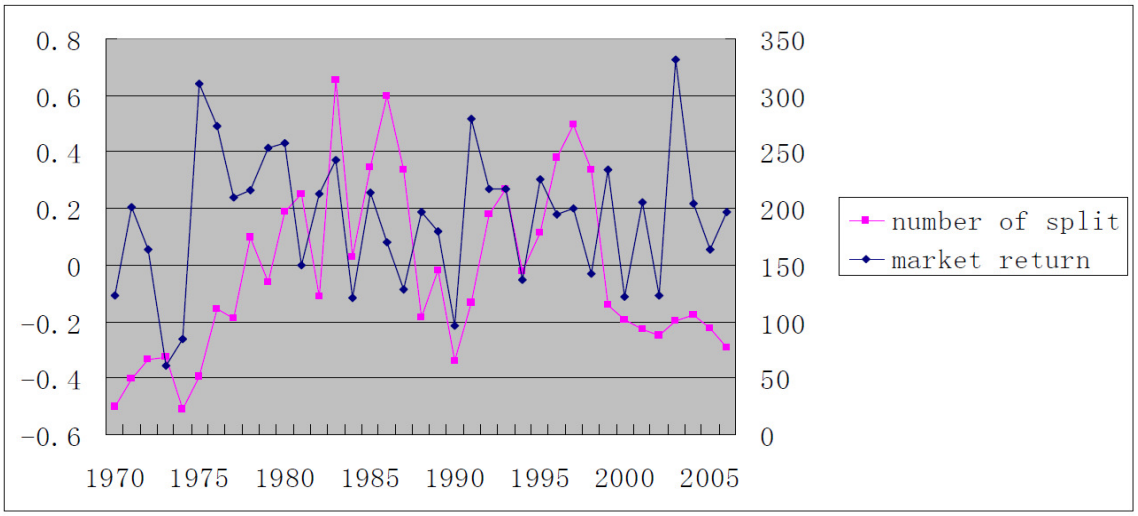

Figure 3
Cluster Analysis