STOCK SPLITS AND ADVERSE SELECTION

by

SARA SOLTANIZADEH

Master of Business Administration, Universiti Teknologi Malaysia, 2014

Bachelor of Science in Computer Engineering, Islamic Azad University, Iran, 2008

and

ABHISHEK ROKADE

Master of Management Studies (Finance), Mumbai University, India, 2011

Bachelor of Technology (Electrical Engineering), V.J.T.I., India, 2009

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Name: Sara Soltanizadeh

Abhishek Rokade

Degree: Master of Science in Finance

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Supervisory Committee:

_____

Amir Rubin
Senior Supervisor
Associate Professor

_____

Alexander Vedrashko
Second Reader
Associate Professor

Date Approved: _____

Abstract

What impact can the market expect from a stock split announcement? This paper delves into the effect of stock split announcements on the immediate excess return over the market for stocks in the US market by considering stock splits over a span of 35 years from 1980 to 2014 across different industries. We find that the average market reaction to stock splits announcement is 1.5%. We also find that excess return over the market after stock split announcement is negatively correlated with firm size and positively correlated with bid-ask spread upon the application of industry fixed effect and year fixed effect. However, upon the application of firm fixed effect, these relationships are not significant. In addition, we found that there is no significant relationship between analyst forecast error and the excess return over the market.

Keywords: Stock split, adverse selection, bid-ask spread, excess return over the market, analyst forecast error, market capitalization

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- Sara Soltanizadeh

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1. Introduction

If a stock split is just a change in number of shares that is exactly accounted for by a reduction in price, why is it a popular event in equity markets? What are the incentives for firms to do so? To answer these questions we explore previous literatures which have focused on return and trading activity after stock split announcements and executions (Angel, 1997; Desai, Nimalendran, & Venkataraman, 1998; Easley, O'hara, & Saar, 2001; Nguyen & Wang, 2013).

According to Dyl and Elliott (2006) managers use stock splits to bring stock price to an optimal range to increase the liquidity in order to make it attractive for small investors. Schultz (2000) showed increase in number of trades and a change in trading behavior from sell initiated trades to buy initiated trades after stock splits. By increasing the number of shares outstanding and attracting more small investors, firms enhance ownership base (Maloney & Mulherin, 1992) and as stated in Guo, Zhou, and Cai study (2008) that is what affects the market value of the firm's stock price. The other common cited reason for stock splits is that managers try to convey good information about future performance of the firm to the public (Kalay & Kronlund, 2014); this idea is based on managers having better information than investors, which can explain the excess return over the market after stock split announcement.

The motivation of this study is to conduct an empirical study on the abnormal price change after stock split announcement and possible reasons behind it by investigating the effect of firm size, bid-ask spread, and analyst forecast error on market reaction. All three measures are typically used as proxies for information asymmetry. Furthermore, we examine these relations for firms within various industries.

For this study, data of stock split in the US market over the period from 1980 to 2014 is extracted from two data sources within the Wharton Research Data Services (WRDS) database, namely The Center for Research in Security Prices (CRSP) and Thomson Reuters Institutional Brokers Estimate System (I/B/E/S) and the sample industry classification is based on North American Industry Classification System (NAICS). We find an excess return of 1.5% over the market immediately after stock split announcement for this period; this excess return is higher for smaller firms and lower for bigger ones,

suggesting that information asymmetry plays a role as smaller firms have more information asymmetry than bigger firms. Furthermore, our analysis shows that excess return over the market has positive correlation with bid-ask spread and no significant relationship with analyst forecast error.

The paper is organized as follows: Section 2 is the literature review. Data gathering and research methodology are presented in Section 3. Section 4 shows empirical results and their description. Limitation of study is provided in Section 5 and Section 6 concludes.

2. Literature Review

2.1 Stock Split Announcement

Stock-split is a corporate action in which the firm divides its shares based on a certain multiple, typically two. In theory, while the number of share increases, the dollar value of the company should not change as a stock split should not change the future cash-flows, and hence the result of a two factor split will be a double of the shares outstanding with a corresponding split is share price. Considering it does not change the corporate real value and there are costs associated with stock split implementation, in a perfect capital market, there should be no motive for corporations to do so. However, the reality is different; according to CRSP, there were 11516 stock splits in the U.S. market during the period between 1980 and 2014.

Fama, Fisher, and Roll (1969) study is considered as the first contribution to the effects of stock split announcement (SSA) on the share price. Since then, there are different event studies on both the motivation and consequences of stock split. According to Guo, Zhou, and Cai (2008) signaling hypothesis, trading range, liquidity hypothesis, and tick size hypothesis are the three main motivations for stock split. The signaling hypothesis implies that management is sending a signal of income increase or that managers believe their firm is undervalued. This hypothesis assumes there is asymmetry of information between management and investors and management tries to convey good information to investors by the stock split. Previous studies such as Brennan and Hughes (1991), Ikenbery, Rankine and Stice (1996), Conroy and Harris (1999) found support for the

signaling hypothesis by taking stock splits excess return over the market as an evidence of success to deliver positive information. In this we do a similar analysis.

Trading range or liquidity hypotheses state that management tends to set the price at optimal trading range that results in increase the liquidity. Prior research found that the number of transactions and trading volume increases after splits. Furthermore investors' trading behavior changes from sell initiated trades to buy initiated trades (Schultz, 2000). The tick size hypothesis suggests managers try to keep tick size relative to stock price. As stated in previous literatures, this hypothesis recommends that stock split provides optimal tick size that attracts uninformed investors, as liquidity providers, to buy the stock (Nguyen & Wang, 2013; Schultz, 2000).

2.2 Adverse Selection and Asymmetry of Information

According to self-selection theory introduced by Ikenberry et al. (1996), managers chose to split their stock if they have a positive view about firm's future performance. Kalay and Kronlund (2014) suggested that there is a common basis for all hypothesis associated with the rationale behind splits: all explanations are somewhat related to the idea that managers believe that the firm is doing well and they want to keep their share price in a certain range.

Prior researches divided investors into two groups namely, informed and uninformed (or noise traders). The latter are believed to loss from trading with informed investors. Bharath, Pasquariello and Wu (2009) presented that investors with an intimate relation with the firm such as employees, suppliers, and traders have better information than other investors. Hence, there is asymmetry of information between market participants.

Some research findings support to the hypothesis that stock split reduces information asymmetry (Brennan & Hughes, 1991). On the other hand, Easley, O'hara, and Saar (2001) found no appreciable change in information asymmetry after stock split announcement since stock split announcement increase both informed and uninformed trading. Similarly, short interest changes surrounding splits have been suggested as a measure for quantifying the level of signaling (Kadiyala and Ventsuypens, (2002), however, their result provide only weak evidence of the information value in stock splits.

Doran (2011) conveyed that in the absence of wrong signaling costs, managers of both undervalued and overvalued firms would announce stock split that eventually results to eliminate stock split announcement informative value. Heinkel (1994) offered the risk of reputation loss as the cost of wrong signaling.

There are measures that have been found to be sensitive to corporate events, they have been used to measure asymmetry of information such as effective bid-ask spread (George, Kaul, & Nimalendran, 1991), analyst forecast error (McNichols & Dravid, 1990), return volume coefficient (Llorente, Michaely, Saar, & Wang, 2002), and the probability of informed trading (Easley, Kiefer, O'hara, & Paperman, 1996). In this study, after checking whether there is any excess return over the market after stock split announcement, we check the effect of two of these variables: analyst forecast error and bid-ask spread

2.3 Bid-ask Spread and Abnormal Excess Return

Maloney and Mulherin (1992) suggested liquidity-based explanation for the excess return over the market since there is some negative effect after split announcement such as increase in bid-ask spread, and volatility. There are two categories of liquidity measurement namely, friction measures such as return and bid-ask spread and activity measures such as trading volume, and number of shareholders.

Glosten and Milgorm (1985) in their sequential model of the market maker's pricing defined two components of bid-ask spread as adverse selection component due to information asymmetry and transitory component result of inventory costs, specialist monopoly power, and clearing cost. We predict there is positive correlation between bid-ask spread and excess return over the market; the higher the spread, the higher the expected excess return over the market. Higher bid-ask spread means higher asymmetry of information, which also means lower liquidity.

According to Dyl and Elliott (2006), stock splits and consequently the decrease in share price especially attract small or uninformed investors and enhance ownership base that increases liquidity of stock and decrease trading cost (Dyl & Elliott, 2006). On the other hand, Easley, O'hara, and Saar (2001) concluded that stock splits announcements does not enhance the execution quality of trade since the increase in the cost of executing

market orders, and the resulting larger spread outweighed the increase in the number of executed limit orders.

2.4 Analyst Forecast Error and Abnormal Excess Return

McNichols and Dravid (1990) tested whether stock split acts as a signal of information regarding company earning and/or future cash flow. They used analyst forecast error, computed as first annual earnings reported after stock split less than the median of analyst forecasted earning prior to split scaled by that median, as a measure of management private information. They found that management choice of split factor conveys information regarding company future earnings cash flow and investors revise their beliefs according to it. Kalay and Kronlund (2014) found analyst consensus estimates rise after stock split announcements by measuring the revision in analyst EPS forecasts (ΔEPS/P). Moreover, they presented evidence that when fewer numbers of analysts follow a firm or when market capitalization is lower, analyst forecast revision after stock split announcement is higher; hence, they conclude stock splits announcement reduces asymmetry of information for firms with more opaque information environment.
We expect analyst forecast error to have a positive correlation with excess return over the market; higher analyst forecast error means higher asymmetry of information and as a result, higher excess return over the market after stock split announcements. According to signaling hypothesis, one of the stock split motivations is to convey a positive expectation about company profit by managers, the information which is not known or clear for public, and to reduce asymmetry of information. Hence, for the companies with higher analyst error forecast and higher information asymmetry environment, we predict higher excess return over the market after stock split announcement.

2.5 Market Capitalization and Industry Classification

As (Atiase, 1980) suggested, we know less about smaller firms considering they have fewer announcement published in the financial press. Other studies (P. Brown, Kleidon,

& Marsh, 1983; Grinblatt, Masulis, & Titman, 1984) suggested log-linear relation between firm size and excess return as a result of stock split announcement; in other words split announcements are expected to create greater market interest for small firms than larger ones. According to Brennan and Hughes (1991), number of analysts following the firm has negative correlation with excess return over the market after stock split announcement. More recently, Chan, Menkveld, and Yang (2008) In their study of information asymmetry and asset price in Chinese stock market pointed out two issues regarding market capitalization of the firms; firstly, larger companies display greater financial disclosure as information costs are typically lower for large firms and consequently less information asymmetry and secondly, larger firms have more liquid domestic and foreign market.

Similarly, we expect negative correlation between market capitalization and excess return over the market; the bigger companies with higher market capitalization usually tend to give more information to the public and a larger number of analysts follow them. As a result, there should be less information asymmetry and as we discussed earlier when there is less asymmetry of information, share price should be less sensitive to stock split announcements. But, for the smaller companies for which less information is available in the market, we predict to see a larger market reaction.

Zhang (2006) used firm size and firm age among other proxies to measure information asymmetry and found both are negatively correlated and significant; firms with longer history in mature industries have more information available.

In another study, Aboody & Lev (2000) suggested that insider trading gain in R&D intensive firms is significantly higher than firms without R&D. They conclude that R&D is a major contributor to information asymmetry. Hence, we can predict that information asymmetry in new industries as well as high-tech industries with more complex product/production to be higher. As stated in Aboody and Lev study (2000), industries with low level of concentration and imperfect competition have significantly higher excess return over the markets after stock split announcement than those in industries with high level of concentration.

3. Data and Methodology

This research focusses on the impact of a stock split announcement on the return of a stock. We consider the stock return on the day of the announcement and the day after the announcement. In order to execute the above mentioned analyses, we require data at a daily level to measure the impact of the event precisely.

For the study, we have included data for firms in the US undergoing stock splits over a 35 year period from 1980 to 2014. The data for variables used in our analysis is pulled from two data sources within the Wharton Research Data Services (WRDS) database, namely The Center for Research in Security Prices (CRSP) and Thomson Reuters Institutional Brokers Estimate System (I/B/E/S).

Our data includes firms from 19 different industries as classified by the North American Industry Classification System (NAICS). In order to check for the veracity of data pulled from CRSP, we cross-checked a few numbers from CRSP with the stock data from the Bloomberg terminal.

An important issue to consider is endogeneity owing to the nature of the data. Endogeneity is defined as the phenomenon where there exists a correlation between the independent variable and the error term. In order to eliminate the endogeneity problem, we use the average of a 15-day period before the stock split announcement for the calculation of the bid-ask spread. For calculating the excess return over the market, we compute the sum of difference between the stock return and the market return on the day of the stock split announcement and the day after the announcement. Hence, the excess return is calculated as the sum of the return on the day of the stock split announcement and the day after. The idea behind taking the sum of the returns and excess returns over two days is to include the possibility of an evening announcement. For the analyst forecast error, we are interested only in the deviation of the values from the ideal expected value of zero. Hence, we ignore the sign of the error by using the absolute value in the calculation and measure only on the magnitude of the error (in % terms).

Table-1 summarizes the different variables used in the study and the sources from which the data for the same was extracted.

Table 1

Description of analysis related factors

Variable	Variable definition	Source
Market Capitalization	Market capitalization for a stock is defined as the product of s*hares outstanding* and the s*hare price*	CRSP
Spread (%)	Spread is defined as the mean of difference between the *ask price* and *bid price* for a stock over the 15-day period before the announcement of split. This difference is divided by the sum of the bid price and ask price.	CRSP
Excess Return over the market (%)	Excess Return over the market for a stock is defined as the sum of the differences between the *stock return* and *value-weighted return* over the announcement day and the day after the announcement day	CRSP
Return (%)	Return for a stock is defined as the sum of the *returns over the announcement day and the day after the announcement*	CRSP
Analyst Forecast Error (%)	The absolute difference between analysts' consensus forecast latest and prior to the stock split announcement of the annual EPS estimate and the actual value, all divided by the absolute value of the actual.	I/B/E/S
Industry	The industries are classified as per the conventions defined by *NAICS.*	CRSP

The firm-specific variables such as market capitalization, spread, return, excess return over the market, and the industry classification are all derived from CRSP data source while the variables pertaining to analyst forecasted return (used to calculate the analyst forecast error) are derived from I/B/E/S data source. The two datasets are then merged to carry out the analysis based on the common variables namely, company, ticker and the date. The tool we used for data analysis is STATA.

3.1 Descriptive Statistics

Table-2 provides the descriptive statistics of the dependent and independent variables used in the study. As reported below, the table indicates vital measures such as mean, median, standard deviation, maximum value, and minimum value for each of the variables. The values in the table correspond to the data of those firms that have undergone a stock split over the period 1980-2014.

Table 2

Variable	Mean	Median	Std Dev	Max	Min
Market Capitalization	$ 2.49 billion	$ 210 billion	$ 13.71 billion	$ 450 billion	$ .518 million
Spread (%)	1.360	0.824	1.558	8.150	0.004
Excess Return over market (%)	1.5	1.0	4.9	19.0	-18.6
Abnormal Return (%)	1.6	1.1	5.0	19.5	-19.3
Analyst Forecast Error (%)	25.290	7.183	58.181	305.405	0.000

4. Empirical Results

Table-3 presents the breakdown of our sample based on market capitalization of the firms and their industries. The majority of the firms in our sample are small cap, 9653 out of 11516. According to industry classification, Finance and Insurance industry, Manufacturing industry, and Real Estate, Rental and Leasing have the most number of stock splits respectively. On the other hand, the lowest number of stock splits happened in Public Administration industry with only 3 stock splits over the 35-year time period.

Table-3 here (see Appendix - I)

At first we run t-test on both return and excess return over the market to determine whether both the returns are statistically significant after stock split announcement. Table-4 (see Appendix I) shows us the deviation of the mean of returns (1.63%) and excess return over the markets (1.50%) from the expected value of zero with 95 percent confidence interval. In addition, t-statistic for both return and excess return over the market are high (35.4517 and 33.3124) and greater the t-statistic, greater the evidence against our null hypothesis; hence, we reject the null hypothesis that mean is equal to zero. The result also shows the daily return and daily excess return are behaving almost the same way and this is similar to Brown and Warner (1985) contribution on daily stock return properties and the effect of these characteristics on event study.

The mean difference from zero is an indicator of a spike in the return values on and after the day of a stock split announcement which could be of interest to investors. Thus, even though stock splits do not change the intrinsic value of a company, they enable investors to take advantage of the small margin.

Table-4 here (see Appendix - I)

Next, we run two-sample t-test to capture the difference between means of expected excess return over the market for firms with different sizes. Table-5 (see Appendix I) summarizes the results of the two-sample t-test; the mean for small cap firms is 1.55% higher than the mean for mid-cap 1.2626% and large cap 1.2580%. In addition, the table highlightins that the difference between means of small-cap and mid-cap returns is greater than the difference between mean of large-cap and mid-cap returns. Thus, we can conclude that the stock split announcement has a bigger impact on smaller firms than the bigger firms. This can be attributed to the attention of more investors and analysts towards bigger firms and the regular dissemination of news and updates from those big firms in comparison to smaller firms.

Table-5 here (see Appendix - I)

As the third step to capture the return of stock split event, we categorize our sample based on the data gathered from the CRSP data base for industry classification and run one-sample t-test on excess return over the market for each industry separately. Table-6 (see Appendix I) outlines the excess return over the market for the different industries in descending order of the average deviation from the expected value of zero. Our analysis shows that the maximum mean and consequently excess return over the market for the Art, Entertainment, and Recreation industry is 2.67% which is more than five times the least mean, 0.48% for the Utilities industry. This exhibits that government-owned public companies have lower asymmetry of information owing to regular public disclosures and news updates.

Table-6 here (see Appendix - I)

In the next step, we perform t-test two more times, once on the bid-ask spread for each industry and the other time on the analyst forecast error for each industry. The results of the same are tabulated in Table-7 and Table-8 (see Appendix I). The t-test on average spread shows the highest difference from mean equal to zero for Real Estate, Rental and Leasing industry. After that Finance and Insurance, Wholesale, and Construction have the higher amount of bid-ask spread. According to the t-test analysis on analyst forecast error, we found that the forecast error is maximum for Information industry and the least for the Accommodation and Food Services for the same reasons as mentioned for Table-6 (see Appendix I), thus ratifying our analysis in Table-7 and Table-8 (see Appendix I).

Table-7 and Table-8 here (see Appendix - I)

In order to assess the contribution of independent variables to excess return after stock split announcement, for each independent variable, first we perform ordinary least square (OLS) year fixed effect regression on excess return over the market to capture heterogeneity across years; second we perform least square dummy variable (LSDV) regression on excess return over the market by considering industry as a dummy variable to capture industry fixed effect and heterogeneity across industries; then we perform year, industry and firm fixed effects regression. Furthermore, we run these three regressions for the combination of all explanatory variables.

Table-9 here (see Appendix - I)

Table-9 (see Appendix I) presents the results of the twelve regression analyses. Coefficient of market capitalization is negative which indicates an inverse relationship between firm size and excess return over market after stock split announcement which is compatible with the result of our two-sample t-test. This can be attributed to the fact that larger firms draw more attention from investors and analysts and have more visibility in the public domain as mentioned above.

The regression coefficients show positive relation between the spread and the excess return over the market. However, according to t-statistics 3.58, this relationship is significant only by considering both year and industry fixed effects. The key takeaway

here is that, for stocks that can be valued well (lower spread) it is difficult for investors to exploit the spread and make bigger excess return over the markets.

The third step in regression analysis is the regression on analyst forecast error and excess return over the market for year fixed effect, industry fixed effect, and firm fixed effect. Surprisingly, based on t-statistics there is no significant relation between the analyst forecast error and the excess return over the market.

In the final stage of our data analysis, we consider all the independent variables to quantify their collective impact on the excess return over the market; we get almost the same result except the coefficient for bid-ask spread is negative and as shown by t-statistic, there is no significant relationship between spread and excess return over the market.

Furthermore, by looking at the t-statistics we can find once we applied firm fixed effect, we do not find any significant relationship between our independent variables and excess return over the market.

5. Shortcomings in the Research

Although we have carefully analyzed the data, our research has some shortcomings owing to the data availability issues.

Firstly, for the analyst forecast error calculation, we extracted the data from I/B/E/S database. We consider the consensus forecast numbers at the firm level just before the announcement of the stock split. Having said that, the analyst forecast numbers weren't available for all companies. Owing to this, we had to skip such firms and perform the analysis on the reduced dataset. Hence, even though, we could see that our results are in line with the expectations and research studies performed previously, our observations may not be as compelling as they should be.

Secondly, the data available was restricted only to the US market. This did not enable us to perform an analysis across different markets. Hence, the results could be biased towards the characteristics of the stock market in the US. However, it is not much of a concern as the methodology would remain the same for any other market.

Third, we haven't included frictional costs in the return calculations used in our analysis. We believe, it could result in a slightly different value of the realized return. The reason for not including frictional costs was the unavailability of the data and besides, frictional costs are never consistent.

6. Conclusion

In this event study we investigated the existence of excess return over the market after stock split announcement for the 35 years period from 1980 to 2014 in the US stock market. In addition, based on the main explanations of firms' motivation on stock split, signaling hypothesis to reduce asymmetry of information, we examine the contribution of two factors namely bid-ask spread and analyst forecast error on the hypothetical excess return over the market for firms with different market capitalization and within different industries.

According to the result of our statistical analysis, we found 1.5 % excess return over the market immediately after stock split announcement; this excess return over the market has negative correlation with firm size which means bigger the firm, lower the excess return over the market. Besides, the result offers higher return for Art, Entertainment, and Recreation industry, Information industry and Scientific and Technical services.

Our analysis shows a positive correlation between bid-ask spread and excess return over the market. Based on these findings, we conclude that higher the spread, implying both higher adverse selection and less liquidity, higher is the excess return over the market immediately after the stock split announcement.

The above results are valid upon the application of industry fixed effect and year fixed effect; however, once we applied firm fixed effect, we did not find any significant relationship between market capitalization or bid-ask spread and excess return over the market. This result could be due to some firm characteristics which are either observable or non-observable in the market and may require further research.

In addition, although the correlation between analyst forecast error and excess return over the market is negative, this relationship is not significant..

7. References

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8. Appendices

8.1 Appendix I: Tables

The sample includes all the stock split announcements in the US market over period 1980 to 2014.

Market cap is equal to the share price multiplied by number of shares outstanding on the day which stock split is announced. Small market cap are splits of firms with a market cap of less than $2 billion, medium market cap are splits of firms with a market cap of between $2 billion to $10 billion, while large market cap are splits of firms with market cap of above $10 billion.

The industry classification is based on North American Industry Classification System (NAICS) which includes 19 different industries.

Table 3

	Number of splits
Market Cap	
Small	9653
Medium	1349
Large	514
Industry	
Agriculture, Forestry, Fishing, and Hunting	19
Mining, Quarrying, Oil and Gas Extraction	299
Construction	103
Manufacturing	3070
Transportation and Warehousing	253
Information	257
Utilities	280
Wholesale	365
Retail	712
Finance and Insurance	3700
Real Estate, Rental and Leasing	1074
Accommodation and Food Services	65
Art, Entertainment, and Recreation	83
HealthCare and Social Assistance	221
Professional, Scientific, and Technical Services	750
Administrative, Support, Waste Management, and Remediation Services	16
Educational Services	12
Public Administration	3
Other Services	234
Total (across all industries)	**11516**

Table 4
Summary of t-test result for return

Return is the cumulative return over the split announcement day and the day after the announcement day and excess return is return minus the value-weighed return.
Mean, standard deviation and t-statistic of each t-test are calculated against a two side test for H0=0.

Variable	Mean (%)	Std. Dev.	t-statistic
Excess Return	1.5048	4.8474	33.3124
Return	1.6343	4.9472	35.4517

Table 5

Summary of two-sample t-test result for excess return over the market based on market capitalization: Small, Mid, Large

Variables are defined in Table 1 or 2. Mean, standard error and t-statistic of each t-test are calculated against a two side test for H0: diff=0; diff = mean (small) – mean (mid) and for the second test diff = mean (mid) – mean (large) and the level of confidence for the t-tests is 95%.

* Number of observation for two-sample t-test is the combined number of observations.

MktCap	# of Observation	Mean (%)	Std. Err.	t-statistic
Small	9653	1.5517	0.0501	30.9853
Mid	1349	1.2626	0.1219	10.3552
Large	514	1.2580	0.1922	6.5464
Diff (Small , Mid)	11002*	0.2892	0.1415	2.0435
Diff (Mid , Large)	1863*	0.0045	0.2304	0.0197

Table 6

Summary of one-sample t-test result on excess return over the market for each industry

Variables are defined in previous tables. The industries with less than 50 observations are omitted.

Industry	No. of observation	Mean (%)
Art, Entertainment, and Recreation	83	2.670
Manufacturing	3070	2.080
Professional, Scientific, and Technical Services	750	2.040
Other Services	234	1.980
Construction	103	1.870
Wholesale	365	1.830
Retail	712	1.760
HealthCare and Social Assistance	221	1.550
Information	257	1.440
Accommodation and Food Services	65	1.320
Real Estate, Rental and Leasing	1074	1.240
Mining, Quarrying, Oil and Gas Extraction	299	1.190
Transportation and Warehousing	253	1.040
Finance and Insurance	3700	0.970
Utilities	280	0.480

Table 7

Summary of t-test result on spread for each industry

Spread is equal to the difference between bid and ask price of company share from an average of 15 days prior to the announcement day divided by the sum of bid price and ask price. Mean, is calculated against a two side test for H0=0 and the level of confidence for the t-tests is 95%.

Industry	No. of observations	Mean Spread (%)
Real Estate, Rental and Leasing	1074	1.9143
Finance and Insurance	3700	1.7435
Wholesale	365	1.5165
Constructon	103	1.1937
Manufacturing	3070	1.1245
Utilities	280	1.1226
Art, Entertainment, and Recreation	83	1.0936
Accommodation and Food Services	65	1.0926
HealthCare and Social Assistance	221	1.0626
Other Services	234	1.0273
Information	257	0.9972
Retail	712	0.9735
Professional, Scientific, and Technical Services	750	0.8835
Transportation and Warehousing	253	0.7665
Mining, Quarrying, Oil and Gas Extraction	299	0.6900

Table 8

Summary of t-test result on analyst forecast error for each industry

The analyst forecast error is the difference between analysts' consensus forecast latest and prior to the stock split announcement of the annual EPS estimate and the actual value, all divided by the absolute value of the actual. Mean, is calculated against a two side test for H0=0 and the level of confidence for the t-tests is 95%.

Industry	No. of observations	Mean Analyst Forecast Error (%)
Information	158	43.6890
Art, Entertainment, and Recreation	57	34.2764
Real Estate, Rental and Leasing	527	32.7181
MQOG	237	32.2780
Professional, Scientific, and Technical Services	597	29.9563
Wholesale	244	29.0597
Construction	76	26.2496
Manufacturing	2291	25.9751
Other Services	176	25.2731
Transportation and Warehousing	219	24.4652
HealthCare and Social Assistance	174	22.3797
Finance and Insurance	2177	21.1637
Utilities	195	20.3308
Retail	568	19.3965
Accommodation and Food Services	50	16.7916

Table 9
Regression Analysis

The dependent variable is cumulative excess return over the split announcement day and the day after the announcement day, where excess return is return minus the value-weighed return. The regression analysis is ran 12 times; for each independent variable three times, once with year fixed effects, second time with both year and industry fixed effects, and the third time for year , industry, and firm fixed effect and then for all three variable. t-statistics are provided in parentheses. *,**,*** present significant t-statistic at 90%, 95%, and 99% respectively. ****When firm fixed effect were applied, industry fixed effect were omitted because of collinearity.

	1	2	3	4	5	6	7	8	9	10	11	12
Market cap (log)	-0.0007	-0.0014	-0.0004							-0.0010	-0.0014	-0.0008
	(-2.65)***	(-5.18)***	(-0.22)							(-2.61)***	(-3.63)***	(-0.37)
Bid-ask spread				0.0004	0.0012	0.0005				-0.0011	-0.0005	-0.0011
				-1.28	(3.58)***	-0.43				(-1.48)	(-0.70)	(-0.050)
Analyst forecast error							-0.000001	-0.000003	-0.000003	-0.000003	-0.000008	-0.000003
							(-0.11)	(-0.36)	(-0.15)	(-0.28)***	(-0.87)	(-0.14)
Intercept	0.0279	0.0697	0.0137	0.0145	0.0418	0.0065	0.0145	0.0503	0.0059	0.0356	0.0793	0.0205
	(5.72)***	(5.72)***	-0.43	(23.06)***	(3.78)***	-0.49	(26.08)***	(3.54)***	-0.45	(4.39)***	(4.85)***	-0.51
Firm Fixed Effects****			yes			yes			yes			yes
Industry Fixed Effects		yes	yes		yes	yes		yes	yes		yes	yes
Year Fixed Effects	yes	Yes	Yes	yes	Yes	Yes	yes	Yes	Yes	yes	Yes	Yes
Observations	11516	11516	11516	11516	11516	11516	7773	7773	7773	7773	7773	7773
Number of firms												
R-squared	0.0085	0.021	0.5173	0.008	0.0198	0.5173	0.0066	0.0149	0.5694	0.0075	0.0168	0.5695