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The information content of stock splits

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ABSTRACT

This study examines whether stock splits contain information content about future operating performance or whether splits are undertaken by firms to realign their share prices and to improve trading liquidity. In the four years following split announcements, splitting firms do not experience improved operating performance relative to non-splitting firms. Furthermore, stock split signals are not related to future profitability. The positive announcement effect can be explained by lower share prices and improved market liquidity following stock splits but not by split signals and post-split operating performance. Our results show very little evidence that stock splits signal improvement in long-run operating performance and are more consistent with the trading range/liquidity hypothesis.

While numerous studies have examined stock splits, the underlying reasons for a firm to split its share remain unsettled. Given the finding of an increase in stock prices after split announcements as documented in the finance literature, one plausible explanation is that firms split their equity shares to signal information about their future profitability. According to the signaling hypothesis (Brennan and Copeland, 1988), stock splits are associated with positive announcement excess returns because managers use stock splits to convey favorable private information about their firms' future prospects. For instance, Ikenberry et al. (1996) find that splits are associated with excess returns in the three years following the announcement. They interpret their finding to be consistent with the expectation that managers will undertake a split only if they are optimistic about the firm's future.

Empirically, there is little evidence that split announcements provide informational content about a firm's improved future profitability in the long run (see Table 1). Earlier studies (e.g., Lakonishok and Lev, 1987; Asquith et al., 1989) document that firms that split their shares have higher short-term earnings growth than firms that do not. McNichols and Dravid (1990) find a significant relation between excess announcement returns and one-year-ahead earnings forecast error, suggesting that announcement period returns can be explained by management's private information about future earnings. Ikenberry and Ramnath (2002) suggest that the stock split return anomaly is related to market underreaction to information. Specifically, they find that financial analysts tend to underestimate splitting firms' earnings. All these prior studies focus only on short-term earnings and hence do not necessarily indicate an increase in distant future profitability following a stock split announcement.

Alternatively, the trading range hypothesis suggests that there is an "optimal" trading range and that splits realign share prices to this range (Lakonishok and Lev, 1987). Realigning share price could draw more attention to a stock (Grinblatt et al., 1984) and hence increase the liquidity of the stock with an enlarged clientele and reduced trading cost (Muscarella and Vetsuypens, 1996). Indeed, the survey research by Baker and Powell (1992) reports that moving the stock price into a better trading range and improving the stock's liquidity are the primary motives for managers to undertake a split. Moreover, management may prefer to

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Table 1
Summary of previous empirical studies on stock splits.

Study	Hypothesis examined	Variable used	Summarized findings
Lakonishok and Lev (1987)	Signaling	Growth in earnings	Splitting firms yield higher earnings growth than similar, non-splitting firms in 5 years before the split. Except for year 1, there is no abnormal earnings growth for splitting firms in post-split years.
Asquith et al. (1989)	Signaling	Earnings changes	Splitting firms show significant increases in earnings four years before stock splits. The largest increase occurs in the announcement year. After that, the increase in earnings ceases.
McNichols and Dravid (1990)	Signaling	Analysts' one-year-ahead earnings forecast errors	Analysts' one-year-ahead earnings forecast errors are positively correlated with split announcement abnormal returns.
Brennan and Hughes (1991)	Trading range/liquidity	Number of analysts following a firm	The number of security analysts following a firm is positively related to the magnitude of stock splits.
Schultz (2000)	Trading range/liquidity	Size of trade orders	After splits, there are a lot of small orders, but not large orders.
Easley et al. (2001)	Trading range/liquidity	Trading by investors	The number of uninformed trades increases after stock splits.
Ikenberry and Ramnath (2002)	Signaling	Long-term abnormal returns	The positive stock price drift in the year following a split is related to the underestimation of splitting firms' earnings by analysts.
Dhar et al. (2003)	Trading range/liquidity	Trading by investors	Individual investors buy more after stock splits while institutional investors buy less.

This table summarizes previous empirical studies that analyze the signaling and liquidity effects following stock splits.

bring more small investors, investors who tend not to exercise too much control, into the firm to create a more controllable ownership mix (Powell and Baker, 1993/1994). The empirical literature suggests an enlarged ownership base after split (Schultz, 2000; Easley et al., 2001; Dhar et al., 2003), more analysts following the stock (Brennan and Hughes, 1991), and improved trading liquidity (Anshuman and Kalay, 2002; Dhar et al., 2003).

In this study, we examine whether firms split their stock shares to signal higher future profitability to the market or to improve trading liquidity. Using 2148 stock splits for NYSE, AMEX, and NASDAQ firms from 1963 through 1999, we find that splitting firms' profitability increases in the four years prior to the split announcement, peaks at the year when the announcement is made, and then declines in the four years subsequent to the announcement. Specifically, the mean (median) return on assets increases from 6.27% (6.17%) in year 4 before the split announcement to 8.19% (7.68%) in the announcement year and falls to 4.90% (5.50%) four years later. This result may indicate that the management of most sample firms undertakes splits based on current and recent past performance information and tends to be too optimistic about the firm's *long-term* future profitability.

Compared to non-splitting firms that are matched by industry, market-to-book ratio, and operating performance, these splitting firms do show significant higher operating performance in each of the four years before and after the announcement, suggesting that stock splits may contain some information content. However, when the analysis is conducted on changes instead of levels of operating performance, the result becomes inconsistent with the signaling hypothesis. Specifically, we find that the mean and median changes in return on assets in the four years after the announcement are all negative. In addition, while the mean (median) return on assets increases by 1.96% (0.76%) from year −4 to year 0, the mean (median) declines by 3.30% (1.30%) from year 0 to year +4. Contrary to an improved operating performance as implied by the signaling argument, our sample splitting firms show deterioration in their long-run profitability following the announcement of stock splits.

Using a regression analysis, we find no significant positive relation between the unexpected information revealed by splits and changes in operating performance in the four years following split announcements. Indeed, our results reveal that split signals are in general negatively related to changes in operating performance, albeit insignificant.

Consistent with the liquidity argument, we do find improved trading liquidity for splitting firms after splits. The turnover ratio of the splitting firms increases significantly following the split. In addition, we find a substantial decrease in Amihud's (2002) illiquidity ratio, indicating a smaller price impact of order flow after the split. The two liquidity measures suggest that liquidity improves following stock splits. Our results also show that the excess returns during a five-day announcement period cannot be explained by future operating performance, but can be explained by the change in liquidity and the split signal. However, the inclusion of post-split stock price in the regression analysis renders the relation between the split signal and the announcement period excess returns to become negative. These findings suggest that the positive market reaction to split announcements is more consistent with the trading range/liquidity hypothesis rather than with the signaling hypothesis.

The rest of the paper is organized as follows. Section 1 describes the data and presents some statistics of the sample splitting firms. In Section 2, we report operating performance for splitting and matched non-splitting firms. In Section 3, we report empirical results of the relation between split signals and operating performance of splitting firms. Section 4 concludes the paper.

1. Data and descriptive statistics

We employ the CRSP daily return file to identify all NYSE, AMEX, and NASDAQ firms that have stock splits. To be included in the sample, a firm has to meet the following criteria: (1) it announced a stock split during the time period 1963–1999; (2) stock prices, number of shares outstanding, and return data are available in the CRSP daily return file from one year prior to and five days around the announcement date; (3) the COMPUSTAT annual files contain information on the firm's operating income, net income, assets, and equity for all the nine years around the split announcement year (year −4 through year +4); and (4) no other corporate events like dividend payments, earnings announcements, and equity issues are announced during the five-day split

Table 2
Description of sample.

Panel A: By split ratio	
Split ratio	Number of splits
Three-for-one	115
Two-for-one	1147
Three-for-two	632
Four-for-three	43
Five-for-four	137
Other	74
Total	2148

Panel B: Market performance

	Mean	10%	25%	50%	75%	90%
RUNUP (%)	72.84	2.86	18.75	40.55	79.15	148.28
EHR (%)	3.55	−2.79	−0.28	2.34	5.97	10.97
CRSP (%)	0.27	−1.94	−0.82	0.35	1.36	2.34

This table describes the stock split sample used in the current study. To be included in the sample, a splitting firm needs to wait for five years before it can reenter the stock split sample. The sample period is 1963–1999. RUNUP is rate of return calculated using the price of a firm's stock five trading days prior to the split and the price one year before the split. EHR is the difference between the five-day announcement holding period (−2, −1, 0, 1, 2) return of a sample firm and that of the CRSP value-weighted index. CRSP is the five-day announcement holding period return for the CRSP value-weighted index.

announcement period (−2 to +2).[1] Following Loughran and Ritter (1997), in which they examine multiyear operating performance of firms that conduct seasoned equity offerings, we require a splitting firm to wait for five years before it can reenter the final sample to avoid dependence in overlapping data. The resulting sample consists of 2148 split announcements.

Table 2 reports the number of stock splits by split ratio. Similar to prior research, our results show that certain split ratios are more common than others. About 53% (1147 firms) of the sample have a 2-for-1 stock split ratio; another 29% are for a 3-for-2 split.[2]

Table 2 also reports the price run-up, the excess announcement holding period return,[3] and the corresponding announcement holding period return for the CRSP value-weighted index. The mean (median) price run-up (rate of return calculated using the stock price of a firm five trading days prior to the split and the price one year before the split) of 72.84% (40.55%) indicates that most firms announce a stock split when they experience a substantial increase in the stock price during the year prior to the announcement. All of our splitting firms have a positive yearly return prior to the announcement. Consistent with the literature, the market reacts to the split announcements favorably in our sample. The mean (median) market-adjusted holding period return during days −2 to +2 relative to the split announcement is 3.55% (2.34%). These positive announcement returns suggest that splits may contain some sort of information content in signaling, improved liquidity, or both. Nevertheless, about 27.7% of firms show a negative market reaction.

2. Operating performance surrounding stock splits

2.1. Levels of operating performance for splitting and matched non-splitting firms

If splits convey positive information to the market, then operating performance should improve in the years after split announcement. We measure return on assets (ROA) as net income (COMPUSTAT item 172) scaled by the book value of total assets (item 6).[4] In addition to ROA, we also examine return on sales (ROS) and return on equity (ROE) to check for the robustness of our results. The ROS is equal to operating income (item 13) scaled by sales (item 12). The ROE is equal to net income (item 172) scaled by the book value of equity (item 60).

Panel A of Table 3 reports the operating performance of splitting firms for years −4 through +4, where year 0 is the stock split announcement year. The results show that the mean return on assets increases consistently over the preceding four years, peaks at the split announcement year, and then declines monotonically over the four years following the announcement. Specifically, the mean (median) return on assets increases from 6.27% (6.17%) in year −4 to 7.66% (7.05%) in year −1. In year 0, the mean (median) return on assets is 8.19% (7.68%). The mean (median) then falls to 7.31% (7.12%) in year +1, 6.47% (6.50%) in year +2, 5.20% (5.87%) in year +3, and 4.90% (5.55%) in year +4. Similar patterns are also observed in the ROS and the ROE. This pattern of operating performance is consistent with Lakonishok and Lev (1987), in which they document that splitting firms' earning growth rates

[1] The results, however, remain qualitatively the same if the sample includes these events.
[2] Because we impose a five-year window for a splitting firm to reenter the sample, the reported number of splits certainly does not reflect the actual number of splits.
[3] Excess holding period return is computed as the difference between the five-day announcement period (−2, −1, 0, +1, +2) return of a sample firm and that of the CRSP value-weighted market index.
[4] We also calculate ROA as operating income before depreciation (item 13) scaled by total assets. This earnings measure has the advantage of not being affected by factors such as unusual items, interest payments, and income taxes when compared to other measures of earnings such as net income. Nevertheless, the results are qualitatively the same.

Table 3
Measures of operating performance for the stock splitting firms and matching non-splitting firms, 1963–1999.

Year	ROA		ROS		ROE	
	Mean	Median	Mean	Median	Mean	Median
Panel A: Splitting firms						
−4	6.27	6.17	16.27	13.86	12.64	13.91
−3	6.29	6.14	16.22	13.72	12.86	13.86
−2	6.65	6.38	16.83	14.11	13.52	14.19
−1	7.66	7.05	17.86	15.05	15.79	15.20
0	8.19	7.68	18.78	16.14	16.55	16.23
+1	7.31	7.12	18.05	16.03	14.49	15.40
+2	6.47	6.50	17.58	15.30	12.99	14.42
+3	5.20	5.87	17.03	14.76	9.83	13.52
+4	4.90	5.55	16.68	14.43	10.08	13.25
Panel B: Matching non-splitting firms						
−4	3.09	5.16	12.79	12.91	3.02	13.07
−3	3.97	5.44	14.12	13.28	5.13	13.39
−2	5.04	5.79	16.14	13.80	9.90	13.66
−1	7.13	6.66	17.62	14.46	14.58	14.91
0	5.96	5.98	16.71	13.86	12.78	14.03
+1	4.54	5.42	15.51	13.27	9.85	13.20
+2	3.94	5.04	15.13	13.03	9.30	12.25
+3	3.24	4.80	14.50	12.83	5.86	12.02
+4	2.32	4.63	13.78	12.60	7.91	11.41
Panel C: Difference between split firms and non-split firms						
−4	3.08***	1.32***	2.90***	1.54***	9.18***	1.36***
−3	2.37***	1.00***	1.68***	0.89***	7.74***	1.07***
−2	1.56***	0.67***	0.73*	0.69**	3.55***	0.94***
−1	0.37*	0.40**	0.25	0.93*	0.90*	0.59*
0	2.16***	1.39***	1.97***	2.14***	3.60***	2.54***
+1	2.73***	1.70***	2.40***	2.33***	4.18***	2.50***
+2	2.29***	1.50***	2.26***	2.26***	3.11***	2.22***
+3	1.83***	1.24***	2.18***	2.33***	3.46***	1.86***
+4	2.44***	1.00***	2.47***	2.03***	1.79	2.21***

This table reports measures of operating performance for the 2148 firms that announce stock split over the period 1963 to 1999 and their paired matching firms. The ROA (return on assets) is equal to net income (Compustat item 172) scaled by the book value of total assets (item 6). The ROS (return on sales) is equal to operating income (item 13) scaled by sales (item 12). The ROE (return on equity) is equal to net income (item 172) scaled by the book value of equity (item 60). Matching non-split firms are chosen based on industry classification, the market-to-book ratio in year −1, and ROA in year −1. Panel C reports mean and median differences between the sample split firms and their matching peers. The means and medians are calculated using observations that have been Winsorized at the first and the 99th percentiles. Significance levels are based on a *t*-test for the means and the Wilcoxon signed-rank test for the medians. ***, **, and * denote significant at the 1%, 5%, and 10% levels, respectively. All the numbers are in percentage.

decline in the three years following the announcement. This result implies that splits contain little information about improved *long-term* future operating performance. In addition, the declining trend in operating performance is inconsistent with Asquith et al.'s (1989) argument that managers may not use stock splits to signal abnormal growth in future earnings, but rather as a means to convey that pre-split earnings growth is permanent, not transitory.

This result may also indicate that the management of most sample firms undertakes splits based on current and recent past performance information and tends to be too optimistic about the firm's *long-term* future profitability. The behavioral finance literature suggests that managers tend to be optimistic in their assessment of future firm performance. This upward bias can be attributed to (i) managers believing that they have a great deal of control over their firm's performance and (ii) managers being highly committed to their firm's performance because their wealth, professional reputation, and employability depend on it (see Heaton, 2002). Prior studies find that managerial optimism on future performance could cause the winner's curse in corporate takeovers (Roll, 1986), increase in dividend payments (DeAngelo et al., 1996), overvaluation of investment projects (Heaton, 2002), and higher financial leverage (Hackbarth, 2004).

To evaluate whether or not splitting firms' operating performance is abnormal, we follow Barber and Lyon (1996) and Lie (2001), and estimate expected operating performance based on a matching firm that is selected on the basis of industry, market-to-book ratio, and past operating performance. Specifically, we select matching firms that do not split their stock over a five-year period using the following procedures: (1) firms that have the same two-digit SIC code as the sample firm; (2) the market-to-book (M/B) ratio is within ±20% of the sample firm's market-to-book ratio in year −1; and (3) the return on assets (ROA) is within ±20% of the sample firm's ROA in year −1.[5] From the firms that meet these characteristics, we choose the firm that has ROA closest to that of the sample firm. If we cannot find any firms that meet the criteria, we repeat the procedure first with the same one-digit

[5] Lie (2001) investigates five methods for generating control firms. Clearly, which method is more appropriate is an empirical issue. Since we do not know which method is better *a priori*, we tried all five methods and choose the one that gives us insignificant median absolute differences in ROA, change in ROA, and M/B between sample firms and control firms. See Lie for the detail of the five methods.

Table 4
Changes in operating performance, 1963–1999.

Year	ROA		ROS		ROE	
	Mean	Median	Mean	Median	Mean	Median
Panel A: Unadjusted changes						
−4 to −3	−0.07	0.02	−0.04	0.09	−0.02	−0.01
−3 to −2	0.32***	0.12***	0.54***	0.24***	0.24	0.19**
−2 to −1	0.92***	0.36***	0.96***	0.57***	2.13***	0.69***
−1 to 0	0.57***	0.39***	0.85***	0.59***	0.73***	0.60***
0 to +1	−0.90***	−0.08***	−0.58***	0.06*	−2.16***	−0.34***
+1 to +2	−0.94***	−0.24***	−0.63***	−0.08***	−1.64***	−0.66***
+2 to +3	−1.20***	−0.27***	−0.45***	−0.07***	−3.77***	−0.62***
+3 to +4	−0.34**	−0.09***	−0.45***	−0.02***	−0.34	−0.36***
−4 to 0	1.96***	0.76***	2.43***	1.54***	3.85***	1.85***
0 to +4	−3.30***	−1.30***	−2.14***	−0.87***	−6.28***	−2.70***
Panel B: Matching performance-adjusted changes						
−4 to −3	−0.78**	0.09	−1.74***	−0.22***	−0.02	0.22
−3 to −2	−0.82***	0.06	−1.70***	0.01*	−3.85**	0.19
−2 to −1	−1.06***	−0.03	−0.54***	0.03	−1.82*	0.11
−1 to 0	1.78***	0.60***	1.79***	0.86***	2.25***	1.29***
0 to +1	0.54**	0.22**	0.55***	0.21**	0.35	0.16
+1 to +2	−0.53**	−0.06	−0.27	−0.14	0.03	−0.23
+2 to +3	−0.33	−0.18	−0.20	−0.17	−0.32	−0.34
+3 to +4	0.48	−0.05	0.26	0.07	−0.07	−0.05
−4 to 0	−0.71**	0.54***	−2.19***	0.67***	−5.57***	0.89
0 to +4	0.12	−0.21	0.59	0.01	−2.62	−0.58*

This table reports the mean and median changes in three measures of operating performance for the 2148 firms that announce stock split over the period 1963 to 1999 and their paired matching firms. The ROA (return on assets) is equal to net income (Compustat item 172) scaled by the book value of total assets (item 6). The ROS (return on sales) is equal to operating income (item 13) scaled by sales (item 12). The ROE (return on equity) is equal to net income (item 172) scaled by the book value of equity (item 60). The matching performance-adjusted change is equal to unadjusted change minus the change in performance of a matching non-split firm. Matching non-split firms are chosen based on industry classification, the market-to-book ratio in year −1, and ROA in year −1. The means and medians are calculated using observations that have been Winsorized at the first and the 99th percentiles. Significance levels are based on a *t*-test for the means and the Wilcoxon signed-rank test for the medians. ***, **, and * denote significant at the 1%, 5%, and 10% levels, respectively. All the numbers are in percentage.

SIC code as the sample firm, and then for all firms without the use of industry classification. Just like sample firms, we also require the COMPUSTAT annual files to contain information on the matching firm's operating income, net income, assets, and equity for all the nine years around the split announcement year (year −4 through year +4).[6]

The operating performances of the matched non-splitting firms are reported in Panel B of Table 3. The result shows that the matching firms have similar trends in all three operating performance measures as the sample firms, except that these operating performances peak at the year prior to the announcement rather that the split year.

In Panel C, we report the mean and median difference of the three operating performance measures between the sample and matching firms. We test statistical significance of the mean and median difference using a *t*-statistic and a Wilcoxon matched-pair signed-rank *z*-statistic, respectively. Compared to their matched non-splitting firms, the splitting firms show a significantly better operating performance for the nine-year period. This better performance appears to be more pronounced in the post-split period, suggesting that splits may contain information on improved future profitability.

2.2. Changes in operating performance for splitting and matched non-splitting firms

In a study that analyzes how to detect abnormal operating performance, Barber and Lyon (1996) find that test statistics using changes in operating performance are more powerful than those using levels.[7] We therefore also conduct the analysis on changes in operating performance. Table 4, Panel A reports changes in operating performance of the splitting firms. Although all three operating performance measures continue to increase during the three years until the end of the announcement year, they show a significant decline in each of the four years following the announcement. For instance, over the four-year pre-split period, the return on assets shows a mean (median) increase of 1.96% (0.76%). In contrast to the pre-split period, the mean (median) return on

[6] The matching firms show a mean ROA (operating income before depreciation scaled by total assets) of 17.35% in year −1, which is insignificantly different from 17.54% for the splitting sample firms.

[7] To detect abnormal operating performance in event studies, researchers usually use a peer group as the benchmark for comparison. Some studies use the level of operating performance from the peer group to measure the expected operating performance. Barber and Lyon (1996) point out that using the level of operating performance has a drawback of ignoring the past performance of a firm relative to its peers. For instance, consider a firm that has yielded a much higher ROA than the benchmark because of some highly profitable projects. If these projects continue to yield above-average profits after an event (e.g., stock split), then this firm would appear to have a better operating performance due to the event. Thus, inferences on abnormal operating performance should be based on the change in operating performance that incorporates a firm's pre-event performance relative to its peers.

assets declines significantly by 3.30% (1.30%) over the four-year period following the announcement. Similar results are also observed in the ROS and the ROE. This finding indicates that splits signal the past rather than the future. In other words, after several years of experiencing good operating performance, the management of a firm tends to become too optimistic and splits its stock to try to convey the continued good performance in the future, if the signaling theory holds.

Table 4, Panel B reports changes in operating performance of the splitting firms relative to the matched non-splitting firms. The sample firms significantly outperform the matching firms for only two years, including the year right before the announcement (year −1 to year 0) and the announcement year. After the split announcement, the sample firms underperform their peers in year +1. The finding that the splitting firms have the largest excess performance relative to the control firms in the year prior to the split again suggests managerial overconfidence. Over the four-year pre-split period, the splitting firms significantly underperform their peers while the splitting firms do not significantly under- or outperform their peers over the four-year post-split period.

2.3. Changes in liquidity for splitting and matched non-splitting firms

Rather than signaling, another view of splits is that they improve trading liquidity of a firm's stock. As Baker and Powell's (1992) survey research documents, the primary motive for firms to split their stocks is to move the stock price to an optimal trading range, leading to improved liquidity. Thus, one plausible explanation for the positive market reaction to stock split announcements is the increased market liquidity when firms split their shares.

The finance literature suggests a strong relation between stock split and market liquidity. Anshuman and Kalay (2002) present a theoretical model that shows firms split their stocks to create liquidity. Their model implies that because of price discreteness related commissions, liquidity traders will time their trades based on stock price levels. Specifically, liquidity traders may defer their trades until stock prices drop to lower base levels in order to save transaction costs. To enhance liquidity, a firm can reset the stock price to an optimal level by splitting its stock. Empirically, a number of studies (e.g., Murray, 1985; Muscarella and Vetsuypens, 1996; Desai et al., 1998) find that trading activity increases after stock splits. Moreover, Mukherji et al. (1997) find that abnormal split announcement returns are positively related to changes in the number of shareholders.

To assess the change in liquidity upon stock splits, we calculate a turnover ratio and an illiquidity measure. Prior studies have used the turnover ratio as a proxy for liquidity because turnover is negatively correlated with the bid-ask spread. The turnover ratio is calculated as the average of the daily ratio of trading volume (in shares) to shares outstanding. Following Amihud (2002), the illiquidity measure is calculated as:

$$ILLIQ = \frac{1}{N}\sum \frac{|R_d|}{VOLD_d}, \tag{1}$$

where N is the number of days for which data are available (i.e., trading volume is not zero), $|R_d|$ is the absolute return on day d, and $VOLD_d$ is dollar trading volume on day d. As Amihud points out, ILLIQ measures how daily stock price reacts to a dollar of trading volume and hence is closely related to Kyle's (1985) concept of illiquidity, defined as the price impact of order flow. Amihud also shows that ILLIQ is strongly positively correlated with illiquidity measures that are calculated from microstructure data. For an economy that values liquidity, short-term abnormal returns could be due to the improved liquidity upon stock splits. Dhar et al. (2003) find that individual investors, compared to professional investors, trade more after splits and make up a much larger fraction of the investor base. They also find an increase in the number of shares traded and a decrease in trade size after splits, implying improved liquidity.

Table 5 presents the two liquidity measures for the 250 trading-day period preceding the split announcements and 250 days following the ex-dates. The mean (median) turnover ratio increases from 0.361% (0.222%) in the pre-split period to 0.371% (0.224%) in the post-split period. The mean increase in the turnover ratio is highly significant. However, the median turnover ratio does not show any evidence of improved liquidity. The illiquidity measure also suggests an improved liquidity after the split. The mean (median) illiquidity measure declines from 0.465×10^{-6} (0.051×10^{-6}) before the split to 0.417×10^{-6} (0.036×10^{-6}) after the split, which is consistent with Dhar et al. (2003). Both the mean and median changes in illiquidity are

Table 5
Changes in liquidity.

Liquidity measures		Pre-split period	Post-split period	Change
Turnover ratio (%)	Mean	0.361	0.371	0.010**
	Median	0.222	0.224	−0.004
Illiquidity ($\times10^{-6}$)	Mean	0.465	0.417	−0.044**
	Median	0.051	0.036	−0.001***

This table reports two liquidity measures for the 2148 firms that announced stock split over the period 1963 to 1999. Pre-split measures are estimated over the 250 trading-day period preceding the split announcements, while post-split measures are estimated over the 250 days following the ex-dates. Turnover ratio is the average of the daily ratio of stock trading volume (in shares) to the shares outstanding. Illiquidity is the average of the ratio of a stock's daily absolute return to its dollar trading volume. The means and medians are calculated using observations that have been Winsorized at the first and the 99th percentiles. The significance levels are for testing a zero mean and median using a t-test and the Wilcoxon signed-rank test, respectively. *** and ** denote significant at the 1% and 5% levels, respectively.

significant. These two liquidity measures, especially the illiquidity measure, suggest that liquidity has improved following stock splits.

3. Split signals, changes in operating performance and liquidity, and excess returns

3.1. Split signals and changes in operating performance

In the previous section, we examine whether splits contain information content using the matching sample approach. The results from the matching sample approach, however, could be matched-sample specific. In this sub-section, we reexamine the signaling effect using the regression analysis. Unlike the matching sample approach, the regression analysis enables us to explicitly model the behavior of future operating performance by using several control variables. We regress future profitability of a splitting firm on a variable that is used as a proxy for the signal of management's split decision and various control variables for the nonlinearities in operating performance. If the signaling hypothesis holds, the split signal will be positively related to future operating performance and will add some explanatory power to predicting future profitability.

According to the signaling hypothesis, managers use stock splits to reveal favorable private information about the firm's future profitability. To extract management's private information about the firm's performance contained in splits, we specify a group of factors that may affect the split decision. Following McNichols and Dravid (1990) and Nayak and Prabhala (2001), the following probit regression model is used:

$$SPL_i = \alpha_0 + \alpha_1 PR\_PRICE_i + \alpha_2 RUNUP_i + \alpha_3 MV_i + \psi_i, \tag{2}$$

where SPL_i is a latent variable that is 1.0 for the splitting firms and zero for the matched non-splitting firms, PR_PRICE_i is firm i's share price five trading days before the split, $RUNUP_i$ is the price run-up as reported in Table 2, MV_i is the natural logarithm of the market value of the firm five trading days prior to the split, and ψ_i is the regression residual. The variable PR_PRICE is included because firms with higher share prices are more likely to split. Similarly, we include the variable RUNUP to capture the observation that splits are usually made by firms with large price increases. We include the market value of firm (MV) as a control variable, since larger firms might prefer to maintain higher share prices or the problem of information asymmetry is less severe for larger firms.

Eq. (2) is estimated as an independent probit model to determine the decision to split using the information from the splitting firms and the matched non-splitting firms. The estimated probit regression model is

$$SPL_i = \underset{(15.8)}{0.631} + \underset{(389.6)}{0.018}\, PR\_PRICE_i + \underset{(15.7)}{0.034}\, RUNUP_i - \underset{(54.0)}{0.103}\, MV_i,$$

where numbers in parentheses are chi-squared tests of significance of the associated coefficients. The coefficient for PR_PRICE is positive and highly significant, suggesting that splitting firms tend to have a high stock price. The coefficient for RUNUP is positive and highly significant, indicating that firms split their shares when they have performed well in the market. Consistent with McNichols and Dravid (1990) and Nayak and Prabhala (2001), the coefficient for the market size variable is negative, implying that small firms are more likely to split than do large firms.

As Nayak and Prabhala (2001) point out, under the assumption that ψ_i is standard normal, a firm's decision to split can be described as a standard probit model as Eq. (2). Using the probit estimates from Eq. (2), we then calculate the inverse Mills ratio for splitting firms that can be seen as a splitter's private information not known to the market when a split is made, and use it as a proxy for the signal of management's favorable private information.[8] If the signaling hypothesis holds, the split signal should be positively related to changes in future profitability.

In testing whether splits convey positive operating performance, we examine regressions relating the future changes in return on assets and in return on equity on management's private information, measured by the inverse Mills ratio, and various control variables. Following Fama and French (2000), we use a nonlinear partial-adjustment model to control for both the nonlinear mean reversion in profitability and the nonlinearity in the autocorrelation of changes in profitability. The regression model is the following:[9]

$$\begin{aligned} \Delta OP_t = {} & a_0 + a_1 \mathrm{MILLS}_0 + (b_1 + b_2 \mathrm{NDOPD}_0 + b_3 \mathrm{NDOPD}_0 \times \mathrm{DOP}_0 + b_4 \mathrm{PDOPD}_0 \times \mathrm{DOP}_0) \times \mathrm{DOP}_0 \\ & + (c_1 + c_2 \mathrm{N}\Delta OPD_0 + c_3 N\Delta OPD_0 \times \Delta OP_0 + c_4 P\Delta OPD_0 \times \Delta OP_0) \times \Delta OP_0 + e_t, \end{aligned} \tag{3}$$

[8] The inverse Mills ratio is the ratio of the standard normal probability density function over the standard normal cumulative density function using the predicted values from the probit Eq. (2). The inverse Mills ratio calculated in this way is to approximate the probability that the explanatory variables fail to predict the stock split decision (i.e., the failure rate) and is used to proxy for management's private information.

[9] Unlike Fama and French (2000) in which they examine changes in profitability over time, our cross-sectional nonlinear partial adjustment regression uses ΔROA in year 0, rather than ΔROA in year $t-1$, as a control variable. We use this specification because our purpose here is to check whether split announcements contain information about future profitability. Clearly, ROA in future years is unknown in year 0 when the split is announced. Thus, using ΔROA_{t-1} as a control variable in the specification suffers from a look-ahead bias when $t \geq 2$. A similar model is used in Grullon and Michaely (2004) for testing the information content of share repurchase programs and in Grullon et al. (2005) for testing the relation between dividend changes and changes in future profitability.

for $t=1$, 2, 3, and 4, where ΔOP_t is the change in operating performance (ROA or ROE) in year t. $MILLS_0$ is the inverse Mills ratio that is used to proxy for unexpected information revealed by a split decision. DOP_0 is the operating performance in year 0 minus the expected value of operating performance in year 0. The expected value of operating performance is the fitted value from the cross-sectional regression of operating performance in year 0 on the natural log of total assets in 2000 dollars in year −1, the ratio of dividends to the book value of equity in year −1, a dummy variable that is 1.0 when dividends are zero in year −1 and zero otherwise, the market-to-book ratio in year −1, and the operating performance in year −1. $NDOPD_0$ is a dummy variable that is 1.0 if DOP_0 is negative, and zero otherwise. $PDOPD_0$ is a dummy variable that is 1.0 if DOP_0 is positive, and zero otherwise. ΔOP_0 is the change in operating performance in year 0. $N\Delta OPD_0$ is a dummy variable that is 1.0 if ΔOP_0 is negative, and zero otherwise. $P\Delta OPD_0$ is a dummy variable that is 1.0 if ΔOP_0 is positive, and zero otherwise. The coefficient b_1 measures the mean reversion in operating performance. The coefficients b_2, b_3, and b_4 are to measure the nonlinear mean reversion in operating performance, meaning that the reversals are stronger for large changes of either sign. The coefficient c_1 measures the autocorrelation of changes in operating performance. The coefficients c_2, c_3, and c_4 measure the nonlinearity in the autocorrelation of changes in operating performance.

Since the inverse Mills ratio is a calculated variable, an errors-in-variables problem will arise in the estimation of Eq. (3) and hence the standard errors are inconsistent. We estimate consistent standard errors using Heckman's (1979) two-stage method that was generalized by Greene (1981). Table 6, Panel A reports the regression results of Eq. (3) using ROA to measure operating performance. The signaling hypothesis expects that the coefficient of interest, a_1, to be positive and significant. As can be seen, almost all the split signal coefficients, a_1, are negative, which is inconsistent with the signaling hypothesis. This finding suggests that the expected information revealed by stock split announcements does not contain favorable information content about future operating performance.

The results also suggest that the change in the return on assets reverses from one year to the next (the regression coefficient, b_1, on the return on assets in year 0, $DROA_0$, is −0.166 for $t=1$). Similar to Fama and French (2000), we find evidence of mean reversion in return on assets and a strong mean reversion when the return on assets in year 0 is below its expected value. The mean reversion appears to be somewhat nonlinear in that mean reversion is stronger when the deviations from its mean are more extreme, especially for negative extreme deviations. There is also evidence that the change in return on assets tends to reverse after year +1 (c_1 is negative and significant). Moreover, this reversal is stronger for more extreme changes (both estimates of c_3 and c_4 are highly significant).

Table 6
Split signals and changes in operating performance.

Year	a_0	a_1	b_1	b_2	b_3	b_4	c_1	c_2	c_3	c_4	Adjusted R^2
Panel A											
$\Delta ROA_t = a_0 + a_1 MILLS_0 + (b_1 + b_2 NDROAD_0 + b_3 NDROAD_0 \times DROA_0 + b_4 PDROAD_0 \times DROA_0) \times DROA_0 + (c_1 + c_2 N\Delta ROAD_0 + c_3 N\Delta ROAD_0 \times \Delta ROA_{-0} + c_4 P\Delta ROAD_0 \times \Delta ROA_0) \times \Delta ROA_0 + e_t$											
$t=1$	−0.001	0.002	−0.166***	1.383***	4.610***	8.824***	0.672***	−0.736**	−2.556**	−7.756***	18.01%
	(−0.169)	(0.155)	(−4.980)	(3.316)	(4.249)	(8.117)	(3.187)	(−2.020)	(−2.435)	(−10.466)	
$t=2$	−0.003	−0.016	1.179***	−2.644***	−3.102**	−8.935***	−1.184***	2.221***	−0.045	7.536***	6.28%
	(−0.282)	(−1.340)	(4.239)	(−5.377)	(−2.407)	(−6.912)	(−4.721)	(5.129)	(−0.036)	(8.551)	
$t=3$	0.002	−0.006	0.525*	1.150**	4.214***	3.378**	−1.126***	0.438	1.311	−0.851	5.56%
	(0.252)	(−0.442)	(1.810)	(2.226)	(3.136)	(2.508)	(−4.308)	(0.970)	(1.008)	(−0.927)	
$t=4$	0.004	−0.023	0.841**	−1.234**	0.993	−1.892	−0.743**	0.460	−4.046***	1.484	0.73%
	(0.409)	(−1.630)	(2.561)	(−2.109)	(0.653)	(−1.239)	(−2.510)	(0.900)	(−2.749)	(1.426)	
Panel B											
$\Delta ROE_t = a_0 + a_1 MILLS_0 + (b_1 + b_2 NDROED_0 + b_3 NDROED_0 \times DROE_0 + b_4 PDROED_0 \times DROE_0) \times DROE_0 + (c_1 + c_2 N\Delta ROED_0 + c_3 N\Delta ROED_0 \times \Delta ROE_{-0} + c_4 P\Delta ROED_0 \times \Delta ROE_0) \times \Delta ROE_0 + e_t$											
$t=1$	−0.240	0.126	5.004***	−6.591**	−2.255	−0.858	0.860	−0.161	2.214	−1.985*	1.18%
	(−1.493)	(0.573)	(3.040)	(−2.510)	(−1.186)	(−0.502)	(0.667)	(−0.070)	(1.164)	(−1.813)	
$t=2$	0.167	−0.121	−6.797***	4.230	1.695	2.414	1.097	1.016	−1.666	−0.051	1.95%
	(1.003)	(−0.533)	(−3.995)	(1.558)	(0.862)	(1.367)	(0.824)	(0.428)	(−0.847)	(−0.045)	
$t=3$	−0.264	0.288	0.418	5.177	−8.998*	−0.513	−1.208	−0.288	9.840**	1.557	0.57%
	(−0.661)	(0.526)	(0.102)	(0.794)	(−1.905)	(−0.121)	(−0.377)	(−0.051)	(2.082)	(0.573)	
$t=4$	0.436	−0.666	−0.853	−8.201	7.273	−0.494	1.868	3.135	−8.149*	−0.597	0.87%
	(1.113)	(−1.242)	(−0.213)	(−1.285)	(1.573)	(−0.119)	(0.596)	(0.562)	(−1.762)	(−0.224)	

This table reports the regression coefficients from regressing operating performance on unexpected information revealed by split and various control variables. The ROA (return on assets) is equal to net income (Compustat item 172) scaled by the book value of total assets (item 6). The ROE (return on equity) is equal to net income (item 172) scaled by the book value of equity (item 60). $MILLS_0$ is the inverse Mills ratio that is used to proxy for unexpected information revealed by a split decision. The inverse Mills ratio is calculated from an independent probit model. DOP_0 is operating performance in year 0 minus the expected value of operating performance in year 0. The expected value of operating performance is the fitted value from the cross-sectional regression of operating performance in year 0 on the log of total assets in year −1, the dividends to the book value of equity in year −1, a dummy variable that is 1.0 when dividends are zero in year −1 and zero otherwise, the market-to-book ratio of equity over book value of equity in year −1, and the operating performance in year −1. Year 0 is the stock split announcement year. $NDOPD_0$ is a dummy variable that is 1.0 if DOP_0 is negative, and zero otherwise. $PDOPD_0$ is a dummy variable that is 1.0 if DOP_0 is positive, and zero otherwise. ΔOP_0 is the change in operating performance in year 0. $N\Delta OPD_0$ is a dummy variable that is 1.0 if ΔOP_0 is negative, and zero otherwise. $P\Delta OPD_0$ is a dummy variable that is 1.0 if ΔOP_0 is positive, and zero otherwise. Inside the parentheses are t-statistics computed by adjusting standard error using the Heckman (1979) method. ***, **, and * denote significant at the 1%, 5%, and 10% levels, respectively.

The results from using return on equity in the analysis are given in Table 6, Panel B. The results show that the split signal coefficient is positive but insignificant in years +1 and +3, and is negative and insignificant in years +2 and +4. Both panels show that there is no evidence that split signals are significantly positively related to changes in future profitability.[10]

3.2. Announcement period excess returns, changes in profitability and liquidity, and share price

Prior studies have linked excess returns surrounding the split announcement to management's optimism about the future. If the signaling hypothesis holds, the excess returns should be positively related to changes in profitability. Another explanation for the positive market reaction is that splits effectively reduce share price and improve trading liquidity. If firms intend to improve market liquidity when they split their shares and if liquidity is priced, we would expect that the short-term announcement effect can be explained (at least partially) by the improved trading liquidity. Specifically, if liquidity premium is a component of equity premium in asset pricing, then there should be a positive relation between stock return and market illiquidity. Thus, an improved liquidity (or lower illiquidity) following stock splits will raise the stock price and generate a positive market reaction due to the decrease in a firm's equity risk premium and its cost of capital. To examine these relations, we regress excess return surrounding the split announcements on changes in profitability, changes in trading liquidity, unexpected information revealed by split, and various control variables. The regression model is:

$$EHR_i = \beta_0 + \beta_1 \Delta OP_{-4\text{ to }-1} + \beta_2 \Delta OP_0 + \beta_3 \Delta OP_{0\text{ to }+4} + \beta_4 \Delta ILLIQ + \beta_5 MILLS_0 + \beta_6 M/B_{-1} + \beta_7 ASSET_{-1} + \varepsilon_i. \quad (4)$$

EHR is the difference between the five-day announcement holding period (−2, −1, 0, 1, 2) return and that of the CRSP value-weighted index from Table 2.[11] $\Delta OP_{-4\text{ to }-1}$ is the change in operating performance (either ROA or ROE) from year −4 to year −1. ΔOP_0 is the change in operating performance from year −1 to year 0. $\Delta OP_{0\text{ to }+4}$ is the change in operating performance from year 0 to year +4. We use the unadjusted change in ROA or in ROE to proxy for the change in operating performance.[12] A positive and significant coefficient for $\Delta OP_{0\text{ to }+4}$ would indicate that the announcement effect reflects improved future operating performance. ΔILLIQ is the change in illiquidity measure as reported in Table 5. The improved liquidity hypothesis suggests that the coefficient of ΔILLIQ should be positive. $MILLS_0$ is the inverse Mills ratio, which is calculated using parameters estimated from the probit model in Eq. (2), and is used to proxy for unexpected information revealed by a split decision. If the coefficient for $MILLS_0$ is positive and significant, then splits convey additional positive information content than improved profitability and liquidity. M/B_{-1} is the market-to-book ratio of equity in year −1. $ASSET_{-1}$ is the natural logarithm of total assets in 2000 dollars in year −1. The market-to-book ratio and asset size are included as additional variables to control for possible information asymmetry.

The results reported in Table 7 (column 1) show that the market reaction is positively related to prior and current changes in return on assets but is not related to the future change in return on assets. This finding indicates that the announcement excess return can be explained by the current and recent past operating performances but not long-term future operating performance. This result, coupled with the findings reported above that splits do not signal improved operating performance (see Table 6), does not support the argument that firms undertake splits to signal their improved operating performance in the future. The estimated coefficient of ΔILLIQ is negative and highly significant, suggesting that lower illiquidity leads to higher stock returns. This finding is consistent with Amihud and Mendelson (1986) in which they show that a decrease in liquidity leads to a decrease in the equity value of a firm because investors require compensation for illiquidity costs. Thus, the positive market reaction seems to be more consistent with the improved liquidity hypothesis. That is, the management of splitting firms may not intend to use stock splits as a signal. Instead, they may split shares to draw attention (Grinblatt et al. (1984)) or to enlarge the ownership base (e.g., Amihud and Mendelson, 1986; Powell and Baker, 1993/1994; Anshuman and Kalay, 2002) resulting in improved trading liquidity. Our finding of a positive relation between the announcement effect and liquidity is consistent with prior studies (e.g., Mukherji et al., 1997; Amihud et al., 1999) that report a positive relation between the announcement abnormal return and the broadening of investor base. Nevertheless, the positive and significant coefficient of the split signal,[13] $MILLS_0$, implies that a large portion of the announcement effect cannot be explained by the improved liquidity. We also find a stronger relation between the market reaction and the liquidity measure for firms with larger market-to-book value.

The positive and significant coefficient of $MILLS_0$ indicates that managers use stock splits to signal favorable private information on their firms' future prospect. However, it is unclear what type of information is being conveyed in the split signal beyond improved trading liquidity. In fact, prior survey studies (see, for example, Baker and Gallagher, 1980; Baker and Powell, 1992) cite that realigning share prices to lower trading ranges is the main reason for corporations to conduct a stock split. The specifications in Eq. (4), however, do not enable us to assess the possibility that the realignment of share price explains part of the market

[10] We also examine whether splits convey improvement in operating performance using matching adjusted changes in operating performance (both ROA and ROE). The results are qualitatively the same.

[11] We also perform the regression analysis using the cumulative abnormal return of the splitter's stock return over the CRSP value-weighted index over the five-day announcement period, as the dependent variable. The results are similar and hence are not reported.

[12] To check for robustness, we also use three different operating performance measures. The first operating performance measure is to compare the performance to year −1 rather than to year 0. The second operating performance measure is the matching performance-adjusted ΔOP, which is equal to the change in operating performance (ROA or ROE) of a splitting firm minus the change in operating performance of a matching firm. The third measure is the excess operating performance (ROA or ROE) of a split firm vs. the matched non-split firm in years +1 to +4, compared to the same excess operating performance in years −4 to −1. The results from all three operating performance measures are qualitatively the same.

[13] Nayak and Prabhala (2001) find that the split signal, measured by the inverse Mills ratio, is positively related to the split announcement return. Consistent with their results, we find that the coefficient on the inverse Mills ratio is positive and highly significant if the inverse Mills ratio is the only explanatory variable.

Table 7
Excess returns, changes in profitability and liquidity, split signals, and post-split share price.

	OP = ROA		OP = ROE	
	w/o PO_PRICE	w/PO_PRICE	w/o PO_PRICE	w/PO_PRICE
Intercept	−0.001	0.070***	0.001	0.074***
	(−0.059)	(6.252)	(0.049)	(6.615)
$\Delta OP_{-4\ to\ -1}$	0.101***	0.090***	0.034***	0.030***
	(3.655)	(3.306)	(3.025)	(2.712)
ΔOP_0	0.116***	0.103***	0.028	0.023
	(2.902)	(2.610)	(1.544)	(1.305)
$\Delta OP_{0\ to\ +4}$	−0.026	−0.013	0.007	0.011
	(−1.246)	(−0.621)	(0.838)	(1.384)
ΔILLIQ	−0.126***	−0.122***	−0.134***	−0.128***
	(−2.972)	(−2.870)	(−3.148)	(−3.022)
$MILLS_0$	0.043***	−0.016	0.045***	−0.017
	(5.371)	(−1.406)	(5.510)	(−1.562)
M/B_{-1}	0.002***	0.002***	0.002***	0.002***
	(2.949)	(3.978)	(3.329)	(4.355)
$ASSET_{-1}$ ($\times 10^{-5}$)	−0.026**	−0.005	−0.030**	−0.007
	(−1.995)	(−0.383)	(−2.292)	(−0.570)
PO_PRICE		−0.001***		−0.001***
		(−7.387)		(−7.752)
Adjusted R^2	3.67%	6.05%	2.99%	5.64%

This table reports the regression coefficients from regressing EHR (excess holding period return) on the change in operating performance, the change in a liquidity measure, unexpected information revealed by split, post-split share price, and various control variables. The regression model is

$$EHR_i = \beta_0 + \beta_1 \Delta OP_{-4\ to\ -1} + \beta_2 \Delta OP_0 + \beta_3 \Delta OP_{0\ to\ +4} + \beta_4 \Delta ILLIQ + \beta_5 MILLS_0 + \beta_6 M/B_{-1} + \beta_7 ASSET_{-1} + \beta_8 PO\_PRICE + \varepsilon_i.$$

EHR is the difference between the five-day announcement holding period (−2, −1, 0, 1, 2) return and that of the CRSP value-weighted index. $\Delta OP_{-4\ to\ -1}$ is the change in operating performance from year −4 to year −1. ΔOP_0 is the change in operating performance from year −1 to year 0. $\Delta OP_{0\ to\ +4}$ is the change in operating performance from year 0 to year +4. ΔILLIQ is the change in illiquidity after stock split. $MILLS_0$ is the inverse Mills ratio that is used to proxy for unexpected information revealed by a split decision. The inverse mills ratio is calculated using parameters estimated from a probit model that regresses a latent variable for a split decision on price run-up (calculated as the ratio of stock price in day −5 to price in day −250), stock price in day −5, and the natural logarithm of the market value of equity in day −5. M/B_{-1} is the market-to-book ratio of equity in year −1. $ASSET_{-1}$ is the natural logarithm of total assets in 2000 dollars in year −1. PO_PRICE is share price after the split and is calculated as share price five trading days before the split divided by (one plus the split factor). Year 0 is the stock split announcement year. Changes in operating performance have been Winsorized at the first and the 99th percentiles. Inside the parentheses are *t*-statistics computed by adjusting standard error using the Heckman (1979) method. *** and ** denote significant at the 1% and 5% levels, respectively.

reaction. In addition, Brennan and Hughes (1991) suggest that the split ratio itself is an informative signal, especially for splits that result in low post-split share prices. To examine this, we re-estimate Eq. (4) by adding post-split price, PO_PRICE, as an additional variable. PO_PRICE is share price after the split and is calculated as share price five trading days before the split divided by (one plus the split factor). If the primary motivation behind a split is to return the share price to a lower range, we should observe a negative coefficient for PO_PRICE, meaning that the market reacts more positively to lower price after the split.

As expected, the split announcement is negatively related to the post-split stock price (column 2, Table 7). More importantly, the coefficient of $MILLS_0$ transforms from a significant and positive number to an insignificant and negative number while other coefficients remain qualitatively the same when compared to those in column 1.[14] This finding suggests that the positive market reaction is due to the realignment of share prices and the improved liquidity, which is consistent with prior survey results (Baker and Gallagher, 1980; Baker and Powell, 1992) and with the main conclusion of Lakonishok and Lev (1987).

It can be argued that the return on equity is a major engine that drives the equity value. Consequently, we redo the regression analysis using the change in ROE as a measure of operating performance. The results are shown in columns 3 and 4 in Table 7. Most of the results from using ROE are qualitatively the same as those from using ROA. That is, the positive announcement effect can be explained by lower share price after the split and improved trading liquidity. Also, the positive announcement effect cannot be explained by the change in future ROE.

4. Conclusions

In this study, we examine whether firms split their shares to signal improved future profitability to the market, to adjust share prices to a desired trading range, or to improve trading liquidity. Using a sample of 2148 stock splits over the 1963–1999 period, we find that the split announcement year has the highest operating performance and the operating performance declines substantially over the subsequent four years. However, we do not find evidence that the splitting firms outperform their matching peers in changes in operating performance following the split announcement. Moreover, our regression analysis shows a negative relation between split signals and post-split operating performance regardless of whether future operating performance is measured by return on assets or by return on equity.

[14] PO_PRICE is negatively correlated with the inverse Mills ratio with a correlation coefficient of −0.73.

Our results show improved market liquidity following stock splits. This improved liquidity also significantly explains the stock split announcement effect. While the split signal can also explain the announcement effect, we find that the alignment of share prices to lower price ranges not only significantly explains the announcement effect, but renders the significant explanatory power of the split signals to become insignificant and, more importantly, reverse the sign of the coefficient estimate. Post-split operating performance cannot explain the announcement effect. Overall, our results show little evidence that stock splits signal improvement in long-run operating performance. Instead, our results are more consistent with the trading range/liquidity hypothesis.

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