Effects of Reverse Stock Splits on Return Volatility and Market Maker Profitability

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Abstract

The motivation for reverse splits is investigated. Post-reverse split return volatility, trading activity, liquidity changes, and dealer incentive to promote stocks following reverse stock splits are also analyzed. The results indicate that reverse splits on NASDAQ may be a means to save a stock from being delisted. Additionally, a significant decline in return volatility following reverse splits is observed, and this decline is related to the decline in trading activity following reverse splits. NASDAQ market makers' revenues increase for medium and large trades.

Introduction

A reverse stock split, a phenomenon which decreases the number of shares outstanding and increases the share price proportionately, is normally associated with low priced stocks. However, in the past three years, some reputable firms, such as AT&T and Ericsson, have engaged in reverse splits. Reverse splits, like ordinary stock splits, are essentially aesthetic without real economic implications. However, stock splits frequently increase the average tick size as a proportion of the stock's price resulting in an increase in trading costs as measured by the proportional bid-ask spread, which, in turn, increases dealer incentives to promote the stock (Schultz, 2000). Reverse stock splits receive little attention in financial research, since their features are thought to simply be the opposite of those of ordinary stock splits. The contribution of this study is five-fold.

First, we investigate the motivation for reverse splits and find that reverse splits on NASDAQ may be used to avoid delisting. Our finding contradicts that of Han (1995). Han asserts that most reverse splits are not dictated by exchange requirements.

Second, we investigate post-reverse split return volatility. We find that the decline in return volatility following reverse stock splits is associated with a decline in the daily number of trades. Our finding may explain the puzzling anomaly in the behavior of stock prices following stock splits and reverse stock splits: the increase (decrease) in volatility of returns following stock splits (reverse stock splits).

Third, using daily trading volume as a proxy for liquidity, we find an increase in liquidity following reverse splits suggesting that there is an increase in the average trade size following reverse splits, since we also find a decrease in the daily number of trades.

The increase in liquidity following a reverse split is consistent with prior literature on stock splits, since Schultz (2000) finds a decrease in liquidity following stock splits.

Next, contrary to Han (1995), we find an increase in large trades; mostly sell orders, following reverse stock splits, indicating that large traders lack confidence in the future profitability of the firms undertaking reverse splits.

Finally, as in Schultz (2000) with stock splits, our results show an increase in trading costs, as measured by the percentage effective spread, but unlike Schultz, we find that trading costs increase only for medium and large sized trades on NASDAQ.

A reverse split is a reduction in a firm's number of shares outstanding with a proportionate increase in stock price. After a one-for-ten reverse split, each shareholder has one-tenth as many shares, and the firm's number of shares outstanding also decreases by a factor of 0.1(the reverse split factor). The value of the firm does not change since each share is worth ten times more. One benefit of reverse stock splits, however, is a reduction in the percentage spread (Han, 1995). A reduction in the proportional spread, a measure of trading costs, may reduce dealers' motivation to promote the stock. Investors, on the other hand, may favor reverse splits since the cost of liquidity is reduced. Several empirical studies present indirect evidence to support the assertion that a reduction in the percentage spread is a motivation for reverse splits (Demsetz, 1968; Schultz, 2000). Another motivation for reverse splits is to increase the price of the stocks to attract large traders. West and Brouilette (1970) assert that a firm chooses to reverse split in order to boost its image among prospective investors, to enhance its marketability, and to reduce trade execution costs. Hence, shareholders are expected to find reverse splits beneficial and the market is expected to respond favorably to this event. On the contrary, reverse splits signal negative firm performance and a lack of assurance in the firm's future profitability. Spudeck and Moyer (1985) claim that reverse splits seem to signal management's lack of confidence in the future performance of the firm. Wooldridge and Chambers (1983) further assert that, upon learning of an approaching reverse split, shareholders should sell their shares. Desai and Jain (1997) find negative abnormal returns following reverse stock splits.

One of the most baffling anomalies in stock price behavior is the significant increase in the variance of returns starting on the ex-date of stock splits (French and Foster, 2002). Furthermore, the variance increase continues for extended periods. Consistent with the stock split anomaly, we find a significant decrease in the variance of returns following reverse stock splits. There are a number of plausible explanations for this anomaly. According to Amihud and Mendelson (1987), two components of the market microstructure, bid-ask bounce and price discreteness, could cause measurement errors leading to a biased estimate of the return variance. Koski (1998) examines these components by controlling for bid-ask bounce using bid-to-bid prices to compute returns and for price discreteness using different price intervals. Her results show that post-split return volatility is not affected by bid-ask bounce or price discreteness. French and Foster (2002) also conclude that the increase in return volatility following stock splits cannot be explained by price discreteness. We investigate post-reverse split trading activity as a determinant of the post-reverse split return volatility change.

Our study investigates the motivation, post-reverse split return volatility, the effects on trading and the benefits to shareholders and market makers of a reverse-split stock.

Data and Methodology

Our sample consists of all reverse splits that occurred between May, 2001 and September, 2003. Reverse split dates are identified using split factors (factor to adjust prices) in CRSP. Stocks with split factors between 0 and 1 are reverse splits and the days that these values occur are assumed to be the ex-reverse split dates. A reverse split factor (RSF) is calculated as:

$$RSF = \frac{\text{Post - Split Shares Outstanding}}{\text{Pre - Split Shares Outstanding}} \tag{1}$$

All stocks with 90 days of return data before and after the reverse split are retained. A 90-day pre/post-reverse split window, as used by French and Foster (2002), is chosen because it is wide enough to identify transient changes that may occur around the ex-date and it also leaves a window large enough to draw inferences on post-reverse split return variance behavior for the entire sample. Intraday trade and quote data is obtained from the NYSE's Trade and Quote (TAQ) database. The resulting sample consists of 115 reverse splits. Table I depicts the sample characteristics. Panel A shows a cumulative frequency of the reverse splits for each factor range. Of the 115 sample reverse splits, 53 have an RSF greater than 0.2 and 46 have an RSF between 0.1 and 0.2. Panel B shows the mean prices of stocks before and after the reverse splits. Considering all the sample stocks, the pre-reverse split price is $1.15 and the post-reverse split price is $5.38. NASDAQ stocks have the lowest pre-reverse split prices with an average of $0.81. The mean post-reverse split price for the NASDAQ stocks is $4.56. Panel C depicts the percentage spread of the quotes. There is no significant difference between the mean pre-reverse split percentage spread and the mean post-split percentage spread for the entire sample. This insignificant difference contrasts with Han (1995), who documents a decrease in percentage spread following reverse splits. We find that NYSE/AMEX proportional spreads decrease as in Han, however NASDAQ proportional spreads show a significant increase.

Motivation for reverse splits

One may wonder why managers embark on reverse splits and why shareholders, who will apparently be hurt, approve them. Reverse stock splits generally occur in low priced stocks. Since these firms are likely to be dropped from the exchanges if their stock prices fall below the minimum stipulated price, these firms may embark on reverse stock splits once their prices fall too low. Hence, one reason given for reverse splits is that they may be dictated by exchange regulations. Given that NASDAQ stocks are delisted when the price falls below $1.00, the average pre-reverse split price of $0.81 indicates that these NASDAQ companies may be using reverse splits as a way to prevent delisting from NASDAQ. Our finding empirically supports the assertion that reverse splits may be motivated by exchange requirements and contradicts the suggestion by Han (1995) that reverse splits are dictated by reasons other than exchange requirements.

Examining the post-reverse split return volatility

French and Foster (2002) attribute the increase in post-split return volatility to the increase in trading activity following the stock split. However, this assumption has not been established empirically. Our study establishes the relationship between trading activity and return volatility using evidence from reverse splits. Several researchers examine post-split behavior empirically. Investigating 910 firms effecting 1,257 stock splits from 1962 to 1981, Ohlson and Penman (1985) find an increase in the variance of daily stock returns of 35% following the splits. Further, this new higher level of return variance persists for over one year. Similar conclusions are drawn by Kryzanowski and Zhang (1996) from a sample of firms on the Toronto Stock Exchange. Conversely, a post-reverse stock split period exhibits a decline in trading activity due to a decrease in the number of shares and the negative signal the market receives from reverse splits (Woolridge and Chambers, 1983). Jones, Kaul, and Lipson (1994) find that number of trades is primarily and positively related to volatility. We hypothesize that the post-reverse split period is characterized by a decrease in trading activity which leads to a decrease in the volatility of stock returns.

The variance of continuously compounded daily stock returns is used as a proxy for return volatility. The continuously compounded daily stock return is calculated as:

$$R_{ci} = In\ (1 + R_i) \tag{2}$$

where R_{ci} is the continuously compounded daily return for stock i and R_i is the ordinary daily return for stock i, using bid to bid returns. The daily stock returns are adjusted by subtracting the CRSP equally weighted index return to ensure that the returns are not affected by any trends in market volatility over the pre/post-reverse split window.

Several factors impact the volatility of returns. If any of these factors change with a reverse split, then volatility will change as well. According to French and Foster (2002), one potential problem with using daily returns computed from closing prices is that a part of the observed variance may be due to bid-ask bounce. Bid-ask bounce occurs when the closing price on one day is at the quoted bid and is followed the subsequent day with a closing price at the ask. To eliminate bid-ask bounce, pre-reverse split and post-reverse split returns are computed using bid-to-bid returns (see Desai, Nimalendran, and Venkataraman (1998) and Koski (1998)).

Table 2 depicts the mean pre-and post-reverse split return variances by exchange and also for the total sample. The decrease in return variance following reverse splits, for the entire sample, is statistically significant at the 1% level. The decrease in return variance holds for both NYSE/AMEX and NASDAQ stocks.

As documented by French and Foster (2002), the split factor and the post-reverse split price may also affect volatility changes. The trading range hypothesis postulates that firms like to keep their stock prices within particular price ranges, close to the industry median, reflecting the belief that greater liquidity exists within certain price ranges. Consequently, RSFs are generally chosen so that the resulting post-reverse split price will be close to the industry median. The choice of an RSF may influence post-reverse split abnormal returns. We test whether the RSF has an impact on the variance of the returns. Additionally, according to Desai, Nimalendran, and Venkataraman (1998), the level of post-reverse split price may also influence variance changes. We control for price, by including the mean post-split price for the 90 days after the reverse split, in the regression. To control for all these factors and test the effect of trading activity on the volatility of post-reverse split returns the following regression, as estimated by French and Foster (2002), is estimated for all stocks:

$$In\left(\frac{\sigma^2{}_{i,post}}{\sigma^2{}_{i,pre}}\right) = \beta_0 + \beta_1 In\left(\frac{T_{i,post}}{T_{i,pre}}\right) + \beta_2 RSF_i + \beta_3 P_i + \varepsilon_i \qquad (3)$$

where σ^2 is the variance of stock returns, T is number of trades, *post* represents the post-reverse split data, *pre* is for pre-reverse split data, and P is the mean post-reverse split stock price. The regression relates the percentage change in variance to the percentage change in the number of trades after the reverse split, the RSF, and the post-reverse split stock price. If the coefficient for $In\left(\frac{T_i, post}{T_i, pre}\right)$, β_1 is significantly positive, then the post-reverse split volatility is positively influenced by the trading activity. Table III presents the regression results for the entire sample and also by exchange. β_1 is statistically significant at the 1% level for the entire sample and also for the NASDAQ subsample, indicating that the decline in return volatility following reverse splits is related to the decrease in trading activity following the reverse split. None of the other coefficients is significant except the RSF coefficient for the NYSE/AMEX subsample. We do not draw inferences regarding the RSF coefficient, since the NYSE/AMEX subsample is small. It appears that the post-reverse split price and the RSF do not contribute to the post-reverse split return volatility decline.

Reverse Split and Stock Liquidity

As stated earlier, reverse splits should result in lower proportional transaction costs and increase liquidity, Han (1995). Barclay, Kandel, and Marx (1998) find a significant negative relation between changes in bid–ask spreads and trading volume. Additionally, if the motive for the reverse split is to move the price to an "optimal price range" (Lakonishok and Lev, 1987), then the reverse split could enhance the marketability of the stock. The enhancement in stock marketability, according to Demsetz (1968), will improve liquidity of the stock. One might argue, however, that reverse splits decrease the liquidity of the stock by increasing the price of the stock, reducing affordability of the stock to small investors and hence, decreasing the trading volume. For example, after a one-for-five reverse split, the cost of a round-lot becomes five times more expensive and hence, less affordable to small investors.

Trading volume [Lakonishok and Lev (1987), Lamoureaux and Poon (1987)] and the bid-ask spread [Amihud and Mendelson (1988), Conroy, Harris, and Benet (1990)] are proxies for stock liquidity. Ceteris paribus, higher trading volume and/or lower bid-ask spread indicate higher stock liquidity. We know from Table I that the change in percentage spread following the reverse split is not statistically significant for the entire sample. There is however a significant decrease in percentage spread for the NYSE/AMEX subsample and the NASDAQ subsample shows a significant increase in percentage spread. We also analyze daily trading volume in Table IV. As a gauge of trading volume, the reverse-split adjusted number of shares traded is used. Although the pre-reverse split volume is directly estimated by the number of shares traded, the post-reverse split volume is measured by the number of shares divided by the RSF as done by Han (1995).

The difference between the post-and pre-reverse split average daily trading volume for the whole sample is significant with a t-statistic of 6.14, indicating an increase in liquidity following the reverse splits and confirming the findings of Han (1995). Generally, a reverse split is associated with an increase in trading volume and hence, liquidity.

Evidence that Reverse Splits Make Stocks Unattractive to Large Investors

Han (1995) suggests that stocks may become more attractive to large investors following reverse splits due to the increased stability of returns as well as decreased trading costs. Figure 1 shows the trading activity, as measured by the number of trades, for small, medium, and large trades around the reverse split event. As previously mentioned, post-reverse split shares are adjusted by dividing them by their respective RSFs. Small trades are defined as trades less than 501 post-reverse split shares, medium trades are between 501 and 10,000 post-reverse split shares and large trades surpass 10,000 post-reverse split shares. Figure 1 depicts a decline in the number of medium and large trades following reverse splits. However, the number of small trades increases following reverse splits.

Figure 2 shows the net selling activity. To determine the net selling activity, the number of buy-initiated trades is subtracted from the number of sell-initiated trades. We use the classification method of Ellis, Michealy and O'Hara (2000). A trade price at the bid (ask) is classified as a sell (buy) and trade prices within the quotes are classified using the tick rule and we do not lag quotes. One caveat is that this procedure ignores trades that occur outside the quotes. Figure 2 shows that most of the large trades following reverse splits tend to be sell orders. These sell orders seems to be an informed reaction to the event. Desai and Jain(1997) find abnormal returns of -10.76 percent and -33.90 percent respectively after examining one and three-year performance of common stocks following 76 reverse split announcements. Thus, investors should be wary of reverse splits even with the touted features such as an increase in liquidity and a decrease in volatility of returns following reverse splits.

Evidence on Dealer Incentives to Promote Stocks Following Reverse Splits

Reverse stock splits may reduce market making profitability by reducing transaction costs. Market making costs may also decline and so, it is not apparent if profitability declines. Decreased profitability, however, reduces dealers' incentives to promote the stock. According Schultz (2000), most NASDAQ market makers own retail brokerage businesses and can capture additional profits directly. With NYSE/AMEX listed stocks, brokerage houses realize their profits through their specialist functions. For dealers engaged in preferencing activities, particularly payment for order flow, the revenues from making a market in a stock may be reduced after a reverse stock split. Since payment for order flow is typically a predetermined amount per share and given that fewer shares are traded, preferencing revenues will fall.

Higher transaction costs following stock splits motivate market makers to promote stocks (Angel, 1997). Hence, small investors learn about the stocks and purchase them, even with the higher trading costs. With a reverse split however, there is a reduction in the number of shares in circulation, as well as a reduction in the proportional transaction costs, leading to a decline in market making revenues. Incentives to promote a stock can be determined, partly, by the proportional transaction costs. The effective spread (ES), which captures spreads for trades outside or within the quotes, is a good measure of transaction costs. The ES for trade *t* is computed as twice the absolute value of the difference between the price of a trade and the contemporaneous bid-ask midpoint. That is,

$$ES_t = 2^* | P_t - 0.5(B_t + A_t) |, \tag{4}$$

where P_t = the price of trade t, B_t = the bid price of trade t, A_t = the ask price of trade t. The percentage effective spread (PES) is calculated as,

$$PES_t = \frac{ES_t}{0.5(B_t + A_t)} \tag{5}$$

As in Schultz (2000), we estimate the mean effective spread as a percentage of the stock price before and after reverse splits for each stock for three trade size categories; less than

501 shares, 501-10,000 shares, and greater than 10,000 shares. Trade sizes are measured in terms of post-reverse split shares after adjustment with the RSF. Hence, a 2,000 share trade that occurs after a one-for-five reverse split would be counted as a 10,000 share trade.

Lower proportional transaction costs may not necessarily lower dealer incentive to promote stocks if the cost of market making decreases following reverse splits. Generally, market makers require lower compensation to trade less volatile stocks (Schultz 2000) and stocks that undergo reverse splits generally have lower return volatility following the splits. Table II shows lower post-reverse split return volatility, which indicates that the risk of trading these stocks declines and hence a decline in the cost of market making. Table V shows a significant increase in percentage effective spreads for medium and large size trades for the NASDAQ subsample, with t-statistics of 17.05 and 4.67, respectively. The increase in percentage spread shows that NASDAQ market makers generate higher revenues from medium and large trades following reverse splits and could explain the sharp decline in medium and large trades following reverse splits. The NYSE/AMEX subsample shows a decline in percentage effective spreads for medium size trades.

Summary and Conclusion

Our study investigates reverse stock splits. We investigate the motivation for reverse splits, post reverse split return volatility, liquidity, and transaction costs. First, we discover that reverse splits on NASDAQ may be a mechanism to prevent delisting. Our finding is different from that of Han (1995), who finds that most reverse splits are not dictated by exchange regulations. Second, we discover that the decline in return volatility following reverse stock splits is associated with a decline in the daily number of trades. Our finding may explain the anomalous behavior of stock prices following stock splits and reverse stock splits: the increase (decrease) in volatility of returns following stock splits (reverse stock splits). Third, we find an increase in liquidity after reverse splits indicating that there is an increase in the average trade size following reverse splits, since we also find a decline in the daily number of trades. The boost in liquidity after a reverse split is consistent with prior literature on stock splits, since Schultz (2000) finds a decrease in liquidity following stock splits. Next, converse to Han (1995), we discover an increase in large trades; mostly sell orders, after reverse stock splits, indicating that large traders lack confidence in the future profitability of the firms undertaking reverse splits. Finally, as in Schultz (2000) with stock splits, our results show an increase in trading costs, as measured by the percentage effective spread, but unlike Schultz, we find that trading costs increase only for medium and large sized trades on NASDAQ.

Our findings give new insights into reverse stock splits. The decrease in return volatility following reverse splits was puzzling. Our results imply that a contributing factor is the number of trades. The number of trades declines for medium and large trades following reverse splits. However, trading volume increases following reverse splits, indicating that average trade size increases following reverse splits. The increase in daily trading volume for the NASDAQ subsample may be driven by market maker promotions, since we observe a significant boost in percentage bid-ask spread in the NASDAQ subsample following reverse splits.

Extending the work of Angel (1997), who finds that stock splits increase dealer commissions and may motivate dealers to promote stocks, Schultz (2000) suggests that the wider effective spreads, typical of stock splits, may increase brokerage profits and give extra incentive to promote stocks. We find that the change in effective spread following reverse splits is similar to the change in effective spread following stock splits and is consistent with a boost in dealer revenues.

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TABLE I

Sample Characteristics

The sample consists of all reverse splits that occurred from May 2001 to September 2003 found on CRSP with trade and quote data on TAQ. Share prices pre-and post-reverse splits are defined as the last day's mean bid-ask midpoint prior to the ex-date and the first day's mean bid-ask midpoint after the ex-date. The mean percentage spread is calculated as the average percentage spread for the 90 day window.

Panel A **Reverse split factor (RSF) cumulative frequency**

RSF	>0.20	>0.10	>0.07	>0.05	>0.04	>0.03
Splits	53	99	106	111	113	115

Panel B **Share Prices ($)**

	ALL	NYSE/AMEX	NASDAQ
N	115	20	95
Mean pre-reverse split	1.15	2.81	0.81
Mean post-reverse split	5.38	9.63	4.56

Panel C **Percentage Spread**

	ALL	NYSE/AMEX	NASDAQ
Mean pre-reverse split	0.144	0.312	0.114
Mean post-reverse split	0.142	0.152	0.140
T – statistic of difference	-0.667	-10.531***	13.220***

* Indicates statistical significance at the 0.10 level.
** Indicates statistical significance at the 0.05 level.
*** Indicates statistical significance at the 0.01 level.

TABLE II

Return Volatility

Return variances are computed using daily closing bid prices 90 days before and 90 days after the reverse split date and converting them to continuously compounded returns. Tests represent a difference from zero for the test of increase in mean variance (mean post-reverse split return variance minus mean pre-reverse split return variance).

	ALL (N=115)	NYSE/AMEX (N=20)	NASDAQ (N=95)
Mean pre-reverse split variance	0 .007	0.005	0.008
Mean post-reverse split variance	0.005	0.003	0.005
T – statistic of difference	-4.030***	-2.112**	-3.677***

* Indicates statistical significance at the 0.10 level.
** Indicates statistical significance at the 0.05 level.
*** Indicates statistical significance at the 0.01 level.

Table III

Regression examining the effect of the decrease in trades on the variance of post-reverse split returns
Stock returns were computed using daily closing bid prices 90 days before and 90 days after the ex-date.

Regression: $In\left(\frac{\sigma^2{}_i, post}{\sigma^2{}_i, pre}\right) = \beta_0 + \beta_1 In\left(\frac{T_i, post}{T_i, pre}\right) + \beta_2 RSF_i + \beta_3 P_i + \varepsilon_i$

	ALL (N=115)	NYSE/ AMEX (N=20)	NASDAQ (N=95)
β_0	-0.229	0.306	0.002
	(-1.440)	(0.87)	(0.02)
β_1	0.329	0.194	0.260
	(2.820)***	(0.98)	(2.59)***
β_2	0.017	-0.096	-0.010
	(1.140)	(-2.41)**	(-0.73)
β_3	-0.013	0.162	-0.018
	(-0.900)	(1.25)	(-1.26)
R^2	0.079	0.428	0.094

* Indicates statistical significance at the 0.10 level.
** Indicates statistical significance at the 0.05 level.
*** Indicates statistical significance at the 0.01 level.

TABLE IV

Stock Liquidity
Liquidity is measured by the daily trading volume. The pre-reverse split volume is directly estimated by the number of shares traded while the post-reverse split volume is measured by the number of shares divided by the RSF. Difference = Mean post-reverse split volume minus mean pre-reverse split volume.

	ALL (N=115)	NYSE/ AMEX (N=20)	NASDAQ (N=95)
Mean pre-reverse split	1738.74	2195.72	1516.22
Mean post-reverse split	4584.32	7124.13	3891.39
Difference	2845.58	4928.41	2375.17
T-statistic	6.142***	2.401**	5.769***

* Indicates statistical significance at the 0.10 level.
** Indicates statistical significance at the 0.05 level.
*** Indicates statistical significance at the 0.01 level.

Table V

Percentage Effective Spreads around Reverse Splits

The percentage effective spread for a trade is twice the absolute value of the difference between the trade price and the contemporaneous bid-ask midpoint divided by the bid-ask midpoint. The mean percentage effective spread is calculated for trades of different sizes pre-and post-reverse split study period, for each of the 115 sample stocks. A cross-sectional grand average of the individual stock mean percentage effective spreads is estimated and depicted below. Trade sizes are measured in terms of reverse split shares. The t-statistics test if the mean difference in percentage effective spreads across stocks is significantly different from zero.

	ALL (N=115)	NYSE/ AMEX (N=20)	NASDAQ (N=95)
Panel A: Small trades (less than 501 shares)			
Mean pre-reverse split	0.060	0.112	0.087
Mean post-reverse split	0.057	0.093	0.086
T-statistic of difference	-0.765	-0.551	-0.493
Panel B: Medium trades (between 501 and 10,000 shares)			
Mean pre-reverse split	0.057	0.117	0.081
Mean post-reverse split	0.080	0.071	0.122
T-statistic of difference	4.322***	-2.028*	17.046***
Panel C: Large trades (greater than 10,000 shares)			
Mean pre-reverse split	0.072	0.095	0.073
Mean post-reverse split	0.106	1.347	0.094
T-statistic of difference	0.034	0.978	4.667***

* Indicates statistical significance at the 0.10 level.
** Indicates statistical significance at the 0.05 level.
*** Indicates statistical significance at the 0.01 level.

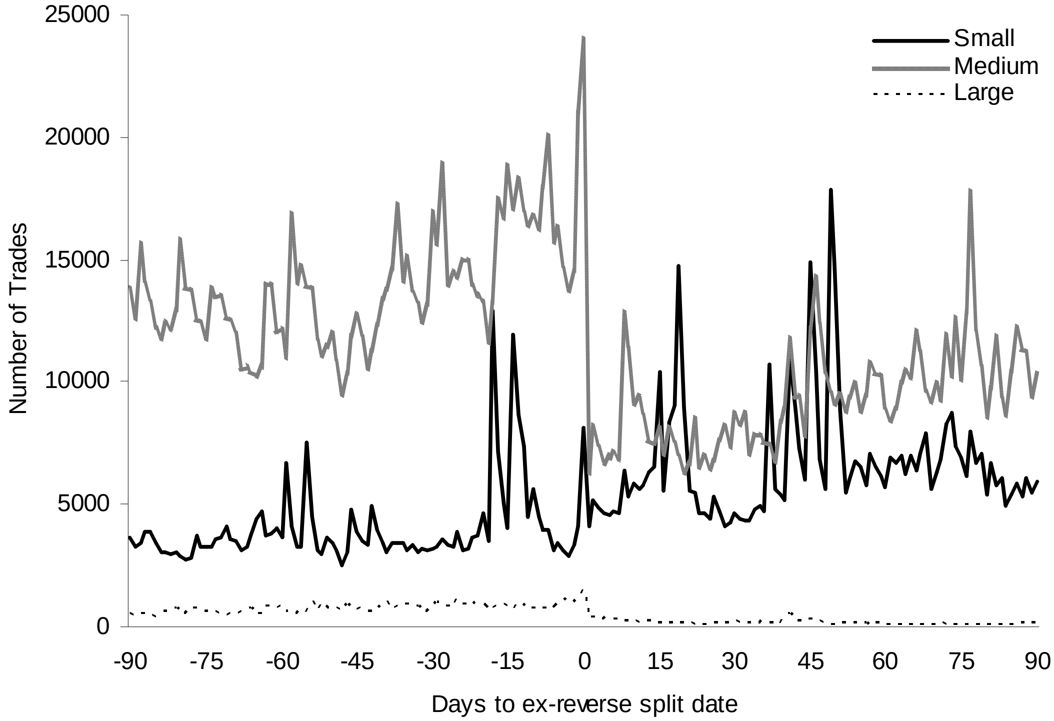

Figure 1. Trading activity as measured by the aggregate number of trades. Small; defined as trades less than 501 post- reverse split shares, medium; between 501 and 10,000 post-reverse split shares, and large trades; surpass 10,000 post-reverse split shares.

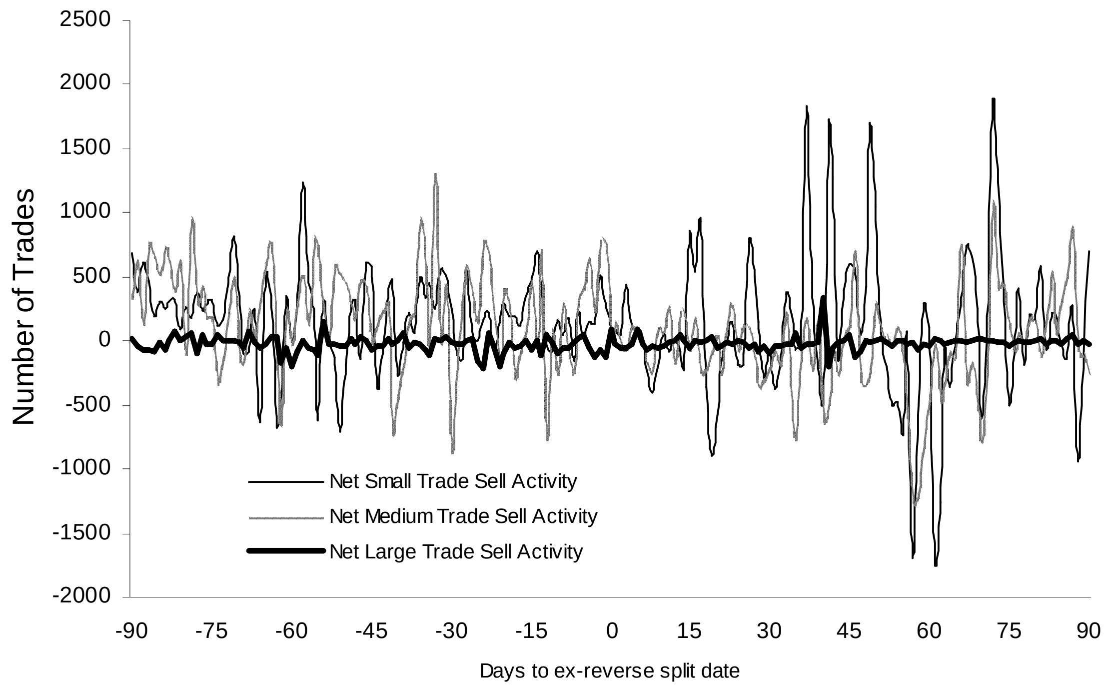

Figure 2. Net sell trading activity by trade size. Small; defined as trades less than 501 post- reverse split shares, medium; between 501 and 10,000 post-reverse split shares, and large trades; surpass 10,000 post-reverse split shares.