

Reverse split announcements, effective dates and survival

Marie-Claude Beaulieu*
and
William R. Sodjahn[‡]

Université Laval

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* RBC Chair in Financial Innovations, Centre interuniversitaire sur le risque, les politiques économiques et l'emploi (CIRPÉE), Département de Finance et Assurance, Faculté des Sciences de l'Administration, Université Laval, CANADA Telephone: 418-656-2926, email: Marie-Claude.Beaulieu@fas.ulaval.ca.

[‡] Ph.D Candidate, Département de Finance et Assurance, Faculté des Sciences de l'Administration, Université Laval, CANADA Telephone: 418-656-2131, ext. 4689, email: william.sodjahn.1@ulaval.ca.

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Abstract

In the context of a reverse split, we examine separately the determinants of the decision, the choice of the factor and the time span between the announcement and the execution of the reverse split. We also examine the extent to which the chosen factor and the execution delay can predict firm survival. Results reveal that while a significant rundown in stock price and poor growth opportunities lead to a reverse split decision, the choice of factor is determined by the size of the firm, its preannouncement price level and liquidity. We observe a strong age and size effect in setting the execution delay. Finally, we show that both the factor and the execution delay and also managers' and directors' incentives predict the firms' survival.

Keywords: reverse split decision, reverse split factor, reverse split execution delay, managers' and directors' incentives, survival.

JEL code: G30 and G39.

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I. Introduction

This paper investigates the factors that influence the probability of a reverse split decision and the determinants of the reverse split factor. It further characterizes the reverse split execution delay and its determinants. We seek to understand how this delay varies across firms and to identify the determinants of this variation. Our paper is the first to examine separately the reverse split decision, the choice of the split factor and of the execution delay, as well as the influence of managers' and directors' incentives on the various steps of reverse split policy. The paper also investigates whether the split factor or the execution delay can predict the survival of reverse-splitting firms. Finally, the paper investigates how managers' and directors' incentives can affect the probability of reverse-splitting firms' survival. These investigations are important as they provide more insight into the reverse split process and a better understanding of the motivations behind the reverse split. Our findings offer guidance on using the reverse split size and the reverse split execution delay to predict firm survival.

A reverse split is nothing more than “substitution of one new share for a certain number of outstanding shares” (Han, 1995). Compared to the stock split, little research has been conducted regarding the motivation for reverse splits or the information content of the reverse split factor and the reverse split execution delay. Most of the previous literature has documented negative abnormal returns around reverse split dates.¹ Empirical evidence shows that reverse splits are viewed as a negative signal about future performance, since the only way for reverse-splitting firms to improve their stock price is through artificial means (Spudeck and Moyer, 1985). A rational manager expecting earnings and price growth would not incur reverse split costs. Moreover, managers may undertake reverse splits to maintain

¹ See Woodridge and Chambers (1983), Lamoureux and Poon (1987), Han (1995) and Desai and Jain (1997), among others.

listing on the current exchange. Indeed, Peterson and Peterson (1992) distinguished discretionary versus nondiscretionary reverse splits.

Note, however, that some empirical studies have also revealed certain value-improving results. Reverse splits increase liquidity (Han, 1995), increase investors' ability to buy the stock on margin (Masse, Hanrahan, and Kushner, 1997), improve the stock's image and make it more attractive to institutional investors² (West and Brouillette, 1970) and decrease risk (Peterson and Peterson, 1992). Masse et al. (1997) have observed a positive market reaction to reverse splits in Canada. But to date, no study has investigated factors that determine the probability of a reverse split decision, the information content of the reverse split factor, the timing of reverse split execution and the extent to which reverse split factors or the reverse split execution delay can convey information about the likelihood of firm survival.

These findings raise the following questions: What are the real motivations for engaging in reverse splits? How can one distinguish between "good" and "bad" motivations? In other words, some firms will consider a reverse split despite positive growth prospects in order to move stock into a price range that will attract institutional investors. These firms have good reason to reverse split. Other firms, however, engage in reverse splits to keep their stock listed on an exchange when their earnings prospects are poor. This study seeks to answer the following questions: Why are reverse splits undertaken? What factors (liquidity, continued low price and poor earnings performance or growth opportunities) affect the probability of a reverse split decision? As with stock splits, do managers' and directors' incentives play a role (Beaulieu and Sadjahin, 2007)? Is there information content in reverse split factors? Also, what factors determine the reverse split execution delay? Do reverse split factors and reverse split execution delays help predict the survival of reverse-splitting firms? How do managers' and directors' incentives affect the likelihood that reverse-splitting firms will survive?

² In fact, penny stocks are in disfavor with institutional investors.

This study contributes to the literature by providing insights on factors associated with reverse split decisions, the choice of reverse split factor and the reverse split execution delay. We also examine the predictability of the reverse-splitting firms' survival based on reverse split size and execution delay. We estimate a probit model of the probability of a reverse split decision and analyze how this probability is affected by past performance, prospect indicators and managers' and directors' incentives. Second, we examine whether reverse split factors and reverse split execution delays reveal incremental management information.³ This private information is computed using the Inverse Mills Ratio⁴ (see Heckman, 1979; Nayak and Prabhala, 2001). Third, we estimate robust least squares models of the reverse split factors and of the execution delay to identify factors that help explain these decisions. Finally, we estimate probit models of reverse-splitting firms' survival to investigate the role of reverse split factors or reverse split execution delay in the probability of survival.

We find, consistent with the signaling hypothesis, that the reverse split decision is essentially motivated by unusual rundowns in stock price and poor growth opportunities. We find respectively negative and positive conditional incremental information in the size of the reverse split factor and in the reverse split execution delay. More specifically, we observe that the choice of the reverse split factor is determined by the size of the firm, the preannouncement price level and liquidity, while reverse split execution is affected by the age and the size of the firm. Finally, results indicate that the likelihood of surviving 12 months after the reverse execution is positively related to the chosen reverse split size, but negatively associated with how long firms wait to execute the announced reverse split. We also find that when firms are not doing well, as is often the case when a reverse split occurs, granting loans to exercise stock options may be burdensome and directors' ownership may make directors

³ Aside from the reverse split decision itself. This private information is computed using the Inverse Mills Ratio.

⁴ The predicted values of the reverse split decision are used to generate the Inverse Mills Ratio, which is the ratio of the probability density function over the cumulative distribution function of a distribution.

overbearing and the reverse split disastrous (see Holmstrom, 2005; Song and Thakor, 2007) for splitting firms, negatively affecting their probability of survival.

The remainder of this paper is organized as follows. Section 2 develops the research hypotheses in the context of prior literature. Section 3 describes the sample, data sources, variable specifications, and testing methodology. Section 4 provides descriptive statistics for the sample firms and discusses the results of empirical tests. Section 5 concludes.

II. Theory and hypotheses

This section develops the research hypotheses in the context of prior literature. The central questions we address are whether distinct information can be drawn from the reverse split decision itself, the reverse split factor and the execution delay and whether the reverse split factor and the reverse split execution delay help predict the survival of reverse-splitting firms. Four hypotheses are tested. The first hypothesis links the reverse split decision, on the one hand, to past market performance and growth opportunities, and on the other hand, to managers' and directors' incentives. Hypotheses 2 and 3 present respectively the relationship of the reverse split factor and of the execution delay with past market performance, growth opportunities and managers' and directors' incentives. Hypothesis 4 deals with the impact of the split factor, the execution delay and managers' and directors' incentives on reverse-splitting firms' survival.

In light of the many studies documenting average negative abnormal returns (Han, 1995, and Desai and Jain, 1997, among others), reverse splits convey unfavorable private information about the current value of firms. Thus, if reverse splits signal negative information, then information about poor past market performance and weak growth opportunities will have a strong positive impact on the reverse split decision, as opposed to what occurs with stock splits (Beaulieu and Sodjahn, 2007). Consequently, we examine the following testable hypothesis:

Hypothesis 1a: Firms with poor past market performance and weak growth opportunities are more likely to reverse split.

Hypothesis 1b states that in the presence of managers' and directors' incentives, firms will be more concerned by their image and will undertake a reverse split to move their stock out of the penny stock zone. We therefore test the following hypothesis:

Hypothesis 1b: Managers' and directors' incentives positively affect the reverse split decision.

When there is little rundown in preannouncement price and better growth opportunities, firms will logically prefer smaller reverse splits. In such a scenario, stock price will increase without any strong artificial intervention. Although the information content of stock split factors has been addressed in the literature (McNichols and Dravid, 1990, and Beaulieu and Sodjahin, 2007, among others), so far no direct evidence has been found concerning the reverse split factor. Let us define $0 < \rho < 1$, the elasticity of the estimated intrinsic value with respect to Z that represents the information about past market performance and future prospect indicators (which investors need to estimate stock prices) and $\mathcal{G} = \frac{1}{1-\rho} > 0$. $G(.,.)$ is a function of the number of shares outstanding before the split (m) and the pre-split demand in the firm's sector (X_0). X_t is the state variable that captures market conditions (the aggregate demand in the firm's sector). Using these variables, Beaulieu and Sodjahin (2007) derive the optimal split factor f^* :

$$f^* = \left[G(m, X_0) Z^\rho \right]^\mathcal{G},$$

We define r as the risk-free interest rate, σ as the volatility of the process and \hat{w}_t as a standard Brownian motion. Ensuring that $\delta > 0$ and under the risk-neutral measure, X_t follows the following dynamics:

$$dX_t = (r - \delta)X_t dt + \sigma X_t d\hat{w}_t$$

In a reverse split framework, $0 < f^* < 1$. The reverse split size is defined as $1 - f^*$. Since $\frac{\partial f^*}{\partial Z} > 0$, low Z (poor past market performance and weak growth opportunities) imply a large $1 - f^*$. Thus, we test the following hypothesis:

Hypothesis 2a: Firms with poor past market performance and weak growth opportunities are more likely to choose a larger reverse split magnitude.

Conditioning on the preannouncement price and growth opportunities, firms with managers' and directors' incentives will choose larger reverse split sizes to maintain investor perceptions and corporate image in general. This leads to the following hypothesis:

Hypothesis 2b: Managers' and directors' incentives are positively related to the reverse split magnitude.

A reverse split announcement signals that price will continue to decrease (see Han, 1995, among others), in which case the manager will not wait long to bring the stock price out of the penny stock range to a more attractive trading range.

The following hypothesis is therefore examined:

Hypothesis 3a: Firms with poor past market performance and weak growth opportunities will realize the announced reverse split earlier.

We also examine the subsequent hypothesis:

Hypothesis 3b: Managers' and directors' incentives are negatively related to the reverse split execution delay.

Firms with managers' and directors' incentives will, again for image reasons, quicken the execution of the reverse split to bring up their stock price as soon as possible into a more attractive trading range.

Finally, our last hypothesis states that the size of the reverse split factor and the reverse split execution delay can predict the survival of reverse-splitting firms:

Hypothesis 4: The probability of survival for reverse-splitting firms is positively related to the factor magnitude and to managers' and directors' incentives, but negatively associated with the execution delay.

In fact, firms with larger reverse split factors are more likely to survive since their post reverse split price is high enough to meet listing requirements. Moreover, firms with better governance are less likely to face delisting (see Charitou et al., 2007). Last, firms that wait longer to move their price out of the penny stock range are less likely to survive.

III. Univariate analysis

This section presents the data and summary statistics of our sample as well as an initial exploration of the relation between the reverse split factor and firm characteristics on the one hand and the timing of the reverse split execution and firm characteristics on the other.

III. a. Data description and summary statistics

The sample is collected from four sources: Center for Research in Security Prices (CRSP) daily master files (for reverse split effective date, reverse split factor, etc.), Bloomberg (for the reverse split announcement date), COMPUSTAT (for growth opportunities and other accounting series) and the Institutional Shareholder Services (ISS) database for managers' and directors' incentives. Due to the availability of ISS data, our sample extends from January 2003 to December 2005. Our primary sample is composed of 145 reverse splits for which information on announcement dates was retrieved from Bloomberg.

Next we provide information about the variables used in our analysis.

Past market performance is measured with the variable *Rundown* computed as the buy-and-hold return from one year before the reverse split announcement through five trading days prior to the reverse split announcement. It is the same variable called *RUNUP* in the stock split literature (see, e.g., Desai and Jain, 1997, and Nayak and Prabhala, 2001).

Growth opportunities is captured by the variable *Market-to-book* ratio since this ratio has commonly been used in the literature as a proxy for a firm's growth opportunities (see, e.g., Daniel and Titman, 1999, and D'Mello and Ferris, 2000).

Managers' and directors' incentives includes the following variables:

- *Dirsubstock*: equals 1 if directors are subject to stock ownership requirements (otherwise it is equal to zero);
- *Diownership*: equals 1 if directors' and officers' ownership as a percentage of shares

outstanding is greater than 5% but less than or equal to 30% (otherwise it is equal to zero).

The alternatives for this variable in ISS are: officers' and directors' ownership as a percentage of shares outstanding of less than 1% or greater than 30% (1) and greater than or equal to 1% and less than or equal to 5% (2). We choose *Diownership* since in reality, very few firms are owned in a proportion higher than 30%.

- *Stockplan*: takes the value of 1 when company managers are remunerated with options and 0 otherwise.
- *Loansoption*: takes the value of 1 when the company provides loans to executives for exercising their options and 0 otherwise.
- *Overall incentives*: takes the value of 1 when at least one of the *Dirsubstock*, *Diownership*, *Stockplan* and *Loansoption* variables takes the value of 1 and 0 otherwise. Since specific incentives can have different effects on the decisions surrounding a split (decision to split, choice of split factor and split effective date), *Overall incentives* allows us to assess the global effect of incentives.

The survival of reverse-splitting firms is measured by *Survival*, which takes the value of 1 when the end dates in the CRSP database (variable ENDDT) are later than 12 months from the reverse split effective dates and 0 otherwise.

INSERT TABLE I ABOUT HERE

Table 1 reports summary statistics for the sample of reverse stock splits analyzed in this paper. Panel A reports information on the distribution of split factors by year. Let $s(t)$ be the number of shares outstanding after the reverse split and $s(t')$ be the number of shares outstanding before the reverse split. As reported in CRSP, the reverse split factor is

$$FACPR = \frac{s(t) - s(t')}{s(t')} \quad (1)$$

Notice that, contrary to splits, FACPR is negative for reverse splits. Reverse split factors range from -0.122 (43 for 49) to -0.980 (1 for 50). The most common reverse split factors are respectively -0.800 (5 for 1), -0.900 (10 for 1) and -0.750 (4 for 1). The highest number of reverse splits (60) occurred in 2003 (41%), followed by 53 (37%) in 2005 and 32 (22%) in 2004.

INSERT FIGURE 1 ABOUT HERE

Figure 1 provides an overview of the number of reverse splits over months and years. The number of reverse splits fluctuates considerably throughout the year. The highest occurrences of reverse splits in 2003, 2004 and 2005 are respectively observed in June, October and December. These results reveal that reverse split announcements are not concentrated at a specific time of the year.

Panel B reports an average elapsed time between announcement date and effective date of 12.28 days (10.24 for the trimmed sample) versus 36.89 days in our previous study on stock splits (see Beaulieu and Sodjahn, 2007). We trim the top 1% of observations from the reverse split execution delay to limit the impact of outliers. The timing of reverse split execution exhibits a high variability of 35.63 (25.83 for the trimmed sample) but a low median time of 3 days. This high variability makes the reverse execution delay important to study. Notice that the standard deviation of the reverse split execution delay for tercile three is much higher (57.50 and 40.73 for the trimmed sample), followed by tercile two (0.52) and tercile one (0.13). Panel C shows that the difference between the short and the long split execution delay is significant for both trimmed and non-trimmed samples.

III. b. Reverse split factors and firm characteristics

Panel A of Table II tests on a univariate basis the relationship between reverse split factors and firm characteristics. We observe that firms that choose a large reverse split magnitude (5-for-1 and over) are much smaller, have a significantly lower price level and are more liquid. Although the median rundown of firms that choose factors of 5-for-1 and over is much higher, the average rundown is not substantially different from zero. There are no statistically significant differences between the larger split magnitude (5-for-1 and over) and the smaller one (less than 5-for-1) in terms of growth opportunities.

INSERT TABLE II ABOUT HERE

Results in Panel B of Table II show that firms do not choose significantly different reverse split factors when there are managers' and directors' incentives or, more specifically, when directors and officers own stock.

III. c. Reverse split execution delay and firm characteristics

Table III deals with the relationship between the reverse split execution delay and firm characteristics. Panel A tests on a univariate basis the relation between reverse split execution delays and firm characteristics. We observe that firms which realize the announced reverse split earlier (tercile one) are much smaller and have a significantly lower preannouncement price than firms that realize the reverse split later. The mean differences between terciles one and three are statistically significant at the 1% level. There are no statistically significant differences between terciles one and three for other characteristics such as past performance, growth opportunities, reverse split factor and liquidity.

INSERT TABLE III ABOUT HERE

Panel B shows that when there are managers' and directors' incentives or, more specifically, when directors and officers own stock, a firm's reverse split execution delay does not differ substantially from the delay of firms without such incentives. Although the difference in medians for directors' stock ownership requirements is significant at the 1% level, the difference in mean is significant only at 10%.

IV. Multivariate analysis

In this section we present and discuss tests of the hypotheses developed above. Results are presented for the reverse split decision, the choice of reverse split factor, the delay in reverse split execution and the survival model. Table IV deals with the reverse split decision; Table V presents conditional reverse split effects. Table VI presents the results for the reverse split factor choice, while Table VII deals with the delay in reverse split execution. Table VIII reports the influence of reverse split magnitude, execution delay and incentives on the probability of survival of reverse-splitting firms.

We distinguish between the choice of the reverse split factor and the reverse split decision itself for a better understanding of explanatory factors relative to each decision.

a) Reverse split decision

The main question we address in this section is: Why do firms decide to undertake reverse splits?

To answer this question we specify an empirical model for $RSPL_i$, the latent variable ruling a reverse split decision which takes the value of 1 if firm i announces a reverse split during the calendar year and 0 otherwise. $Rundown_i$ is past market performance, MB is the market-to-book, $Incentives$ is managers' and directors' incentives, C is the control variables, and the error term u_i is assumed to be normally distributed and independent of $Rundown_i$,

MB , *Incentives*, and *C* . The empirical model is:

$$RSPL_i = \gamma_1 + \gamma_2 Rndown_i + \gamma_3 MB_i + \gamma_4 Incentives_i + \gamma_5 C_i + u_i \quad (2)$$

Under the assumption of u_i normality, the reverse split decision is a standard probit model. The control variables *C* include preannouncement stock price, size, age, trading volume and earnings changes before and around the reverse split announcement. We include preannouncement *price* as firms with lower stock prices are more likely to announce reverse splits, if reverse splits are really intended to move stock out of the penny stock range. We include *size* since, as with stock splits (McNichols and Dravid, 1990, and Nayak and Prabhala, 2001), conditional on price, small firms may be more likely to reverse split. Firm size is also used as a proxy for the level of information asymmetry (see, e.g., Grossman and Stiglitz, 1976; Zeghal, 1984; and Freeman, 1987). We also include the *age* of the firm at the reverse split announcement date (days from listing date to reverse split announcement date), since this variable can capture prudence motives (see, e.g., Del Guercio, 1996, and Gompers and Metrick, 2001). We expect *age* to be negatively related to the reverse split decision and the reverse split factor but positively related to the reverse split execution delay. We include *trading volume* since Han (1995), among others, suggests that reverse splits are associated with changes in trading volume. Finally, we consider earnings changes before and around reverse split announcement dates because some studies (see, e.g., Robinson, 2007) observe that the market reaction is positively related to earnings performance before and after the reverse split.

INSERT TABLE IV ABOUT HERE

Table IV presents probit regression results. In the first model, the explanatory variables are firm attributes, preannouncement performance, growth opportunity and liquidity.

Model 2 extends Model 1 by introducing earnings changes while Models 3 and 4 add managers' and directors' incentives variables. Results show that the coefficient for firm size is negative and significant at the 5% level through all specifications except for Model 2 (10% level). This suggests that smaller firms are more likely to engage in reverse splits than are larger firms, probably because small firms are more likely to trade in the penny stock range. If we compare with stock splits (see, e.g., Nayak and Prabhala, 2001), we find that the coefficients for *Rundown*⁵ and *Market-to-book* are negative and strongly significant throughout our four models. This suggests, first, that firms whose stocks have experienced unusual rundowns are more likely to make reverse split decisions and that past market performance has a greater effect on the reverse split decision than on operating performance. Second, it suggests that poor growth opportunities play a key role in the reverse split decision. These results are consistent with the signaling hypothesis. Moreover, we find no evidence that liquidity, earnings changes or managers' and directors' incentives have any effect on the reverse split decision. These results are in full accordance with Hypothesis 1a but not with Hypothesis 1b. A reverse split decision does not appear to be determined by managers' and directors' incentives, unlike stock split decisions (Beaulieu and Sodjahn, 2007).

Before studying the determinants of the reverse split factor and of the execution delay, let us examine if there is any incremental information in the reverse split factor and the execution of the timing beyond the reverse split decision itself.⁶

Let X_i^{rs} be the market preannouncement information set for firm i . As in Nayak and Prabhala (2001), X_i^{rs} includes preannouncement price, size, rundown and trading volume. Let

⁵ We also investigated the influence of the operating performance measured by ROA (Return on Asset). Although the ROA coefficient (-0.002 in Model 1) has the same sign as *Rundown*, it is not statistically significant (p-value 0.120).

⁶ Whether or not a reverse split is announced to the market.

ψ_i^{rs} represent the announcing firm's private information.

Firm i announces a reverse split (RS) if

$$RSPL_i = X_i^{rs} \theta + \psi_i^{rs} > 0 \quad (3)$$

If there is respectively negative and positive incremental information in the reverse split magnitude and in the timing of reverse split execution, we would find that both the reverse split factors⁷ and the reverse split execution delay are positively related to the unrevealed information of the reverse split decision. Consequently, both β^f and β^d should be positive in the following regression:

$$E(RSFACT_i | RS) = \gamma^f + \beta^f E(\psi_i^{rs} | X_i^{rs} \theta + \psi_i^{rs} > 0) \quad (4)$$

$$E(Delay_i | RS) = \gamma^d + \beta^d E(\psi_i^{rs} | X_i^{rs} \theta + \psi_i^{rs} > 0) \quad (5)$$

The above equations represent respectively the *conditional* reverse split factor and the *conditional* reverse split execution delay, given the vector of characteristics X_i^{rs} associated with the reverse-splitting firm. Under the assumption that ψ_i^{rs} is normally distributed and defining $\hat{\lambda}_{rsi}$ as the Inverse Mills Ratio (IMR) for the reverse split announcement, we may write equations (4) and (5) as:

$$E(RSFACT_i | RS) = \gamma^f + \beta^f \hat{\lambda}_{rsi} \quad (6)$$

$$E(Delay_i | RS) = \gamma^d + \beta^d \hat{\lambda}_{rsi} \quad (7)$$

⁷ Recall that, contrary to split factors, reverse split factors are negative since there are fewer shares in the firm after the reverse split.

Defining $\phi(\cdot)$ as the density probability function and $\Phi(\cdot)$ as the cumulative probability function, we find $\hat{\lambda}_{rs}$, which is estimated using a probit estimate for the vector of parameters (θ), that is:

$$\hat{\lambda}_{rsi} = \frac{\phi(X_i^{rs} \cdot \theta)}{\Phi(X_i^{rs} \cdot \theta)}. \quad (8)$$

We empirically estimate equation (8) using a probit model since ψ_i^{rs} is assumed to be normally distributed. We also estimate equations (6) and (7) using least squares with adjusted standard errors (see Heckman, 1979). Results are presented in Table V.

INSERT TABLE V ABOUT HERE

Panel A of Table V reports the probit reverse split decision with explanatory variables reduced to the Nayak and Prabhala (2001) market preannouncement information set. Only coefficients of *Log(size)* and *Rundown* are significant as in Table VI. Panels B and C present adjusted least squares standard error regressions for the reverse split magnitude (absolute value of the reverse split factor)⁸ and execution delay. Results reveal that significant coefficients of the estimated Inverse Mills Ratio (IMR) are negative in reverse split magnitude and positive in execution delay equations. Our results suggest that whether or not a reverse split is announced and conditioning on the market preannouncement information set (X_i^{rs}), including preannouncement price, size, rundown and trading volume, negative incremental information is conveyed in the reverse split magnitude and positive incremental information is conveyed in the reverse split execution delay. These results reveal that some publicly unobserved characteristics that increase the likelihood of a reverse split contribute to further

⁸ The fact that the split factor is negative in the case of a reverse split suggests that the larger the reverse split magnitude, the more negative the reverse split factor will be.

reduce the reverse split size and increase the reverse split execution delay. If we interpret the unobserved characteristics as the presence of asymmetric information concerning the firm, then our results suggest that the presence of this asymmetry is consistent with a smaller reverse split size and a longer reverse split execution delay.

b) Reverse split factor

We seek to answer the following question: What determines the reverse split factor magnitude?

To answer this question we estimate a model of the reverse split magnitude with adjusted standard error least squares. Results are reported in Table VI.

INSERT TABLE VI ABOUT HERE

Model 1 of Table VI focuses on the impact of the attributes of a reverse-splitting firm (preannouncement price, age and size) past market performance, growth opportunities and liquidity on the reverse split magnitude. Model 2 adds earnings changes while models 3 and 4 introduce managers' and directors' incentives variables. Preannouncement price and firm size exhibit negative and strongly significant coefficients in all specifications. These results suggest that low preannouncement prices lead to large reverse split magnitude. It further reveals that smaller firms are more likely to choose larger reverse split magnitudes. Moreover, the age coefficient is positive and significant at the 5% level in all specifications except in Model 2 (10% level). This suggests that younger firms are more likely to prefer small reverse split magnitudes than older firms, probably due to prudence. We also find that preannouncement trading volume has a strong and positive impact on the magnitude of the reverse split in all specifications. Indeed, low-volume preannouncement firms will likely be concerned with moving out of the penny stock range to attract institutional investors. These

firms will avoid large reverse split magnitudes to ensure that small investors continue to hold their stock. Finally, we observe that controlling for price level and prospect indicators, firms will choose higher reverse split magnitudes to maintain investor perceptions and corporate image in general when directors are subject to stock ownership requirements. However, we find no evidence that managers' and directors' incentives, past performance and growth opportunities have an overall impact on the choice of reverse split magnitude.

c) Timing of reverse split execution

The main question we address in this section is: What determines the choice of split execution delay?

We investigate the effect of firm attributes, past market performance, growth opportunities and managers' and directors' incentives on the split execution delay. We define $\text{Log}(\text{Delay})$ as the natural logarithm of days elapsing from announcement date to effective date for firm i . Rundown_i is past performance, MB is the market-to-book, Incentives is managers' and directors' incentives, C is the control variables including firm attributes, and the error term ω_i is assumed to be normally distributed and independent of Rundown , MB and Incentives .

We estimate the following empirical model:

$$\text{Log}(\text{Delay})_i = \delta_1 + \delta_2 \text{Rundown}_i + \delta_3 \text{MB}_i + \delta_4 \text{Incentives}_i + \delta_5 C_i + \omega_i \quad (9)$$

Results of adjusted standard error least squares from equation (9) are presented in Table VII.

INSERT TABLE VII ABOUT HERE

The first two models add the reverse split magnitude to the previously described explanatory variables. The reverse split execution delay is not significantly determined by the magnitude of the chosen factor. Results from the four models reveal strong and positive age and size effects on reverse split timing. This indicates that smaller or younger firms are more likely to realize the announced reverse split early. Indeed, these firms are more subject to information asymmetry (see, e.g., Zeghal, 1984, and Freeman, 1987) and a long waiting period can be negatively interpreted by the institutional investors these firms wish to attract. Moreover, small firms are more affected by low prices and do not wait long to bring the stock price out of the penny stock range to a more attractive trading range. Contrary to our expectations, we find that when directors are subject to stock ownership requirements, the split execution delay is strongly and positively affected, probably because directors' oversight is greater, thus setting back execution of the reverse split. This means that the reverse split execution delay is longer when directors are subject to ownership requirements. Nevertheless, managers' and directors' incentives taken globally do not affect the timing of reverse split execution, contrary to the timing of split execution (Beaulieu and Sodjahin, 2007). Nor do past performance, growth opportunities and liquidity significantly affect the reverse split execution delay.

d) Reverse split factor, execution delay and probability of survival

This section investigates whether the reverse split magnitude or the reverse split execution delay can predict the survival of reverse-splitting firms. The influence of managers' and directors' incentives on the probability of survival is also examined. We define *Survival* to take the value of 1 when the end dates⁹ in the CRSP database (variable ENDDT) occur

⁹ This date corresponds to the end of the stock database.

within 12 months¹⁰ from the effective date of the reverse split and 0 otherwise. The number of firms that disappear is 26 which represent about 18% of our reverse-splitting sample.

$|RSFACT|$ is the reverse split magnitude, $\text{Log}(\text{delay})$ is the natural logarithm of days from announcement date to effective date, *Incentives* represents managers' and directors' incentives, *C* is the control variables including firm attributes as well as profitability and leverage since reasonably more profitable and low-leverage firms are likely to survive. To study the link between the likelihood of survival and both the reverse split factor and execution delay, we use a probit regression model:

$$\text{Survival}_i = \eta_1 + \eta_2 |RSFACT|_i + \eta_3 \text{Log}(\text{Delay})_i + \eta_4 \text{Incentives} + \eta_5 C_i + v_i \quad (10)$$

The error term v is assumed to be normally distributed and independent of the explanatory variables. The empirical results are presented in Table VIII below.

INSERT TABLE VIII ABOUT HERE

In full accordance with Hypothesis 4, Table VIII reveals a strong and positive impact of reverse split magnitude and of reverse split execution delay in the four models presented. These results indicate that the likelihood of surviving 12 months after the reverse split execution is positively related to the chosen reverse split magnitude. Indeed, firms with greater reverse split magnitudes are more likely to survive since their post reverse split price is high enough to attract institutional investors and to meet exchange listing requirements. Moreover, the probability of surviving 12 months after the reverse split execution is negatively related to how long firms wait to execute the reverse split. Intuitively, firms that wait longer to bring their price out of the penny stock range will be less likely to survive even though the reverse execution delay may contain positive incremental information, as found

¹⁰ A 12-month horizon is chosen because of data availability since our sample goes from January 2003 to December 2005.

earlier. Also, results in Table VIII logically suggest that larger and more profitable firms are more likely to survive 12 months after their reverse split. In fact, firm size and *ROA* exhibit strongly positive and significant coefficients in all specifications. Furthermore, managers' and directors' incentives, contrary to our expectations (Hypothesis 4), negatively affect the survival of reverse-splitting firms. This is confirmed by the negative and statistically significant coefficient of *Overall incentives*. More specifically, results indicate that firms which grant loans to exercise stock options are less likely to survive. Indeed, granting loans to exercise stock options may be burdensome, especially for reverse-splitting firms with weak growth opportunities (see Table IV). Moreover, stock ownership requirements for directors (see *Dirsubstock* variable) negatively affect the survival of reverse-splitting firms. In fact, director ownership may make directors overbearing, particularly when the firm is not doing well. Holmstrom (2005) notes that “[p]owerful boards can be disastrous for a company...” while Song and Thakor (2007) state that “greater board oversight can produce the opposite of its intended effect.” This may also explain why longer delays in reverse split execution lead to a lower probability of survival, perhaps because management is forced to deal with an overbearing board.

V. Conclusion

In the context of reverse splits, this paper investigates the factors that separately determine the decision, the choice of factor and magnitude, and the execution delay. We also examine whether reverse split factors and reverse split execution delays help predict firms' survival and how managers' and directors' incentives affect the likelihood of a firm to survive a reverse split.

The findings reveal that a reverse split decision is essentially motivated by unusual rundowns in stock price and poor growth opportunities. These results are consistent with the signaling hypothesis advocated in the literature (see Spudeck and Moyer, 1985, among

others). We observe that whether or not a reverse split is announced, and based on the market preannouncement information set (including preannouncement price, size, rundown and trading volume), negative incremental information is conveyed by reverse split factors and positive incremental information is conveyed by reverse split execution delays. Also, it appears that larger firms are less likely to announce a reverse split than smaller firms.

Moreover, the choice of reverse split factor is determined by firm size and preannouncement price level. In fact, low preannouncement prices lead to large reverse split magnitudes. We find that large firms are more likely to prefer small reverse split magnitudes. Younger firms are also more likely than older firms to prefer small reverse split magnitudes, probably due to prudence. Firms with low preannouncement trading volumes will be more concerned with moving out of the penny stock range and will avoid large reverse split sizes so as not to discourage small investors from holding their stock. Controlling for price level and prospect indicators, firms appear to be more concerned with corporate image in general and investor perceptions in particular and will therefore choose larger reverse split sizes when directors are subject to stock ownership requirements. This implies that directors' incentives lead to different decisions regarding the choice of reverse split factor than when directors' wealth is independent of the firm's value.

Our empirical results also reveal that smaller or younger firms are more likely to realize the announced reverse split earlier. Contrary to our expectations, we find that when directors are subject to stock ownership requirements, the split execution delay is longer (strong and positive impact), probably because directors' oversight is greater, thus setting back execution of the announced reverse split.

Lastly, the findings of this study indicate that the likelihood of surviving 12 months after the reverse execution is positively related to the chosen reverse split magnitude. Firms with larger reverse split sizes are more likely to survive given that their post reverse split price

is high enough to attract institutional investors and to meet listing requirements. Moreover, the probability of surviving 12 months after the reverse execution is negatively related to how long firms wait to make the reverse split effective. Intuitively, firms that wait a long time to move their price out of the penny stock range will be less likely to survive. It is also interesting to note that while larger firms appear more reluctant to announce a reverse split, when they do so they are also less likely to survive. It appears that large firms consider reverse splits a last-resort solution. For reverse-splitting firms, we also find that granting loans to exercise stock options may be burdensome and that directors' ownership may make directors overbearing, leading to disastrous consequences (see Holmstrom, 2005; Song and Thakor, 2007) which reduce the probability of survival.

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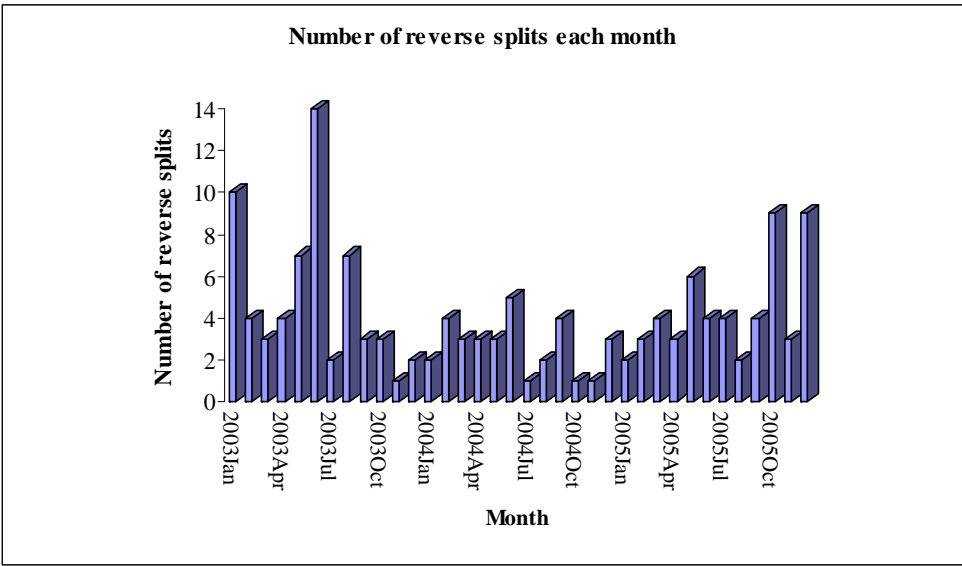


Figure 1: This figure provides an overview of the number of reverse stock splits over time. The sample includes 145 reverse stock splits announced from January 1, 2003, to December 31, 2005.

Table I: Summary Statistics

Our initial sample contains 145 reverse splits that occurred on NASDAQ, NYSE and AMEX from January 2003 to December 2005. Panel A reports reverse splits by factors and year. Panel B provides descriptive statistics for reverse split delay. We trim the top 1% of observation from the reverse split execution delay to limit the impact of outliers. The descriptive statistics of the trimmed sample are presented in parentheses. Panel C reports the p-value of tests on the split delay across split delay terciles. The *split execution delay* is equal to the number of days that elapse from the announcement date to the effective date. As reported in CRSP, the *split factor* is $FACPR = [S(t)/S(t')] - 1$, where $s(t)$ is the number of shares outstanding after the split and $s(t')$ is the number of shares outstanding before the split. Also reported are p-values of mean comparisons (with unequal variance) and Man-Whitney (Wilcoxon rank-sum) comparisons between different groups. The symbols ***, **, * indicate a significance level of respectively 1%, 5% and 10%.

Panel A: Distributions of reverse stock splits by factor and year

Reverse Split Size	CRSP FACPR	Year			
		2003	2004	2005	Total
43 for 49	-0.122	0	0	1	1
11 for 15	-0.267	0	0	1	1
1 for 2	-0.500	1	3	3	7
2 for 5	-0.600	1	0	2	3
1 for 3	-0.667	6	5	2	13
1 for 4	-0.750	10	5	11	26
1 for 5	-0.800	12	5	13	30
1 for 6	-0.833	4	2	2	8
1 for 7	-0.857	4	0	3	7
1 for 8	-0.875	3	1	1	5
1 for 9	-0.889	1	0	0	1
1 for 10	-0.900	12	7	9	28
1 for 12	-0.917	0	0	1	1
1 for 13	-0.923	0	0	1	1
1 for 15	-0.933	2	1	0	3
1 for 20	-0.950	2	2	2	6
1 for 25	-0.960	0	1	0	1
1 for 30	-0.967	2	0	0	2
1 for 50	-0.980	0	0	1	1
Total		60	32	53	145

Panel B: Timing of split execution tercile

	Mean (in days)	Median (in days)	Std. Dev.	Max	Min	Number of Observations
1 (short delay)	0.98 (0.98)	1 (1)	0.13 (0.13)	1 (1)	0 (0)	58 (58)
2	3.07 (3.07)	3 (3)	0.52 (0.52)	4 (4)	2 (2)	41(41)
3 (long delay)	34.74 (28.69)	14.5 (14)	57.50 (40.73)	307 (203)	5 (5)	46 (45)
Total	12.28 (10.24)	3 (3)	35.63 (25.83)	307 (203)	0 (0)	145 (144)

Panel C: Tests of equality of means and medians (p-values)

	Mean	Median
1 versus 3	0.000***	0.000***
1 versus 2	0.000***	0.000***

Table II: Reverse split factor and firm characteristics

Panel A presents univariate relations between reverse split factor delay and firm characteristics. Panel B tests the effects of directors' ownership, directors' and officers' ownership (5%-30%), stock option plan and loan for option exercise on reverse split delay. The *reverse split execution delay* is equal to the number of days from announcement date to effective date. *Log(age)* is the natural logarithm of the firm age at the announcement date (days from listing date to split announcement date). *P_Price* and *Log(size)* are respectively the price level and the natural logarithm of the market value on trading date [-5], where [0] represents the split announcement date. *Rundown* is the buy-and-hold return from one year before the reverse split announcement through five trading days prior to the reverse split announcement. *Market-to-book* is the monthly market-to-book ratio prior to the reverse split announcement. *Volume* is computed as the ratio of the average number of shares traded in the month prior to the split announcement to the total quarterly number of outstanding shares before the reverse split announcement. Also reported are p-values of mean comparisons (with unequal variance) and Man-Whitney (Wilcoxon rank-sum) comparisons between different groups. The symbols ***, **, * indicate a significance level of respectively 1%, 5% and 10%.

Panel A: Reverse split factor and firm characteristics

	1 (<5 for 1)		2 (5 for 1)		3 (>5 for 1)		Diff. mean (median) 1 versus 2&3 p-Value
	Mean	Median	Mean	Median	Mean	Median	
Firm attributes							
Log(age)	3.45	3.41	3.31	3.31	3.44	3.41	0.375 (0.458)
P_Price	6.01	2.24	0.84	0.64	0.85	0.96	0.001*** (0.000***)
Log(size)	7.50	7.28	6.98	7.01	6.35	6.14	0.000*** (0.000***)
Past performance							
Rundown	0.20	-0.05	0.70	-0.39	-0.43	-0.50	0.288 (0.000***)
Growth opportunities							
Market-to-Book	3.18	1.63	3.77	1.86	1.42	0.65	0.549 (0.101)
Split factor							
Split factor	-0.66	-0.75	-0.80	-0.80	-0.90	-0.90	0.000*** (0.000***)
Liquidity							
Volume	0.13	0.07	0.29	0.16	0.21	0.08	0.026** (0.058*)

Panel B: Reverse split factor and managers' and directors' incentives

		Split factor		Diff. mean p-value
		Mean	Median	
Directors' ownership	Yes	-0.654	-0.625	0.215 (0.076*)
	No	-0.799	-0.800	
Directors' and officers' ownership (5%-30%)	Yes	-0.802	-0.800	0.542 (0.964)
	No	-0.790	-0.800	
Stock option plan	Yes	-0.782	-0.800	0.629 (0.363)
	No	-0.796	-0.800	
Loan for option exercise	Yes	-0.813	-0.800	0.167 (0.752)
	No	-0.786	-0.800	
Overall incentives	Yes	-0.800	-0.792	0.812 (0.280)
	No	-0.798	-0.833	

Table III: Timing of reverse split execution and firm characteristics

Panel A presents univariate relations between the reverse split execution delay and firm characteristics. Panel B tests the effects of directors' ownership, directors' and officers' ownership (5%-30%), stock option plan and loan for option exercise on reverse split delay. The *reverse split execution delay* is equal to the number of days from announcement date to effective date. *Log(age)* is the natural logarithm of firm age at the announcement date (days from listing date to split announcement date). *P_Price* and *Log(size)* are respectively the price level and the natural logarithm of the market value on trading date [-5], where [0] represents the split announcement date. *Rundown* is the buy-and-hold return from one year before the reverse split announcement through five trading days prior to the reverse split announcement. *Market-to-book* is the monthly market-to-book ratio prior to the reverse split announcement. *Volume* is computed as the ratio of the average number of shares traded in the month prior to the split announcement to the total quarterly number of outstanding shares before the reverse split announcement. Also reported are p-values of mean comparisons (with unequal variance) and Man-Whitney (Wilcoxon rank-sum) comparisons between different groups. The symbols ***, **, * indicate a significance level of respectively 1%, 5% and 10%.

Panel A: Reverse split execution delay and firm characteristics

	1 (short)		2		3 (long)		Diff. mean (median) 1 versus 3 p-Value
	Mean	Median	Mean	Median	Mean	Median	
Firm attributes							
Log(age)	3.41	3.40	3.32	3.29	3.52	3.55	0.096* (0.063*)
P_Price	1.53	0.63	1.28	0.62	5.36	1.31	0.021** (0.007***)
Log(size)	6.61	6.36	6.54	6.39	7.47	7.22	0.000*** (0.000***)
Past performance							
Rundown	-0.05	-0.39	0.37	-0.18	-0.21	-0.42	0.501 (0.851)
Growth opportunities							
Market-to-Book	2.20	1.10	1.91	1.02	3.34	1.55	0.540 (0.136)
Split factor							
Split factor	-0.81	-0.83	-0.81	-0.80	-0.76	-0.80	0.131 (0.230)
Liquidity							
Volume	0.18	0.08	0.24	0.10	0.18	0.07	0.992 (0.761)

Panel B: Reverse split execution delay and managers' and directors' incentives

		Split execution delay		Diff. mean (median) p-value
		Mean	Median	
Directors' ownership	Yes	1.59	1.73	0.087* (0.008***)
	No	0.52	0.48	
Directors' and officers' ownership (5%-30%)	Yes	0.50	0.48	0.418 (0.266)
	No	0.58	0.48	
Stock option plan	Yes	0.66	0.48	0.436 (0.479)
	No	0.53	0.48	
Loan for option exercise	Yes	0.58	0.48	0.683 (0.646)
	No	0.53	0.48	
Overall incentives	Yes	0.60	0.48	0.242 (0.601)
	No	0.49	0.48	

Table IV: Probit models of the reverse split decision

This table presents the results of robust probit regressions explaining the reverse split decision. The dependent variable takes the value of 1 if the firm announced a reverse split during the calendar year and 0 otherwise. *Log(age)* is the natural logarithm of the number of days from listing date to reverse split announcement date. *Rundown* is the buy-and-hold return from one year before the reverse split announcement through five trading days prior to the reverse split announcement. *Market-to-book* is the monthly market-to-book ratio prior to the reverse split announcement. *Volume* is computed as the ratio of the average number of shares traded in the month prior to the reverse split announcement to the total quarterly number of outstanding shares before the reverse split announcement. *Earnings Changes*=1 if ΔEPS (earnings per share) > 0 around reverse split announcement and *Earnings Changes*=1 if ΔEPS (earnings per share) > 0 before reverse split announcement. *Dirsubstock*: equals 1 if directors are subject to stock ownership requirements and 0 otherwise. *Diownership* equals 1 if Directors' and officers' ownership as a percentage of shares outstanding is greater than 5 percent and less than or equal to 30 percent (otherwise it is equal to zero). *Stockplan* takes the value of 1 when the company's directors are remunerated with options and 0 otherwise. *Loansoption* takes the value of 1 when the company provides loans to executives for exercising options and 0 otherwise. *Overall incentives* takes the value of 0 when *Dirsubstock* and *Diownership* and *Stockplan* and *Loansoption* take simultaneously the value of 0 and 1 otherwise. Heteroscedasticity-consistent p-values are provided in parentheses. ***, **, * indicate a significance level of respectively 1%, 5% and 10%.

	(1)	(2)	(3)	(4)
Firm attributes				
Log(age)	0.032 (0.903)	0.100 (0.710)	0.006 (0.981)	0.068 (0.795)
P_Price	-0.009 (0.580)	-0.022 (0.232)	-0.017 (0.396)	-0.012 (0.480)
Log(size)	-0.230** (0.029)	-0.188* (0.080)	-0.216** (0.046)	-0.211** (0.047)
Past performance				
Rundown	-0.149*** (0.001)	-0.140*** (0.002)	-0.148*** (0.001)	-0.147*** (0.002)
Growth opportunities				
Market-to-book	-0.0001*** (0.000)	-0.0002*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)
Liquidity				
Volume	0.041 (0.818)	0.052 (0.770)	0.049 (0.781)	0.044 (0.805)
Earnings changes				
=1 if ΔEPS >0 around split		0.118 (0.469)		
=1 if ΔEPS >0 before reverse split		0.130 (0.423)		
Managers' and directors' incentives				
Dirsubstock			0.527 (0.392)	
Diownership			-0.134 (0.418)	
Stockplan			0.112 (0.661)	
Loansoption			-0.017 (0.923)	
Overall incentives				-0.172 (0.281)
Intercept	1.411 (0.228)	0.754 (0.525)	1.461 (0.218)	1.266 (0.284)
Diagnostics				
Pseudo R ²	13.19%	12.85%	13.65%	13.46%
Wald χ^2 test (all coeff.=0)	41.71*** (0.000)	38.27*** (0.000)	44.16*** (0.000)	41.02*** (0.000)
No. of observations	312	300	312	312

Table V: Conditional incremental reverse split effects

This table presents the results of conditional incremental information in reverse split size and in reverse split execution delay. Panel A reports the robust probit reverse split decision with explanatory variables reduced to Nayak and Prabhala (2001) market preannouncement information set. The dependent variable takes the value of 1 if the firm announced a reverse split during the calendar year and 0 otherwise. Panel B and C represent least squares regressions respectively for reverse split magnitude (absolute value of reverse split factor) and reverse split execution delay with the estimated Inverse Mills Ratio (IMR) as explanatory variable. P_Price and $Log(size)$ are respectively the price and the natural logarithm of the market value on trading date [-5], where [0] represents the reverse split announcement date. $Rundown$ is the buy-and-hold return from one year before the reverse split announcement through five trading days prior to the reverse split announcement. $Volume$ is computed as the ratio of the average number of shares traded in the month prior to the reverse split announcement to the total quarterly number of outstanding shares before the reverse split announcement. Heteroscedasticity-consistent p-values are provided in parentheses. ***, **, * indicate a significance level of respectively 1%, 5% and 10%.

Panel A: Probit model for reverse splits

Dependent variable: $REVSP$

Market's prevent information:

P_Price	-0.009 (0.589)
$Log(size)$	-0.234 (0.025)**
$Rundown$	-0.151 (0.001)***
$Volume$	0.033 (0.852)
Constant	1.553 (0.028)**

Diagnostics

Pseudo R^2	13.08%
Wald χ^2 test (all coeff.=0)	23.07 (0.000)***
No. of observations	314

Panel B: Second stage regression with reverse split magnitude

Dependent variable: $|RSFACT|$

λ_{rs} (Inverse Mills Ratio)	-0.215 (0.003)***
Constant	0.991 (0.000)***

Diagnostics

R^2	28%
F (all coeff.=0)	9.39 (0.003)***
No. of observations	120

Panel C: Second stage regression with reverse split execution delay

Dependent variable: $Log(delay)$

λ_{rs} (Inverse Mills Ratio)	0.489 (0.041)**
Constant	0.121 (0.529)

Diagnostics

R^2	6.16%
F (all coeff.=0)	4.26 (0.041)**
No. of observations	120

Table VI: OLS models of reverse split factor

This table presents the results of standard error adjusted least squares regressions explaining the reverse split magnitudes. The dependent variable is the reverse split magnitude measured by the absolute value of the reverse split factor

$|RSFACT = [S(t)/S(t')] - 1|$, where $s(t)$ is the number of shares outstanding after the reverse split and $s(t')$ is the number of

shares outstanding before the reverse split. $Log(age)$ is the natural logarithm of the number of days from listing date to reverse split announcement date. $Rundown$ is the buy-and-hold return from one year before the reverse split announcement through five trading days prior to the reverse split announcement. $Market-to-book$ is monthly market-to-book ratio prior to the reverse split announcement. $Volume$ is computed as the ratio of the average number of shares traded in the month prior to the reverse split announcement to the total quarterly number of outstanding shares before the reverse split announcement. $Earnings\ Changes=1$ if ΔEPS (Earnings per share) > 0 around reverse split announcement and $Earnings\ Changes=1$ if ΔEPS (Earnings per share) > 0 before reverse split announcement. $Dirsubstock$: equals 1 if directors are subject to stock ownership requirements and 0 otherwise. $Diownership$ equals 1 if Directors' and officers' ownership as % of shares outstanding is greater than 5 percent and less than or equal to 30% (otherwise it is equal to zero). $Stockplan$ takes the value of 1 when the company's directors are remunerated with options and 0 otherwise. $Loansoption$ takes the value of 1 when the company provides loans to executives for exercising options and 0 otherwise. $Overall\ incentives$ takes the value of 0 when $Dirsubstock$ and $Diownership$ and $Stockplan$ and $Loansoption$ take simultaneously the value of 0 and 1 otherwise. Heteroscedasticity-consistent p-values are provided in parentheses. ***, **, * indicate a significance level of respectively 1%, 5% and 10%.

	(1)	(2)	(3)	(4)
Firm attributes				
Log(age)	0.062** (0.038)	0.055* (0.083)	0.064** (0.981)	0.062** (0.037)
P_Price	-0.009*** (0.000)	-0.006*** (0.000)	-0.010*** (0.000)	-0.009*** (0.000)
Log(size)	-0.035*** (0.002)	-0.040*** (0.001)	-0.035*** (0.002)	-0.035*** (0.002)
Past performance				
Rundown	-0.005 (0.353)	-0.005 (0.369)	-0.005 (0.271)	-0.005 (0.365)
Growth opportunities				
Market-to-book	0.0005 (0.688)	0.001 (0.374)	0.001 (0.289)	0.0006 (0.677)
Liquidity				
Volume	0.059*** (0.003)	0.053*** (0.008)	0.062*** (0.001)	0.059*** (0.003)
Earnings changes				
=1 if $\Delta EPS > 0$ around split		0.017 (0.338)		
=1 if $\Delta EPS > 0$ before reverse split		0.019 (0.273)		
Managers' and directors' incentives				
Dirsubstock			0.111** (0.013)	
Diownership			-0.017 (0.311)	
Stockplan			0.023 (0.324)	
Loansoption			-0.002 (0.885)	
Overall incentives				-0.005 (0.783)
Intercept	0.843*** (0.000)	0.329*** (0.000)	0.844*** (0.000)	0.841*** (0.000)
Diagnostics				
R ²	55.33%	42.99%	57.32%	55.36%
F (all coeff.=0)	14.92*** (0.000)	18.59*** (0.000)	24.10*** (0.000)	12.62*** (0.000)
No. of observations	118	113	118	118

Table VII: OLS models of reverse split execution delay

This table presents the results of standard error adjusted least squares regressions explaining the reverse split execution delay. The dependent variable is the $\log(\text{days from announcement date to effective date})$. The reverse split magnitude is measured by the absolute value of the reverse split factor $|RSFACT| = \left| \frac{S(t)}{S(t')} - 1 \right|$, where $S(t)$ is the number of shares outstanding after the reverse split and $S(t')$ is the number of shares outstanding before the reverse split. $\text{Log}(\text{age})$ is the natural logarithm of the number of days from listing date to reverse split announcement date. Rundown is the buy-and-hold return from one year before the reverse split announcement through five trading days prior to the reverse split announcement. Market-to-book is the monthly market-to-book ratio prior to the reverse split announcement. Volume is computed as the ratio of the average number of shares traded in the month prior to the reverse split announcement to the total quarterly number of outstanding shares before the reverse split announcement. $\text{Earnings Changes}=1$ if ΔEPS (Earnings per share) > 0 around reverse split announcement and $\text{Earnings Changes}=1$ if ΔEPS (Earnings per share) > 0 before the reverse split announcement. Dirsubstock : equals 1 if directors are subject to stock ownership requirements and 0 otherwise. Diownership equals 1 if Directors' and officers' ownership as a percentage of shares outstanding is greater than 5 percent but less than or equal to 30 percent (otherwise it is equal to zero). Stockplan takes the value of 1 when the company's directors are remunerated with options and 0 otherwise. Loansoption takes the value of 1 when the company provides loans to executives for exercising options and 0 otherwise. $\text{Overall incentives}$ takes the value of 0 when Dirsubstock and Diownership and Stockplan and Loansoption take simultaneously the value of 0 and 1 otherwise. Heteroscedasticity-consistent p-values are provided in parentheses. ***, **, * indicate a significance level of respectively 1%, 5% and 10%.

	(1)	(2)	(3)	(4)
Reverse split factor				
$ RSFACT $	0.960*	0.822		
	(0.095)	(0.175)		
Firm attributes				
$\text{Log}(\text{age})$	0.062***	0.444**	0.505***	0.493***
	(0.009)	(0.018)	(0.004)	(0.003)
P_Price	0.009	0.012	-0.007	0.002
	(0.470)	(0.431)	(0.463)	(0.819)
$\text{Log}(\text{size})$	0.279***	0.262***	0.228***	0.232***
	(0.000)	(0.001)	(0.002)	(0.001)
Past performance				
Rundown	-0.046*	-0.044*	-0.050*	-0.053**
	(0.067)	(0.099)	(0.081)	(0.039)
Growth opportunities				
Market-to-book	0.0003	0.0006	0.004	0.0003
	(0.980)	(0.964)	(0.742)	(0.980)
Liquidity				
Volume	-0.019	-0.026	0.062	0.026
	(0.891)	(0.851)	(0.744)	(0.849)
Earnings changes				
=1 if $\Delta\text{EPS}>0$ around split		0.025		
		(0.824)		
=1 if $\Delta\text{EPS}>0$ before reverse split		0.054		
		(0.600)		
Managers' and directors' incentives				
Dirsubstock			0.805***	
			(0.002)	
Diownership			-0.059	
			(0.612)	
Stockplan			0.159	
			(0.312)	
Loansoption			0.085	
			(0.510)	
$\text{Overall incentives}$				0.119
				(0.229)
Intercept	-3.660***	-3.482***	-2.772***	-2.795***
	(0.000)	(0.000)	(0.001)	(0.000)
Diagnostics				
R^2	28.50%	27.85%	30.88%	27.71%
F (all coeff.=0)	6.15***	4.80***	12.26***	5.77***
	(0.000)	(0.000)	(0.000)	(0.000)
No. of observations	118	113	118	118

Table VIII: Probit models of reverse-splitting firms' survival

This table presents the results of robust probit regressions explaining the probability of reverse-splitting firms survival. The dependent variable *Survival* takes the value of 1 when the end dates in the CRSP database (variable ENDDT) are later than 12 months from the reverse split effective dates and 0 otherwise. The reverse split magnitude is measured by the absolute value of the reverse split factor $|RSFACT| = |S(t)/S(t') - 1|$, where $s(t)$ is the number of shares outstanding after the reverse split and

$s(t')$ is the number of shares outstanding before the reverse split. $\text{Log}(\text{delay})$ is the natural logarithm of days from announcement date to effective date. $\text{Log}(\text{age})$ is the natural logarithm of the number of days from listing date to reverse split announcement date. *Rundown* is the buy-and-hold return from one year before the reverse split announcement through five trading days prior to the reverse split announcement. *Market-to-book* is the monthly market-to-book ratio prior to the reverse split announcement. *Volume* is computed as the ratio of the average number of shares traded in the month prior to the reverse split announcement to the total quarterly number of outstanding shares before the reverse split announcement. ROA is the preannouncement return on assets. *Total debt/total Assets* is defined as the sum of long-term debt and debt in current liabilities, divided by total assets. *Dirsubstock*: equals 1 if directors are subject to stock ownership requirements and 0 otherwise. *Diownership* equals 1 if Directors' and officers' ownership as a percentage of shares outstanding is greater than 5 percent but less than or equal to 30 percent (otherwise it is equal to zero). *Stockplan* takes the value of 1 when the company's directors are remunerated with options and 0 otherwise. *Loansoption* takes the value of 1 when the company provides loans to executives for exercising options and 0 otherwise. *Overall incentives* takes the value of 0 when *Dirsubstock* and *Diownership* and *Stockplan* and *Loansoption* take simultaneously the value of 0 and 1 otherwise. Heteroscedasticity-consistent p-values are provided in parentheses. ***, **, * indicate a significance level of respectively 1%, 5% and 10%.

	Model 1	Model 2	Model 3	Model 4
Reverse split factor				
RSFACT	4.524*** (0.007)	6.284*** (0.000)	7.252*** (0.000)	6.488*** (0.000)
Execution delay				
Log(delay)	-0.883*** (0.001)	-1.010*** (0.001)	-0.992*** (0.001)	-1.022*** (0.001)
Firm attributes				
Log(age)	-0.476 (0.329)	-0.745* (0.073)	-0.612 (0.198)	-0.511 (0.285)
P_Price	0.016 (0.595)			
Log(size)	0.503** (0.015)	0.618*** (0.003)	0.850*** (0.000)	0.735*** (0.000)
Past performance				
Rundown	-0.050 (0.553)			
Growth opportunities				
Market-to-book	0.034 (0.258)			
Liquidity				
Volume	1.945* (0.093)	2.779 (0.103)		
Profitability				
ROA		0.008*** (0.001)	0.007*** (0.005)	0.005** (0.026)
Leverage				
Total debt/total assets		-0.005 (0.189)	-0.008** (0.032)	-0.007* (0.063)
Managers' and directors' incentives				
Dirsubstock			-1.462** (0.035)	
Diownership			-0.041 (0.907)	
Stockplan			0.056 (0.899)	
Loansoption			-0.906** (0.016)	
Overall incentives				-0.806** (0.022)
Intercept	-4.346* (0.074)	-4.911* (0.079)	-6.873** (0.035)	-5.838** (0.057)

Diagnostics

Pseudo R ²	21.04%	28.33%	28.54%	26.28%
Wald χ^2 test (all coeff.=0)	23.88*** (0.002)	26.68*** (0.000)	41.14*** (0.000)	30.44*** (0.000)
No. of observations	118	121	123	123
