

Delisted Firms and Momentum Profits

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ABSTRACT

I find that approximately 40 percent of the momentum profit is generated by firms that are delisted from the market during the holding period, although the proportion of these firms in the momentum portfolio is around 10 percent. Most of the delisting-profit is derived from bankrupt firms, while merged firms have a minor effect on the momentum profitability. I further show that ex ante, firms with high bankrupt risk exhibit a stronger negative momentum than the average past loser, while firms with high likelihood to be merged exhibit a weaker positive momentum than the average past winner. A trading rule based on this asymmetry yields an average profit that is 1.5 times higher than the standard price momentum profit.

Keywords: momentum strategies; delisting

JEL Classifications: G12, G14, G33, G34

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I. Introduction

A typical momentum strategy requires investments in hundreds of firms each month. Specifically, 20 percent of the firms traded in the market are included in the momentum portfolio (the top decile in a long position and the bottom decile in a short position). Many of these firms are delisted from the market during the holding period. Hence, the strategy profit is composed of returns from ‘surviving firms’ (firms that still exist in the market at the end of the holding period) and returns from ‘delisted firms’ (firms that exit the market prior to the end of the holding period). This partition raises questions regarding the role of delisted firms in the momentum puzzle.

Since Jegadeesh and Titman (1993) first documented the momentum anomaly, many studies have explored factors that affect the source and size of momentum. These include trading volume (Lee and Swaminathan (2000)), analyst coverage (Hong, Lim, and Stein (2000)), size and book-to-market (Lewellen (2002)), business cycle (Chordia and Shivakumar (2002)), and industry (Grinblatt and Moskowitz (1999)). This study contributes to the literature by decomposing the momentum anomaly to surviving firms and delisted firms, and examining the differences between these two sub-groups in terms of profitability and mispricing.

The paper contains two main parts. In the first part I examine the effect of ex-post delisted firms on the momentum profitability. I show that delisted firms contribute approximately 40 percent of the momentum profit, while the proportion of these firms in the investment portfolio is only 10 percent. Adjusting the returns to common asset pricing models confirms that the positive effect of delisted firms on the momentum profit is not attributed to risk, although delisted firms are significantly smaller than surviving firms.

Consistent with these result, I find a positive time-series relation between the profit of a portfolio and the proportion of delisted firms in the portfolio; i.e., the investor would be better off when more firms in the momentum portfolio are delisted from the market during the holding period.

Examining separately the main delisting causes shows that most of the delisting-profit is derived from bankrupt firms, while merged firms have a minor effect on the momentum profit.¹ I offer an explanation for this difference that is based on different characteristics of the pre-delisting price movements of merged and bankrupt firms.

In the second part of the paper I examine whether ex-ante, information about the likelihood of delisting has effect on the momentum profitability. By employing bankruptcy- and merger-prediction models, I find that firms with high likelihood to go bankrupt exhibit a stronger negative momentum pattern than the average past loser, while firms with high likelihood to be merged exhibit a weaker positive momentum pattern than the average past winner. I show that a trading rule based on these differences yields an average profit that is almost 1.5 times higher than that of the standard price momentum strategy.

The remainder of the paper is organized as follows. The next section reviews the literature. Section III describes the trading strategies. Section IV examines the contribution of delisted firms to the momentum profit. Section V addresses the effect of the likelihood of delisting on momentum. Section VI discusses the implications of the results, and Section VII concludes.

¹ Throughout the paper ‘merged firms’ refers to targets in merger transactions.

II. Related literature

Many studies show that past returns have predictive ability over future returns. Jegadeesh and Titman (1993) examine whether an investor can use return momentum (both positive and negative) to create abnormal positive profits. They find that a strategy based on buying past winners (the stocks with the highest past returns) and selling past losers (the stocks with the lowest past returns) generates a positive profit of approximately 1 percent per month in the short run. Similar results were documented ever since by other studies (see, e.g., Chan, Jegadeesh, and Lakonishok (1996), Lee and Swaminathan (2000), and Jegadeesh and Titman (2001)). Rouwenhorst (1998) tests the same phenomenon in European stock markets, and finds that momentum strategies work in 11 out of the 12 countries examined.

Several researchers (e.g., Conrad and Kaul (1998)) argue that the momentum profit compensates for risk, i.e., that the positive returns of momentum strategies are driven by cross-sectional differences and not by time-series predictions. However, most researchers dismiss the idea of risk premium as a source of the momentum profitability. Fama and French (1996), Jegadeesh and Titman (2001), and others have shown that the significance of the momentum profitability survives after controlling for risk premium.

The momentum phenomenon has attracted the attention of many researchers who tried to identify variables that contain information about the momentum profitability. Grinblatt and Moskowitz (1999) conclude that momentum is not a single firm characterization, but rather one of a whole industry. They find that strategies of buying stocks that belong to past-prosperous industries and selling stocks belonging to past-depressed industries generate abnormal positive returns, while within an industry,

strategies of buying (selling) past winners (losers) do not lead to any significant profits. Lewellen (2002) shows that size and book-to-market portfolios exhibit momentum as strong as that in individual stocks and industries, and therefore concludes that momentum must be due to macroeconomic factors and not firm-specific returns. Consistent with this notion, Chordia and Shivakumar (2002) document that momentum profit is positively related to the market conditions.

Lee and Swaminathan (2000) find that trading volume predicts momentum's existence and strength. They show that a strategy of buying past winners with low trading volume and selling past losers with high trading volume outperforms standard momentum strategies by 2 to 7 percent a year. Their explanation is based on two ideas. First, they conjecture that trading volume is an indicator of the level of interest that investors have in a firm. Second, they claim that stock returns of "neglected" firms tend to increase in the short run, while stock returns of "popular" firms tend to decrease in the short run. Therefore, by combining these two notions, the investor can improve the performance of the momentum strategy. Hong, Lim, and Stein (2000) find that momentum is stronger in firms with lower analyst coverage. This result is explained by the relatively slow release of new information about these firms, which generates a continuous response of investors to the information.

Other studies offer behavioral explanations for the momentum phenomenon that are based on investor judgment biases such as conservatism, over-confidence, self-attribution, and inconsistency (See Barberies, Shleifer, and Vishny (1998), Daniel, Hirshleifer, and Subramanyam (1998), and Hong and Stein (1999)). These studies model two possible explanations for momentum. The first is underreaction of investors to new

information. This explanation suggests that new information about a firm is not reflected immediately in its stock price, but rather gradually over time. Therefore, when new information arrives, the firm enters a period with a sequence of returns in the same direction (i.e., momentum). The second explanation is continued overreaction of investors. This explanation suggests that although new information about the firm is reflected immediately in the returns, the stock price continues to drift in the same direction in the near future. That is, the continued overreaction of investors to the same piece of information creates a monotone sequence of returns over time, which is the price momentum.

III. Trading strategies

As in Jegadeesh and Titman (1993), I construct strategies with four different horizons of the formation period (3, 6, 9 and 12 months) and four different horizons of the holding period (3, 6, 9 and 12 months). Thus, there are 16 strategies distinguished by different formation and holding period combinations, denoted by J-K. For example, an investor who follows a 6-3 strategy would construct a portfolio each month according to the returns in the past 6 months and would hold each portfolio for 3 months. Using CRSP data, I apply these strategies to monthly returns of all stocks listed on NYSE, Amex, and Nasdaq, between January 1975 and December 2000.

The average monthly returns of firms that are delisted from the market during the holding period are calculated as follows: the cumulative return from the beginning of the holding period until the delisting date, including the final delisting return, divided by the number of months of the holding period (i.e., assuming a zero return between the delisting date and the end of the holding period). For example, suppose that a stock is

purchased at the beginning of January 1997 for a holding period of 12 month, and is delisted from the market at the end of May that year. If the cumulative return on that stock during those 5 months until the delisting date is 25 percent and the delisting return is -10 percent, then the average monthly return on the stock over the entire holding period is $[(1.25 \cdot 0.9) - 1] / 12 = -1$ percent.²

Table 1 summarizes the average monthly profits generated by each of the 16 strategies. The results are comparable with those of Jegadeesh and Titman (1993). The strategies generate an average monthly return of around 1 percent, where strategy 3-3 is the only one that has no significant evidence of a positive profit (average monthly return of 0.25 percent with a t-statistic of 1.15). In all other strategies the results are significant at any common significance level (all t-statistics are greater than 3). The most successful strategy in the sample is 9-6 with an average monthly return of 1.54 percent. This strategy also contains the highest winners' performance (2.14 percent per month) and together with strategy 12-6, the lowest losers' performance (0.6 percent per month).

IV. The effect of ex-post delisted firms on the momentum profit

A. The proportion of delisted firms in the momentum portfolio

There are two main causes for firms to be delisted from the market—merger and bankruptcy. Both of these causes are associated with pre-delisting price drifts. Naturally, a bankrupt firm experiences a period of negative abnormal returns prior to the delisting date. In contrast, a merged firm is more likely to experience a period of abnormal positive

² Shumway (1997) documents that delisting return data in CRSP are subject to biases. However, the results hold also when the cumulative returns of delisted firms are calculated without the delisting returns.

returns prior to the merger date (see Schwert (1996)). Figure 1 shows the cumulative average pre-delisting market-adjusted returns of all merged and bankrupt firms traded in NYSE, Amex, and Nasdaq between 1975 and 2000.³ As expected, merged firms have a positive pre-delisting drift (a cumulative average return of approximately 47 percent in the 24 months prior to the delisting date), and bankrupt firms have a negative pre-delisting drift (a cumulative average decrease of 63 percent).

These patterns imply that if the delisting occurs during the holding period of a momentum strategy, then the pre-delisting drift is reflected both in the formation period and in the holding period, until the delisting month. As a result, an ex-post merged firm has a higher probability to be included in the top decile than that of the average firm, and therefore to be purchased by the investor. In the same way, an ex-post bankrupt firm has a higher probability to be included in the bottom decile than that of the average firm, and therefore to be sold by the investor. Due to the monotonicity of the drifts, both merged and bankrupt firms are expected to generate positive profits. Following this analysis, the proportion of delisted firms in the momentum portfolio is expected to be higher than the proportion of delisted firms in the entire market, where there is an asymmetry between the top and the bottom deciles—more mergers in the top decile, more bankruptcies in the bottom decile.

Table 2 presents the distribution of merged and bankrupt firms in the entire market, in the momentum portfolio, and in the top and the bottom deciles separately, for two

³ The market-adjusted return is the difference between the raw return and the CRSP value-weighted portfolio of NYSE, Amex, and Nasdaq stocks. Although CRSP has a specific code for bankruptcy, I include all the delisting categories associated with poor performance such as ‘liquidation’ and ‘dropping due to bad performances’ in the bankruptcy group.

representative strategies, 6-6 and 12-12. While the proportion of delisted firms during an interval of 6 (12) months is 3.3 (6.6) percent, the proportion of delisted firms in the momentum portfolio is significantly higher; 9.7 (15.6) percent of the firms included in the momentum portfolio are delisted during the holding period for the 6-6 (12-12) strategy.⁴ As expected, there is a significant difference between the delisting distribution in the top and the bottom deciles. Delisted firms in the top decile are mostly merged firms in both 6-6 and 12-12 strategies (86.4 and 84.8 percent, respectively), while delisted firms in the bottom decile are mostly bankrupt firms (81.7 and 78.6 percent). Overall, this evidence supports the prediction that relative to the average firm, ex-post merged firms tend to enter the top decile, ex-post bankrupt firms tend to enter the bottom decile, and as a result, the proportion of delisted firms in the momentum portfolio significantly exceeds that in the entire market.

B. The profitability of delisted firms

I examine whether delisted firms generate higher profits than surviving firms. An ex-post merged firm is likely to experience a positive return in the holding period. However, firms in the top decile also experience (on average) a positive return in the holding period. Therefore, the effect of merged firms on the momentum profit would be positive only if the average pre-delisting return of merged firms during the holding period is higher than that of surviving firms in the top decile. In a similar way, bankrupt firms would increase the momentum profit only if the average pre-delisting return during the holding period is lower than that of surviving firms in the bottom decile.

⁴ Chi-Square tests for the differences between the proportions of delisted firms in the momentum portfolio and in the entire market generate extremely low p-values.

To examine the effect of delisted firms on the momentum profit, I calculate the average profits after excluding the returns of the delisted firms. The results presented in Table 3 show that in all 16 strategies the profit decreases when excluding the delisted firms' returns. For example, the monthly profit of the strategy 6-6 decreases from 1.21 to 0.86 percent, and the monthly profit of the strategy 12-12 decreases from 0.92 to 0.48 percent. Consistent with these results, the returns of delisted firms are significantly higher than those of surviving firms. The average monthly return generated by delisted firms is 4.2 percent, compared to 0.76 percent generated by surviving firms, where the t-statistics of the differences between delisted and surviving firms' returns range between 6 and 13.

Taking into account the differences in the returns of surviving and delisted firms and the proportion of delisted firms in the momentum portfolio allows estimating the contribution of delisted firms to the momentum profit.⁵ In the strategy 6-6 (12-12) the delisted firms account for 9.7 (15.6) percent of the portfolio, but contribute 35 (53) percent of the total momentum profit. On average (considering all 16 strategies), delisted firms account for 10 percent of the momentum portfolio and contribute 40 percent of the profit. Delisted firms therefore have a significant positive effect on the momentum profit.

C. Risk adjustment

Many studies have shown that the profitability of momentum strategies remains significant after adjusting for risk by controlling for common factors such as size and

⁵ The average profit of a momentum strategy can be presented as: $\pi_{all} = (1 - \alpha)\pi_s + \alpha\pi_d$ where α is the proportion of delisted firms in the momentum portfolio, and π_{all}, π_s, π_d are the average monthly returns of all firms, surviving firms, and delisted firms, respectively. Hence, the proportion of the profit generated by delisted firms is $\alpha\pi_d / \pi_{all}$.

book-to-market ratio. Nevertheless, since delisted firms have different characteristics than surviving firms (e.g., delisted firms are expected to be smaller), I examine whether the significant positive effect of delisted firms on the momentum profitability holds after controlling for size and book-to-market.

Table 4 presents the average size and the median book-to-market ratio for the ten deciles in the 6-6 strategy.⁶ Consider first the entire sample. Firms included in the two extreme deciles are relatively small, although there is a substantial difference between the average size of top decile firms (\$481.5M) and bottom decile firms (\$93.3M). The reason for this asymmetry is that the size is measured at the end of the formation period. Since the returns of stocks included in the top decile (past winners) were much higher than those in the bottom decile (past losers) in the past 6 months, the average size of past winners has increased by much more than the average size of past losers. A similar pattern is observed when considering surviving firms and delisted firms separately. In addition, the average size of delisted firms is, as expected, much smaller than that of surviving firms, especially in the bottom decile.

The differences in the book-to-market ratios among the ten deciles are less significant, except for the book-to-market ratio of the top decile, which is relatively low at 0.45 (compared to ratios around 0.7 in the other deciles). Unlike in the case of size, the differences between book-to-market ratios of delisted firms and surviving firms are quite small, and in general delisted firms have lower book-to-market ratios.

To control for the effects of size and book-to-market I adjust the momentum profits to the three-factor model (Fama and French (1993)). Table 5 presents the adjusted-profit of

⁶ I report the median book-to-market ratio because the average book-to-market is influenced by extreme outliers of book value in COMPUSTAT data.

the 16 strategies, with and without delisted firms' returns. The results show that the positive effect of delisted firms is even greater when using the three-factor model as a benchmark for normal returns. For instance, in the strategy 6-6 the profit decreases by nearly 50 percent, and in the strategy 12-12 by 90 percent, when excluding the delisted firms' returns. Furthermore, in 7 strategies (out of the 16), the significance of the positive momentum profit is lost when delisted firms are excluded. These results indicate that the positive effect of delisted firms on the momentum profit is not attributed to risk premium.

D. Time series relation between profitability and delisting proportion

An additional indication of the effect of delisted firms on the momentum profit can be derived from a time series relation between the proportion of delisted firms in a momentum portfolio and the profit generated by the portfolio. That is, a positive relation will be consistent with a positive effect of delisted firms on momentum profits. Moreover, a time-series relation will indicate that the relatively high profits generated by delisted firms are not attributed to a certain period, but rather are consistent over time.

Since the delisted firms during the holding period are related to a specific portfolio, I use portfolio returns, instead of monthly returns, as a dependent variable. This method does not affect the average profit of the strategies, and increases the power of the tests due to a direct match between a specific portfolio's return and the proportion of delisted firms in that portfolio (see the appendix for details). Table 6 shows the slope coefficients (and their t-statistics) of the regressions for all 16 strategies. All the coefficients are positive, where in 15 out of the 16 strategies the t-statistics are higher than 2; i.e., the higher the proportion of delisted firms in the portfolio, the higher the profit. This result

provides additional evidence that delisted firms play an important role in the momentum puzzle.

E. Mergers and bankruptcies

Merger and bankruptcy profits

I examine the separate effects of ex-post merged firms and bankrupt firms on the momentum profit. Table 7 (Panel A) presents the average profits of strategies 6-6 and 12-12 with and without delisted firms, with and without bankrupt firms, and with and without merged firms. As shown in the previous section, in both strategies the profit significantly decreases when excluding the delisted firms as one group. However, this table shows that the reduction in the profit is attributed almost entirely to bankrupt firms. Without bankruptcies the profit of the strategy 6-6 decreases from 1.21 to 0.94 percent, while without mergers, the profit decreases from 1.21 to 1.20 percent only. A similar pattern is observed in the strategy 12-12.

The table further shows that the average return of bankrupt firms in the strategy 6-6 (12-12) is 7.14 (4.94) percent and the average return of merged firms is 1.70 (0.97) percent, while the average return of surviving firms is 0.86 (0.48) percent. That is, the average profit generated by bankrupt firms is eight-to-ten times higher than that generated by surviving firms, and four-to-five times higher than that generated by merged firms.

Panel B shows the t-statistics of the differences between the three sub-groups of the momentum portfolio. Bankrupt firms' returns are significantly higher than those of merged and surviving firms (t-statistic higher than 9), while the differences between the merged and the surviving firms' average returns are smaller, but still significant (t-

statistics of 2.81 and 1.83). In summary, by decomposing the momentum portfolio into three sub-groups of firms, I find that bankrupt firms are the most profitable, followed by merged firms and surviving firms.

Pre-delisting returns structure

One possible explanation for the difference between the effects of mergers and bankruptcies is that the cumulative return (in absolute values) prior to bankruptcy is higher than that prior to merger. As shown previously, the average cumulative return during the 24 months prior to the delisting date of bankrupt firms is -63 percent, compared to 47 percent of merged firms. However, if a delisted firm is included in the momentum portfolio, then the holding period of the strategy begins no earlier than 12 months prior to the delisting date. Hence, cumulative returns during only the 12 months prior to the delisting dates should be compared.

The pre-delisting drift of merged firms is mostly concentrated in the 12 months prior to the delisting date, while the pre-delisting drift of bankrupt firms is more linear through the entire 24 months (see Figure 1). Thus, the difference in the cumulative returns of the two groups is becoming smaller when approaching the delisting month. Considering all sub-holding-periods during the 12 months prior to the delisting dates, the difference between the average monthly returns of bankrupt and merged firms is less than 1 percent. Since the difference between the average monthly profits generated by bankrupt and merged firms is much higher (between 4 and 5.5 percent, see Table 7), it is unlikely that the difference in the effects is derived from the magnitudes of the cumulative pre-delisting returns.

A second possible explanation for the difference between the effects of merged and bankrupt firms on the momentum profit is that the correlation between the formation and the holding period excess returns within the pre-delisting drift of merged firms is lower than that of bankrupt firms.⁷ Figure 2 illustrates this point. The solid lines represent the observed pre-delisting average drifts of merged and bankrupt firms. Although the average drifts are quite symmetric, they are composed of different structures of individual drifts (represented by the dashed lines). The main difference between these structures is that within the mergers drifts the correlation between the formation and the holding period returns is negative, while within the bankruptcies drifts the correlation is positive. Consider two merged firms ($M1, M2$) and two bankrupt firms ($B1, B2$). Out of the two merged firms, firm $M1$ has the higher return in the formation period and is therefore more likely to enter the top decile. Out of the two bankrupt firms, firm $B2$ has the lower return in the formation period and is therefore more likely to enter the bottom decile. However, due to the negative correlation of merged firms returns, firm $M1$ generates relatively low profit in the holding period, while due to positive correlation of bankrupt firms' returns, firm $B2$ generates relatively high profit in the holding period (low return in short position). Hence, the contribution of bankrupt firms to the momentum profit is higher than that of merged firms.

⁷ The excess return of a merged (bankrupt) firm is the difference between the raw return and the average return of all merged (bankrupt) firms. That is, this argument implies the following:

$\text{corr}(R_{bi}^f - \overline{R_b^f}, R_{bi}^h - \overline{R_b^h}) > \text{corr}(R_{mj}^f - \overline{R_m^f}, R_{mj}^h - \overline{R_m^h})$, where $R_{bi}^{f(h)}$ is the formation (holding) period return of bankrupt firm i , $\overline{R_b^{f(h)}}$ is the average formation (holding) period return of all bankrupt firms, $R_{mj}^{f(h)}$ is the formation (holding) period return of merged firm j , and $\overline{R_m^{f(h)}}$ is the average formation (holding) period return of all merged firms.

The correlation structures can be tested by applying the momentum strategy separately to merged firms and bankrupt firms, where the higher the correlation, the higher the expected profit. This can be illustrated using the same example. Within the bankrupt firms' momentum, firm *B1* enters the top decile (and is purchased by the investor), and firm *B2* enter the bottom decile (and is sold by the investor). This strategy will generate a positive profit since the return of firm *B1* in the holding period is higher than that of firm *B2*. Within the merged firms' momentum, firm *M1* enters the top decile (and is purchased by the investor), and firm *M2* enters the bottom decile firms (and is sold by the investor); however, this strategy will generate a negative profit since the return of firm *M1* in the holding period is lower than that of firm *M2*. Hence, if the correlation between the formation and the holding period returns within bankrupt firms is higher than that within merged firms, then the average profit of the bankrupt firms' strategy is expected to exceed that of the merged firms' strategy.⁸

Table 8 shows the average profits of momentum strategies when applied separately to bankrupt firms and merged firms. In order to maintain a sufficient number of firms in the momentum portfolio I divide the firms into five quintiles instead of the standard ten deciles. The results show that in each of the 16 horizons the profit of the bankruptcies momentum is significantly positive, while the profit of the mergers momentum is significantly negative. That is, the results indicate not only that the correlation of bankrupt firms' returns is higher than that of merged firms' returns, but also that the correlation of merged firms' returns is negative. These results strongly support the

⁸ Note that the profit of a momentum strategy that is applied to delisted firms only is different from the average profit of delisted firms as a part of the standard momentum strategy.

hypothesis that the difference in the effect of bankrupt and merged firms on the momentum profit is derived from different correlation structures within the two groups.

The difference in the correlation structure of bankrupt and merged firms' returns can be explained by the pre-delisting processes of the two groups. The market price of firms that approach bankruptcy typically declines gradually overtime, with no particular reason for extreme jumps at specific dates. Therefore, the typical pre-delisting drift of bankrupt firms is roughly linear, which is associated with positive correlation (as described in Figure 2).

Merged firms, however, are characterized by different structure of pre-delisting drift, where a significant price change is concentrated in relatively short interval around the bid announcement. Schwert (1996) shows that most of the pre-delisting price change of merged firms occurs during the 21 trading days prior to the first bid announcement date. This pattern suggests that merged firms that are included in the top decile are more likely to be those that already had the first bid, and therefore to have relatively low return in the holding period. Merged firms that are not included in the top decile, however, are more likely to have the first bid during the holding period, and therefore to have relatively high return in that period. This implies a negative correlation between the formation period and the holding period returns within merged firms, resulting in a lower contribution to the momentum profit than that of bankrupt firms.

V. The effect of the likelihood of delisting on the momentum profit

A. Ex-post delisted firms and ex-ante delisting-candidates

The evidence that ex-post delisted firms, mainly bankrupt firms, generate a higher profit than surviving firms within the momentum portfolio, raises the questions of

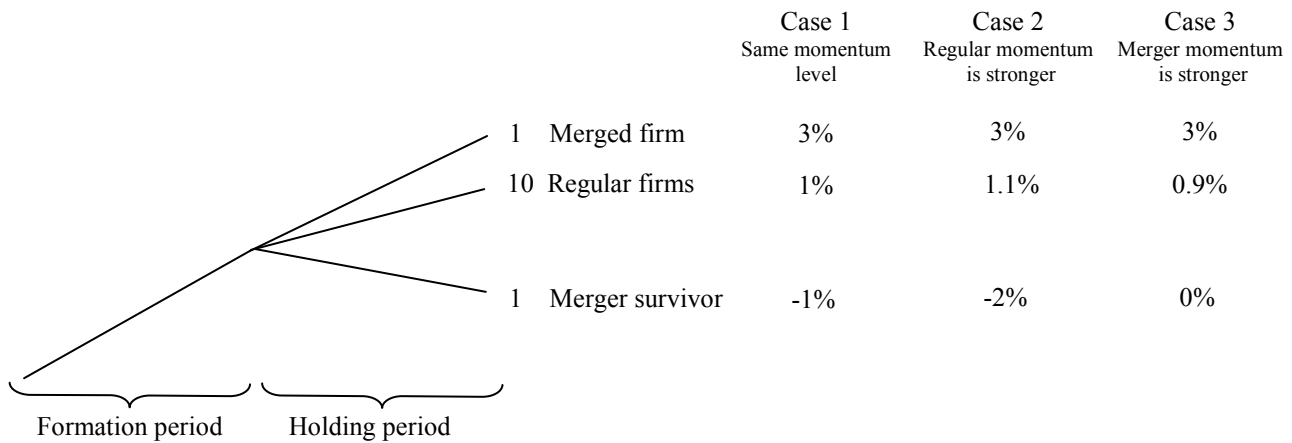
whether ex-ante ‘delisting-candidates’ (firms with relatively high probability to exit the market in the short run) are relatively mispriced. Based on the results so far, we cannot draw a clear conclusion regarding the relative accuracy of the pricing of delisting-candidates. This is because we observe only firms that ex-post left the market, and we do not observe firms that had high likelihood to be delisted, but eventually survived. This can be demonstrated using the following example.

Suppose that the top decile at the end of the formation period contains 12 firms, out of which two are candidates for a merger during the holding period, with a probability of 0.5 to be merged, and the remaining ten have no merger possibilities (referred to as ‘regular’ firms).⁹ Consider three cases: (1) The market is equally accurate in valuing merger-candidates and regular firms. In this case, the regular momentum is equal to 1 percent, which means that the average return in the holding period of the ten regular firms is 1 percent. The merger momentum is also equal to 1 percent, which means that the expected return of the two merger-candidates is 1 percent; in particular, assume that the return of merger-candidates is 3 percent in case of merger and -1 percent in case of no-merger. (2) The market is more accurate in valuing merger-candidates than regular firms. In this case, the regular momentum is stronger than the merger momentum. Assume that the average return of the ten regular firms is 1.1 percent, while the expected return of the two merger-candidates is 0.5 percent (3 percent in case of merger and -2 percent in case of no-merger). (3) The market is less accurate in valuing merger-candidates than regular firms. In this case, the regular momentum is weaker than the merger momentum. Assume that the average return of the ten regular firms is 0.9 percent, while the expected return of

⁹ A similar analysis can be performed for bankruptcies.

the two merger-candidates firms is 1.5 percent (3 percent in case of merger and 0 percent in case of no-merger).

The figure below describes the holding period returns of the 12 firms in each case:



Examining the profit generated by the momentum strategy ex-post allows to distinguish only between merged firms and surviving firms (regular firms and merger survivors are observed as one group—the surviving firms). The average returns generated by these two groups are presented in the table below. Apparently, all three cases yield the same returns, where the general profitability of the momentum is 1 percent, the profitability of the merged firm is 3 percent, and the profitability of the surviving firms is 0.82 percent.

	Case 1	Case 2	Case 3
All firms	$\frac{1}{12}(3 \cdot 1 + 1 \cdot 10 + (-1) \cdot 1) = 1$	$\frac{1}{12}(3 \cdot 1 + 1.1 \cdot 10 + (-2) \cdot 1) = 1$	$\frac{1}{12}(3 \cdot 1 + 0.9 \cdot 10 + 0 \cdot 1) = 1$
Surviving firms only	$\frac{1}{11}(1 \cdot 10 + (-1) \cdot 1) = 0.82$	$\frac{1}{11}(1.1 \cdot 10 + (-2) \cdot 1) = 0.82$	$\frac{1}{11}(0.9 \cdot 10 + 0 \cdot 1) = 0.82$
Merged firms only	3	3	3

In summary, although each of the three cases represent different accuracy-level of the market in valuing merger-candidates and regular firms, still, they all generate the same “observed” results. Hence, the evidence of higher returns of delisted firms does not necessarily imply that mergers (or bankruptcies) are associated with less or more accurate pricing than regular firms.

To address the effect of ex-ante delisting-candidates on the momentum profits I employ delisting prediction models, both for mergers and bankruptcies. I measure the score of the delisting models for each firm in the momentum portfolio at the end of the formation period, and accordingly divide the firms into two groups—delisting-candidates and non-delisting-candidates firms.

B. Delisting-candidates momentum

Bankruptcy-candidates portfolio

The criteria I use for measuring bankruptcy risk is based on Altman’s z-score (see Altman (1968)), a widely used model of bankruptcy prediction.¹⁰ According to the model, the lower the z-score, the higher the bankruptcy risk, where a z-score below 1.81 indicates high bankruptcy risk. I calculate the z-score for each of the firms in the bottom decile each month, and construct two sub-portfolios accordingly. The first one, referred

¹⁰ Altman’s Z-score model for predicting bankruptcies is: $Z\text{-score}=1.2(\text{working capital}/\text{total assets})+1.4(\text{retained earnings}/\text{total assets})+3.3(\text{earnings before interest and taxes}/\text{total assets})+0.6(\text{market value of equity}/\text{book value of total liabilities})+0.999(\text{sales}/\text{total assets})$.

The inputs of the model are computed from COMPUSTAT, where for each month, the relevant variables are taken from the previous quarter. For instance, the inputs for any of the months between January 98 and March 98 are computed from the last quarter of 1997, the inputs for any of the month between April 98 and June 98 are computed from the first quarter of 1998, and so on.

to as ‘low z-score’, includes all firms in the top decile and only firms with z-scores below 1.81 in the bottom decile. This portfolio is based on strategy of buying all past winners and selling only past losers that are bankruptcy-candidates. The second sub-portfolio, referred to as ‘high z-score’, includes all firms in the top decile and only firms with z-scores above 1.81 in the bottom decile (i.e., buying all past winners and selling only past losers that are not bankruptcy-candidates).

Table 9 presents the profitability of the standard, the low z-score, and the high z-score strategies, in each of the 16 horizons. Since the winners’ decile contains the same firms in all of the three strategies, I report the winners’ returns only for the standard strategy. The table also report the average returns in the formation period to ensure that the differences in the profits are not affected by differences in the formation period returns; i.e., that the differences in the profits are not driven by the standard momentum effect. The results show indeed that there are only minor differences in the formation period returns between the low z-score and the high z-score portfolios.

In all 16 horizons the low z-score strategy generates a higher return than the high z-score strategy. In the 6-6 horizon, for example, the average profit of the low z-score strategy is 1.47 percent, while the average profit of the high z-score strategy is 1.01 percent (compared to standard profit of 1.20 percent).¹¹ The differences between the profits are derived from the losers’ decile, where the average losers’ return in the standard, the low z-score, and the high z-score strategies are 0.75, 0.47, and 0.93 percent, respectively. Thus, the average return of the bankruptcy-candidates is significantly lower than that of the rest of the firms in the bottom decile. While the average monthly profit of

¹¹ The profit of this strategy, as well those of the other strategies, is not equal to the profit presented in previous tables due to missing values restrictions when applying the Altman model.

the standard strategy is 1.09 percent, the low z-score portfolio generates an average profit of 1.34 percent and the high z-score portfolio generates an average profit of 0.85 percent (the average losers' returns are 0.76, 0.52, and 1.01 percent, respectively).

These results suggest that firms with high bankruptcy risk exhibit a stronger negative momentum than the average past loser.¹²

Merger-candidates portfolio

Several studies have attempted to develop a model for predicting merger targets. These include Simkowitz and Monroe (1971), Stevens (1973), Wansley (1984), Dietrich and Sorenson (1984), Palepu (1986), Pastena and Ruland (1986), and Barnes (1990). I use the Stevens models (the Wansley model produces similar results).¹³ Similar to the bankruptcy-candidates portfolio, I calculate the Stevens-model value (referred to as the m-score) for each of the firms in the top decile each month, where the lower the m-score, the higher the probability to be merged. However, since there is no a specific value that indicates high merger probability (equivalent to the 1.81 z-score in the Altman model), I simply use the median of the scores to construct two sub-portfolios. The first one, referred to as 'low m-score', includes all firms in the bottom decile and only firms with m-score below the median in the bottom decile. This strategy is based on buying past merger-candidates winners and selling all past losers. The second sub-portfolio, referred

¹² This result is consistent with Avramov, Chordia, Jostova, and Philipov (2006) who show that Momentum profitability is significantly larger among firms with low credit rating.

¹³ Stevens model for predicting mergers is: $M=0.108(EBIT/Sales)-0.033(net\ working\ capital/total\ assets)+0.987(sales/total\ assets) +0.111(long-term\ liabilities/total\ assets)$, where the lower the value, the higher the probability of merger. The inputs of the model are computed from COMPUSTAT in the same way as in the Altman model.

to as the ‘high m-score’, includes all firms in the bottom decile and only firms with m-score above the median in the top decile (i.e., buying past winners that are not merger-candidates and selling all past losers).

Table 10 presents the average profits (as well as the average returns in the formation period) of the standard strategy and the two merger-based strategies. In this case, the losers’ decile contains the same firms in all of the three strategies; hence, I report the losers’ returns only for the standard strategy. As in the bankruptcy-candidates strategies, the formation period returns of the high m-score and low m-score strategies are quite similar, suggesting that the differences in the average profits are not driven by the general momentum effect.

The results show that in all 16 horizons the high m-score strategy generates a higher return than the low m-score strategy. In the 6-6 horizon, the average profit of the high m-score strategy is 1.51 percent, while the average profit of the low m-score strategy is 0.90 percent (compared to a standard profit of 1.21 percent). The differences are derived from the winners’ decile, where the average winners’ returns in the standard, the low m-score, and the high m-score strategies are 1.94, 2.24, and 1.64 percent, respectively. Thus, the average return of the merger-candidates is lower than that of the rest of the firms in the top decile. While the average monthly profit of the standard strategy is 1.11 percent, the high m-score strategy generates an average profit of 1.36 percent, and the low m-score generates an average profit of 0.86 percent (the average winners’ returns are 1.87, 2.11, and 1.62 percent, respectively).

These results suggest that firms with high likelihood to be merged exhibit a weaker positive momentum than the average past winner.

Bankruptcy-merger strategy

Both bankruptcy- and merger-based strategies generate higher profits than the standard momentum strategy. Since both strategies are based on partitions of mutually exclusive groups of firms (the top and the bottom deciles), a combined trading rule can be constructed so that the increase in the average profit will be the sum of the profit increases of the two strategies. In particular, excluding all firms with high likelihood of merger from the top decile, and keeping only firms with high likelihood of bankruptcy in the bottom decile.

As in each of the separate strategies, firms in the top and bottom deciles are divided according to Altman and Stevens models, respectively, where ‘high-low score’ refers to strategy of buying past non-merger-candidates winners and selling past bankruptcy-candidates losers. The results in Table 11 show, as expected, that the average monthly profit of the high-low score strategy is higher than that of the profit of the standard strategy in each of the 16 horizons; the average return of the high-low score strategy is 1.59 percent, compared to 1.1 percent of the standard strategy.

When considering each horizon separately, the differences seem to be insignificant, as most of the t-statistics are between 1 and 2. Nevertheless, conducting a joint test based on all 16 strategies suggests that the high-low score strategy yields a significant higher profit at the 5% (10%) level, if the average of the correlation coefficients between the t-statistics of any two strategies is lower than 0.53 (0.77).¹⁴ That is, unless the average

¹⁴ The asymptotic variance of the average of n T-statistics is $v(\bar{T}) = (1 + (n-1)\bar{\rho}_{i,j})/n$, where $\bar{\rho}_{i,j}$ is the average of the correlation coefficients between T_i and T_j for all $i \neq j$. Hence, since $\bar{\rho}_{i,j} \leq 1$, $v(\bar{T}) \leq 1$ (where the upper bound is achieved when $\bar{\rho}_{i,j} = 1$). Since $\bar{T} = 1.46$, then $\Phi(1.46/\sqrt{(1+15\bar{\rho}_{i,j})/16}) > 0.975 \Leftrightarrow \bar{\rho}_{i,j} < 0.53$, and

profits of the 16 strategies are strongly correlated, the results indicate that the momentum strategy profit can be significantly increased by incorporating the likelihood of delisting.

The results in this section provide interesting evidence about the market behavior with respect to potentially-delisted firms. In section IV I show that both merged firms and bankrupt firms generate higher profits than the average firm in the momentum portfolio. In this section, however, I find that while ex-ante bankruptcy candidates in the bottom decile generate higher profits (lower return in short position) than regular firms in that decile, ex-ante merger candidates in the top decile generate lower profits (lower return in long position) than regular firms in that decile (the profitability of the different groups is illustrated in Figure 3). This may suggest that firms with high bankruptcy risk are less accurately priced than the average past loser, while firms with high likelihood to be merged are more accurately priced than the average past winner.

VI. Discussion

The important role that both delisted firms and delisting-candidates firms play in the momentum anomaly may have implication for the forces driving the phenomenon.

The evidence of the relatively high contribution of delisted firms to the momentum profit might shed some light on the underreaction and the overreaction explanations for momentum. One of the main differences between these two alternatives is that underreaction suggests that the stock price converges to its true value in the short run (i.e., during the holding period), while continued overreaction implies that the price is

$\Phi(1.46/\sqrt{(1+15\bar{\rho}_{i,j})/16}) > 0.95 \Leftrightarrow \bar{\rho}_{i,j} < 0.77$, where $\Phi(\cdot)$ is the cumulative function of a standard normal distribution.

overestimated (or underestimated in case of bad news) in the short run, and converges to its true value only in the long run (referred in the literature as long run return reversal, see DeBondt and Thaler (1985, 1987)). Hence, if we assume that the delisting price (the final market price) reflects the true value of the delisted firm (surviving firms can still experience a return reversal after overreaction), then, profits generated by delisted firms cannot be consistent with continued overreaction.¹⁵ I do not argue that profits generated by delisted firms are consistent with underreaction, since the holding period return of delisted firms can be a result of perfectly accurate reactions to new information released during the holding period. However, if the holding period returns of delisted firms partially reflect news from the formation period (due to investors' misreactions), then, this reflection must be a price-correction to prior underreaction to this news.

The difference between the effects of ex-ante merger-candidates and bankruptcy-candidates may provide an explanation for the documented asymmetry in momentum. Several papers find that a negative momentum is stronger than a positive momentum (e.g., Hong, Lim, and Stein (2000)). As found here, most of the merger-candidates (which exhibit relatively weak momentum) are concentrated in the top decile, and most of the bankruptcy-candidates (which exhibit relatively strong momentum) are concentrated in the bottom decile. Thus, the profit generated by the top decile (the positive momentum) is lower than that generated by the bottom decile (the negative momentum).

¹⁵ This assumption is more compatible for bankrupt firms than for merged firms. The cumulative return of an investment in a stock of a bankrupt firm (including the delisting return) reflects the actual proceeds to shareholders from selling the firm's assets, and therefore, is more likely to correctly represent the firm's value. I.e., since the final market price is based on actual transactions on the firm's assets, it is less exposed to biases in the stock market prices. It is used in this context since, as I show in Section IV, most of the delisting-profit is derived from bankrupt firms.

VII. Conclusions

I find that delisted firms play an important role in the momentum anomaly. Approximately 40 percent of the momentum profit is generated by delisted firms, although the proportion of these firms in the portfolio is significantly lower (around 10 percent). Most of this profit is attributed to firms that went bankrupt during the holding period, while merged firms has a minor effect on the momentum profit. I explain this difference by the characteristics of the pre-delisting price movements of merged and bankrupt firms.

I further examine whether ex-ante, firms with high likelihood to be delisted have effect on the momentum profitability. By employing both bankruptcy- and merger-prediction models, I find that firms with high bankruptcy risk exhibit a stronger negative momentum than the average past loser, and firms with high likelihood to be merged exhibit a weaker positive momentum than the average past winner. Incorporating these differences in the momentum strategy achieves an average profit that is 1.5 times higher than the standard momentum profit.

Appendix

The **standard method** to calculate the average profits of momentum strategies is based on **monthly returns**; however, the average profits can also be calculated by a **second method**, which is **based on portfolio returns**. In this appendix I explain why a test that is based on the second method is more powerful when regressing the strategy profits on delisted proportions.

Monthly returns

The **common way** to test the momentum strategy is to **create a sequence of observations**; each of is composed of several portfolios and represents the profitability of a single month (e.g., Jegadeesh and Titman (1993) and Rouwenhorst (1998)). **For instance**, consider a strategy with a formation period of 6 months (**J=6**) and a holding period of 3 months (**K=3**) (I use this strategy as an example throughout the appendix). Then, the **profitability of January 1995** is the **average of three different returns**: the return in January 1995 of the portfolio which was built based on the stocks returns in the period of **July-Dec 1994**, the return in January 1995 of the portfolio which was built based on the stocks returns in the period of **June-Nov 1994**, and the return in January 1995 of the portfolio which was built based on the stocks returns in the period of **May-Oct 1994**. The sequence we obtain contains monthly profits, where averaging the sequence values gives the monthly profitability of the strategy.

The main advantage of this calculation is the serial independence between observations despite the investments overlap, both in the formation and the holding periods. However, it is not suitable for testing the relation between the momentum profit and the delisted proportion. To test this relation, I need to match each observation of

profit with an observation that represents the proportion of delisted firms. But, since according to the method described above, every profit observation is composed of returns of three different portfolios, the delisted proportion observation has to be composed of the three different proportions of the same three portfolios. Thus, there is no direct connection between the delisting proportion and the profitability, which causes a significant loss of information. For instance, consider a specific month, in which both the profitability and the delisted proportion are relatively high. Since both observations contain returns of three different portfolios (say, A, B and C), it might be the case that the high profit in that month is mainly due to extremely high return of portfolio A, while the high delisting proportion of that month is a result of a very high delisting proportion of portfolio B. Therefore, seemingly there is a positive relation whereas actually there is no reason to conclude this.

Portfolio returns

In order to avoid the loss of information described above, I calculate the momentum profitability in a way that allows a direct matching between the delisting proportion and the profitability. I calculate the average profits by looking at each portfolio separately instead of looking at each month separately. Thus, instead of building a sequence of monthly profits, where each profit contains three returns, I build a sequence of observations, where each one of them contains returns of a single portfolio in a three-month period. For example, the observation of March 1995 is the average of the returns in the months January 1995 to March 1995 of the portfolio that was built based on the stocks returns in the period July-Dec 1994. In the same way, the observation of April

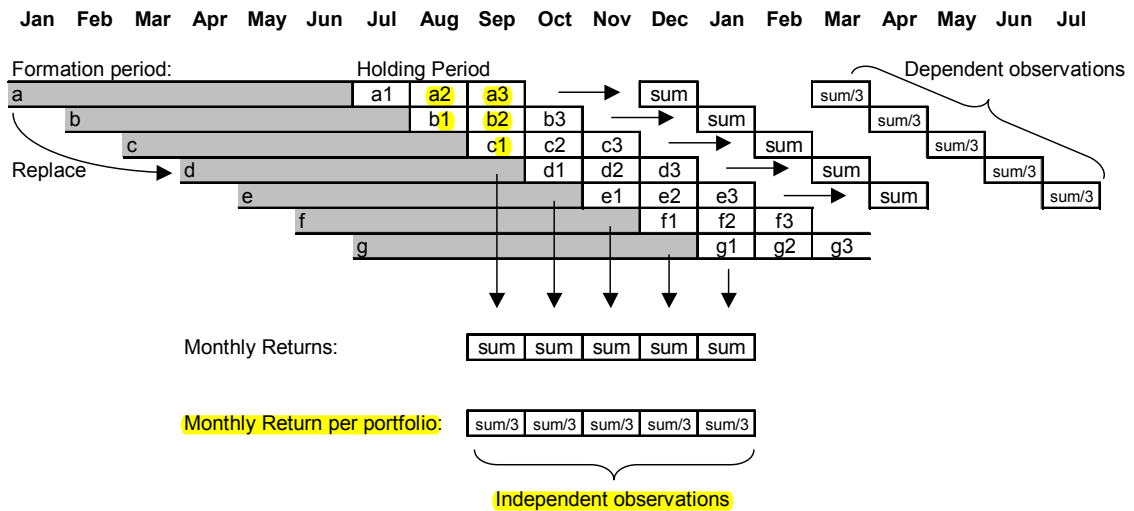
1995 is an average of the returns in Feb-April 1995 of the portfolio that was built based on the stocks returns in the period Aug 1994-Jan 1995 and so on.

This procedure generates a profit sequence of single portfolios and therefore it is easy to match each profit observation with a delisting proportion. For example, the delisting proportion observation for profit observation of March 1995 is the proportion of delisted firms in the top decile and the bottom decile based on the period of July-Dec 1994. Thus, there is a direct connection between the profitability and the delisting proportion, without any loss of information.

It is important to note that, in contrast to the monthly calculation, the profit observations obtained by using this method are not independent because of the investment periods overlaps. Consider for example the observations of Feb 1995 and March 1995. Since the profits in these two months are an outcome of two portfolios that were built in periods with a large overlap (June-Nov 1994 versus July-Dec 1994; i.e., 5 months overlap out of the total 6 months), it is very reasonable to assume that significant fractions of the two portfolios are composed of the same firms, and therefore, there should be a positive correlation between the two profit observations. Moreover, even if the two portfolios contain completely different stocks, there could be a positive serial correlation between the portfolios' returns. This type of dependence exists between any two observation t and $t-s+1$, for $s=1,2\dots j$ (where j is the number of months of the formation period in the strategy). Another important point is that although there is a big difference between the two calculations when testing the relation between the delisting proportion and the profitability, the average profitability is equal in both, since all the

difference when calculating profitability is in the order of averaging (averaging monthly returns and then averaging by portfolios and vice versa).

The figure bellow illustrates the difference between the two calculation methods. The letters represent the portfolios and the numbers represent the month number that the portfolio is held by the investor. For instance, the cell indicated by $b3$ represents the returns of portfolio b in the third month that it is held by the investor. Therefore, according to the original method, observations (monthly returns) are calculated by $(a3+b2+c1)/3$, $(b3+c2+d1)/3$ and so on (indicated by the vertical arrows), where according to the second calculation used in this paper the observations (portfolio returns) are calculated by $(a1+a2+a3)/3$, $(b1+b2+b3)/3$ and so on (indicated by the horizontal arrows).



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Table 1: Returns of momentum strategies

At the end of each month I rank the stocks into ten deciles according to their returns in the past J months (the formation period). The top decile is labeled as the Winners portfolio and the bottom decile is labeled Losers portfolio. The portfolios are equally weighted and held (winners in a long position and losers in a short position) for the next K months (the holding period). The table reports the average monthly return of the winners and the losers portfolios in the holding period, the average profit of the momentum strategy (the difference between the Winners' and the Losers' returns), and its t-statistics of all the 16 strategies, computed over the period 1975-2000. Therefore, each observation of any J-K strategy starts at the Jth month of 1975 and ends in the (12-k)th month of 2000.

		<i>K=3</i>	<i>K=6</i>	<i>K=9</i>	<i>K=12</i>
<i>J=3</i>	<i>Winners</i>	0.0147	0.0158	0.0173	0.0179
	<i>Losers</i>	0.0121	0.0087	0.0085	0.0085
	<i>Winners-Losers</i>	0.0025	0.0071	0.0088	0.0094
	<i>T-stat</i>	1.15	3.75	5.47	6.36
<i>J=6</i>	<i>Winners</i>	0.0184	0.0194	0.0201	0.0191
	<i>Losers</i>	0.0096	0.0073	0.0066	0.0076
	<i>Winners-Losers</i>	0.0088	0.0121	0.0135	0.0115
	<i>T-stat</i>	3.38	5.82	6.91	6.42
<i>J=9</i>	<i>Winners</i>	0.0212	0.0214	0.0203	0.0190
	<i>Losers</i>	0.0090	0.0060	0.0063	0.0079
	<i>Winners-Losers</i>	0.0122	0.0154	0.0141	0.0111
	<i>T-stat</i>	5.02	7.07	7.08	6.30
<i>J=12</i>	<i>Winners</i>	0.0213	0.0201	0.0190	0.0180
	<i>Losers</i>	0.0071	0.0060	0.0071	0.0088
	<i>Winners-Losers</i>	0.0142	0.0142	0.0120	0.0092
	<i>T-stat</i>	5.89	6.86	6.38	5.25

Table 2: Delisting proportions

The table shows the proportions of delisted firms in the entire market and in the investment portfolio for two representative strategies, 6-6 and 12-12. The first column in the upper part of the table presents the proportions of the average frequencies of surviving and delisted firms, as well as the delisting causes (bankruptcy, merger, and other) frequencies, during an interval of 6 months between June 75 and June 2000 (the matched sample period for the strategy 6-6), where the numbers in parenthesis in the second column are the frequencies within the delisted firms' population. The third column presents the frequencies of the surviving and the delisted firms in the two extreme deciles, which is the investment portfolio. The rest of the upper part presents the specific frequencies of the top and the bottom deciles, and the lower part of the table contains the equivalent results for the strategy 12-12.

	<i>General</i>	<i>Two extreme deciles</i>	<i>Top decile</i>	<i>Bottom decile</i>
<i>Strategy 6-6</i>				
<i>Surviving</i>	96.7%	90.3%	91.6%	88.9%
<i>Delisted</i>	3.3%	9.7%	8.4%	11.1%
<i>Bankruptcy</i>	1.3% (38.4%)	5.0% (51.8%)	1.0% (12.2%)	9.1% (81.7%)
<i>Merger</i>	1.8% (55.9%)	4.3% (44.3%)	7.3% (86.4%)	1.4% (12.5%)
<i>Other</i>	0.2% (5.7%)	0.4% (3.9%)	0.1% (1.4%)	0.6% (5.8%)
<i>Strategy 12-12</i>				
<i>Surviving</i>	93.4%	84.4%	88.8%	80.0%
<i>Delisted</i>	6.6%	15.6%	11.2%	20.0%
<i>Bankruptcy</i>	2.5% (38.4%)	8.6% (55.2%)	1.5% (13.2%)	15.7% (78.6%)
<i>Merger</i>	3.7% (55.9%)	6.4% (41.3%)	9.5% (84.8%)	3.4% (17.1%)
<i>Other</i>	0.4% (5.7%)	0.5% (3.5%)	0.2% (2.0%)	0.9% (4.3%)

Table 3: The delisting-effect on the momentum profit

The table shows the effect of delisted firms on the profits of the 16 strategies over the period 1975-2000. In each strategy, the first two numbers are the average monthly profits (and their t-statistics) of the standard strategies (as shown in Table 1). The next two numbers are the average monthly returns (and their t-statistics) after excluding the delisted firms' returns from the profit calculations, and the next two numbers are the average monthly returns (and their t-statistics) of delisted firms only. The final number in each strategy is the t-statistic of the difference between the average returns of the surviving firms and the delisted firms.

			<i>K=3</i>	<i>K=6</i>	<i>K=9</i>	<i>K=12</i>	
<i>J=3</i>	<i>all</i>	<i>Average monthly return</i>	0.0025	0.0071	0.0088	0.0094	
		<i>T-stat</i>	1.15	3.75	5.47	6.36	
	<i>without delisting</i>	<i>Average monthly return</i>	-0.0004	0.0040	0.0062	0.0071	
		<i>T-stat</i>	-0.16	2.06	3.82	4.68	
<i>only delisting</i>	<i>Average monthly return</i>	0.0542	0.0380	0.0274	0.0221		
	<i>T-stat</i>	14.77	15.40	11.17	11.34		
			<i>T-stat (difference)</i>	12.62	10.78	7.21	6.06
<i>J=6</i>	<i>all</i>	<i>Average monthly return</i>	0.0088	0.0121	0.0135	0.0115	
		<i>T-stat</i>	3.38	5.82	6.91	6.42	
	<i>without delisting</i>	<i>Average monthly return</i>	0.0053	0.0086	0.0105	0.0085	
		<i>T-stat</i>	1.95	3.99	5.09	4.48	
<i>only delisting</i>	<i>Average monthly return</i>	0.0626	0.0434	0.0330	0.0270		
	<i>T-stat</i>	17.86	16.03	12.82	12.40		
			<i>T-stat (difference)</i>	12.96	10.04	6.85	6.41
<i>J=9</i>	<i>all</i>	<i>Average monthly return</i>	0.0122	0.0154	0.0141	0.0111	
		<i>T-stat</i>	5.02	7.07	7.08	6.30	
	<i>without delisting</i>	<i>Average monthly return</i>	0.0085	0.0118	0.0106	0.0075	
		<i>T-stat</i>	3.39	5.22	5.13	4.04	
<i>only delisting</i>	<i>Average monthly return</i>	0.0667	0.0472	0.0358	0.0294		
	<i>T-stat</i>	17.43	16.20	13.19	12.51		
			<i>T-stat (difference)</i>	12.71	9.62	7.37	7.34
<i>J=12</i>	<i>all</i>	<i>Average monthly return</i>	0.0142	0.0142	0.0120	0.0092	
		<i>T-stat</i>	5.89	6.86	6.38	5.25	
	<i>without delisting</i>	<i>Average monthly return</i>	0.0102	0.0101	0.0079	0.0048	
		<i>T-stat</i>	4.10	4.74	4.05	2.61	
<i>only delisting</i>	<i>Average monthly return</i>	0.0727	0.0502	0.0377	0.0312		
	<i>T-stat</i>	17.69	15.75	13.11	12.93		
			<i>T-stat (difference)</i>	12.98	10.48	8.59	9.32

Table 4: Size and book-to-market by deciles

The table summarizes data of the strategy 6-6. At the end of each month between June 1975 and June 2000 I rank all stocks into ten deciles according to their returns in the past 6 months. The deciles are denoted by D1 (the losers portfolio) to D10 (the winners portfolio). The *Size* box provides the average size (the firm's size is estimated by its stock price at the end of the formation period, multiplied by the number of its outstanding stocks at the same time) of all firms, surviving firms, and delisted firms in each decile. The *Ratio* column shows the average size (in million dollars) of delisted firms divided by that of surviving firms. The *Book-to-market* box presents the median book-to-market ratios (estimated by the ratio of the firm's equity market value to equity book value) of the all firms, surviving firms, and delisted firms in each decile, computed at the end of the formation period, as well as the ratio between the delisted firms and the surviving firms medians; I use the median measure for the book-to-market ratio instead of the average due to extreme book values in COMPUSTAT.

<i>Decile</i>	<i>Size</i>				<i>Book-to-market</i>			
	<i>All</i>	<i>Surviving</i>	<i>Delisted</i>	<i>Ratio</i>	<i>All</i>	<i>Surviving</i>	<i>Delisted</i>	<i>Ratio</i>
D1	93.3	100.8	17.8	17.6%	0.75	0.75	0.58	77.8%
D2	266.9	274.0	69.2	25.2%	0.79	0.79	0.64	80.7%
D3	436.8	444.9	145.7	32.8%	0.80	0.80	0.66	82.1%
D4	572.3	581.4	224.9	38.7%	0.80	0.80	0.75	94.6%
D5	686.9	698.2	248.7	35.6%	0.78	0.78	0.74	95.2%
D6	758.0	771.2	277.1	35.9%	0.76	0.76	0.68	89.9%
D7	893.0	911.5	358.6	39.3%	0.72	0.72	0.72	99.7%
D8	936.2	958.4	405.8	42.3%	0.67	0.67	0.65	96.2%
D9	860.3	891.5	375.8	42.2%	0.60	0.60	0.58	96.0%
D10	481.5	492.8	359.3	72.9%	0.45	0.45	0.48	107.9%

Table 5: Risk-adjusted delisting-effect on the momentum profit

The table shows the effect of delisted firms on the profits of the 16 strategies over the period 1975-2000 after adjusting the returns for the three-factor model (Fama and French (1993)). I run the following time-series regression: $R_t - r_{ft} = \alpha + \beta(R_{mt} - r_{ft}) + sSMB_t + hHML_t + e_t$ where R_t is the monthly return of portfolio t , r_{ft} is the risk-free rate, R_{mt} is the market index return, SMB is the small size minus big size portfolios returns, and HML is the high book-to-market minus low book-to-market portfolios return; the time-series values of the three factors are taken from Kenneth French's website. In each strategy, the average monthly return is represented by the intercept of the regressions, where similar to Table 3, I present average monthly returns (and their t-statistics) of the standard momentum strategy (all sample), without delisted firms, and delisted firms only, as well as the t-statistics of the differences between the surviving firms' returns and the delisted firms' returns.

			K=3	K=6	K=9	K=12	
J=3	all	Average monthly return	0.0003	0.0035	0.0036	0.0015	
		T-stat	0.14	1.74	2.08	1.04	
	without delisting	Average monthly return	-0.0025	0.0007	0.0010	-0.0010	
		T-stat	-1.03	0.33	0.57	-0.68	
only delisting	Average monthly return	0.0509	0.0328	0.0219	0.0161		
	T-stat	12.20	12.09	8.43	7.90		
			T-stat (difference)	8.09	6.63	4.80	4.85
J=6	all	Average monthly return	0.0032	0.0074	0.0089	0.0053	
		T-stat	1.07	3.23	4.14	2.85	
	without delisting	Average monthly return	-0.0005	0.0037	0.0056	0.0019	
		T-stat	-0.15	1.56	2.46	0.94	
only delisting	Average monthly return	0.0587	0.0397	0.0299	0.0232		
	T-stat	14.58	13.74	11.74	10.72		
			T-stat (difference)	8.25	6.81	5.03	5.15
J=9	all	Average monthly return	0.0051	0.0087	0.0092	0.0060	
		T-stat	1.83	3.67	4.25	3.19	
	without delisting	Average monthly return	0.0015	0.0050	0.0057	0.0021	
		T-stat	0.52	2.05	2.50	1.07	
only delisting	Average monthly return	0.0572	0.0401	0.0301	0.0247		
	T-stat	13.10	12.09	10.75	10.37		
			T-stat (difference)	7.70	6.09	4.80	5.13
J=12	all	Average monthly return	0.0084	0.0087	0.0070	0.0046	
		T-stat	3.04	3.84	3.55	2.45	
	without delisting	Average monthly return	0.0045	0.0049	0.0032	0.0005	
		T-stat	1.57	2.12	1.59	0.23	
only delisting	Average monthly return	0.0667	0.0419	0.0295	0.0241		
	T-stat	13.96	11.36	8.97	9.59		
			T-stat (difference)	8.14	6.15	4.95	5.27

Table 6: Regression of momentum profits on delisting proportions

The table presents (in addition to the strategies profitability and their t-statistics) the Beta coefficients and their t-statistics of the following linear regression (computed over the period 1975-2000): $R_i = \alpha + \beta P_i + e_i$, where P_i is the proportion of delisted firms during the holding period of a specific portfolio, and R_i is the average monthly profit of that portfolio. Since the average profits observations (R_i) are not serially independent (due to overlapping periods, as discussed in Appendix A), I correct the standard errors using the Newey and West (1987) procedure.

		<i>K=3</i>	<i>K=6</i>	<i>K=9</i>	<i>K=12</i>
<i>J=3</i>	<i>Winners-Losers Return</i>	0.0025	0.0071	0.0088	0.0094
	<i>T-stat</i>	1.15	3.75	5.47	6.36
	<i>Beta</i>	0.2404	0.1400	0.1009	0.0902
	<i>T(beta)</i>	2.21	2.34	2.61	3.21
<i>J=6</i>	<i>Winners-Losers Return</i>	0.0088	0.0121	0.0135	0.0115
	<i>T-stat</i>	3.38	5.82	6.91	6.42
	<i>Beta</i>	0.3037	0.1557	0.1223	0.0982
	<i>T(beta)</i>	2.54	2.52	2.79	2.89
<i>J=9</i>	<i>Winners-Losers Return</i>	0.0122	0.0154	0.0141	0.0111
	<i>T-stat</i>	5.02	7.07	7.08	6.30
	<i>Beta</i>	0.2330	0.1681	0.1234	0.0878
	<i>T(beta)</i>	2.11	2.66	2.74	2.53
<i>J=12</i>	<i>Winners-Losers Return</i>	0.0142	0.0142	0.0120	0.0092
	<i>T-stat</i>	5.89	6.86	6.38	5.25
	<i>Beta</i>	0.1941	0.1539	0.1044	0.0777
	<i>T(beta)</i>	1.74	2.51	2.35	2.16

Table 7: Bankruptcy and merger effects

The table presents the specific effects of merged and bankrupt firms on the momentum profit. Panel A shows the average monthly return (and their t-statistics) of two representative strategies, 6-6 and 12-12, and the average monthly returns with and without delisted firms, with and without merged firms, and with and without bankrupt firms, over the period 1975-2000. Panel B shows the differences (and their t-statistics) among the average returns of the three sub-groups.

<i>Panel A: Separate profits</i>		Strategy 6-6	Strategy 12-12
<i>All firms</i>	<i>Average return</i>	0.0121	0.0092
	<i>T-stat</i>	5.82	5.25

<i>Without Delisting</i>	<i>Average return</i>	0.0086	0.0048
	<i>T-stat</i>	3.99	2.61
<i>Without Bankruptcies</i>	<i>Average return</i>	0.0094	0.0057
	<i>T-stat</i>	4.48	3.23
<i>Without Mergers</i>	<i>Average return</i>	0.0120	0.0092
	<i>T-stat</i>	5.61	5.05

<i>Only Delisting</i>	<i>Average return</i>	0.0434	0.0312
	<i>T-stat</i>	16.03	12.93
<i>Only Bankruptcies</i>	<i>Average return</i>	0.0714	0.0494
	<i>T-stat</i>	13.70	14.68
<i>Only Mergers</i>	<i>Average return</i>	0.0170	0.0097
	<i>T-stat</i>	8.36	5.03
<i>Panel B: Differences tests</i>		Strategy 6-6	Strategy 12-12
<i>Only Bankruptcies-Only Surviving</i>		0.0628	0.0446
	<i>T-stat</i>	11.61	11.13
<i>Only Bankruptcies-Only Mergers</i>		0.0544	0.0397
	<i>T-stat</i>	10.22	9.73
<i>Only Mergers-Only Surviving</i>		0.0084	0.0049
	<i>T-stat</i>	1.83	2.81

Table 8: Bankruptcy and merger momentum

The table presents the average monthly profits (and the t-statistics) of the 16 strategies applied separately to merged firms and bankrupt firms, over the period 1975-2000. For strategy j-k I consider only firms that were merged (bankrupt) during the next k months, and divide them into five quintiles. The profit generated by each firm in the top (bottom) quintile is the (minus) cumulative return of the firm until the delisting date, divided by k, where the strategy profit is the average of the individual firms' returns.

		<i>K=3</i>	<i>K=6</i>	<i>K=9</i>	<i>K=12</i>
<i>J=3</i>	<i>Only bankruptcies</i>	0.0235	0.0122	0.0073	0.0045
	<i>T-stat</i>	3.07	3.38	2.57	1.73
	<i>Only mergers</i>	-0.0206	-0.0283	-0.0247	-0.0190
	<i>T-stat</i>	-8.21	-13.01	-13.67	-11.00
<i>J=6</i>	<i>Only bankruptcies</i>	0.0253	0.0176	0.0123	0.0096
	<i>T-stat</i>	3.83	3.79	3.30	2.97
	<i>Only mergers</i>	-0.0232	-0.0325	-0.0279	-0.0220
	<i>T-stat</i>	-8.34	-14.94	-12.62	-10.39
<i>J=9</i>	<i>Only bankruptcies</i>	0.0292	0.0182	0.0150	0.0124
	<i>T-stat</i>	3.67	3.50	3.58	3.40
	<i>Only mergers</i>	-0.0232	-0.0323	-0.0285	-0.0222
	<i>T-stat</i>	-9.49	-14.40	-11.95	-10.01
<i>J=12</i>	<i>Only bankruptcies</i>	0.0378	0.0250	0.0175	0.0132
	<i>T-stat</i>	4.43	4.38	3.90	3.52
	<i>Only mergers</i>	-0.0222	-0.0326	-0.0281	-0.0226
	<i>T-stat</i>	-8.99	-15.12	-11.68	-9.68

Table 9: Bankruptcy-candidates portfolios

Based on the Altman model for predicting bankruptcies (see Altman (1968)), I calculate the z-score of each firm in the bottom decile each month, and construct two sub-portfolios accordingly: the ‘low z-score’ portfolio includes all firms in the top decile and only firms with z-scores below 1.81 in the bottom decile; the ‘high z-score’ portfolio includes all firms in the top decile and only firms with z-scores above 1.81 in the bottom decile. The table presents (for all 16 horizons) the average monthly returns in the formation period and the average monthly profit (and their t-statistics) of the standard, the low z-score, and the high z-score strategies, over the period 1975-2000. Since the winners’ decile contains the same firms in all of the three strategies, the table presents the winners’ returns only for the standard strategies.

			K=3		K=6		K=9		K=12	
			Formation return	Average profit	Formation return	Average profit	Formation return	Average profit	Formation return	Average profit
J=3	Standard	Winners	0.20	0.0148	0.20	0.0158	0.20	0.0172	0.19	0.0176
		Losers	-0.11	0.0122	-0.11	0.0089	-0.11	0.0086	-0.11	0.0083
		Winners-Losers	0.31	0.0026	0.31	0.0069	0.31	0.0086	0.30	0.0093
		T-stat		1.25		3.66		5.31		6.23
	Low z-score	Losers	-0.12	0.0094	-0.12	0.0068	-0.12	0.0062	-0.12	0.0063
		Winners-Losers	0.32	0.0054	0.32	0.0090	0.31	0.0111	0.31	0.0113
		T-stat		2.04		3.55		5.20		5.76
	High z-score	Losers	-0.11	0.0140	-0.10	0.0104	-0.10	0.0102	-0.10	0.0098
		Winners-Losers	0.30	0.0008	0.30	0.0054	0.30	0.0070	0.29	0.0078
T-stat			0.36		3.02		4.62		5.42	
J=6	Standard	Winners	0.15	0.0187	0.15	0.0195	0.15	0.0197	0.15	0.0185
		Losers	-0.07	0.0097	-0.07	0.0075	-0.07	0.0062	-0.07	0.0073
		Winners-Losers	0.23	0.0090	0.22	0.0120	0.22	0.0134	0.22	0.0112
		T-stat		3.56		5.65		6.87		6.21
	Low z-score	Losers	-0.08	0.0063	-0.08	0.0047	-0.08	0.0038	-0.08	0.0055
		Winners-Losers	0.23	0.0123	0.23	0.0147	0.23	0.0159	0.22	0.0130
		T-stat		4.18		5.65		6.69		5.88
	High z-score	Losers	-0.07	0.0123	-0.07	0.0093	-0.07	0.0083	-0.07	0.0090
		Winners-Losers	0.22	0.0064	0.22	0.0101	0.22	0.0114	0.21	0.0095
T-stat			2.44		4.79		6.03		5.39	
J=9	Standard	Winners	0.14	0.0214	0.13	0.0209	0.13	0.0196	0.13	0.0182
		Losers	-0.06	0.0093	-0.06	0.0053	-0.05	0.0055	-0.05	0.0072
		Winners-Losers	0.19	0.0122	0.19	0.0156	0.19	0.0141	0.18	0.0110
		T-stat		5.12		7.04		7.22		6.24
	Low z-score	Losers	-0.06	0.0060	-0.06	0.0028	-0.06	0.0035	-0.06	0.0057
		Winners-Losers	0.19	0.0154	0.19	0.0182	0.19	0.0161	0.19	0.0125
		T-stat		5.32		6.75		6.45		5.15
	High z-score	Losers	-0.05	0.0128	-0.05	0.0080	-0.05	0.0080	-0.05	0.0096
		Winners-Losers	0.19	0.0087	0.19	0.0129	0.18	0.0116	0.18	0.0086
T-stat			3.61		5.84		6.23		5.15	
J=12	Standard	Winners	0.13	0.0207	0.13	0.0193	0.12	0.0181	0.12	0.0171
		Losers	-0.05	0.0063	-0.05	0.0052	-0.05	0.0063	-0.04	0.0080
		Winners-Losers	0.17	0.0145	0.17	0.0141	0.17	0.0118	0.17	0.0091
		T-stat		6.10		6.88		6.39		5.13
	Low z-score	Losers	-0.05	0.0025	-0.05	0.0025	-0.05	0.0042	-0.05	0.0065
		Winners-Losers	0.18	0.0183	0.17	0.0168	0.17	0.0139	0.17	0.0106
		T-stat		6.73		6.66		5.79		4.37
	High z-score	Losers	-0.04	0.0106	-0.04	0.0086	-0.04	0.0094	-0.04	0.0110
		Winners-Losers	0.17	0.0102	0.17	0.0107	0.17	0.0087	0.16	0.0061
T-stat			4.05		5.03		4.80		3.97	

Table 10: Merger-candidates portfolios

Based on the Stevens study for predicting mergers (see Stevens (1973)), I calculate the level of the predicting model (referred to as m-score) of each firm in the top decile each month, and construct two sub-portfolios accordingly: the ‘low m-score’ portfolio includes only firms with m-scores below the median in the top decile and all firms in the bottom decile; the ‘high m-score’ portfolio includes only firms with m-scores above the median in the top decile and all firms in the bottom decile. The table presents (for all 16 horizons) the average monthly returns in the formation period and the average monthly profit (and their t-statistics) of the standard, the low m-score, and the high m-score strategies. Since the losers’ decile contains the same firms in all of the three strategies, the table presents the losers’ returns only for the standard strategies.

			K=3		K=6		K=9		K=12	
			Formation return	Average profit	Formation return	Average profit	Formation return	Average profit	Formation return	Average profit
J=3	Standard	Winners	0.20	0.0150	0.20	0.0157	0.19	0.0172	0.19	0.0177
		Losers	-0.11	0.0123	-0.11	0.0089	-0.11	0.0086	-0.11	0.0082
		Winners-Losers	0.31	0.0027	0.31	0.0068	0.30	0.0087	0.30	0.0095
				1.25		3.51		5.38		6.45
	Low m-score	Winners	0.20	0.0103	0.20	0.0120	0.20	0.0141	0.19	0.0155
		Winners-Losers	0.31	-0.0019	0.31	0.0031	0.31	0.0056	0.30	0.0072
		T-stat		-0.80		1.46		3.13		3.75
	High m-score	Winners	0.19	0.0196	0.19	0.0193	0.19	0.0203	0.18	0.0199
		Winners-Losers	0.30	0.0073	0.30	0.0104	0.30	0.0117	0.29	0.0117
T-stat			3.33		5.10		6.45		7.17	
J=6	Standard	Winners	0.15	0.0185	0.15	0.0194	0.15	0.0199	0.15	0.0186
		Losers	-0.07	0.0092	-0.07	0.0073	-0.07	0.0062	-0.07	0.0073
		Winners-Losers	0.22	0.0093	0.22	0.0121	0.22	0.0137	0.22	0.0113
				3.62		5.69		7.07		6.35
	Low m-score	Winners	0.15	0.0146	0.15	0.0164	0.15	0.0179	0.15	0.0172
		Winners-Losers	0.22	0.0054	0.22	0.0090	0.22	0.0117	0.22	0.0099
		T-stat		1.85		3.86		5.18		4.44
	High m-score	Winners	0.15	0.0223	0.15	0.0224	0.15	0.0219	0.14	0.0200
		Winners-Losers	0.22	0.0131	0.22	0.0151	0.22	0.0157	0.21	0.0127
T-stat			5.30		6.96		7.94		7.06	
J=9	Standard	Winners	0.13	0.0214	0.13	0.0211	0.13	0.0197	0.13	0.0182
		Losers	-0.05	0.0089	-0.05	0.0054	-0.05	0.0056	-0.05	0.0073
		Winners-Losers	0.19	0.0125	0.19	0.0157	0.19	0.0141	0.18	0.0110
				5.26		7.05		7.22		6.08
	Low m-score	Winners	0.13	0.0184	0.13	0.0193	0.13	0.0182	0.13	0.0169
		Winners-Losers	0.19	0.0095	0.19	0.0138	0.19	0.0126	0.18	0.0097
		T-stat		3.66		5.57		5.70		4.65
	High m-score	Winners	0.13	0.0243	0.13	0.0230	0.13	0.0212	0.13	0.0195
		Winners-Losers	0.19	0.0155	0.19	0.0176	0.19	0.0155	0.18	0.0122
T-stat			6.48		7.62		7.61		6.35	
J=12	Standard	Winners	0.13	0.0213	0.13	0.0196	0.12	0.0183	0.12	0.0172
		Losers	-0.05	0.0062	-0.04	0.0052	-0.04	0.0063	-0.04	0.0081
		Winners-Losers	0.17	0.0151	0.17	0.0144	0.17	0.0119	0.17	0.0090
				6.31		7.10		6.51		5.10
	Low m-score	Winners	0.13	0.0187	0.12	0.0175	0.12	0.0165	0.12	0.0155
		Winners-Losers	0.17	0.0124	0.17	0.0123	0.17	0.0101	0.16	0.0074
		T-stat		4.56		5.20		4.74		3.68
	High m-score	Winners	0.13	0.0239	0.13	0.0217	0.12	0.0200	0.12	0.0188
		Winners-Losers	0.17	0.0177	0.17	0.0165	0.17	0.0137	0.17	0.0107
T-stat			7.71		8.32		7.27		5.39	

Table 11: Bankruptcy-merger portfolios

Using the same criteria from the previous two tables (Based on Altman and Stevens models), I construct a combined strategy, denoted as the ‘high-low score’; this strategy is based on buying the high m-score firms from the top decile (non-merger-candidates), and selling the low z-score firms from the bottom decile (bankruptcy-candidates). The table presents the formation return and the average profits (and their t-statistics) of the standard and the high-low score strategies, in each of the 16 horizons, over the period 1975-2000.

		<i>K=3</i>		<i>K=6</i>		<i>K=9</i>		<i>K=12</i>	
		<i>Standard</i>	<i>High-Low score</i>	<i>Standard</i>	<i>High-Low score</i>	<i>Standard</i>	<i>High-Low score</i>	<i>Standard</i>	<i>High-Low score</i>
<i>J=3</i>	<i>Average formation return</i>	0.31	0.32	0.31	0.32	0.31	0.31	0.30	0.31
	<i>Average monthly profit</i>	0.0026	0.0098	0.0069	0.0124	0.0088	0.0138	0.0094	0.0134
	<i>T-stat (profit)</i>	1.25	3.54	3.66	4.55	5.52	5.63	6.49	5.91
	<i>T-stat (difference)</i>		2.06		1.67		1.73		1.47
<i>J=6</i>	<i>Average formation return</i>	0.23	0.23	0.22	0.23	0.22	0.23	0.22	0.22
	<i>Average monthly profit</i>	0.0090	0.0161	0.0120	0.0178	0.0134	0.0181	0.0112	0.0145
	<i>T-stat (profit)</i>	3.56	5.48	5.65	6.62	6.87	7.26	6.21	6.25
	<i>T-stat (difference)</i>		1.84		1.71		1.46		1.14
<i>J=9</i>	<i>Average formation return</i>	0.19	0.19	0.19	0.19	0.19	0.19	0.18	0.19
	<i>Average monthly profit</i>	0.0121	0.0182	0.0156	0.0196	0.0140	0.0174	0.0108	0.0137
	<i>T-stat (profit)</i>	5.10	6.17	7.05	6.59	7.20	6.55	6.04	5.17
	<i>T-stat (difference)</i>		1.62		1.07		1.05		0.89
<i>J=12</i>	<i>Average formation return</i>	0.17	0.18	0.17	0.18	0.17	0.17	0.17	0.17
	<i>Average monthly profit</i>	0.0146	0.0210	0.0143	0.0190	0.0118	0.0156	0.0090	0.0121
	<i>T-stat (profit)</i>	6.16	7.69	6.97	7.35	6.41	6.08	5.14	4.44
	<i>T-stat (difference)</i>		1.75		1.44		1.21		1.01

Figure 1: Pre-delisting drifts of mergers and bankruptcies

The figure shows the cumulative average market-adjusted returns of all merged and bankrupt firms during the 24 months prior to the delisting date, between January 1975 and December 2000. The market-adjusted return is the difference between the raw return and the CRSP value-weighted portfolio of NYSE, Amex, and Nasdaq stocks. The solid line represents the cumulative returns of all merged firms from month -24 to the delisting date, and the dashed line represents the equivalent cumulative returns of all bankrupt firms.

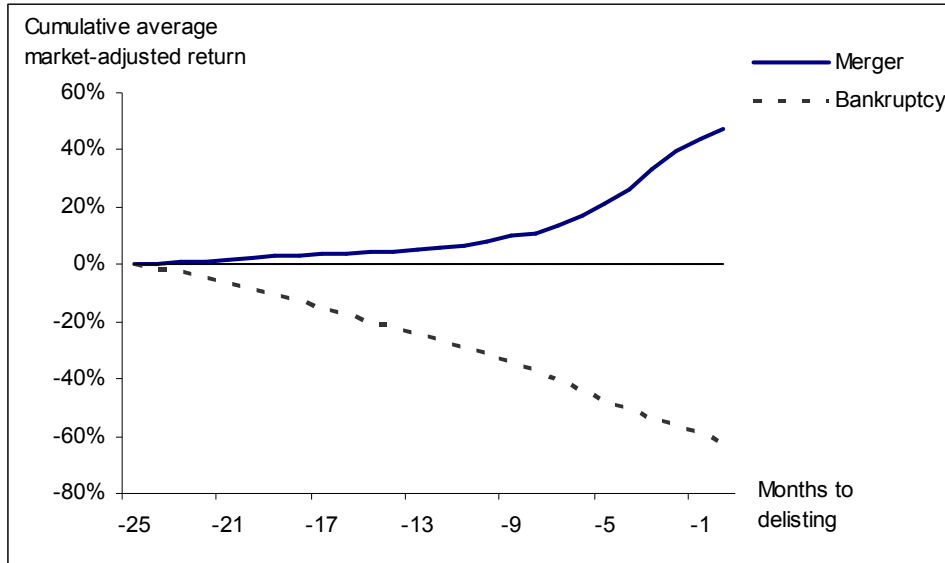


Figure 2: Correlations of pre-delisting drifts

The figure describes correlation structures between the formation period and the holding period returns. The merged firms ($M1, M2$) drifts have negative correlation, where the firms with the highest (lowest) return in the formation period have the lowest (highest) return in the holding period. The bankrupt firms ($B1, B2$) drifts have a positive correlation, where the firms with the highest (lowest) return in the formation period have also the highest (lowest) return in the holding period.

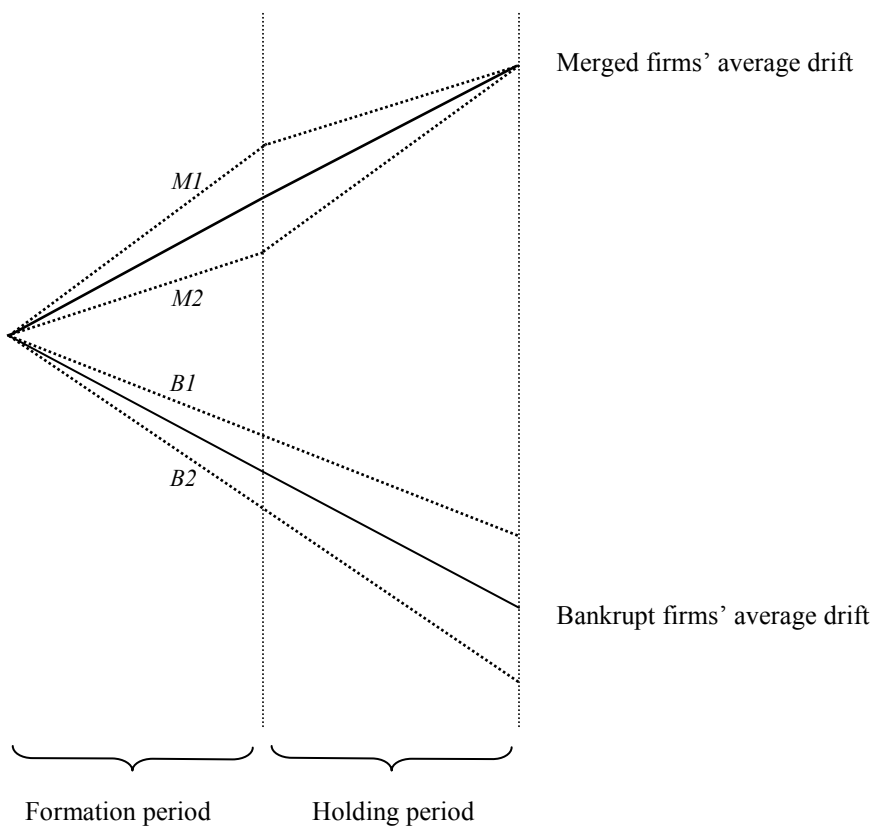


Figure 3: Merger-candidates momentum and bankruptcy-candidates momentum

The figure describes the momentum profit as composed of three groups of firms—regular firms (experience both positive and negative momentum), merger-candidates in the top decile, and bankruptcy-candidates in the bottom decile. The merger-candidates momentum is the average of the returns of merged firms (with a higher return than the standard positive momentum return) and merger survivor (with a lower return than the standard positive momentum return); overall, the merger-candidates positive momentum return is weaker than the standard positive momentum profit, i.e., merger-candidates have a negative effect on the momentum profit. The bankruptcy-candidates momentum is the average of the returns of bankrupt firm (with a lower return than the standard negative momentum return) and bankruptcy survivor (with a higher return than the standard negative momentum return); overall, the bankruptcy-candidates negative momentum return is stringer than the standard negative momentum return, i.e., the bankruptcy-candidates have a positive effect on the momentum profit (low return in short position).

