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Abstract. We study M&A activity in the US mutual fund industry over the period 1962-2009. Any improvement in abnormal performance around M&As accrues primarily to target unitholders. The risk level of acquirers increases around such transactions. An analysis of the risk-return trade-off finds that low levels of risk do not yield greater mean-variance efficient portfolios after merger, but that higher levels of risk are associated with a loss in asset allocation efficiency for unitholders in the acquirer. The analysis of success determinants finds that bidder risk and MER post-M&A, and target past performance significantly affect the potential success of such M&As.

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Keywords: Merger; Mutual fund performance; stochastic discount factor; Risk; Return.

1. INTRODUCTION

Business combinations represent an efficient avenue for growth. If the bid price is fair, mergers can allow for synergies in the employed physical and human capital and may lead to abnormal performances that are not obtainable with separate entities. The visibility of the newly created business, the range of products offered, the quality of the service, the targeted market, the geographic diversification, and the expertise of the new management team are all arguments in favour of merger activity.[1] This stylized fact is supported in the literature for firms in, for example, manufacturing and services (e.g., Asquith *et al.*, 1983; Jensen and Ruback, 1983; Andrade *et al.*, 2001).

As Jayaraman *et al.* (2002) argue the exponential growth in the mutual fund industry has led to consolidation in the financial services industry since the early 2000s. Jayaraman *et al.* (2002) find that target funds are significantly smaller in asset size, incur higher expense ratios, and perform poorly compared to acquiring funds over the five-year study period (1994-1997). The target (acquiring) fund's performance improves (deteriorates) in the first year post-merger and the expense ratio for the combined fund is similar to that of the acquiring fund pre-merger. Perold and Salomon (1991) link the higher size of assets under management (AUM) after merger to greater scale economies resulting from decreased fixed operating costs.

The objective of this paper is to extend the work of Jayaraman *et al.* (2002) by examining the pre-merger conditions of each merger participant separately and the post-

[1] We use the terms 'merger' and 'M&As or mergers and acquisitions' interchangeable throughout this paper.

merger impact of the merger on the acquiring funds for 6,680 mergers over the period 1962-2009. To this end, we examine the effects of M&As and termination activities in terms of costs, reputation, efficiency and risk in the mutual fund industry to test whether wealth transfer persists over a 48-year test period. As the most important concern for unitholders is the risk-return tradeoff, we test if fund performance improves when unitholders of the target fund become acquiring fund unitholders, and the extent to which risk changes post-M&A. Since a target unitholder needs to decide whether to maintain his or her position or to liquidate it, we identify the determinants of M&A success, extending the work of Jayaraman *et al.* (2002) where the determinants of the occurrence of M&As are studied. Potential determinants examined include the sizes, performances, asset flows, expense ratios and investment objectives of the merger participants. Thus, our findings provide some initial guidance in whether a target unitholder should exit or remain with the surviving fund post-M&A. It also provides some guidance to sponsors who wish to increase AUM though external growth.

We estimate the conditional abnormal performance of target and acquiring funds using the four-factor Carhart (1997) model. To obtain efficient estimates, we use Hansen's (1982) generalized method of moments (GMM) and an estimator of the spectral density matrix as the weighting matrix. Consistent with the literature, we find that, while the unitholders of targets benefit more than their counterparts in the acquiring funds unitholders from M&As, the performance improvement is small. Cost efficiency and superior management ability through M&As are more pronounced over shorter and more recent periods than over the full 48-year period. The semi-variance of monthly returns for acquirers changes post-M&A. Explanatory variables considered in a logistic regression to

determine the significant forces driving successful M&As include: the ages of the target and acquiring funds at transaction dates to proxy for their reputations, the sizes of the bidder and the target fund, the past performance of the target fund, the average MER of the bidder and the target, the average net asset flow for the target prior to the M&A, dummy bull/bear market indicators to proxy for the timing of the deal, the Investment Style (hereafter IS) of the target and merger type (within vs. across-IS and within vs. across-family).

The paper makes two contributions to the literature. First, it finds that the abnormal performance improvement around the M&As primarily benefits target unitholders, but that the increase in risk post-M&A is incompatible with a significantly higher abnormal performance. Fund risk increases post-M&A for the unitholders of acquirer and is unchanged for unitholders of targets. The latter finding is consistent with the continuity or smooth transition hypothesis. The mean-variance efficiency of high-risk bidder funds deteriorates while that of low-risk bidder funds remains unchanged. Thus, M&As only affect unitholders of high-risk bidder funds adversely. The window of opportunity and smooth transition hypotheses are supported since the target's reputation (as proxied by its age), target's size and timing of the deal are significantly related to prospective post-M&A outperformance.

The remainder of the paper is organized as follows. Section 2 develops the hypotheses to be tested. Section 3 describes the characteristics of the studied sample. Section 4 reports and analyzes abnormal performance and risk around the M&As. Section 5 presents the specification of the logistic regressions to examine the determinants of

successful fund M&As and analyzes the empirical results. Section six provides concluding remarks.

2. TESTED HYPOTHESES

2.1. Window of opportunity

Sapp and Tiwari (2004) show that the smart money effect documented by Gruber (1996) and Zheng (1999) is explained by the stock return momentum phenomenon. This provides the underpinning for the window of opportunity hypothesis. If investors chase past winners and targets are primarily past losers and the fund M&As occur during bullish times, then they provide opportunities for the acquirer fund to enlarge their AUM (including the attraction of new money).

2.2. Smooth transition

Pollet and Wilson (2008) find that fund managers increase their ownership interest as the fund grows, rather than focusing on new bets, except to accommodate liquidity constraints. Thus, if two entities of the same type enter into an M&A, the newly incumbent managers are more likely to continue with their same investment strategies.

We would expect that the bidder's strategy would prevail post-M&A if the motivation driving the fund M&A is: (i) the target's past poor performance, or (ii) is predicated on a strategic move across family. If consummated successfully, both types of motivated M&As should have a positive impact on the wealth of unitholders but with unitholders of the target (bidder) benefiting most from the first (second) motivation.

The smooth transition hypothesis emanates from the premise that mutual fund sponsors need to ensure that changes to increase returns with unchanged risk are noticed by existing unitholders (particularly, those that remained in the fund regardless of its past

performance). Whether the M&A is within- or across-family, any changes in investment strategy need to be gradual, fully disclosed and explained to the unitholders in order to keep current AUM and to attract new fund inflows. The smooth transition hypothesis is tested by examining risk levels, MERs and the types of assets held for target and bidder funds around fund M&A.

2.3. Diseconomies of scale

The literature finds that smaller funds tend to outperform larger funds due to diseconomies of scale (Chen, Hong, Huang and Kubik, 2004). We hypothesize that M&A success increases if the bidder is smaller. We subsequently test this hypothesis using a logistic regression analysis.

2.4. Fund Flow Effect

Dickson, Shoven, and Sialm (2000) demonstrate that shareholder flows negatively affect after-tax returns of mutual funds. Hence, we expect that the average fund flow into target mutual funds during the one year pre-M&A will be negatively related to the subsequent probability of success of the M&A. This hypothesis is related to the hypothesis that the probability of M&A success and positive abnormal risk-adjusted returns are positively related to poorer performance of the target fund.

3. SAMPLE, DATA AND SOME DESCRIPTIVE STATISTICS

3.1. Data Collection

From the CRSP survivorship-bias-free mutual fund database for the period January 1962 to May 2009, we extract 8,410 mutual funds with “merger” as the delisting cause (i.e. M or M? codes) that also report the identifier of the new entity. The sample is

reduced to 7,151 mergers after excluding those funds with missing monthly returns or monthly returns reported on an irregular basis.

The resulting sample is matched with investment style data using multiple sources of information. Wiesenberger Policy codes are the primary source prior to 1993 and Strategic Investment thereafter until December 1999. Lipper objective code data are used from December 1999. Thomson-Reuters group codes are used to check the coherence of information from the different sources for data from 2008. We manually assign investment objectives to 65 M&As based on the asset classes held by the missing-style funds or their headers, and are unable to assign an investment objective to 96 M&As. Hence, our sample of M&As with style information consists of 7,055 combinations of target and acquiring funds with regular monthly returns and fund style information reported over their business life. Our information-coherence checks result in the exclusion of 375 M&As where the necessary monthly returns before the delisting date of the target fund are missing.

3.2. Descriptive Statistics

Descriptive statistics on the monthly returns of the samples of target and acquiring funds are reported in table 1 for the final sample of 6,680 M&As.[2] The number of acquiring funds of 4,459 is lower than the number of successfully targeted funds of 6,680 due to several instances where more than one targeted mutual fund is merged into the same surviving fund. Specifically, we identify 912 cases with one acquired target, 283

[2] The sample of 7,151 M&As contains 387 M&As where the delisting dates of target funds either do not coincide with the inception dates of merged funds or do not belong to the regularly-reported monthly returns time interval of the surviving funds. Hence, ignoring the investment style information makes the size of the raw sample equal to 6,764 cases.

cases with two acquired targets, 86 cases with three acquired targets, 41 cases with four acquired targets, and finally one case with 13 acquired targets (see table 2). Also, 1,206 funds change from being the acquirer to being the acquired over the study period.

[Please place tables 1 and 2 about here.]

As reported in table 2, the M&A participants have different investment styles for 225 of the M&As. Equity target funds exhibit the greatest number of changes (95 cases) with 77 of them acquired by hybrid funds, ten by bond funds, seven by convertibles funds and one by a money market fund. The targeted bond funds have only 32 cases of investment style changes, 12 to equity, 11 to hybrid, eight to money market and one to convertibles funds. Only two and five of the target money market funds became equity and bond funds, respectively.65, three and one target hybrid funds became equity, bond and convertibles funds, respectively. Eleven, three and eight target convertible funds became equity, bond and hybrid funds, respectively.

The absence of Total Net Assets (TNA) information used to investigate average transaction sizes results in the elimination of 2,059 M&As, involving 4,621 targets and 3,256 acquiring funds. Over the study period for every month-end date, we calculate the 2.5%, 25%, 75%, 97.5% TNA percentiles, and the time-series average of each series of percentiles for the sample of acquired (and acquiring) funds. Table 3 reports the average number of funds involved in monthly M&As, the two extreme percentiles and the median, for the total sample and the five subsamples based on investment style over the whole period 1962-2009 and for the four subperiods (1971-1980, 1981-1990, 1991-2000, 2001-2009) with non-zero percentages.

The 97.5% percentile of target fund sizes is on average the eighth of the size of the corresponding merged funds (95.21 vs. 745.96 million USD). Mutual funds assets acquired in the last decade have increased and represent on average twenty-four times their homologs in the 1970s (322.94 vs. 13.23 million USD). On average, eight targets are involved each month in a M&A over the total study period. The number is 36 M&As over the most period 2001-2009. Merger fund activity (not) differentiated by investment style is more important in size and number during the last decade compared to the distant past. The average equity fund target at the 97.5% percentile of size of 55.78 million USD is close to that of bond funds and greater than all remaining fund categories. With regard to merged funds, equity funds register the highest average 97.5% percentile of TNA over the whole period. During the most recent decade, money market funds are ranked second with an average of 1,244.20 million USD.

[Please place table 3 about here.]

The management expense ratio (MER) is defined as the ratio of total investment that shareholders pay for the fund's operating expenses which include the 12b-1 fees. The MER of a mutual fund may change over time either because of a changing level of operating efficiency or due to competitive forces. Table 4 reports the cross-sectional statistics of time-series averages of MERs for the 6,464 funds (6,464 targets and 4,307 merged entities) with MER information. On average, the expenses incurred by target fund unitholders exceed those of their merged fund counterparts (1.45% vs. 1.34%) for the whole sample and for all but the money market and convertible funds subsamples. This suggests that higher operating costs may be a trigger for some of the mergers. The maximum MERs and kurtosis are substantially larger for target funds (7.51% and 4.09)

than for merged funds (3.82% and 2.50). With more extreme data points, target mutual funds are a less homogeneous group compared to the resulting merging funds.

[Please place table 4 about here.]

Monthly income distributions are one of the selection criteria used by investors seeking short-term income on a regular basis. We obtain 2,037 usable cases with such data and 941 cases (941 targets and 638 merged funds) that also have investment style information. We transform dollar amounts into percentages for each month-end date and every fund, and aggregate all types of income distributions to obtain a single monthly income distribution rate for each fund. Based on table 5, the 858 bond funds have an average rate of income distribution of 0.47% for target funds and 0.45% for merged funds. The average life of included funds is nine years for targets and five years for merged funds, and is largest for money market funds. Tests of whether monthly income distributors represent a suitable candidate for a successful merger are inconclusive. Since the end-of-fiscal-year distributions tend to be higher than those for the rest of the year due to the multiple types of income payments, the rates are consequently higher which adds outliers to each time-series of fund distributions and results in kurtosis being substantially higher than the normal three-level. Furthermore, fat tails are more pronounced for target than for merged funds and for hybrid funds.

[Please place table 5 about here.]

Based on the monthly numbers and volumes of M&As that satisfy our inclusion criteria, the maximum monthly volume of in-sample mergers in the 1970s of 157 million USD was in December 1979 and in the 1980s of 1417.20 million USD was in December

1980.[3] Over the remaining months of both decades, number of M&As and their volumes are small (between zero and 108 million USD). In contrast for the 1990s and 2000s, maximum monthly M&A volume of 3,518.18 and 7,499.60 million USD occurred in October 1994 and August 2005, respectively. The annual number of M&As is very low at the beginning of the studied period and starts to increase after 1987 (i.e., the year of the so-called "Market Crash of 1987"), and declines dramatically around 1999 (i.e., near the end of the tech bubble). The peak in numbers is reached in 2007 with 775 cases. Relative to active funds, on average, only 1% of the mutual funds cease operations annually due to a M&A. In the 2000s, M&As occur more often since they exceed 2% of active funds for 90% of the time. The percentages are rarely higher than two percent in the 1990s, but are larger than 1% for 90% of the time. Also, the annual volume distribution is similar to that of the absolute number of mergers. As the number of funds increases over time, so does the relative size of the merged funds. The average relative size peaks at 1.06% in 1980, and stabilizes at a level of 0.17% in the 1990s and 2000s.

Finally, we examine whether the monthly M&A activity is seasonal. Based on the sample autocorrelations and partial autocorrelations of first-order differences in logarithmic number of changes, mutual fund M&As are generated by an autoregressive process. This could be an indication of merger waves. The monthly merger quartiles and maxima over the whole period show that the month of May has the highest number of M&As, followed by February and October. The subperiods spanning the period 1981 to

[3] All volume and size analyses involve only the 4,621 usable cases for which returns, investment style and TNA information are available.

2009 reveal a similar pattern with a predominance of M&As in July and December for the first decade.

4. ABNORMAL PERFORMANCE AND RISK

4.1 Methodology

The gains from M&A activity are examined first by testing the significance of any abnormal performance shift from the pre- to post-M&A periods for both target and acquirer funds. Given the evidence of performance persistence in the mutual fund industry (Christopherson *et al.*, 1998, Fletcher and Forbes, 2002), performance is estimated using the general asset pricing model with the four-factor Carhart linear model specification for the stochastic discount factor.[4] The investment opportunity set is represented by ten value-weighted industry portfolios (as in Fletcher and Forbes, 2004).[5] The number of moment conditions becomes 12 with the inclusion of the monthly return on the risk-free security R_{ft+1} and the subject mutual fund conditions.[6] The addition of the risk-free security ensures that the SDF takes sensible values (around one) and sums to the numéraire or reference security condition. The addition of the subject mutual fund conditions allows for a test of whether the subject fund is part of the optimal investment opportunity set (abnormal performance is neutral), improves it (abnormal performance is significantly positive) or contains a suboptimal array of securities (abnormal performance is significantly negative).

The set of orthogonality conditions are as follows:

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[4] An alternative method of abnormal performance estimation is provided in Appendix A.
[5] Industries included are Non Durables, Durables, Manufacturing, Energy, HiTech, Telecom, Shops, Health, Utilities and other, whose data are obtained from the Kenneth French Library.
[6] We refer to moment conditions as orthogonality conditions and average pricing errors interchangeably, and stochastic discount factor and pricing kernel interchangeably.

$$\begin{cases} E_t(m_{t+1}R_{ft+1}) = 1 \\ E_t(m_{t+1}r_{t+1}) = 0 \\ E_t(m_{t+1}r_{pt+1}) = \alpha_{pt} \end{cases}$$

where m_{t+1} is the pricing kernel prevailing from time t to time t+1; r_{pt+1} is the excess monthly return of the subject mutual fund over the risk-free rate; and α_{pt} is the measure of abnormal performance attributed to the fund manager. The market timing effect on performance is isolated by estimating conditional performance (Ferson and Schadt, 1996) using the lagged stochastically detrended risk-free rate as the instrumental variable to reflect macroeconomic conditions (Cochrane, 2001).

Unlike a merger announcement for two corporate participants in efficient markets, such an announcement does not have an "immediate" effect on performance for fund M&As. Thus, the event-study method is modified to examine the average abnormal performance of targets and acquiring funds (pre- and post-M&A) over much longer pre- and post-event windows. After testing for the normality of the SDF return distributions, we conduct paired tests of the estimated alphas in pre- and post-periods for the full sample and five fund categories over the full time period and each of the five decades enclosed therein.

4.2 Abnormal Performance

4.2.1. Average performances over fund lifetimes

The median SDF alpha of the target funds is 0.06% whereas the median abnormal performance of the acquiring fund is 0.13% pre-M&A and 0.02% post- M&A. The paired tests, which are reported in the second panel of table 6, show that, on average, differences in SDF alphas are statistically significant. The sample standard deviations of SDF alphas

are comparable for both entities (between 0.90% and 1.00%). Nevertheless, the negative skewness of the SDF alphas for target and pre- M&A acquiring funds, coupled with substantial kurtosis levels, show a tendency for extreme and negative abnormal performance pre- versus post- M&A. The acquiring funds yield the highest percentages of positive (0.01%) and negative (0.52%) significant SDF alphas prior to the M&As. The difference in the percentage of significant SDF alphas between target and post- M&A bidders (p-value=0.02) and between post- and pre- M&A bidders (p-value<0.01) is significant. The primary conclusion from the overall sample is that the abnormal performance distribution for the acquiring funds change upon M&A. The thinner left tails post M&A could result from economies of scale due to larger AUM or from the strategic changes made to offer the most suitable product to existing unitholders of both entities.

[Please place table 6 about here.]

When examined by decade (see Table 6), the median SDF alpha of targets equals 0.05% (-0.22%) and of acquirers equals 0.37% (0.15%) before M&A and -0.03% (0.06%) post-M&A during the 1960s (1970s). In the two first decades of the study, differences in SDF alphas are not significant between targets and post- M&A bidders and between pre- and post- M&A bidders. In the 1980s, the median SDF alpha of the acquiring funds equals 0.09% before M&A and 0.07% thereafter, but the percentage of significant SDF alphas for post- M&A bidders equals 9.63% (3.61% positive and 6.02% negative) whereas that of the pre- M&A bidders reaches 1.23%, all positive. Acquiring funds tend to yield more negative abnormal performance after the M&A confirming the performance deterioration (significant at 0.01 level) around M&A revealed by the medians. Consequently, the integration experiences are not as seamless as they should

have been through the M&A process. The 1990s show the same pattern as the 1980s for median SDF alphas, but the SDF alphas of targets and pre- M&A bidders are on average statistically higher than those for acquirers. This indicates a time-dependent discontinuity in performance for the pre- M&A unitholders of the acquirers after the M&As.

The 2000s are characterized by the neutrality of the performance of acquiring funds post-M&A given no abnormal SDF alphas compared to low but positive percentages pre-M&A. Results show that negative and significant SDF alphas are neutralized post-M&A (from 1.83% to 0.00%) and that targets also benefit from the same phenomenon with their SDF alphas moving from 1.76% to 0.00%. The changes are statistically significant at 0.01 level. However, the median SDF alpha tells a different story. The median SDF alphas of acquirers move significantly from 0.12% to 0.01% post-M&A, and those for targets are significantly higher at 0.05%.

Bond (money market) funds exhibit significant performance improvement post-M&A, with a median SDF alpha of 0.06% (-0.05%) for targets, 0.09% (-0.02%) for acquiring funds pre-M&A and 0.10% (-0.01%) post-M&A. The empirical SDF alphas exhibit positive skewness and high kurtosis pointing to the likelihood of extreme values and the preponderance of high abnormal performances. The money market targets have a tendency to underperform with 7.14% of them having significant negative SDF alphas. In contrast, only 0.15% of bond target funds exhibit significantly negative SDF alphas. This changes post-M&A since the percentage for these two fund types falls significantly to respectively 1.90% (at 0.01 level) and 0.00% (0.10 level). The same gain is experienced by acquiring funds for pre-existing money market but not bond unitholders (at 0.10 level for the former). Finally, pre-M&A acquiring fund median SDF alphas are higher (and of

a different sign) than those post-M&A for equity (0.32% vs. -0.06%), hybrid (0.30% vs. -0.15%) and convertibles (0.15% vs. -0.15%) funds. The shifts are statistically significant for all but the convertibles funds.

4.2.2. Average performances over shorter time periods

The 1-year SDF alphas are the result of a risk-adjusted return optimization based on only one year of data. The objective is to examine whether the effects of synergies, the benefits of a smooth transition and of economies of scale, if any, are captured by the abnormal performance metrics over the short -, mid- and long-term. Table 7 reports results for targets and acquiring funds (pre- and post-M&A). The bottom target fund posts a -4.92% SDF alpha over one year prior to M&A, and only -2.18% over 10 years. The opposite outcome occurs for the top fund with an SDF alpha of 5.65% over one year and 2.78% over ten years. For bidders post-M&A, the bottom fund yields -5.09% abnormal performance after one year and -1.08% after 10 years; both are not significantly different from the bottom bidder fund pre-M&A.

[Please place table 7 about here.]

Median SDF alphas over the short-, mid- and long run for the sample of target funds are all negative and significantly lower than their corresponding values for post-M&A bidders (see table 8). Through the decades, only the 2000s yield significant differences between SDF alphas around M&As (medians of -0.10% to -0.04%, respectively). M&As in the 1990s do not experience a substantial change in short-term performance as changes appear to take from 3 to 7 years post-M&A.

Within-family M&As yield palpable changes by the first year as median SDF alphas move from -0.09% to -0.03%, and for all terms except ten years (because of

missing information about the type of some cases). Across-family mergers take more time to deliver significant performance improvement; namely 2 years, where the median moves from -0.18% to -0.01%. Like within-family mergers, this result is obtained for the rest of the post-M&A time periods.

The sample subdivided by deal size shows no important changes in the short-run in both tails. This result changes after two years for the top 30% (at 0.01 level) and the top 10% (at 0.10 level). For the rest of post-M&A time periods, performance improvement occurs for both tails of the distribution of deal sizes, except for the ten-year term.

An examination of the SDF alphas by asset class types shows that the first gainers from M&A synergies are the equity and money markets funds, where median SDF alphas increase from -0.21% and -0.07 to -0.13% and -0.01%, respectively. In the second year post-M&A, the hybrid funds experience a performance improvement at the 0.05 level, bond funds join the list in the third through tenth year post-M&A.

[Please place table 8 about here.]

4.3 Risk

Overall, the risk of targets (0.12%) is significantly lower than that of acquirers (0.21%), and the risk of bidders (0.10%) is significantly lower pre- versus post- M&A, especially in the 1990s and 2000s, at the 0.01 level. The median risk of target equity funds equals 0.28%, and is significantly lower than that for bidders' (0.43%) at the 0.01 level. This characteristic is shared by all other asset class categories of funds with the exception of the money market funds where targets are significantly riskier than their acquirers at the 0.01 level. Also, other bidder asset class categories (except for fixed

income) are significantly less risky pre- versus post-M&A, especially in the 1990s and 2000s (see table 9).

[Please place table 9 about here.]

4.4 Risk-Return Trade-off

Multiple comparisons of SDF alphas resulting from ANOVA analyses (Hochberg and Tamhane, 1987) confirm that the average target underperforms their acquirers pre- and post-M&A at the 0.05 level. On average, pre-M&A bidders are significantly less risky than their targets and post-M&A, and target risk does not increase post-M&A.

The probability distribution of a Sharpe-like ratio (the ratio of SDF alpha to the square root of semi-variance) is depicted in Figure 1. The distribution of this Sharpe-like ratio for target funds is slightly right-skewed. The distribution of Sharpe-like ratios for acquirers pre-M&A has a similar dispersion and thicker tails than that for the target funds. The right-skewness is more visible and reflects a higher likelihood of better returns for a unit of risk borne by bidder unitholders prior to M&As. The distribution of Sharpe-like ratios of post-M&A acquirers exhibit leptokurtic left skewness. In contrast, the distributions of Sharpe-like ratios over post-M&A periods ranging from one year to ten years differ. The right tails of the distributions for post-M&A bidders are virtually always thicker than their counterparts for pre-M&A bidders and targets and all modes are negative.

[Please place figures 1 & 2 about here.]

The frontiers of the portfolios in the mean-variance domain exhibit variations in the second-order stochastic dominance rankings according to the levels of risk, as proxied by the square root of the semi-variance. Based on Figure 3, the M&A is the most

beneficial to all unitholders at very low levels of riskiness since the post- M&A bidder offers the highest SDF alphas and the target offers the lowest. The target is still better off being acquired to maximize the benefits for its unitholders at intermediary levels of risk, although the portfolio acquirers at this risk level is less efficient post- versus pre-M&A. At high levels of risk, the M&As lead to a suboptimal frontier where the target funds pre-M&A dominate the acquiring funds post-M&A. Thus, the success of mutual fund M&As appears to depend on the level of risk of both targets and acquirers. Those with low levels of risk could be promising candidates for a potential improvement in portfolio mean-variance efficiency via M&As. To further test the robustness of these findings, we examine the first-order stochastic dominance of portfolios of acquirers and targets over different levels of risks for the cases posting significant SDF alphas.

[Please place figure 3 about here.]

Figure 4 depicts the cumulative distribution functions of significant SDF alphas for six categories of risk: bottom 10%, bottom 25%, bottom 50%, top 50%, top 25% and top 10%. We find that for low levels of risk, there are no significant differences between the different entities. For the top levels of risk, the pre-M&A bidders have the most dominant portfolios, although the differences between the post-M&A bidders and targets are not striking. Thus, for more risky mutual funds, the targets posting significant alphas do not experience an important change (whether positive or negative) in the mean-variance efficiency of their portfolios. In contrast, the bidders do lose and the pre-M&A unitholders are better off divesting before the M&A finalizes. For less risky funds, it is unclear whether there is a considerable improvement or deterioration in the mean-variance efficiency of the portfolios.

[Please place figure 4 about here.]

5. DETERMINANTS OF M&A SUCCESS

5.1 Methodology

In this section, we test possible determinants of a successful mutual fund M&A by conducting a logistic regression where the dependent variable $MergerSuccess_i$ is a dummy variable which takes the value of 1 if the average objective-adjusted return is strictly positive and zero otherwise for participant *i*.[7] This mimics an investor whose goal is to choose a better performing fund from among an array of mutual funds that match his liquidity needs, investment horizon and risk tolerance, as proxied by a set of products offering the same investment style. The objective-adjusted monthly return is obtained as the raw return of the subject fund for month *t* minus the mean monthly return of all active funds offering the same investment style for month *t*.

We consider a number of potential determinants of M&A success. We include the age of both the target Age_{Ti} and the acquirer Age_{Pi} in years measured at the deal completion date of merger *i*. Fund age is used as a proxy for reputation as it indicates whether the incumbent investment advisor has been able to attract or retain assets under management (AUM). The asset sizes of the acquirer and the target at the deal date, $Size_B$ and $Size_T$, are included to capture the ability of managers and advisors for the acquirer and target funds to satisfy existing investors and to appeal to prospective investors. The average net asset flow of the target prior to the deal date, $Flow_{Ti}$, is included to reflect the

[7] The Newton-Raphson optimization method is used to implement the iterative process of parameter estimation. A heteroskedasticity and autocorrelation consistent estimator of the asymptotic variance-covariance matrix of the residuals is also used. See Hosmer and Lemeshow (2000) for more details.

(in) ability of target funds to sustain or grow the asset base without the M&A (Del Guercio and Tkac, 2002; Jayaraman, 2002).

The past performance of the target fund, $Alpha_{Ti}$, is included based on its expected negative relationship with the odds of M&A success. If the target is acquired because of relatively poor past performance, the probability of better performance post-M&A should be higher. This variable is measured over different time periods ranging from one to ten years pre-M&A and over the whole lifetime if it exceeds ten years. We include the following three risk measures: σ_P or the pre-M&A risk of the bidder; σ_T or the target risk; and σ_B or the post- M&A risk of the bidder where σ is the square root of the semi-variance to capture downside risk.

The average expense ratios of acquiring and target funds, MER_B and MER_T, are included with an expected negative and positive signs respectively since they capture the operational efficiency of acquiring funds relative to target funds. The dummy variable, $Family_i$, which is equal to 1 for a within-family fund and to 0 otherwise, is included to test whether within-family M&As are the reflection of a desire to eliminate weak, redundant and unappealing funds, or across-family M&As which may be a response to a lack of diversity in the products offered by the acquiring fund family. The categorical variable, IS_{Ti}, stands for the investment style of the target fund for M&A *i*. The categorical variable, $Delta_i$, is a dummy variable equal to 1 for an across-IS M&A and to 0 otherwise, and is included to capture the effects of the different risk tolerances of unitholders by opting for one or the other of the categories of mutual funds.

The two categorical variables, $Market_i$ is equal to one for the bull market state at the time of the deal conclusion and to zero otherwise[8]. This indicator is included to examine if funds exploit windows of opportunity by completing M&As based on early year tournament performance and during bull versus bear markets.

The model to be estimated for merger $i = 1..N$ is as follows:

$$\begin{aligned}\Pr ob.(MergerSuccess_i) &= \alpha + \beta_1(Age_{Ti}) + \beta_2(Age_{Pi}) + \beta_3(Flow_{Ti}) + \beta_4(Alpha_{Ti}) \\ &+ \beta_5(MER_{Bi}) + \beta_6(MER_{Ti}) + \beta_7(\sigma_{Bi}) + \beta_8(\sigma_{Pi}) + \beta_9(\sigma_{Ti}) + \beta_{10}(Size_{Bi}) + \beta_{11}(Size_{Ti}) \\ &+ \beta_{12}(Family_i) + \beta_{13}(IS_{Ti}) + \beta_{14}(Delta_i) + \beta_{15}(Market_i) + \varepsilon_i\end{aligned}$$

Table 10 reports the descriptive statistics of the non-categorical independent variables.[9] The number of observations varies from 6,680 to 4,621 because of the missing information about the characteristics of M&A participants and deal features. The median age of targets in the whole sample is about six years at the transaction date whereas the mean age of bidders at the same date is about seven years. The prior average fund flows of targets are on average negative with a minimum of -$237.07 million over the year preceding the M&A. The average MER for bidders (1.31%) is lower than that of targets (1.45%). The average bidder's downside risk equals 4.68 post-M&A versus 3.48% pre-M&A. The average size of a bidder is about nine times the average size of a target.

[Please place table 10 about here.]

In order to include coherent measures of risk and performance for all entities we use the same length of time for estimates of semi-variances and for the indicators of positive/negative/neutral performances of the targets and the bidders. We examine the

[8] See Appendix for a definition of the variable $Market_i$.

[9] Correlation matrix of independent variables is available upon request.

explanatory power of the above-mentioned features of the deal, the bidders and the targets pre- and post-M&A, for different time periods of 1, 2, 3, 5, 7 and 10 years. The results are reported and analyzed in the next section.

5.2 Empirical Findings

The logistic regression results for merger success likelihood are summarized in Table 11. For the 114 cases with the necessary data over the 7-years post-M&A, M&A success is positively related to target past performance (0.10 level) and bidder size (0.05 level). This supports the expectation that the reputation of the bidder (proxied by size) is an important indicator of post-M&A acquirer success over the long run. Also, prior seven-year performance of targets is directly related to M&A success.

[Please place table 11 about here.]

For the 463 cases with the necessary data over the 5-years post-M&A, M&A success is positively related to the bidder's risk pre-M&A (0.05 level) and bull/bear market indicator (0.01 level), and negatively on the bidder's risk post-M&A (0.01 level). For bond funds, M&A success is positively related to the target's risk, the bidder's risk pre-M&A, and the bidder's size, and negatively related to the bidder's risk post-M&A, bidder's MER ratio and the target's size. In other words, the largest, least risky and least costly bidders need to target the smallest bond funds in order to achieve M&A success when measured over the five years post-M&A. For equity funds, M&A success is negatively related to mean fund flows one-year prior to M&A and to the target's size, and positively related to the target's MERs and the bidder's risk pre-M&A. Hence, the least attractive (low net fund flows), the most costly (high MERs) and the smallest equity

funds (on average $31 million) are targets for bidders that are more likely to result in M&A success when measured over the five years post-M&A.

For the 1,532 cases with the necessary data over the 3-years post-M&A, M&A success is positively related to prior target performance, risk and bull/bear market indicator, and negatively related to the pre- and post-merger bidder risk. For equity funds, the coefficient signs and their respective statistical significance are the same as for the whole sample. For bond funds, M&A success is negatively related to the prior target performance, fund flows, MER and post-merger bidder risk and positively related to target risk and bidder pre-merger risk and size. For hybrid funds, young and risky bidders are more incline to succeed fund mergers. Same-IS mergers show similar relationships between deal features and success probability for the whole sample, but in different-IS mergers, the targets need to be young and unattractive to new cash investments.

For the 3764 cases with the necessary data over the 1-year post-M&A, results show that good performing, risky and costly targets result in higher probabilities of merger success. Paradoxically, bidders need to be small, less costly and risky to affect positively the probability of success. For equity funds, the well-established target and the relatively young bidder are statistically significant criteria of success. Also, on average bidder's size in equity fund merger successes is about $342 million whereas it mounts to $445 million for failures. For bond funds, M&A success is positively related to the age of the bidder.

For the 4,320 cases with the necessary data over the entire lifetime of funds post-M&A, M&A success is positively related to prior performance and the target's MER, and negatively to fund flows, the target's and bidder's risk, and the bidder's MER. The

relationship of M&A success with these fund performance and risk metrics are relatively unchanged for the various post-M&A period examined. The robustness of the results for the various regressions are important because they include all cases whether they survived only a limited term or still existed ten or more years after the M&A.

Considering the window of opportunity hypothesis, we find that the bull/bear market indicator is a significant force driving M&A success. Its effect is negative over the short-term (1-year post-M&A), and become positive over the longer run (2, 3 and 5 years post-M&A). We conclude that the window of opportunity is a viable hypothesis if we consider the mid-term performance of a fund, rather than the short- or the long-term.

6. CONCLUSION

This study examines M&A activity in the US mutual fund industry over a 48-year period. The performance enhancement hypothesis is tested for GMM estimates of abnormal performance under the stochastic discount factor approach. We find little evidence of significant abnormal performance, but its occurrence primarily benefits target unitholders as shown in the literature for other industries.

The smooth transition hypothesis is not supported based on various downside risk comparisons since the acquirer's and the target's risk increases significantly around the M&A. The pre- to post-M&A shift in risk is not compatible with a significantly higher abnormal performance. Furthermore, acquirers displaying greater risk tolerance, in terms of portfolio holdings post-M&A, have less efficient asset portfolios.

Determinants of success vary somewhat as the period over which abnormal performance post-M&A is estimated**.** Data over the lifetimes of funds prove that the fund flow effect hypothesis could not be rejected in that M&A success is negatively related to

the mean fund flows prior to M&A. Over a 1-year period post-M&A, the diseconomies of scale hypothesis is accepted. Also, M&A success is negatively (positively) related to the market state at the time of the deal conclusion over the short-term (mid-term) post-M&A showing that the window of opportunity hypothesis could not be rejected. Finally, we find a consistent negative (positive) relationship between post-M&A bidder risk (target past performance) and M&A success.

Appendix

Over the study period (1962-2009), the value-weighted portfolio of all non-ADR securities traded on the NYSE, NASDAQ and AMEX constitutes the basis for the determination of bull/bear market conditions. Since there are no generally accepted formal definitions of bull and bear markets, we chose to adopt the one suggested by Lunde and Timmermann (2004), inspired by Sperandeo (1990), Chauvet and Potter (2000) and the financial press. The corresponding algorithm allows the identification of turning points from a state to another (from bull to bear and vice versa).

Lunde and Timmermann (2004) use the stochastic process tracking the stock price as the underlying variable to determine the turning points. Suppose that the initial state at time t_0 is the bull state and symbolize the corresponding market state indicator as $I_{t_0} = 1$ and assign to $P_{t_0}^{\max}$ the initial price P_{t_0}. Let $\tau_{\min}$ and $\tau_{\max}$ be the stopping-time variables defined as follows:

$$\tau_{\max}(P_{t_0}^{\max}, t_0 \mid I_{t_0} = 1) = \inf\left\{t_0 + \tau : P_{t_0+\tau} \geq P_{t_0}^{\max}\right\};$$
$$\tau_{\min}(P_{t_0}^{\max}, t_0, \lambda_2 \mid I_{t_0} = 1) = \inf\left\{t_0 + \tau : P_{t_0+\tau} < (1-\lambda_2)P_{t_0}^{\max}\right\}$$

where $\tau \geq 1$

If $\tau_{\max} < \tau_{\min}$ then we update the local maximum price: $P_{t_0+\tau_{\max}}^{\max} = P_{t_0+\tau_{\max}}$ and $I_{t_0+1} = \ldots = I_{t_0+\tau_{\max}} = 1$

If $\tau_{\min} < \tau_{\max}$ then we update the local minimum price: $P_{t_0+\tau_{\min}}^{\min} = P_{t_0+\tau_{\min}}$ and $I_{t_0+1} = \ldots = I_{t_0+\tau_{\min}} = 0$

In the contrary configuration, where $I_{t_0} = 0$ and $P_{t_0}^{\min} = P_{t_0}$, the stopping-time variables are defined as follows:

$$\tau_{\min}(P_{t_0}^{\min}, t_0 \mid I_{t_0} = 0) = \inf\left\{t_0 + \tau : P_{t_0+\tau} \le P_{t_0}^{\min}\right\};$$
$$\tau_{\max}(P_{t_0}^{\min}, t_0, \lambda_1 \mid I_{t_0} = 0) = \inf\left\{t_0 + \tau : P_{t_0+\tau} > (1+\lambda_1)P_{t_0}^{\min}\right\}$$

If $\tau_{\min} < \tau_{\max}$ then we update the local minimum price: $P_{t_0+\tau_{\min}}^{\min} = P_{t_0+\tau_{\min}}$ and $I_{t_0+1} = \ldots = I_{t_0+\tau_{\min}} = 0$

If $\tau_{\max} < \tau_{\min}$ then we update the local maximum price: $P_{t_0+\tau_{\max}}^{\max} = P_{t_0+\tau_{\max}}$ and $I_{t_0+1} = \ldots = I_{t_0+\tau_{\max}} = 1$

The scalar λ_1 (λ_2) represents the threshold of movements in stock prices that trigger a switch from bear (bull) to bull (bear) market. Based on the financial press, as in Lunde and Timmermann (2004), we consider the conventionally used values and apply the filter (0.20, 0.20). Hence, the state changes occur when stock price increases/decreases by 20%.

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Tables

Table 1. Descriptive statistics of target and merged funds rates of return over the period 1962-2009

The table reports the cross-sectional average of mutual funds time-series descriptive statistics, except for the number of target and merged funds (*n)*. Both samples of targets and merged funds are subdivided into five subsamples according to their investment style: equity, bond, money market, hybrid (or asset allocation), and convertible. "T" stands for the cross-sectional average of the number of regularly posted monthly returns for every in-sample fund. "Mean" represents the cross-sectional average of monthly return time-series means. "Median" is the cross-sectional average of monthly return time-series medians. "Min" is the cross-sectional average of monthly return minima. "Max" is the cross-sectional average of monthly return maxima. "Sigma" is the cross-sectional average of monthly returns time-series standard deviations. "Skew" is the cross-sectional average of skewness measures of monthly returns. "Kurt" is the cross-sectional average of kurtosis measures of monthly returns. "Rho" is the cross-sectional average of first-order time series autocorrelations. All numbers are in percentages except for n, size, Skew, Kurt and Rho. Monthly returns, which are from the US Mutual Fund survivorship-bias-free CRSP database, are calculated as the change in the Net Asset Value per share including reinvested dividends from one month to the next and net of management expenses.

	n	T	Mean	Median	Min	Max	Sigma	Skew	Kurt	Rho
Target Funds (statistics concern the period starting from inception up to merger completion)										
Total	6680	90	0.27	0.42	-10.68	9.63	3.81	-0.33	4.16	0.13
Equity	3727	84	0.15	0.33	-16.05	14.22	5.74	-0.31	4.07	0.07
Bond	2082	96	0.42	0.53	-3.75	3.84	1.31	-0.40	4.47	0.11
Money	423	117	0.39	0.39	0.15	0.70	0.14	0.05	3.22	0.88**
Hybrid	420	91	0.47	0.67	-8.38	6.67	2.73	-0.52	4.40	0.05
Convertible	28	78	0.06	0.14	-9.26	7.50	3.20	-0.44	4.71	0.14
Merged Funds (statistics concern the period starting from the transaction dates up to either the end date of study period or delisting date)										
Total	4459	65	0.16	0.60	-11.53	8.51	4.12	-0.57	4.30	0.25
Equity	2530	98	0.23	0.53	-13.43	10.69	3.88	-0.37	3.28	0.13
Bond	1300	108	0.25	0.33	-3.68	3.00	0.91	-0.43	4.17	0.08
Money	322	145	0.22	0.24	0.01	0.49	0.12	-0.02	2.03	0.73**
Hybrid	294	100	0.23	0.46	-8.26	5.28	2.14	-0.55	3.60	0.13
Convertible	13	111	-0.02	0.16	-13.81	7.93	3.26	-0.91	6.61	0.19

*significant at the 95% confidence level.

Table 2. Number of mergers with different participant investment styles

The table represents the cases where a target fund is acquired by a mutual fund with a different investment style or objective. Investment styles are defined by the class of assets held by the mutual fund over the business life of the funds. The five investment styles are: Equity, Bond, Money Market, Hybrid and Convertible. To illustrate, 95 of the 3727 target equity funds merged with different-style funds (10 become bond funds, 1 a money market fund, 77 hybrid funds and 7 convertible funds).

Style of Target	Style of Acquiring Fund					Style changes
	Equity	Bond	Money Market	Hybrid	Convertibles	Total
Equity		10	1	77	7	95
Bond	12		8	11	1	32
Money Market	2	5		0	0	7
Hybrid	65	3	0		1	69
Convertibles	11	3	0	8		22

Table 3. Descriptive statistics for the size of the targets and merged funds at the month-end dates of the transactions

The table reports the time-series averages of the cross-sectional percentiles of the target and merged fund sizes at the time of the transaction. The 2.5%, 50% and 97.5% percentiles of the fund Total Net Assets are calculated each month over the period 1962-2009. The numbers in tables 3a and 3b represent the averages of these percentiles across time over the whole study period in table 3a, and for each of the four subperiods of 1971-1980, 1981-1990, 1991-2000 and 2001-2009 in table 3b. The figures related to the subperiod 1962-1970 are omitted since all their values are equal to zero. Both samples of targets and merged funds are subdivided into five subsamples according to their investment style: equity, bond, money market, hybrid (or asset allocation), and convertible. All averages of percentiles are in millions USD. By convention, the very small funds whose size is less than $ 100,000 report 0.01 as a monthly Total Net Assets. "*n*" stands for the average monthly number of target or merged funds over the respective periods. It is noteworthy that these statistics involve only those mutual funds for which the regularly reported monthly return, the investment style and Total Net Assets information are available.

Table 3a.

Period	Targets				Acquiring funds			
	n	2.5%	50%	97.5%	n	2.5%	50%	97.5%
	Total sample (4621 cases)				Total sample (3256 cases)			
1962-2009	8	4.46	8.51	95.21	8	16.43	47.63	745.96
1971-1980	0	13.23	13.23	13.23	0	1.75	1.75	1.75
1981-1990	0	1.59	1.61	1.65	0	26.77	26.86	30.34
1991-2000	8	5.85	16.55	164.71	8	44.65	123.50	826.33
2001-2009	36	0.58	10.66	322.94	37	5.63	87.58	3182.60

Table 3b.

Period	Targets				Acquiring funds			
	n	2.5%	50%	97.5%	n	2.5%	50%	97.5%
	Equity (2818)				Equity (1989)			
1962-2009	5	4.60	8.21	55.78	5	14.25	42.49	574.25
1971-1980	0	0.11	0.11	0.11	0	0.92	0.92	0.92
1981-1990	0	0.09	0.11	0.14	0	1.01	2.71	4.41
1991-2000	3	20.87	29.63	70.71	3	60.04	126.00	491.45
2001-2009	24	0.85	10.80	229.92	24	6.65	85.34	2644.90
	Bond (1395)				Bond funds (941)			
1962-2009	2	3.68	9.09	54.82	2	23.41	49.24	296.28
1971-1980	0	0	0	0	0	0	0	0
1981-1990	0	0.62	0.64	0.66	0	6.65	6.65	6.65
1991-2000	3	12.50	25.98	80.28	3	75.61	133.37	471.53
2001-2009	10	5.17	19.60	212.65	10	34.18	111.03	1101.00
	Money Market (113)				Money Market (102)			
1962-2009	0	13.89	18.09	39.97	0	128.46	156.53	267.47
1971-1980	0	13.12	13.12	13.12	0	0.83	0.83	0.83
1981-1990	0	0.90	0.90	0.90	0	19.50	19.50	19.50
1991-2000	0	21.51	22.88	52.55	0	118.61	134.20	200.72
2001-2009	1	36.06	58.08	146.09	1	558.60	698.24	1244.20
	Hybrid (282)				Hybrid (216)			
1962-2009	0	6.40	7.81	12.72	1	36.41	52.97	106.63
1971-1980	0	0	0	0	0	0	0	0
1981-1990	0	0	0	0	0	0	0	0
1991-2000	1	12.81	15.37	23.14	1	76.99	115.73	176.85
2001-2009	2	20.87	25.71	44.18	2	113.64	160.91	390.58
	Convertibles (13)				Convertibles (8)			
1962-2009	0	0.04	0.06	0.09	0	0.11	0.30	0.71
1971-1980	0	0	0	0	0	0	0	0
1981-1990	0	0	0	0	0	0	0	0
1991-2000	0	0.14	0.15	0.19	0	0.05	0.07	0.24
2001-2009	0	0.05	0.15	0.30	0	0.57	1.59	3.72

Table 4. Descriptive statistics of the MER of the targets and merged funds

The table reports cross-sectional statistics for management expense ratios (MERs) of the target and merged funds with regularly posted monthly returns, investment style and MER information. All numbers are in percentages except for the skew and kurt measures. For mutual funds reporting different MERs throughout their business life, the time-series average of MERs is used in the cross-sectional computations.

	Mean	Median	Minimum	Maximum	Sigma	Skew	Kurt
Targets							
Total sample (6464)	1.45	1.41	0.00	7.51	0.69	0.49	4.09
Equity (3565)	1.73	1.73	0.00	7.51	0.65	0.48	5.29
Bond (2051)	1.12	1.00	0.00	5.38	0.54	0.72	5.12
Money Market (417)	0.57	0.53	0.00	1.75	0.30	1.35	5.57
Hybrid (407)	1.50	1.46	0.00	4.09	0.59	0.07	3.08
Convertibles (24)	1.52	1.68	0.25	2.25	0.64	-0.65	2.14
Merged entities							
Total sample (4307)	1.34	1.28	0.00	3.82	0.60	0.32	2.50
Equity (2417)	1.59	1.54	0.13	3.82	0.56	0.20	2.62
Bond (1279)	1.06	0.92	0.00	3.09	0.46	0.53	2.47
Money Market (318)	0.60	0.55	0.11	1.70	0.31	1.21	5.01
Hybrid (280)	1.30	1.25	0.00	2.40	0.54	0.02	2.21
Convertibles (13)	1.57	1.52	0.82	2.20	0.45	-0.08	1.91

Table 5. Descriptive statistics on the income distributions of the targets and merged funds

The table reports cross-sectional averages of time-series statistics for income distributions of target and merged funds. Income distributions include all types of distributions converted to percentages by dividing by Net Asset Value per share: capital gains, dividends and interest income. We calculate time-series statistics (number of data points, mean, median, minimum, maximum, standard deviation, skewness and kurtosis) for each in-sample fund, and then we compute their cross-sectional averages. All numbers are in percentages except for n, skew, kurt. "*n*" stands for the number of funds involved in the calculations. "Total sample" for both target and merged funds includes all funds where only regular monthly returns and distribution information are available. We subdivide the sample into five subsamples according to their investment style. Thus, the number of cases only includes those funds where all three variables are available: returns, investment style and income distributions (941 targets and 638 merged funds).

	n	T	Mean	Median	Min	Max	Sigma	Skew	Kurt
	Target Funds								
Total Sample	2037	89	0.50	0.43	0.26	2.16	0.30	2.76	21.04
Equity (16)	16	54	0.90	0.58	0.21	8.80	1.33	3.94	23.91
Bond (858)	858	86	0.47	0.44	0.28	1.65	0.18	3.08	23.67
Money Market (49)	49	110	0.36	0.35	0.14	0.67	0.13	0.30	2.69
Hybrid (12)	12	63	0.53	0.27	0.18	10.54	1.31	5.68	42.00
Convertibles (6)	6	71	0.53	0.53	0.28	2.34	0.29	1.40	11.95
	Acquiring Funds								
Total Sample	848	60	0.64	0.45	0.26	2.35	0.56	1.97	11.69
Equity (13)	13	39	0.64	0.28	0.19	4.82	1.10	2.27	8.57
Bond (564)	564	61	0.45	0.40	0.27	1.19	0.17	1.98	11.60
Money Market (47)	47	67	0.32	0.32	0.08	0.71	0.15	0.36	3.45
Hybrid (13)	13	47	0.51	0.33	0.21	4.55	0.76	2.20	13.20
Convertibles (1)	1	37	0.71	0.18	0.11	9.25	1.73	3.89	18.17

Table 6. SDF performance – Momentum Model outcome

The first panel reports the median of SDF alphas for T (target) funds; Pre-B (pre-merger bidder) funds and Post-B (post-merger bidder) funds. All numbers are in percentages. "EQ" stands for Equity funds; "BD" stands for Bond funds; "MM" tands for Money market funds; "HY" stands for hybrid funds and "CV" stands for convertibles funds. The second panel reports paired tests of SDF alphas both between target and post-merger bidders and between pre-merger and post-merger bidders. The second panel shows t- or z-statistics, testing the differences between SDF alphas, depending on the normality or not of the corresponding series distribution; and their respective p-values are symbolized by asterisks as follows: * 90% confidence level; ** 95% confidence level; *** 99% confidence levels.

SDF alphas results from GMM optimization of the orthogonality conditions on pricing errors. The SDF specification is linear in four factors: market, size, value and momentum. The weighting matrix is the estimator of the spectral density of moment conditions, and the window type employed is the quadratic spectral.

	Median Alpha (in %)			Percentage of Positive Significant Alphas (%)			Percentage of Negative Significant Alphas (%)		
	T	Pre-	Post-	T	Pre-B	Post-B	T	Pre-B	Post-B
All	0.06	0.13	0.02	0.01	0.03	0.01	0.52	0.42	0.13
60s	0.05	0.37	-0.03	0.00	0.00	0.00	0.00	0.00	0.00
70s	-	0.15	0.06	0.00	0.00	11.76	0.00	0.00	0.00
80s	0.05	0.09	0.07	0.00	1.23	3.61	1.20	0.00	6.02
90s	0.10	0.16	0.04	0.32	1.22	0.24	0.57	1.55	2.75
00s	0.05	0.12	0.01	0.11	0.59	0.00	1.76	1.83	0.00
EQ	0.12	0.32	-0.06	0.00	0.03	0.00	0.05	0.27	0.00
BD	0.06	0.09	0.10	0.00	0.00	0.05	0.15	0.05	0.00
MM	-	-	-0.01	0.24	0.00	0.00	7.14	3.81	1.90
HY	0.20	0.30	-0.15	0.00	0.24	0.00	0.00	0.24	0.00
CV	-	0.15	-0.15	0.00	0.00	0.00	0.00	0.00	3.57

Comparison tests between SDF alphas

t or z	All	60s	70s	80s	90s	00s	EQ	BD	MM	HY	CV
T/Post-B	0	-	-1.51	-1.76*	0.38	2.43**	-	-1.02	1.01	-	-
Pre-B/	0.81	-	-1.51	-1	2.86***	5.61***	1.05	-1.02	-	1.03	-

Table 7. Distribution of SDF alphas over the short-,mid- and long-term

The table shows the SDF alphas estimated at different terms, ranging from 1 year to 10 years. N stands for the number of observations for each term. Bottom stands for the poorest performing fund in the subsample, 1%-25%-Median-75%-99% stand for the corresponding percentiles of alphas distribution; and Top: stands for the best-performing fund in the subsample. Panel A shows the target funds SDF alpha results, over the terms 1Y to 10Y. The abnormal performance is estimated using the stochastic discount factor approach using a subperiod, for each fund, corresponding to a specific term. For example, 1Y-SDF alphas for target funds are estimated using the data one year prior to merger. Panel B shows results for acquiring funds subsequent to mergers. Panel C shows results for acquiring funds prior to mergers. All numbers are in percentages except for *n*.

	n	Bottom	1%	25%	Median	75%	99%	Top
Panel A: target funds								
1 Y	4445	-4.92	-2.71	-0.43	-0.11	0.21	1.89	5.65
2 Y	4639	-4.50	-2.47	-0.47	-0.15	0.06	1.67	4.12
3 Y	5133	-2.72	-1.86	-0.45	-0.18	0.01	0.99	2.40
5 Y	4064	-2.82	-1.30	-0.36	-0.14	0.02	0.62	5.80
7 Y	2953	-2.16	-1.24	-0.37	-0.11	0.05	0.43	3.58
10 Y	1639	-2.18	-1.22	-0.36	-0.10	0.04	0.28	2.78
Panel B: Acquiring funds (subsequent to mergers)								
1 Y	4428	-5.09	-2.51	-0.38	-0.06	0.21	1.91	4.68
2 Y	3718	-4.63	-2.16	-0.37	-0.08	0.16	1.75	3.81
3 Y	3962	-2.23	-1.49	-0.27	-0.04	0.18	1.08	1.93
5 Y	2902	-2.39	-1.12	-0.24	-0.07	0.09	0.72	2.43
7 Y	1863	-1.58	-1.01	-0.18	0.00	0.16	0.79	2.39
10 Y	892	-1.08	-0.92	-0.13	-0.01	0.10	0.31	1.70
Panel C: Acquiring funds (prior to mergers)								
1 Y	4308	-5.16	-2.53	-0.29	-0.02	0.26	2.01	5.28
2 Y	4518	-3.77	-1.86	-0.35	-0.06	0.15	1.41	3.23
3 Y	5151	-2.31	-1.53	-0.31	-0.09	0.07	1.10	1.99
5 Y	4295	-2.43	-1.17	-0.24	-0.07	0.09	0.93	2.21
7 Y	3364	-1.93	-1.04	-0.24	-0.03	0.10	0.58	1.32
10 Y	2159	-1.25	-0.81	-0.22	-0.04	0.07	0.34	1.44

Table 8. Median SDF Alphas in each category for targets and post-merger bidders

The table shows the median SDF alphas, over terms ranging from 1 to 10 years, for the whole sample, as well as by subsample divided according to: the decade at which the deal occurred, the type of the merger: within versus across-family, by the size of the deal and by the Investment style of the target. All numbers are in percentages except for *p-values*.

	1Y			2 Y			3 Y			5 Y			7 Y			10 Y		
	T	Post B	p-value	T	Post B	p-value	T	Post B	p-value	T	Post B	p-value	T	Post B	p-value	T	Post B	p-value
All sample	-0.11	-0.06	<0.01	-0.15	-0.08	<0.01	-0.18	-0.04	<0.01	-0.14	-0.07	<0.01	-0.11	0.01	<0.01	-0.10	-0.01	<0.01
By the decade in which the merger occurred																		
1970s	-0.11	-0.14	0.51	-0.64	0.05	0.37	-0.55	0.04	0.04	-0.17	-0.02	0.20	-0.32	0.01	0.18	-0.34	-0.01	0.41
1980s	-0.16	-0.03	0.98	0.06	-0.13	0.06	-0.13	0.05	0.36	0.01	0.00	0.73	-0.14	-0.04	1.00	-0.20	-0.36	0.58
1990s	-0.08	-0.08	0.94	-0.16	-0.15	0.41	-0.15	-0.10	<0.01	-0.10	-0.04	<0.01	-0.04	-0.02	<0.01	-0.03	-0.02	0.28
2000s	-0.10	-0.04	0.01	-0.15	-0.05	<0.01	-0.20	-0.01	<0.01	-0.15	-0.03	<0.01	-0.12	0.08	<0.01	-0.11	-	-
By the category of merger: within vs across family																		
Within	-0.09	-0.03	<0.01	-0.08	-0.03	<0.01	-0.13	0.01	<0.01	-0.09	0.08	<0.01	-0.04	0.16	<0.01	-0.03	-	-
Across	-0.08	-0.05	0.49	-0.18	-0.01	<0.01	-0.20	0.02	<0.01	-0.15	-0.02	<0.01	-0.13	0.09	<0.01	-0.13	-	-
By the size of the deal																		
Bottom 10%	-0.07	-0.06	0.76	-0.17	-0.18	0.98	-0.31	-0.10	<0.01	-0.27	-0.08	0.01	-0.25	0.12	0.01	-0.18	-0.23	1.00
Bottom 30%	-0.09	0.00	0.30	-0.17	-0.13	0.28	-0.30	-0.08	<0.01	-0.27	0.00	<0.01	-0.29	0.10	<0.01	-0.17	-0.06	0.41
Top 30%	-0.05	-0.07	0.30	-0.19	-0.09	<0.01	-0.32	-0.04	<0.01	-0.28	-0.05	<0.01	-0.34	0.01	<0.01	-0.55	-0.04	0.02
Top 10%	-0.03	-0.07	0.23	-0.17	-0.09	0.10	-0.37	-0.04	<0.01	-0.28	-0.04	<0.01	-0.45	0.00	<0.01	-0.31	0.06	0.33
By the IS category																		

EQ	-0.21	-0.13	0.03	-0.29	-0.16	<0.01	-0.32	-0.15	<0.01	-0.29	-0.17	<0.01	-0.35	-0.23	<0.01	-0.40	-0.29	0.01
BD	0.00	-0.01	0.96	-0.05	-0.02	0.25	-0.05	0.13	<0.01	0.02	0.09	<0.01	0.07	0.17	<0.01	0.05	0.11	0.01
MM	-0.07	-0.01	<0.01	-0.07	-0.02	<0.01	-0.06	-0.02	<0.01	-0.06	-0.02	<0.01	-0.05	-0.02	<0.01	-0.05	-0.03	0.03
HY	-0.14	-0.11	0.95	-0.19	-0.13	0.05	-0.23	-0.12	<0.01	-0.19	-0.13	<0.01	-0.14	-0.11	0.21	-0.21	-0.03	<0.01
CV	-0.29	-0.21	0.48	-0.12	-0.15	0.51	-0.32	0.14	0.21	-0.26	-0.08	0.18	0.01	-0.17	0.44	-0.12	-	1.00

Table 9: Risk measure

The table reports the descriptive statistics of the semi-variance of monthly returns for T (target) funds; Pre-B (pre-merger bidder) funds and Post-B (post-merger bidder) funds. All numbers, in the Risk metric panel, are in percentages except for Skewness and Kurtosis of semi-variances. "EQ" stands for Equity funds; "BD" stands for Bond funds; "MM" stands for Money market funds; "HY" stands for hybrid funds and "CV" stands for convertibles funds. The "Paired tests" panel reports paired tests of fund risk measures both between target and post-merger bidders and between post- and pre-merger bidders. The second panel shows t- or z-statistics, depending on the normality or not of the corresponding series distributions, and their respective p-values are symbolized by asterisks as follows: * 90% confidence level; ** 95% confidence level; *** 99% confidence level.

	Median (%)			Standard Deviation (%)			Skewness			Kurtosis		
	T	Pre-B	Post-B	T	Pre-B	Post-B	T	Pre-B	Post-B	T	Pre-B	Post-B
Risk metric: semi-variance of monthly returns												
All	0.12	0.10	0.21	0.56	0.38	0.53	6.95	7.16	4.34	95.47	92.97	40.11
EQ	0.28	0.23	0.43	0.69	0.45	0.57	5.90	6.51	3.93	68.32	73.97	35.01
BD	0.01	0.01	0.02	0.04	0.05	0.31	8.75	10.71	16.08	108.99	156.06	294.11
MM	0.00	0.00	0.00	0.00	0.01	0.02	1.54	17.20	15.98	5.17	318.21	278.80
HY	0.07	0.07	0.19	0.14	0.15	0.30	12.88	10.00	3.18	216.32	147.79	22.05
CV	0.08	0.05	0.24	0.32	1.10	0.38	3.71	1.80	1.31	17.39	4.42	3.74

Comparison tests between SDF alphas											
z	All	60s	70s	80s	90s	00s	EQ	BD	MM	HY	CV
T/ Post-B	-12.32***	0.11	1.33	0.97	-2.70***	-13.15***	-18.96***	-11.64***	8.29***	-15.15***	-2.53***
Pre-B/ Post-B	-16.76***	0.33	-0.55	-0.94	-2.86***	-19.26***	-28.66***	9.91***	14.15***	-13.38***	-2.32**

Table 10: Descriptive statistics of the independent variables

The table reports the descriptive statistics of independent variables, the pre-selected candidate indicators of mutual fund mergers success. Age_T stands for target age (in years); Age_P stands for bidder fund age at the deal date (in years); $Flow_T$ is the average net asset flow of target, one year prior to the deal; MER_B stands for average expense ratio of acquiring fund after merger, MER_T average expense ratio of the target prior to merger; σ_B stands for risk of post-merger bidder; σ_P stands for risk of the pre-merger bidder; σ_T stands for risk the target; $Size_B$ stands for asset size of the acquiring fund, and $Size_T$ asset size of the target's at the deal date.

	Age_T	Age_P	$Flow_T$	MER_B	MER_T	σ_B	σ_P	σ_T	$Size_B$	$Size_T$
Observations	6680	6626	4607	6273	6464	6680	6626	6680	4622	4621
Mean	7.50	8.86	-0.94	1.31	1.45	4.68	3.48	3.91	378.59	43.98
Median	6.25	7.08	-0.09	1.24	1.41	4.58	3.13	3.45	73.90	8.03
Maximum	47.25	47.08	28.67	3.82	7.51	28.57	28.83	38.00	28679.40	3383.10
Minimum	0.08	0.08	-237.07	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Std. Dev.	5.77	7.52	5.94	0.59	0.69	3.78	2.88	3.48	1160.90	145.08
Skewness	2.18	1.92	-21.73	0.40	0.49	0.88	1.62	1.84	10.03	11.30
Kurtosis	10.99	7.93	689.04	2.55	4.09	4.28	8.54	9.07	156.79	193.03

Table 11: Determinants of the successful mergers

The table reports the outcome of logistic regressions where dependent variable is the probability of merger success and the independent variables are: Age_T stands for target age (in years); Age_P stands for bidder fund age at the deal date (in years); $SIZE_B$ stands for asset size of the acquiring fund at the deal date, and $Size_T$ asset size of the target's at the deal date; MER_B stands for average expense ratio of acquiring fund after merger, MER_T average expense ratio of the target prior to merger; σ_B stands for risk of post-merger bidder; σ_P stands for risk of the pre-merger bidder; σ_T stands for risk the target; $Alpha_T$ stands for past performance of the target fund over lifetime; $Flow_T$ is the average net asset flow of target, one year (or the corresponding term over which abnormal performance is estimated) prior to the deal; IS_T stands for investment style of target; *Market* stands for the state of the market at the time of the deal conclusion.

Independent Variables	Lifetime	1-year	2-year	3-year	5-year	7-year
C	0.36***	0.42***	-0.46**	-0.53**	-0.94**	-3.04*
Age_T	0.01	0	0.01	0	0	0.06
Age_P	-0.01	0	0	0	-0.01	0.07
$Alpha_T$	0.19***	0.89***	0.73***	0.60***	0.31	1.09*
$Flow_T$	-0.02**	-0.02	0	-0.01	-0.01	0.38
IS_T	-0.13***	-0.09*	-0.06	-0.06	0.33**	0.05
$Risk_T$	-0.03**	0.12***	0.11***	0.10*	0.11	-0.48
$Risk_B$	-0.08***	-0.80***	-0.64***	-0.72***	-0.47***	0.32
$Risk_P$	-0.01	0.25***	0.21***	0.23***	0.34**	1.05
MER_T	32.12***	22.88**	31.56***	6.24	26.01	-58.98
MER_B	-38.62***	-31.43***	-48.63***	-3.6	-31.69	27.86
$SIZE_T$	0	0	0	0	0	-0.01
$SIZE_B$	0	-0.01**	0	0	0	0.01**
Market	0.04	-0.18**	0.74***	0.73***	0.75***	0.61
Probability(LR stat)	0.00	0.00	0.00	0.00	0.00	0.00
Sample adjusted	6672	5559	3920	2312	746	218
Included observations	4320	3764	2652	1532	463	114
Number of failures	2379	1999	1433	813	242	60
Number of successes	1941	1765	1219	719	221	54

Figures

Figure 1. Probability distribution of Sharpe-like Ratio

The figure represents the probability distribution of the ratios of SDF alphas (over lifetime of the fund) and the square root of semi-variances of monthly returns for target, pre- and post-merger bidders.

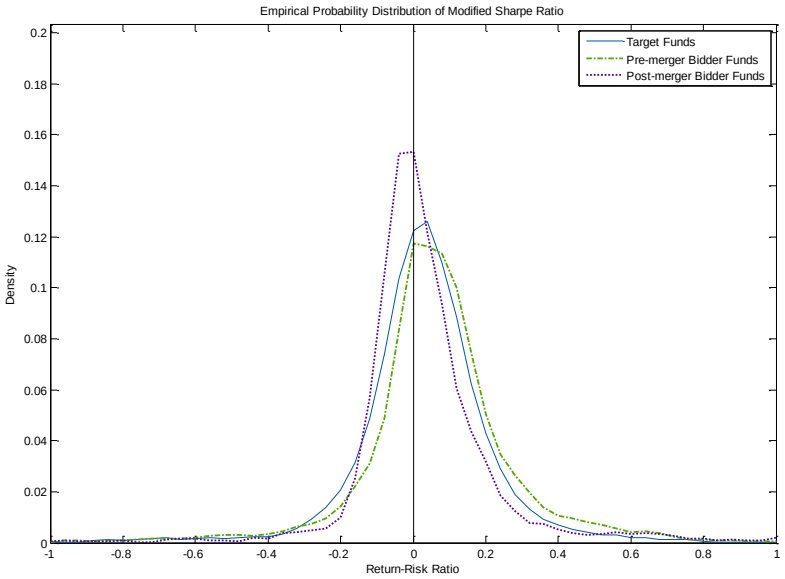

Figure 2. Distribution of Sharpe-like ratio over the short-, mid, and long–run

The figure represents the probability distribution of the ratios of SDF alphas and the square root of semi-variances of monthly returns for target, pre- and post-merger bidders, for different terms: from 1 year to 10 years.

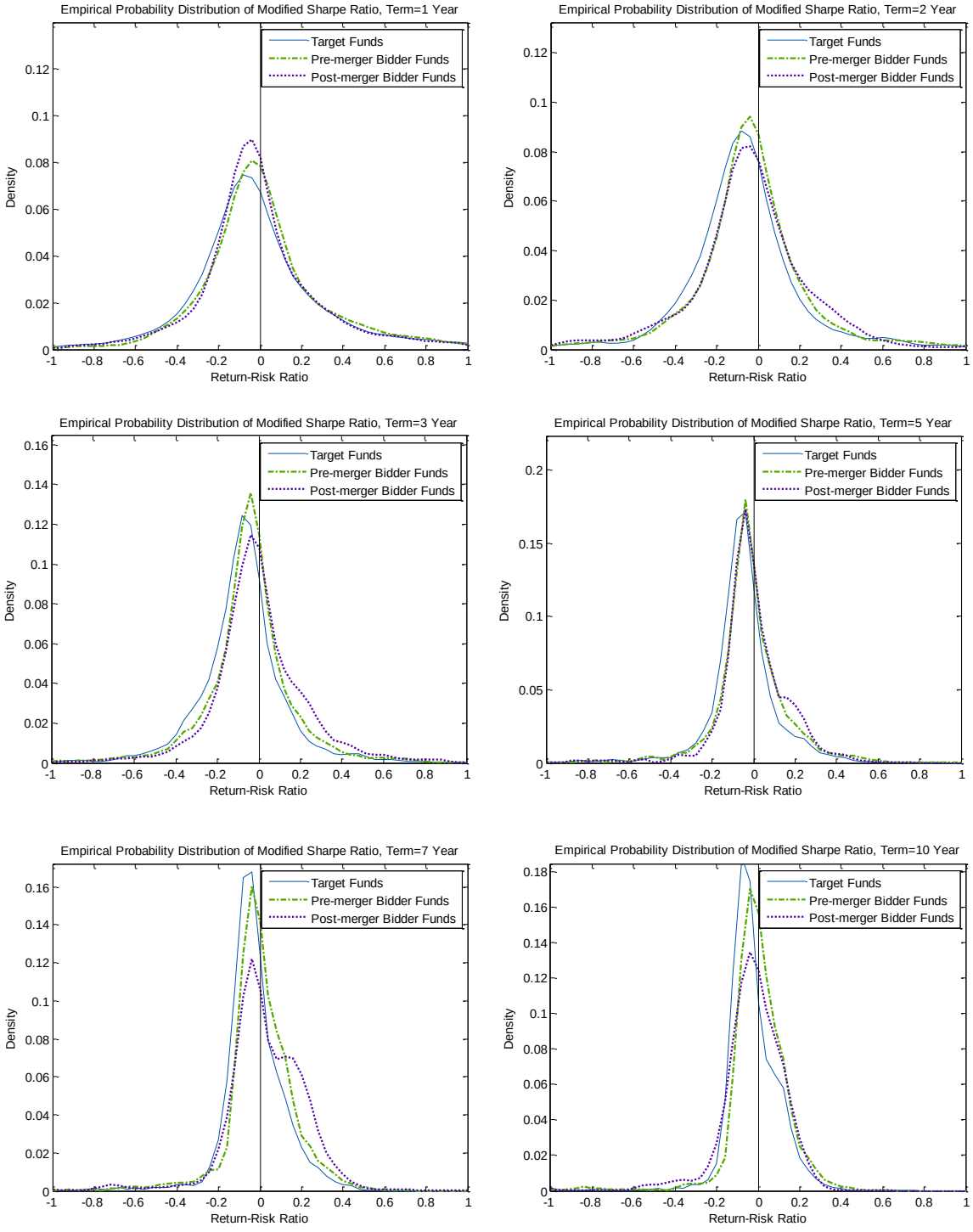

Figure 3. Risk-Return tradeoff: Second-Order stochastic Dominance

The figure represents the portfolio frontiers formed by the targets, pre- and post- merger bidder forms. The x-axis represents the square root of semi-variances (Risk) and the y-axis represents the SDF alphas (Risk-adjusted Reward). All SDF alphas are considered: statistically significant and non significant. The second-order stochastic dominance resides in the offer of a higher abnormal performance for a certain level of risk.

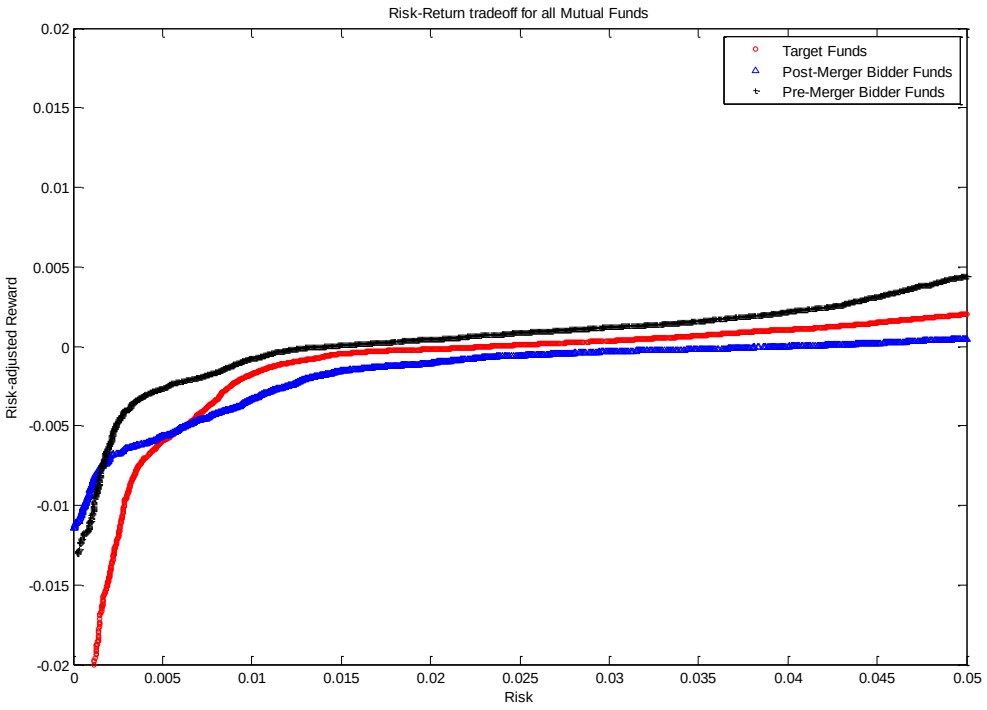

Figure 4. Risk-return tradeoff: First-order stochastic dominance

The figure represents superposed cumulative distribution functions of significant alphas by levels of risk. Included in the bottom 10%, all cases of target and acquiring funds significant alphas with levels of risks lower than the 10th percentile of the downside risk distribution.