Family Values and the Star Phenomenon: Strategies of Mutual Fund Families

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We examine the extent to which a fund's cash flows are affected by the stellar performance of other funds in its family — and consequences of such spillovers. We show that star performance results in greater cash inflow to the fund and to other funds in its family. Moreover, families with higher variation in investment strategies across funds are shown to be more likely to generate star performance. We argue that spillovers may induce lower ability families to pursue star-creating strategies. Consistent with our conjecture, families with high variation in investment strategies across funds significantly underperform low-variation families.

Most mutual funds are members of fund families.[1] There are good reasons for this. A family structure brings economies of scale to the distribution, servicing, and promotion of funds. Compared to stand-alone funds, a family has greater flexibility in reallocating its human and other resources in response to market opportunities. A family's reputation can help to reassure investors about the selection and monitoring of investment managers.

Despite the prevalence of the family organization, little research has been done on the consequences or importance of family membership. The literature has, for the most part, treated funds as though they were stand-alone entities. This is inappropriate if there are significant spillover effects

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[1] More than 80% of mutual funds are members of fund families. The average fund family has about seven diversified equity funds (see Table 1).

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between funds in a family — for example, if good performance by a fund enhances cash inflow to other funds in the family as well. Such spillovers may be generated if, for instance, fund families actively publicize the performance of their best performing funds to promote visibility and thereby attract greater cash inflow. Investors drawn to a star fund may also find it cost effective to diversify by investing in other funds in the family. Without an understanding of performance and strategy at the level of the fund family, we are potentially ignoring significant influences on the behavior and performance of individual funds.

It is well documented in the literature that investors appear to respond asymmetrically to the performance of a fund. A strongly performing fund attracts a disproportionate inflow of new money relative to the cash outflow when performance is poor.[2] While the reasons for such a pattern are not well understood, the convex (call-option-like) response to fund performance suggests a disproportionate benefit from a star performance. When funds are in a family structure, positive spillover effects between funds can further amplify the benefit of a star performer. As a consequence, families with lower ability may be more inclined to follow investment strategies that raise the odds of creating a star. Of course, enthusiasm for a star performer would be considerably diminished if, for instance, the bulk of the new money a star fund attracted was cannibalized from other funds in its family. On the other hand, it may be optimal for higher-ability families to devise investment strategies to maximize their comparative advantage in investing and information acquisition rather than pursuing a star-creating strategy that devalues their investment skills.

We investigate the question of whether there are intrafamily spillover effects and, specifically, whether a star performance affects the flow of new money to the fund and to other funds in the family. For our empirical analysis, we use open-end mutual fund data from the Center for Research in Security Prices (CRSP) for the post-1991 period, for which information on family identity is available. Consistent with much of the existing research, we consider only diversified U.S. equity funds. For our analysis, unless specified otherwise, we define a star fund as one with a Fama and French (1993) three-factor adjusted performance that ranks among the top 5% of performances in the previous 12 months.

Our results confirm that there is a strong positive spillover effect from having a star performer in the family. Overall the new money growth for star families (families with at least one star fund in the preceding 12

[2] One may need a behavioral explanation to account for such a cash flow response pattern. For instance, the pattern may reflect the difficulty of attracting the attention of small, possibly unsophisticated fund investors unless the fund is a star performer and is heavily promoted. On the other hand, if the fund does poorly, investor reaction may be muted since the family has no incentive to publicize its poor performance. The asymmetric reaction may also result from investor aversion to recognizing losses, in line with behavioral evidence on the reluctance of investors to sell losing stocks. For behavioral evidence on fund investors, see Goetzmann and Peles (1997).

months) is significantly higher than that for families with no stars. Compared to a stand-alone star fund, a star performance in a family with seven member funds (mean family size in 1998) delivers an aggregate cash flow increase that is more than three times larger. Our finding is consistent with the empirical evidence in Khorana and Servaes (2000) that the presence of a star fund has a positive and significant impact on fund family market share.

We also examine the spillover effect using a star fund definition that is best known in the mutual fund industry: the five-star-rated Morningstar funds (henceforth, MS stars). A five-star rating indicates a stellar performance. The Morningstar ratings differ from our previously defined star ranking system in the risk-adjustment method, the inclusion of load charges, and the evaluation horizon. As a consequence, the MS stars are quite different from the stars identified by the factor models. In fact, we find evidence that MS star funds draw more new money to themselves than star funds defined by the factor models. However, the two sets of stars generate similar spillover effects within fund families. We also find that the impact of the MS stars is largely independent of the impact of the factor-model stars.

Does the existence of such spillovers affect investment strategy and other decisions made by a fund family? Our conjecture is that disproportionate cash flows to a star family might induce some, especially families of lower ability, to pursue a star-creating strategy. To raise the odds of producing extreme returns, a family can reasonably control two factors (at least over the long run): a higher cross-fund return standard deviation and a greater number of funds in the family. The results of our logistic regression indicate that the probability of creating a star fund is most consistently affected by cross-fund return standard deviation. The impact of the number of funds on the probability of creating star funds is shown to be positive (as predicted), but less significant. Interestingly, the logistic regression indicates that increasing the variance in the cross-fund investment strategies does not help create the longer-term MS stars. As we might expect, the star-creating strategy of adopting higher cross-fund variance investments is more effective and relevant in creating short-term stars.

Next, we investigate whether fund families deliberately choose investment strategies to affect the ex ante probability of producing a star. Lower-ability families may have, as discussed, a greater incentive to choose variance-increasing strategies in order to generate stars. On the other hand, families with higher investment ability are more likely to share information and strategies among member funds, resulting in lower cross-fund return standard deviation. To investigate this issue we examine the relative performance of higher and lower standard deviation families using a portfolio approach. Consistent with the above conjecture, we find that, for both star and nonstar families, higher standard deviation families significantly underperform their lower standard deviation counterparts in

the subsequent year. This suggests that investment strategies that are effective in generating stars are also the ones associated with a lower average performance. Hence a star-creating strategy, presumably targeted to less informed investors, does them no favor.

We then examine whether a naive strategy of chasing star families benefits investors.[3] While stars may be associated with investment ability, they may also be, as discussed, the result of lower-ability families pursuing star-creating strategies. We find that families with star performers in a particular period do not have higher returns in the subsequent period. Blake and Morey (2000) also find little evidence that five-star Morningstar ratings predict superior future performance. Hence a naive strategy of pursuing star families does not benefit investors.

Finally, we examine fund performance conditional on family characteristics that are related to the probability of creating star funds. Families, depending on investment strategies and the number of funds, differ in the ex ante probability of producing a star performance, irrespective of investment ability. Hence conditional on a star performance, the performance will be a better indicator of ability when the family has a low ex ante probability of producing stars, so long as some families have superior investment ability.[4] Based on family characteristics that have a significant influence on the probability of producing a star, we form portfolios based on cross-fund return standard deviation and the number of funds for both star and nonstar families. Interestingly, only one of these portfolios, the low standard deviation and small size star portfolio, displays positive excess returns. Thus there is evidence that at least some families appear to have superior ability — these are star families with low ex ante probability of producing a star.

The rest of the article is as follows. In Section 1, we discuss the related literature. We describe the data and summary statistics in Section 2. We present the methodology and empirical findings in Section 3. Section 4 concludes.

1. Literature Review

It is well documented in the literature that investors tend to chase past fund performance. Spritz (1970), Smith (1978), Kane, Santini and

[3] Gruber (1996) and Zheng (1999) suggest that aggregate fund flows predict future fund performance.

[4] For illustration, consider a situation in which unconditionally a family has a small probability, say 1%, of having superior investment ability. Families with superior ability produce stars with a probability of 50%. However, there are two types of families. In one type, families with no investment ability have a high ex ante probability, say 10%, of producing a star fund. In the other type, families with no ability have a low ex ante probability, say 2%, of producing a star fund. Using Bayes' rule it follows that, conditional on a star performance, a family from the high ex ante probability group has a low posterior probability of having superior ability (about 5%). On the other hand, a star family from the low ex ante probability group has a much greater posterior probability of having investment ability (about 20%).

Aber (1991), and Patel, Zeckhauser, and Hendricks (1994) report a positive relation between past fund performance and new money flows.[5] Ippolito (1992), Gruber (1996), Goetzmann and Peles (1997), Chevalier and Ellison (1997), and Sirri and Tufano (1998) indicate that mutual fund investors reward stellar fund performance with disproportionately high money inflows but do not penalize poor performance equally. As a consequence, some fund families, especially those of lower ability, may have the incentive to adopt strategies that increase their chances of generating star funds.

The effect of incentives on a fund manager's investment decisions has been studied in some articles. Among these, Chevalier and Ellison (1997) report evidence suggesting that fund managers alter the riskiness of their portfolios at the end of the year in order to exploit the nonlinear shape of the performance-flow relation. Brown, Harlow, and Starks (1996) find that managers of investment portfolios that are likely to end up as losers manipulate fund risk differently than others, partly due to compensation and career concerns.

Only recently have researchers started to pay attention to the decisions at the level of mutual fund complex. Goetzmann and Ibbotson (1993) discuss the notion that fund complexes maximize the probability of having a fund at the top of the rankings by managing many funds and by minimizing cross-fund correlations. Khorana and Servaes (1999) study the decision by fund families to start new funds. Khorana and Servaes (2000) analyze the determinants that drive market share in the mutual fund industry. They provide evidence that the presence of a star fund has a strong positive "spillover" effect on fund family market share. In a paper addressing the question of why there are so many mutual funds, Massa (2003) models the process that endogenously leads to market segmentation and to fund proliferation. He explains category and fund proliferation on the basis of the "spillover" effect that the performance of a fund provides to other funds in the same family. Ivkovic (2001) documents a positive spillover effect from the performance of other member funds in the family. However, the article finds little evidence that the presence of individual stellar funds in the family helps to attract more money to other member funds. The difference in results is probably due to the difference in performance measures and in the definition of star funds. Zhao (2002) finds evidence that spillover effects play an important role in a fund family's decision to close a fund to new investors.

[5] At the aggregate level, Warther (1995) and Boyer and Zheng (2002) both document a contemporaneous positive linear relation between aggregate flows into mutual funds and security market returns. Lakonishok, Shleifer, and Vishny (1992) detect a positive association between the number of new accounts gained and the three-year industry-adjusted returns by investigating 250 institutional money managers.

2. Data

2.1. Definition of variables

Our data sample is from the mutual fund database compiled by CRSP. This dataset covers U.S. open-end mutual funds, including defunct funds. For our study we include all diversified U.S. equity funds over the period from January 1992 to December 1998, for which fund complex information, monthly fund total net assets (TNA), monthly fund returns, and annual fund characteristics (turnover ratio, expense ratio, load, etc.) are available. Our sample excludes sector funds, international funds and balanced funds.[6]

To measure the performance of a mutual fund family, we calculate the weighted average of three-factor adjusted returns of all member funds within the family. For each fund, the three-factor adjusted returns are estimated using the Fama and French three-factor model [Fama and French (1993)]. Specifically, we use the following ordinary least squares (OLS) regressions to estimate fund factor loadings and α measures:

$$R_{it} - RF_t = \alpha_i + \beta_{iRMRF} RMRF_t + \beta_{iSMB} SMB_t + \beta_{iHML} HML_t + e_{it}, \quad (1)$$

where R_{it} is the rate of return of fund i in month t, RF_t is the one-month Treasury-bill rate in month t, R_{mt} is the rate of return of the market in month t, $RMRF_t \equiv R_{mt} - RF_t$ is the excess market return in month t, SMB_t is the rate of return on the mimicking portfolio for the size factor in stock returns in month t, HML_t is the rate of return on the mimicking portfolio for the book-to-market equity factor in stock returns in month t, α is the excess return of the corresponding factor model, and the βs are the factor loadings of the corresponding factors. Using the estimated factor loadings (βs) and excess return α, we define the three-factor adjusted return (α_{it}) for fund i in month t as

$$\alpha_{it} \equiv \alpha_i + e_{it}. \quad (2)$$

We then compute the three-factor adjusted return α_{ft} of fund family f in month t as the weighted average of three-factor adjusted returns of all member funds within family f:

$$\alpha_{ft} = \frac{\sum_{i=1}^{n} \alpha_{it} TNA_{it}}{\sum_{i=1}^{n} TNA_{it}}, \quad (3)$$

where TNA_{it} is the total net assets of fund i in month t, and n is the total number of member funds within family f.

[6] Another concern about the use of other fund types is that the standard (Fama and French) three-factor model may not be appropriate in some of these contexts and may require additional risk factors to span the space covered by their investments.

The new money or cash flow of a mutual fund family is calculated as the sum of new money of all member funds. For each member fund, new money is defined to be the dollar change in TNA, net of price appreciation in the fund assets. Assuming that new money is invested at the end of each month, the cash flow for fund i in month t is given by

$$Newmoney_{it} = TNA_{it} - TNA_{i,t-1} * (1 + R_{it}). \tag{4}$$

Normalizing the new money by TNA at the beginning of the month gives a measure for new money growth:

$$Newmoneygrowth_{it} = \frac{Newmoney_{it}}{TNA_{i,t-1}}. \tag{5}$$

For any mutual fund family f, the family-level new money and new money growth are calculated as

$$Newmoney_{ft} = \sum_{i=1}^{n} Newmoney_{it}, \tag{6}$$

$$Newmoneygrowth_{ft} = \frac{Newmoney_{ft}}{\sum_{i=1}^{n} TNA_{i,t-1}}. \tag{7}$$

We use the cross-fund return standard deviation to proxy for the strategy chosen by family management. For any fund family f in month t, we calculate the cross-fund standard deviation of three-factor adjusted returns as

$$(Cross\text{-}fund\ std.\ dev.)_{ft} = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (\alpha_{it} - \overline{\alpha_{ft}})^2}, \tag{8}$$

where $\overline{\alpha_{ft}}$ is the mean of three-factor adjusted returns of all member funds within family f in month t. The family-level turnover ratio, expense ratio, and front-end load are calculated as the TNA-weighted average of the corresponding fund-level measures.

Finally, we need a procedure to identify star and dog funds.[7] For each month in the sample period, we calculate the average three-factor adjusted return over the previous 12 months for each fund. The top (bottom) 5%, funds with the highest (lowest) monthly average returns, are then defined as the star (dog) funds for that month. For any given month, a fund family is defined as a star (dog) family if it has at least one

[7] When we identify star and dog funds, we also adjust for the multiple share classes so that we do not count the same fund more than once.

star (dog) fund under management. Otherwise it is defined as a nonstar (nondog) family.

As a robustness check, we use alternative risk-adjustment models to evaluate fund performance. The alternative measures include one-factor [capital asset pricing model (CAPM)] adjusted returns, Carhart (1997) four-factor adjusted returns, and raw returns.

Alternatively, we identify star funds as the five-star-rated funds by Morningstar, denoted as MS stars. Morningstar star ratings are featured in mutual fund advertisements, and many investors use the ratings in their fund selections. A five-star rating indicates a stellar performance. We replicate the Morningstar ratings based on the description published by Morningstar because we do not have access to the actual Morningstar ratings for our entire sample period. Morningstar ranked funds within four categories in our sample period: stock funds, international stock funds, taxable fixed-income funds, and tax-free municipal bond funds. We rank funds within our overall sample of diversified U.S. equity funds. Only funds with at least three years of performance history are given ratings. Ratings are calculated for 3-, 5-, and 10-year periods if available, and are then weighted to calculate an overall rating. In general, a fund's rating is determined by the difference between a return component and a risk component. We describe details of the procedure that Morningstar uses to assign star ratings in the appendix.

Note that due to the slightly different samples to start with, the Morningstar ratings we replicate may be different from the published ratings that investors observed. To check the accuracy of our star rating replication, we compare the group of five-star funds generated by our replication exercise with those reported in Morningstar Principia Pro Plus. We randomly pick a date — May 1995 — and compare the two groups. Overall, our replication results are close to those disclosed by Morningstar. There are 76 five-star funds from our calculation and 81 five-star funds from the Morningstar publication. Sixty-seven five-star funds are common between the groups.

2.2 Summary statistics

Table 1 provides annual summary statistics for mutual fund families. The number of fund families in the sample increases from 178 in 1992 to 278 in 1998. The average size of fund families also increases over this period in terms of both the number of member funds and the TNA under family management. The average number of funds managed by a family is 3.88 in 1992. In 1998 the number climbs to 6.83. On average, the TNA managed by a fund family increases almost three times, from \$1,638.09 million in 1992 to \$4,121.75 million in 1998. Moreover, the average TNA per member fund also exhibits a dramatic increase over the sample period. The family turnover ratios and expense ratios appear

Table 1
Annual summary statistics for mutual fund families, 1992–1998

Year	Number of families	Number of funds per family	New money growth (%)	Family TNA ($ mil.)	Average TNA per fund ($ mil.)	Turnover ratio	Expense ratio (%)	Front-end load (%)	Three-factor adjusted return (%)	Standard deviation of returns (%)
					Mean					
1992	178	3.88	1.71	1638.09	275.43	0.76	1.30	2.14	−0.05	1.08
1993	198	4.30	1.73	2071.09	310.88	0.72	1.28	1.90	0.10	1.22
1994	216	4.56	1.20	2127.50	311.14	0.77	1.33	1.66	−0.18	1.05
1995	223	5.03	1.35	2553.43	366.60	0.78	1.30	1.55	−0.16	1.21
1996	238	5.22	1.45	3395.60	453.90	0.78	1.30	1.40	−0.07	1.15
1997	253	5.81	1.92	3816.58	471.18	0.74	1.27	1.20	−0.30	1.30
1998	278	6.83	1.11	4121.75	456.25	0.85	1.29	1.21	−0.23	1.47
					Standard deviation					
1992	—	3.10	3.76	4925.36	496.40	1.35	0.67	2.42	0.39	0.49
1993	—	4.02	3.36	6786.54	592.47	0.61	0.53	2.30	0.41	0.65
1994	—	4.70	4.20	6408.60	606.70	0.72	0.69	2.19	0.47	0.48
1995	—	5.48	4.02	7004.37	720.02	1.05	0.60	2.12	0.50	0.57
1996	—	5.91	5.50	9415.96	899.13	1.05	0.60	1.99	0.42	0.46
1997	—	6.74	5.63	8860.67	776.04	0.59	1.12	1.84	0.54	0.55
1998	—	7.86	4.54	8978.18	748.99	1.28	0.84	1.80	0.60	0.66

The table reports annual summary statistics for mutual fund families in the period 1992–1998. Our sample excludes all single-fund families. We adjust for multiple share classes so that we only count the same fund once. For each year in the sample period, the table shows the means and standard deviations of the following family characteristics: the year-end number of mutual fund families, the number of funds within a family, the new money growth (%), the family TNA (in million dollars), the average TNA per member fund (in million dollars), the turnover ratio, the expense ratio (%), the front-end load (%), the three-factor adjusted return (%), and the cross-fund standard deviation of three-factor adjusted returns (%). The number of fund families, turnover ratio, expense ratio, and front-end load are year-end measures. All other variables are measured on a monthly basis. For each mutual fund family in the sample, we first calculate the monthly averages of these variables in any given year. Then we calculate the means and standard deviations of the monthly averages across all families.

quite stable over the sample period, while the average front-end loads decrease from 2.14% to 1.21%. The last two columns of the table report the summary statistics for three-factor adjusted returns and cross-fund standard deviation of three-factor adjusted returns. For all years in the sample period (except 1993), the average excess return (three-factor adjusted) earned by fund families is negative. Overall, the average standard deviation of three-factor adjusted returns exhibits an increasing trend.

To better understand the characteristics of star funds and families, in Table 2 we report summary statistics for the stars identified at the end of each calendar year over the sample period. The number of star funds increases from 39 in 1992 to 72 in 1998, due to the increase in sample size. The average performance of star funds, measured by three-factor adjusted returns over the year, is typically greater than 1% on a monthly basis. In the context of fund families, the average size of star families (measured by the number of member funds under management) and the average cross-fund standard deviation of three-factor adjusted returns are both higher than the corresponding average statistics reported in Table 1. For instance, an average star family manages more than 10 member funds in 1998, well above the average number of 6.83 funds for the full sample. Meanwhile, the cross-fund return standard deviation for star families averages 1.73% versus 1.47% for all fund families. Hence preliminary evidence suggests that fund families with more member funds and higher cross-fund return standard deviations are more likely to produce stars.

To provide a general idea on how star funds are distributed among different families, we categorize fund families into four different groups based on the following family characteristics: cross-fund standard deviation of three-factor adjusted returns and the number of member funds. A fund family is defined as having a high (low) standard deviation if its average cross-fund return standard deviation over the previous 12 months is above (below) the industry median. Similarly a fund family is defined as large (small) if its average number of member funds over the previous 12 months is above (below) the industry median. As indicated in Table 2, most star families belong to the group of high standard deviation families.

3. Methodology and Empirical Results

3.1 What does a star bring to the family?

3.1.1 The star fund effect on family-level new money growth. To explore the effect of star funds on family cash flows, we compare the new money growth of star families to that of nonstar families, after controlling for past family performance and other family characteristics. Specifically we

Table 2
Summary statistics for star funds and star families, 1992–1998

Year	Number of funds	Number of families	Average fund-level performance (%)	Average family size	Average return std. dev. (%)	Number of high std. dev. and large families	Number of low std. dev. and large families	Number of high std. dev. and small families	Number of low std. dev. and small families	Number of families with one member fund
1992	39	34	1.17	5.56	1.34	14	4	6	2	5
1993	46	40	1.53	6.80	1.57	22	3	9	2	2
1994	53	41	1.07	6.87	1.31	12	5	10	3	5
1995	60	48	1.39	7.64	1.47	17	6	16	2	4
1996	66	53	1.27	8.50	1.53	22	2	19	4	2
1997	73	64	0.83	8.43	1.47	22	7	15	11	2
1998	72	52	1.33	10.03	1.73	25	7	12	5	0

The table presents summary statistics for the star funds and star families identified at the end of each calendar year in the sample period. Star funds are defined as the top 5% performers with the highest average three-factor adjusted returns over the previous 12 months. Star families are defined as the fund families that have at least one star fund under management. Both the number of star funds and the number of star families are year-end measures. For each star fund in any given year, we compute the monthly average of three-factor adjusted returns during the year. The average performance of star funds for that year is then measured by the mean of these monthly averages across all star funds. The average size and return standard deviation of star families are defined in a similar manner. For each star family in any given year, we first compute the monthly average of the number of member funds and the monthly average of cross-fund standard deviations of three-factor adjusted returns during the year. The average size and standard deviation of star families for that year are then measured by the means of the corresponding monthly averages across all star families. We also count the number of star families within each of the following groups: high standard deviation and large families, low standard deviation and large families, high standard deviation and small families, low standard deviation and small families, and single-fund families. For any given year, a fund family is defined as a large (small) family if the monthly average of number of funds under management is above (below) that of the median family. Similarly a fund family is defined as a high (low) standard deviation family if the monthly average of cross-fund standard deviations of three-factor adjusted returns is above (below) that of the median family.

estimate the following fixed-effect panel regression:

$$\begin{aligned}(Newmoneygrowth)_{f,t} = {} & \alpha_f + \beta_1 * (past\ performance)_{f,[t-12,t-1]} \\ & + \beta_2 * (cross\text{-}fund\ std.\ dev.)_{f,t-1} \\ & + \beta_3 * (number\ of\ funds)_{f,t-1} + \beta_4 * (family\ size)_{f,t-1} \\ & + \beta_5 * (turnover\ ratio)_{f,t-1} + \beta_6 * (expense\ ratio)_{f,t-1} \\ & + \beta_7 * (front\text{-}end\ load)_{f,t-1} \\ & + \beta_8 * (star\ family\ dummy)_{f,[t-12,t-1]} \\ & + \beta_9 * (MS\ star\ family\ dummy)_f \\ & + \beta_{10} * (dog\ family\ dummy)_{f,[t-12,t-1]} + \varepsilon_{f,t}. \qquad (9)\end{aligned}$$

Here, f is the index for the fund family, t is the index for month, and α_f captures the family fixed effect. Other than the dummy variables indicating star and dog identity, the other variables are similar to those used in previous studies of the performance-flow relation. The variable *newmoneygrowth* is given by Equation (7). *Past performance* is measured by the average family-level risk-adjusted return over the previous 12 months. *Cross-fund std. dev.* is calculated by Equation (8). *Number of funds* is the logarithm of the total number of member funds managed by the family. *Family size* is measured by the logarithm of the average TNA per member fund relative to the TNA per fund of the median family. *Turnover ratio*, *expense ratio*, and *front-end load* are defined as earlier.

To control for autocorrelation and heteroscedasticity in the panel regression, we allow for disturbances to follow a common AR(1) process and for each family (panel) to have its own variance. Moreover, we allow for disturbances to be contemporaneously correlated across families (panels). As robustness checks, we estimate the panel regression of Equation (9) using alternative measures of risk-adjusted returns and star ranking mechanisms.[8]

To analyze the impact of star and dog performers in the fund family, we rely on indicator variables *star family dummy*, *MS star family dummy*, and *dog family dummy*. The *star family dummy* equals one if a fund family has at least one star fund under management. For each month in the sample period, the star funds and star families are identified by ranking

[8] As another robustness check, we estimate the regression in Equation (9) using Carhart four-factor adjusted returns and raw returns to measure past performance to calculate cross-fund standard deviation of returns and to identify star and dog performance. The coefficient estimates are similar to those reported in Table 3. Moreover, we examine the impact of having multiple stars on family-level new money growth. After controlling for the star identity of fund families, the coefficient estimate for the multiple-star dummy is estimated, as expected, to be positive. It is not, however, statistically significant. Hence we do not have reliable evidence that having multiple stars helps star families attract additional cash flows.

the factor-adjusted returns in the previous 12 months. A similar definition applies to the *dog family dummy*. The *MS star family dummy* equals one if a fund family has at least one MS star according to the the Morningstar ranking. The coefficients of the *star family dummy* capture the mean difference in new money growth between star and nonstar families after controlling for other variables that potentially affect new money growth. It indicates whether the presence of one or more star funds helps the family attract additional new money in the future.

The results presented in Table 3 indicate that the coefficients on the *star family dummy* are positive and significant for all performance measures. The finding provides supporting evidence that having a star fund increases the total level of new money flows to the entire family. For example, in the columns labeled Three-factor star, the new money growth for star families is on average 4.4% (on an annual basis) higher than that for nonstar families. Given the average family TNA ($4,122 million) at the end of 1998, this implies that a star family, on average, attracts $181 million more than a nonstar family on an annual basis. The finding of a "spillover" effect at the family level is consistent with the evidence in Khorana and Servaes (2000). The results are similar but slightly weaker when we use the one-factor risk adjustment.

Next, we investigate the impact of having a dog in the family. For a variance-increasing strategy to be attractive at the family level, it needs to be verified that family-level cash flows exhibit an asymmetric pattern in response to fund performance. Family management would have little incentive to adopt investment strategies that increase the odds of producing both stars and dogs—if there were substantial negative spillover effects associated with having a dog in the family. As reported in Table 3, the coefficient estimate on the *dog family dummy* is negative but not statistically significant, regardless of the performance measures. Moreover, the point estimate of the coefficient on the *dog family dummy* is much smaller than the point estimate of the coefficient on the *star family dummy*.

We also compare the new money growth of MS star families to other non-MS star fund families. In the columns labeled MS star, the *MS star family dummy* is economically and statistically significant, indicating that having an MS star fund increases the total level of new money flows to the fund family. It is interesting to note that the coefficient on the *MS star family dummy* is more than twice as large as that of the star dummy defined earlier. This finding suggests that MS stars, possibly on account of their sustained performance over longer periods or their marketing label, have even more power in generating total new money for a family than the previously defined stars.

In the last column (labeled Combined) of Table 3, we include both the *star family dummy* (defined by three-factor adjusted returns) and the *MS*

Table 3
The star-fund effect on family-level new money growth

Independent variables	Dependent variables: Family new money growth (t)						
	Three-factor star		One-factor star		MS star		Combined
Past performance	204.35***	200.36***	159.21***	157.73***	205.17***	201.14***	192.26***
	(11.24)	(10.68)	(8.84)	(8.48)	(11.76)	(11.12)	(10.31)
Cross-fund std. dev.	7.23	7.40	13.40**	13.47**	7.71	7.89	7.39
	(1.26)	(1.29)	(2.56)	(2.57)	(1.35)	(1.38)	(1.29)
Number of funds	−1.11***	−1.10***	−0.94***	−0.94***	−1.18***	−1.16***	−1.21***
	(−4.43)	(−4.33)	(−3.83)	(−3.80)	(−4.75)	(−4.64)	(−4.78)
Family size	−2.25***	−2.26***	−2.25***	−2.25***	−2.33***	−2.34***	−2.36***
	(−12.42)	(−12.46)	(−12.40)	(−12.41)	(−13.08)	(−13.11)	(−13.25)
Turnover ratio	−0.54**	−0.54**	−0.57**	−0.57**	−0.53**	−0.53**	−0.54**
	(−2.12)	(−2.12)	(−2.23)	(−2.24)	(−2.09)	(−2.10)	(−2.11)
Expense ratio	−25.19***	−24.85***	−24.06***	−24.04***	−25.56***	−25.21***	−25.58***
	(−2.80)	(−2.77)	(−2.87)	(−2.87)	(−2.87)	(−2.84)	(−2.90)
Front-end load	−45.14***	−44.94***	−45.25***	−45.19***	−45.96***	−45.75***	−46.11***
	(−5.07)	(−5.04)	(−5.16)	(−5.15)	(−5.21)	(−5.17)	(−5.21)
Star family dummy	0.37**	0.37**	0.23*	0.23*			0.35**
	(2.54)	(2.55)	(1.66)	(1.67)			(2.40)
MS star family dummy					0.94***	0.94***	0.93***
					(7.00)	(7.01)	(6.95)
Dog family dummy		−0.15		−0.08		−0.15	−0.16
		(−1.01)		(−0.54)		(−1.04)	(−1.08)
No. of observations	15,769	15,769	15,769	15.769	15,769	15,769	15,769
Adjusted R^2	0.06	0.06	0.06	0.06	0.06	0.06	0.06

The table examines the star fund effect on the family-level new money growth. We estimate the following fixed-effect panel regressions:

$$\begin{aligned}(Newmoneygrowth)_{f,t} = {} & \alpha_f + \beta_1(past\ performance)_{f,[t-12,t-1]} + \beta_2(cross\text{-}fund\ std.\ dev.)_{f,t-1} \\ & + \beta_3(number\ of\ funds)_{f,t-1} + \beta_4(family\ size)_{f,t-1} + \beta_5(turnover\ ratio)_{f,t-1} \\ & + \beta_6(expense\ ratio)_{f,t-1} + \beta_7(\ front\text{-}end\ load)_{f,t-1} \\ & + \beta_8(star\ family\ dummy)_{f,[t-12,t-1]} + \beta_9(MS\ star\ family\ dummy)_f \\ & + \beta_{10}(dog\ family\ dummy)_{f,[t-12,t-1)} + \varepsilon_{f,t}.\end{aligned}$$

Here, f and t denote family and month, respectively. *Newmoneygrowth* is the new money flow into the family normalized by the previous month-end family TNA. *Past performance* is measured by the average family-level risk-adjusted return over the previous 12 months. *Cross-fund std. dev.* is defined as the standard deviation of three-factor adjusted returns across all funds in the family. *Number of funds* is the logarithm of the total number of member funds managed by the family. *Family size* is measured by the logarithm of average TNA per member fund relative to the TNA per fund of the median family. *Turnover ratio*, *expense ratio*, and *front-end load* are defined as the TNA-weighted averages of the corresponding fund-level measures. *Star family dummy* and *dog family dummy* are dummy variables indicating whether the family has at least one star or dog fund under management. *MS star family dummy* is a dummy variable indicating whether the family has at least one Morningstar five-star fund under management. The columns labeled three-factor (one-factor) star report coefficient estimates when three-factor (one-factor) adjusted returns are used to measure past performance, to calculate cross-fund standard deviation of returns, and to identify star and dog families. In the columns labeled MS star, while using three-factor adjusted returns to define past performance and standard deviation, we use Morningstar rankings instead to identify star families. The last column of the table (labeled Combined) reports coefficient estimates when both star measures (three-factor stars and MS stars) are included in the regression. As in the previous column, we use three-factor adjusted returns to measure past performance and to calculate standard deviation. The reported coefficient estimates and standard errors are adjusted for autocorrelation (AR1), contemporaneous correlation across panels, and heteroscedasticity. T-statistics are reported in parentheses. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. All coefficients reported in the table are the actual coefficient estimates multiplied by 100.

star family dummy in the regression. Consistent with the low rate of overlap between the two star measures, both coefficients remain significant. The coefficient estimates are very similar to those obtained earlier when we examine the effect of the two star measures separately.

The regression results in Table 3 also indicate that family cash flows are positively related to past performance and are negatively related to turnover ratio, expense ratio and front-end load during our sample period.

3.1.2 The star fund effect on other funds in the family. Having found the star fund effect on new money growth at the family level, we now examine whether a star fund helps attract greater cash inflows to other funds in the same family. As mentioned, such a spillover may occur if investors come to have a more positive view of other funds in the star family. These may also occur if new investors attracted to the star fund find it cost effective to diversify by investing in other funds in the same family. A spillover effect would result in higher new money growth for the nonstar funds in star families than for similarly situated funds in nonstar families. On the other hand, if the cash inflows to star funds are largely the consequence of cannibalizing cash flows from other funds in the same family, the new money growth for nonstar funds in star families may well be lower.

To investigate such spillover effects, we estimate the following fixed-effect panel regression by utilizing fund-level information and by explicitly taking into account whether a particular fund belongs to a star family or not:

$$\begin{aligned}(Newmoneygrowth)_{i,t} = {} & \alpha_i + \beta_1 * (past\ performance)_{i,[t-12,t-1]} \\ & + \beta_2 * (fund\ size)_{i,t-1} + \beta_3 * (turnover\ ratio)_{i,t-1} \\ & + \beta_4 * (expense\ ratio)_{i,t-1} + \beta_5 * (front\text{-}end\ load)_{i,t-1} \\ & + \beta_6 * (star\ fund\ dummy)_{i,[t-12,t-1]} \\ & + \beta_7 * (star\ family\ dummy)_{i,[t-12,t-1]} \\ & + \beta_8 * (MS\ star\ fund\ dummy)_i \\ & + \beta_9 * (MS\ star\ family\ dummy)_i \\ & + \beta_{10} * (dog\ fund\ dummy)_{i,[t-12,t-1]} \\ & + \beta_{11} * (dog\ family\ dummy)_{i,[t-12,t-1]} + \varepsilon_{i,t}.\end{aligned}$$

In the above regression, i is the index for individual fund, t is the index for month, and α_i captures the fixed fund effect. *Past performance* is measured by the average fund-level risk-adjusted return over the previous 12 months. *Fund size* is computed as the logarithm of fund-level TNA relative to the TNA of the median fund. *Turnover ratio*, *expense ratio*, and *front-end load* are all fund-level statistics. The remaining six variables are dummy variables. *Star fund dummy* equals one if the fund itself is a star

fund, while *star family dummy* equals one if the fund is not a star but belongs to a star family. For each month in the sample period, the star funds and star families are identified by ranking the monthly averages of risk-adjusted returns in the previous 12 months. We define *dog fund dummy* and *dog family dummy* in a similar manner. In addition to the star performers defined using the factor models, we also consider the impact of star performers identified by the Morningstar rankings. *MS star fund dummy* equals one if the fund itself is an MS star, while the *MS star family dummy* equals one if the fund is not an MS star but belongs to a family that has at least one MS star fund under management. As before, the regressions are estimated allowing for autocorrelation (AR1) of residuals and cross-fund heteroscedasticity. As a robustness check, we estimate the panel regression of Equation (10) using alternative measures of risk-adjusted returns and star ranking mechanisms.

We report the regression results in Table 4.[9] In the columns labeled three-factor star, the coefficient estimates on the *star fund dummy* are positive and significant at the 1% level. Specifically the new money growth for a star fund is, on average, about 13% (on an annual basis) higher than that for a nonstar fund. This result is not surprising since, as earlier studies have documented, a strongly performing fund attracts a disproportionate inflow of funds relative to the cash outflow when performance is poor. Of greater interest, the regressions provide evidence that there are positive spillover effects associated with a star performance. The star identity of a family brings more cash inflows to its nonstar member funds, as indicated by the positive and significant coefficient estimates for the *star family dummy*. The subsequent new money growth for its nonstar member funds is, on average, 4.4% (on an annual basis) higher than that for other nonstar funds. Hence both the star and nonstar funds in a star family benefit from the star identity. As one might expect, the magnitudes of the coefficients indicate that a star fund attracts more new money than a nonstar fund that belongs to a star family. Columns labeled one-factor star in Table 4 indicate a similar spillover effect.

For perspective on the economic significance of the spillover effect, note that the average fund family has about seven members in 1998. Assuming that the TNA of funds are similar, the spillover effect is such that, compared to a stand-alone star fund, the overall cash inflows from a star performance in the context of an average family are about 27% larger. Hence, compared to a stand-alone star fund, an average-size family

[9] As another robustness check, we estimate the regression in Equation (10) using raw returns to measure past performance and to identify star and dog performers. The coefficient estimates are similar to those reported in Table 4. Moreover, we examine the spillover effect of having multiple stars in the family by adding a multiple-star family dummy in the regression. After controlling for the star identity of the family to which a fund belongs, the multiple-star effect is found to be negative and statistically insignificant. Hence there is no evidence that having multiple stars in the family generates additional positive spillover effect to other family members.

Table 4.
The star fund effect on fund-level new money growth

	Dependent variables: Fund new money growth (t)						
Independent variables	Three-factor star		One-factor star		MS star		Combined
Past performance	187.55***	180.84***	156.04***	149.04***	189.28***	183.39***	172.86***
	(27.89)	(24.96)	(30.50)	(27.50)	(29.74)	(26.73)	(23.82)
Fund size	−4.81***	−4.82***	−4.77***	−4.77***	−4.91***	−4.91***	−4.92***
	(−82.84)	(−82.67)	(−82.68)	(−82.63)	(−83.78)	(−83.59)	(−83.92)
Turnover ratio	−0.81***	−0.81***	−0.79***	−0.79***	−0.78***	−0.78***	−0.79***
	(−7.71)	(−7.70)	(−7.56)	(−7.55)	(−7.51)	(−7.50)	(−7.53)
Expense ratio	−44.58***	−44.56***	−46.06***	−46.82***	−45.73***	−45.69***	−45.98***
	(−5.01)	(−5.01)	(−5.23)	(−5.32)	(−5.16)	(−5.16)	(−5.19)
Front-end load	−13.44**	−13.42**	−13.51**	−13.59**	−12.48**	−12.46**	−12.63**
	(−2.28)	(−2.28)	(−2.31)	(−2.33)	(−2.13)	(−2.13)	(2.16)
Star fund dummy	1.04***	1.07***	1.63***	1.66***			0.97***
	(5.44)	(5.58)	(9.35)	(9.50)			(5.10)
Star family dummy	0.37***	0.37***	0.19**	0.19**			0.35***
	(4.08)	(4.09)	(2.26)	(2.25)			(3.98)
MS star fund dummy					3.09***	3.09***	3.06***
					(19.96)	(19.95)	(19.75)
MS star family dummy					0.22**	0.22**	0.20**
					(2.36)	(2.35)	(2.13)
Dog fund dummy		−0.56***		−0.81***		−0.51***	−0.55***
		(−2.96)		(−4.32)		(−2.73)	(−2.94)
Dog family dummy		0.02		−0.03		0.01	0.02
		(0.23)		(−0.32)		(0.08)	(0.24)
No. of observations	141663	141663	141663	141663	141663	141663	141663
Adjusted R^2	0.11	0.11	0.11	0.11	0.11	0.11	0.11

The table examines the spillover effect associated with the star performance. We estimate the following fixed-effect panel regressions:

$$\begin{aligned}(Newmoneygrowth)_{i,t} = {} & \alpha_i + \beta_1(past\ performance)_{i,[t-12,t-1]} + \beta_2(fund\ size)_{i,t-1} + \beta_3(turnover\ ratio)_{i,t-1} \\ & + \beta_4(expense\ ratio)_{i,t-1} + \beta_5(front\text{-}end\ load)_{i,t-1} + \beta_6(star\text{-}fund\ dummy)_{i,[t-12,t-1]} \\ & + \beta_7(star\ family\ dummy)_{i,[t-12,t-1]} + \beta_8(MS\ star\ fund\ dummy)_i \\ & + \beta_9(MS\ star\ family\ dummy)_i + \beta_{10}(Dog\ fund\ dummy)_{i,[t-12,t-1]} \\ & + \beta_{11}(dog\ family\ dummy)_{i,[t-12,t-1]} + \varepsilon_{i,t}.\end{aligned}$$

Here, i is the index for individual fund and t is the index for month. *Past performance* is measured by the average fund-level risk-adjusted return over the previous 12 months. *Fund size* is defined as the logarithm of fund-level TNA relative to the TNA of the median fund. Dummy variables and *front-end load* are all fund-level statistics. The remaining six variables are *dummies. Star fund dummy* and *MS star fund dummy* equal one if the fund itself is a star or MS star fund, while star family dummy and *MS star family dummy equal* one if the fund is not a star or MS star but belongs to a star or MS star family. Similar definitions apply to *dog fund dummy* and *dog family dummy*. The columns labeled three-factor (one-factor) star report coefficient estimates when three-factor (one-factor) adjusted returns are used to measure past performance and to identify stars and dogs. In the columns labeled MS star, while using three-factor adjusted returns to define past performance and dogs, we use Morningstar rankings instead to identify star funds and star families. The last column of the table (labeled Combined) reports coefficient estimates when both star measures (three-factor stars and MS stars) are included in the regression. As in the previous column, we use three-factor adjusted returns to measure past performance and to identify dogs. The reported coefficient estimates and standard errors are adjusted for autocorrelation (AR1) and heteroscedasticity in the residuals. T-statistics are reported in parentheses. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. All coefficients reported in the table are the actual coefficient estimates multiplied by 100.

receives an increase in fund inflow that is more than three times larger. The magnitude of the spillover effect is therefore substantial and could well affect fund families' investment strategies and thus decisions regarding the number of funds in a family and the introduction of new funds.

As discussed in the previous section, for a variance-increasing strategy to be attractive at the family level, it needs to be verified that there are no substantial negative spillover effects associated with having a dog in the family. As reported in Table 4, the coefficients on the *dog fund dummy* are negative and significant at the 1% level, indicating that poorly performing funds lose money or attract significantly less money than other funds. In particular, when three-factor adjusted returns are used as the performance measure, the new money growth for dog funds is on average 6.7% lower than that for other funds on an annual basis. The coefficients on the *dog family dummy*, however, are small in magnitude and statistically insignificant, indicating that the existence of a dog fund does not have much impact on the cash flows of other funds in the family. Hence, unlike for star funds, there is no evidence of a negative spillover effect associated with a dog performance.

Interestingly, the spillover effect of MS stars is similar in magnitude and statistical significance to the spillover effect that we observe for the stars defined earlier, as indicated by the fact that the coefficient on the *MS star family dummy* is comparable to the coefficient on the *star family dummy*. Hence the higher total family new money attracted by MS stars documented in Table 3 is mainly driven by the higher new money flows into the MS star funds themselves. The coefficient on the *MS star fund dummy* is higher than the coefficient on the *star fund dummy*, indicating that there is a differential impact due to the marketing label attached by the MS stars that is over and above the pure performance measures. This finding is consistent with the evidence in Del Guercio and Tkac (2002).

In the last column (labeled Combined) of Table 4, we report regression results that include both types of *star dummy variables*. The coefficient estimates for *star family dummy* and *MS star family dummy* are both positive and significant at the 5% level. Again, the results indicate that the stars defined by our procedure and the stars identified by Morningstar rankings have a largely independent impact on fund flows.

As an alternative to the panel regression approach, we estimate the impact of star performance using the cross-sectional regression approach of Fama and MacBeth (1973). We estimate both the family-level and the fund-level new money growth regressions. The findings are largely consistent with those obtained using the panel approach.[10] In particular, the

[10] Using the Fama and MacBeth approach, we find a positive and significant relation between fund-level cash flows and fund expense ratios. This finding is consistent with the results in Barber, Odean, and Zheng (2000) and Wilcox (2002).

results confirm that there is a strong positive spillover effect associated with a star performance. The results are similar when we include a control for past new money growth.

In summary, we find evidence indicating that (1) having a star fund significantly increases family-level new money growth; (2) funds (nonstars) that belong to star families attract significantly greater amounts of new money than funds that belong to nonstar families; (3) star funds attract significantly greater amounts of new money than nonstar funds.

3.2 Do low-ability families pursue star-creating strategies? The cash flow patterns discussed in the previous section indicate that a family is well rewarded in terms of new cash inflows for producing star funds. A star performance, however, may simply reflect attributes of the fund family rather than investment ability. But do lower-ability families deliberately acquire attributes that enhance the odds of producing stars? We proceed by examining whether the performance of families (both star and nonstar), with a greater ex ante probability of producing stars, is significantly different from that of other families. A significantly poorer performance would be consistent with lower-ability families resorting to strategies designed to create stars.

3.2.1 Ex ante probability of a star performance. We investigate family characteristics that are associated with higher odds of producing a star fund.[11] These characteristics will also be the attributes that a family seeking to enhance the odds of producing a star might want to acquire.

For each year in the sample period we estimate a logit model to explore the relation between the probability of a star performance and potentially relevant family characteristics: cross-fund standard deviation of three-factor adjusted returns, family size measured by the average TNA per fund, total number of funds within the family, family turnover ratio, family expense ratio, and family front-end load. In any given year, family characteristics are calculated as monthly averages. Besides the above family characteristics, we add two dummy variables in the regression indicating a family's star and dog identity in the previous year.

In Table 5 we present the results of the logit regression. Among all the family characteristics examined, the *cross-fund standard deviation* of three-factor adjusted returns has the most consistent and positive impact on the

[11] Goetzmann and Ibbotson (1993) point out that the collection of mutual funds under management by a fund family resembles a portfolio of options due to the high payoffs of a star fund. As such, the value of the portfolio is maximized by increasing the variance of individual fund performance and decreasing the correlations across funds. They also hypothesize that the more funds a family manages, the higher the probability that one of them will be a winner, if only due to pure luck. Other factors may also affect the likelihood of creating a star fund. For example, higher research effort or expenses may increase the likelihood of producing a star fund.

Table 5
Factors affecting the probability of producing star funds: stars based on the three-factor model

	1992	1993	1994	1995	1996	1997	1998
Constant	−5.61***	−5.70**	−3.59***	−5.28***	−4.28***	−3.13***	−3.96***
	(−4.77)	(−4.07)	(−3.39)	(−5.06)	(−4.76)	(−4.40)	(−5.06)
Cross-fund std. dev.	100.60**	138.00**	135.70***	180.10***	223.60***	111.80**	49.61
	(2.18)	(2.97)	(2.66)	(3.34)	(4.14)	(2.45)	(1.25)
Family size	0.49**	0.42*	0.13	0.14	0.03	−0.17	0.04
	(2.23)	(1.89)	(0.64)	(0.78)	(0.22)	(−1.22)	(0.28)
Number of funds	0.98**	1.57***	0.35	1.26***	0.52	0.53*	0.38
	(2.05)	(3.48)	(0.86)	(3.36)	(1.58)	(1.82)	(1.40)
Turnover ratio	0.08	0.88*	0.68	−0.42	−0.01	−0.40	0.29
	(0.58)	(1.90)	(1.59)	(−0.96)	(−0.04)	(−1.10)	(1.10)
Expense ratio	68.97*	−63.01	−79.42	−10.34	−41.80	−13.99	40.54
	(1.95)	(−0.80)	(−1.29)	(−0.20)	(−0.93)	(−0.82)	(1.52)
Front-end load	4.16	−13.50	0.71	−8.41	−21.63*	−11.93	9.28
	(0.43)	(−1.14)	(0.07)	(−0.78)	(−1.85)	(−1.17)	(0.90)
Lagged star dummy	0.61	1.25**	1.18**	0.30	0.57	0.13	1.22***
	(1.04)	(2.08)	(2.18)	(0.57)	(1.25)	(0.31)	(3.08)
Lagged dog dummy	0.46	−0.72	−0.14	−0.80	−0.32	0.67	−0.80
	(0.68)	(−0.67)	(−0.21)	(−1.16)	(−0.57)	(1.45)	(−1.46)

The table examines which factors contribute to increasing the odds of producing stars. For each year from 1992 to 1998, we apply the following logit model to examine how family characteristics are related to the probability of producing star funds:

$$S_f = \beta_0 + \beta_1(\textit{cross-fund std. dev.})_f + \beta_2(\textit{family size})_f + \beta_3(\textit{number of funds})_f + \beta_4(\textit{turnover ratio})_f + \beta_5(\textit{expense ratio})_f + \beta_6(\textit{front-end load})_f + \beta_7(\textit{lagged star dummy})_f + \beta_8(\textit{lagged dog dummy})_f.$$

Here, f is the index for fund family and S is an indicator variable that equals one if the family has at least one star fund and zero otherwise. *Cross-fund std. dev.* is the monthly average of the cross-fund standard deviations of three-factor adjusted returns for the family. *Family size* is the logarithm of monthly average of the relative family size (measured by the average TNA per member fund relative to that of the median family). *Number of funds* is the logarithm of monthly average of the total number of member funds managed by the family. *Turnover ratio*, *expense ratio*, and *front-end* load are the monthly averages of the corresponding statistics for the family. *Lagged star dummy* is a dummy variable that equals one if the family has at least one star fund in the previous year. *Lagged dog dummy* is a dummy variable that equals one if the family has at least one dog fund in the previous year. In this regression, we identify star and dog families in each year based on three-factor adjusted returns. *T*-statistics are reported in parentheses. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, ** and ***, respectively.

probability of producing star funds over the sample period. The coefficient estimates are significant at the 5% level for all years except for 1998. Another family characteristic, *number of funds*, also exhibits a positive but weaker impact on the probability of producing stars. We find no evidence that current star or dog identity has a significant impact on the probability of creating stars in the subsequent year.[12]

In Table 6 we estimate a logit model to investigate what factors affect the probability of creating MS stars. Unlike in the previous case, *cross-fund*

[12] The referee suggested that the average riskiness of the fund family in the time-series sense could also be an important factor affecting the probability of creating stars. It turns out, however, that the time-series variation in family returns is highly correlated with the cross-fund return standard deviation. Hence families that have high-variance investment strategies across funds also tend to have riskier funds on average. On account of the multicollinearity problem, the regression equation that includes both types of standard deviation yields unreliable estimates, and is not reported.

Table 6
Factors affecting the probability of producing star funds: MS stars based on morningstar rankings

	1992	1993	1994	1995	1996	1997	1998
Constant	−3.39***	−4.14**	−2.46***	−3.64***	0.07	−1.55*	−2.15***
	(−3.34)	(−3.12)	(−2.48)	(−3.46)	(0.07)	(−1.93)	(−2.99)
Cross-fund std. dev.	19.63	125.00**	45.10	68.42	117.20**	−66.62	−4.92
	(0.35)	(2.20)	(0.82)	(1.28)	(2.08)	(−1.21)	(−0.14)
Family size	0.47**	0.59**	0.27	0.20	0.10	0.31*	0.26*
	(2.05)	(2.31)	(1.27)	(0.99)	(0.50)	(1.71)	(1.74)
Number of funds	0.08	0.07	0.52	0.74**	0.83**	0.95***	1.07***
	(0.16)	(0.15)	(1.44)	(2.22)	(2.47)	(3.08)	(4.04)
Turnover ratio	0.01	−0.39	−0.67	0.32*	−1.02*	−0.67	−0.30
	(0.04)	(−0.78)	(−1.24)	(1.66)	(−1.90)	(−1.43)	(−0.93)
Expense ratio	59.75*	8.53	−12.41	−91.60	−328.80***	−4.67	−33.38
	(1.70)	(0.12)	(−0.21)	(−1.27)	(−4.23)	(−0.09)	(−0.64)
Front-end load	−1.46	3.37	−13.43	16.63	−8.89	−22.56*	−13.86
	(−0.15)	(0.32)	(−1.18)	(1.64)	(−0.72)	(−1.88)	(−1.30)
Lagged MS star dummy	2.08***	2.70***	2.69***	1.79***	1.99***	1.92***	0.66*
	(4.25)	(4.81)	(4.89)	(3.73)	(3.41)	(4.36)	(1.76)

The table examines which factors contribute to increasing the odds of producing MS stars. For each year from 1992 to 1998, we apply the following logit model to examine how family characteristics are related to the probability of producing star funds:

$$S_f = \beta_0 + \beta_1(\textit{cross-fund std. dev.})_f + \beta_2(\textit{family size})_f + \beta_3(\textit{number of funds})_f + \beta_4(\textit{turnover ratio})_f + \beta_5(\textit{expense ratio})_f + \beta_6(\textit{front-end load})_f + \beta_7(\textit{lagged MS star dummy})_f.$$

Here, *f* is the index for fund family and S is an indicator variable that equals one if the family has at least one MS star fund and zero otherwise. *Cross-fund std. dev.* is the monthly average of the cross-fund standard deviations of three-factor adjusted returns for the family. *Family size* is the logarithm of monthly average of the relative family size (measured by the average TNA per member fund relative to that of the median family). *Number of funds* is the logarithm of monthly average of the total number of member funds managed by the family. *Turnover ratio*, *expense ratio*, and *front-end load* are the monthly averages of the corresponding statistics for the family. *Lagged MS star dummy* is a dummy variable that equals one if the family has at least one MS star fund in the previous year. In this regression, we identify MS star funds and MS star families in each year based on year-end Morningstar rankings. *T*-statistics are reported in parentheses. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

standard deviation is not significantly related to the probability of creating MS stars, suggesting that it is difficult to create (longer-term) MS stars by gaming with investment strategies. There is, however, some evidence that the *number of funds* is related to the probability of creating MS stars. The most significant explanatory variable is the one-year *lagged MS star dummy*. However, this is not surprising since Morningstar ratings are calculated based on the past 3-year, 5-year, and 10-year returns.

3.2.2 Portfolio formation. We construct portfolios based on the two family attributes that affect the likelihood of generating stars: cross-fund standard deviation of three-factor adjusted returns and the number of member funds. A family is defined as a high standard deviation (HighStd) family if its monthly average cross-fund standard deviation of three-factor adjusted returns in the previous year is above the industry median. Otherwise the family is characterized as a low standard deviation (LowStd) family. Similarly a family is defined as large if its monthly average number

of member funds in the previous year is above the industry median. Otherwise the family is characterized as a small family. We also form portfolios based on the above two factors separately for star families and nonstar families. We denote all portfolios by cross-fund standard deviation of returns, family size, and the star identity. For example, HighStd-Large-Star refers to the portfolio consisting of all funds belonging to star families with high standard deviation and large size. Other portfolios are similarly denoted. We form our portfolios at the beginning of each calendar year and hold them for one year. We report test results for TNA-weighted portfolios, in which we use the previous year-end TNA as weights.[13] For comparison purposes, we also construct a TNA-weighted diversified portfolio containing all funds in the sample.

As a robustness check, we form portfolios with monthly rebalancing. The portfolios are formed at the beginning of each month based on family characteristics in the previous 12 months. They are held for exactly one month and rebalanced at the end of the month. We report test results for TNA-weighted portfolios in which we use the previous month-end TNA as weights.

We use the Fama and French three-factor model as well as the one-factor model and the Carhart four-factor model to evaluate portfolio performance. The Carhart model allows us to adjust for momentum in underlying stock returns. In other words, the Carhart performance measure regards a portfolio strategy that exploits momentum in stock returns as having no superior performance.

3.2.3 Portfolio performance. We investigate whether lower ability families pursue star-creating strategies by comparing the performance of various portfolios constructed on the basis of family characteristics. Figure 1 plots the monthly average four-factor adjusted returns for selected portfolios. The plots of one-factor and three-factor adjusted returns exhibit similar patterns. As shown in Figure 1, high cross-fund standard deviation portfolios perform worse than the low standard deviation portfolios, the market, and the diversified portfolio. After adjusting for momentum, we find that the HighStd-Large-Star portfolio underperforms the market by 3.6% per year and underperforms the diversified portfolio by 2% per year. The performance differences are statistically significant at the 5% level. Hence the evidence indicates that star families that have a greater ex ante probability of generating stars underperform the market and the diversified portfolio.

Table 7 provides a more detailed comparison of the performance differences among annually rebalanced portfolios formed on the basis of family strategy, specifically the cross-fund standard deviation of risk-adjusted returns and the number of funds. In panel A, the performance of high

[13] We also construct equally weighted portfolios. The results are qualitatively similar.

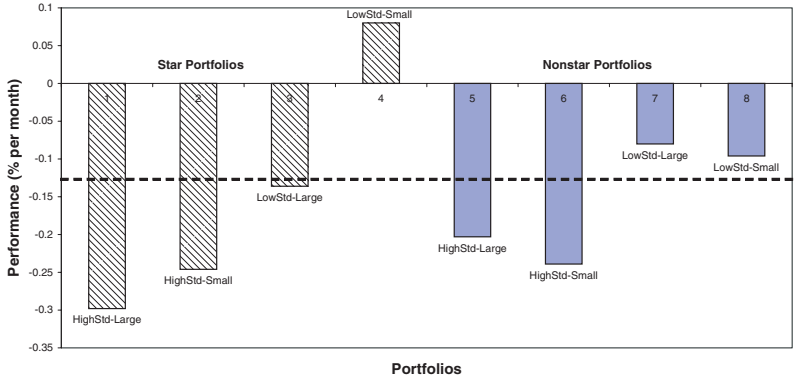

Figure 1
Average monthly four-factor adjusted returns for portfolios of star and nonstar families
The figure plots the average monthly four-factor adjusted returns for the eight portfolios reported in panel B of Table 9. The first four portfolios consist of funds belonging to star families and the last four portfolios consist of funds belonging to nonstar families. The dashed line represents the average monthly four-factor adjusted return (−0.125%) for the TNA-weighted diversified portfolio (including all funds in the sample).

standard deviation families is compared to that of low standard deviation families for all families and separately for star and nonstar families. In panel B we compare the performance of large families to that of small families. Panels C and D compare the performance of the LowStd-Small portfolio and HighStd-Large portfolio to that of other portfolios.

The results in panel A indicate that cross-fund standard deviation of returns is related to future family returns. First, families with high cross-fund standard deviation of returns perform worse than families with low cross-fund standard deviation. In other words, families that are more likely to be pursuing a star-creating strategy perform worse than families that follow a focused strategy. The performance difference for the entire sample is about 2% on an annual basis using the four-factor model and significant at the 5% level using both the one-factor and the four-factor model. We then compare the performance between high standard deviation families and low standard deviation families within the star and the nonstar groups. Using four-factor adjusted returns, we find that star families with high standard deviation underperform star families with low standard deviation by 2.2% in the subsequent year. Consistently, high standard deviation nonstar families tend to underperform low standard deviation nonstar families by 1.5% in the subsequent year. These test results are significant at the 5% level. The evidence is consistent with families adopting investment strategies conditioned upon their investment abilities.

The results in panel B indicate that, unlike cross-fund standard deviation of returns, the number of funds does not appear to be related to future performance in general. Taking a closer look at the evidence, we report in panel C that the LowStd-Small portfolio outperforms the portfolios of

Table 7
Star-creating strategy and family performance: annual rebalancing

Portfolios	One-factor adjusted monthly returns (%)	Three-factor adjusted monthly returns (%)	Four-factor adjusted monthly returns (%)
Panel A: HighStd portfolios — LowStd portfolios			
All funds	−0.206 (−2.23)**	−0.076 (−1.16)	−0.159 (−2.63)***
Funds from star families	−0.175 (−1.24)	−0.012 (−0.12)	−0.183 (−2.13)**
Funds from non star families	−0.170 (−1.81)*	−0.106 (−1.68)*	−0.128 (−2.06)**
Panel B: Large portfolios — small portfolios			
All funds	−0.006 (−0.06)	−0.007 (−0.11)	−0.011 (−0.19)
Funds from star families	−0.088 (−0.62)	0.019 (0.18)	−0.036 (−0.41)
Funds from non-star families	0.027 (0.29)	−0.013 (−0.22)	0.015 (0.24)
Panel C: LowStd-small portfolio — other portfolios			
HighStd-Large	0.202 (1.90)*	0.089 (1.20)	0.169 (2.46)**
HighStd-Small	0.214 (1.70)*	0.105 (1.44)	0.160 (2.25)**
LowStd-Large	0.002 (0.02)	0.021 (0.36)	0.013 (0.23)
Panel D: HighStd-Large portfolio — other portfolios			
HighStd-Small	0.012 (0.09)	0.016 (0.19)	−0.010 (−0.13)
LowStd-Large	−0.200 (−2.18)**	−0.069 (−1.00)	−0.157 (−2.50)**
LowStd-Small	−0.202 (−1.90)*	−0.089 (−1.20)	−0.169 (−2.46)**

The table examines how cross-fund standard deviation and family size are related to family performance. At the beginning of each calendar year we form portfolios based on the two family attributes in the previous year: cross-fund standard deviation of three-factor adjusted returns and the number of member funds. The portfolios are held for exactly one year and rebalanced at the year-end. A family is defined as a high standard deviation (HighStd) family if its monthly average cross-fund standard deviation of three-factor adjusted returns in the previous year is above that of the median family. Otherwise the family is characterized as a low standard deviation (LowStd) family. Similarly a family is defined to be large (small) if its monthly average number of member funds in the previous year is above (below) that of the median family. We also form portfolios based on the above two factors separately for star families and nonstar families. For each portfolio we use the monthly average of TNA-weighted risk-adjusted returns during the period 1992 to 1998 to measure performance. In panel A, the performance of HighStd portfolios is compared to that of LowStd portfolios for all funds in the sample and separately for funds belonging to star and nonstar families. In panel B, the performance of large portfolios is compared to that of small portfolios for all funds in the sample and separately for funds belonging to star and nonstar families. Panels C and D compare the performance of LowStd-Small portfolio and HighStd-Large portfolio to that of other portfolios. To check for robustness, we use alternative return measures (one-factor adjusted returns, three-factor adjusted returns, and four-factor adjusted returns) to identify star families and to measure portfolio performance. The *t*-statistics are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

high standard deviation families (HighStd-Large portfolio and HighStd-Small portfolio). The performance difference is significant at the 5% level using the four-factor adjusted returns and significant at the 10% level when one-factor adjusted returns are used. Moreover, the results in panel D indicate that the HighStd-Large portfolio significantly underperforms the LowStd-Large and LowStd-Small portfolios. These findings are again consistent with fund families choosing investment strategies across funds based on their investment abilities.[14]

[14] There is no evidence that the differences in portfolio performance are affected by differences in expense ratios. We examined the expense ratios of funds in the HighStd-Large portfolios. The mean (annual) expense ratio of funds in this portfolio is 1.45%, virtually identical to the mean expense ratio of 1.43% for all funds in the sample.

Table 8
Star-creating strategy and family performance: monthly rebalancing

Portfolios	One-factor adjusted monthly returns (%)	Three-factor adjusted monthly returns (%)	Four-factor adjusted monthly returns (%)
Panel A: HighStd portfolios — LowStd portfolios			
All funds	−0.197 (−2.12)**	−0.076 (−1.17)	−0.156 (−2.60)**
Funds from star families	−0.076 (−0.59)	−0.080 (−0.83)	−0.169 (−2.19)**
Funds from non-star Families	−0.223 (−2.38)**	−0.124 (−1.97)**	−0.160 (−2.52)**
Panel B: Large portfolios — small portfolios			
All funds	0.024 (0.27)	0.008 (0.13)	−0.009 (−0.15)
Funds from star families	−0.004 (−0.03)	0.019 (0.19)	−0.037 (−0.43)
Funds from non-star families	0.011 (0.12)	0.017 (0.29)	0.001 (0.02)
Panel C: LowStd-Small portfolio — other portfolios			
HighStd-Large	0.204 (1.96)*	0.091 (1.24)	0.174 (2.54)**
HighStd-Small	0.307 (2.37)**	0.140 (1.80)*	0.192 (2.55)**
LowStd-Large	0.021 (0.29)	0.023 (0.40)	0.023 (0.41)
Panel D: HighStd-Large portfolio — other portfolios			
HighStd-Small	0.103 (0.74)	0.048 (0.57)	0.018 (0.24)
LowStd-Large	−0.183 (−2.01)**	−0.068 (−1.03)	−0.150 (−2.47)**
LowStd-Small	−0.204 (−1.96)*	−0.091 (−1.24)	−0.174 (−2.54)**

The table examines how cross-fund standard deviation and family size are related to family performance. At the beginning of each month we form portfolios based on the two family attributes in the previous 12 months: cross-fund standard deviation of three-factor adjusted returns and the number of member funds. The portfolios are held for exactly one month and rebalanced at month-end. A family is defined as a high standard deviation (HighStd) family if its monthly average cross-fund standard deviation of three-factor adjusted returns in the previous 12 months is above that of the median family. Otherwise the family is characterized as a low standard deviation (LowStd) family. Similarly a family is defined to be large (small) if its monthly average number of member funds in the previous 12 months is above (below) that of the median family. We also form portfolios based on the above two factors separately for star families and nonstar families. For each portfolio we use the monthly average of TNA-weighted risk-adjusted returns during the period 1992 to 1998 to measure performance. In panel A, the performance of HighStd portfolios is compared to that of LowStd portfolios for all funds in the sample and separately for funds belonging to star and nonstar families. In panel B, the performance of large portfolios is compared to that of small portfolios for all funds in the sample and separately for funds belonging to star and nonstar families. Panels C and D compare the performance of LowStd-Small portfolio and HighStd-large portfolio to that of other portfolios. To check for robustness we use alternative return measures (one-factor adjusted returns, three-factor adjusted returns, and four-factor adjusted returns) to identify star families and to measure portfolio performance. The *t*-statistics are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

Table 8 documents the relative performance between various portfolios with monthly rebalancing. The results in all panels are very similar to those of Table 7 in both magnitudes and statistical significance. Hence the finding that low-ability families are more likely to pursue a star-creating strategy is robust to a different rebalancing frequency.

3.3 Do some families have superior investment skills?

The cash flow patterns indicate that investors chase star performance not only at the fund level but also at the family level. Star performances, as we have discussed, are not necessarily indicators of investment ability and may result from a strategy to create stars. In this section we investigate

whether we can identify families with superior investment skills using the portfolio approach.

We first examine whether a naive strategy of investing in star families delivers significant benefits to an investor. In panel A of Table 9, we compare the performance of star and nonstar portfolios to that of the diversified portfolio. The results indicate that the star portfolio (consisting

Table 9
Relative performance of fund family portfolios: annual rebalancing

Portfolios	One-factor adjusted monthly returns (%)	Three-factor adjusted monthly returns (%)	Four-factor adjusted monthly returns (%)
Panel A: Diversified portfolio — star and nonstar portfolios			
Star portfolio	0.050 (0.47)	0.018 (0.23)	0.084 (1.23)
Non-star portfolio	0.029 (0.38)	0.026 (0.43)	0.001 (0.01)
Panel B: LowStd-Small-star portfolio — other portfolios			
Star portfolios:			
HighStd-Large	0.431 (2.65)***	0.361 (2.27)**	0.378 (3.64)***
HighStd-Small	0.344 (1.86)*	0.354 (2.06)**	0.326 (2.78)***
LowStd-Large	0.264 (1.71)*	0.351 (2.25)**	0.216 (2.14)**
Nonstar portfolios:			
HighStd-Large	0.384 (2.68)***	0.411 (2.71)***	0.283 (2.97)***
HighStd-Small	0.460 (2.68)***	0.421 (2.72)***	0.319 (3.27)***
LowStd-Large	0.229 (1.88)*	0.312 (2.17)**	0.160 (1.91)*
LowStd-Small	0.249 (1.87)*	0.300 (2.03)**	0.176 (1.94)*
Panel C: HighStd-Large-Star portfolio — other portfolios			
Star portfolios:			
HighStd-Small	−0.087 (−0.50)	−0.007 (−0.06)	−0.052 (−0.49)
LowStd-Large	−0.167 (−1.13)	−0.010 (−0.10)	−0.162 (−1.78)*
LowStd-Small	−0.431 (−2.65)***	−0.361 (−2.27)**	−0.378 (−3.64)***
Nonstar portfolios:			
HighStd-Large	−0.047 (−0.35)	0.049 (0.53)	−0.095 (−1.10)
HighStd-Small	0.029 (0.18)	0.060 (0.62)	−0.059 (−0.66)
LowStd-Large	−0.202 (−1.71)*	−0.049 (−0.60)	−0.218 (−2.88)***
LowStd-Small	−0.182 (−1.41)	−0.062 (−0.71)	−0.202 (−2.48)**

The table documents the relative performance between various portfolios. At the beginning of each calendar year we form portfolios based on the following family attributes in the previous year: cross-fund standard deviation of three-factor adjusted returns, the number of member funds, and the star identify. The portfolios are held for exactly one year and rebalanced at year-end. A family is defined as a high standard deviation (HighStd) family if its monthly average cross-fund standard deviation of three-factor adjusted returns in the previous year is above that of the median family. Otherwise the family is characterized as a low standard deviation (LowStd) family. Similarly a family is defined to be large (small) if its monthly average number of member funds in the previous year is above (below) that of the median family. A family is defined as a star family if it has at least one star fund under management based on the monthly average of risk-adjusted returns in the previous year. We denote all portfolios by the family characteristics defined above. LowStd-Small-Star refers to the portfolio consisting of all funds belonging to star families with high standard deviation and small size. Similar notation applies to other portfolios. For comparison purposes, we also construct a diversified portfolio that includes all funds in the sample. For each portfolio we use the monthly average of TNA-weighted risk-adjusted returns during the period 1992 to 1998 to measure performance. Panel A reports the performance difference between the diversified portfolio and the star (non-star) portfolio. In panel B we compare the performance difference between the LowStd-Small-Star portfolio and other portfolios. In panel C we compare the performance difference between thee HighStd-Large-Star portfolio and other portfolios. To check for robustness, we use alternative return measures (one-factor adjusted returns, three-factor adjusted returns, and four-factor adjusted returns) to identify star families and to measure portfolio performance. The *t*-statistics are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

of all funds belonging to star families) does not outperform the diversified portfolio. This is consistent with the conjecture that a naive strategy of following star families does not benefit mutual fund investors. Blake and Morey (2000) find only weak evidence that the Morningstar five-star funds outperform four- and three-star funds. They also conclude that the Morningstar ratings, at best, do only slightly better than alternative predictors in predicting future fund performance. Thus the high cash inflows to MS star funds are not necessarily justified by subsequent superior performance.

The naive strategy may be improved upon, however, by taking account of a family's ex ante probability of having one or more star funds. Hence, in investigating investment ability, we examine the performance of star families where the star performance is more likely to be an indicator of investment ability. These are the cases of star families with a relatively low ex ante probability of producing a star fund.

Only one of the portfolios in Figure 1, the LowStd-Small-Star portfolio, displays positive excess returns: about 1% per year after adjusting for the momentum factor and about 2.8% per year before adjusting for the momentum factor. Moreover, this portfolio outperforms the diversified portfolio at the 5% significance level using all measures of risk-adjusted returns. Note that the LowStd-Small-Star portfolio consists of funds belonging to star families with low standard deviation and a small number of funds. Thus we find evidence that the star families that have a low ex ante probability of producing stars perform significantly better in the subsequent year compared to the diversified portfolio.

Panels B and C of Table 9 document the relative performance between various portfolios with annual rebalancing. In panel B we compare the performance of the LowStd-Small-Star portfolio to that of other portfolios. In panel C, the performance of the HighStd-Large-Star portfolio is compared to that of other portfolios.

The results in panel B suggest that star families with a lower ex ante probability of producing a star (LowStd-Small-Star portfolio) outperform all other star and nonstar portfolios. These results are statistically significant and robust to the use of alterative performance measures. In contrast, the results in panel C indicate that star families with a higher ex ante probability of generating stars (HighStd-Large-Star portfolio) underperform the LowStd-Star and nonstar portfolios. In other words, the results suggest that a star performance is a useful indicator of ability and future performance only when the ex ante probability of producing a star is low. As a result, a more discerning strategy of investing in the "true" stars yields superior returns. Overall this evidence supports the notion that some families have superior investment skills.

Table 10 documents the relative future performance between various portfolios with monthly rebalancing. Consistent with our earlier results,

Table 10
Relative performance of fund family portfolios: monthly rebalancing

Portfolios	One-factor adjusted monthly returns (%)	Three-factor adjusted monthly returns (%)	Four-factor adjusted monthly returns (%)
	Panel A: Diversified portfolio — star and nonstar portfolios		
Star portfolio	0.012 (0.13)	−0.014(−0.19)	0.017 (0.27)
Nonstar portfolio	0.047 (0.60)	0.028 (0.47)	0.017 (0.29)
	Panel B: LowStd-Small-Star portfolio — other portfolios		
Star portfolios:			
HighStd-Large	0.184 (1.21)	0.252 (1.47)	0.230 (2.24)**
HighStd-Small	0.321 (1.62)	0.236 (1.31)	0.226 (1.86)*
LowStd-Large	0.140 (1.06)	0.231 (1.37)	0.089 (0.88)
Nonstar portfolios:			
HighStd-Large	0.341 (2.53)**	0.344 (2.13)**	0.275 (2.74)***
HighStd-Small	0.384 (2.36)**	0.369 (2.22)**	0.272 (2.55)**
LowStd-Large	0.123 (1.08)	0.223 (1.44)	0.115 (1.29)
LowStd-Small	0.125 (0.98)	0.222 (1.40)	0.119 (1.22)
	Panel C: HighStd-Large-Star portfolio — other portfolios		
Star Portfolios:			
HighStd-Small	0.136 (0.71)	−0.015 (−0.13)	−0.004 (−0.04)
LowStd-Large	−0.044 (−0.34)	−0.020 (−0.20)	−0.142 (−1.75)*
LowStd-Small	−0.184 (−1.21)	−0.252 (−1.47)	−0.230 (−2.24)**
Non-star Portfolios:			
HighStd-Large	0.156 (1.17)	0.093 (1.01)	0.045 (0.55)
HighStd-Small	0.200 (1.25)	0.118 (1.19)	0.042 (0.48)
LowStd-Large	−0.062 (−0.54)	−0.028 (−0.35)	−0.116 (−1.70)*
LowStd-Small	−0.059 (−0.47)	−0.029 (−0.33)	−0.111 (−1.43)

The table documents the relative performance between various portfolios. At the beginning of each month we form portfolios based on the following family characteristics in the previous 12 months: cross-fund standard deviation of three-factor adjusted returns, the number of member funds, and the star identify. The portfolios are held for exactly one month and rebalanced at month-end. A family is defined as a high standard deviation (HighStd) family if its monthly average cross-fund standard deviation of three-factor adjusted returns in the previous 12 months is above that of the median family. Otherwise the family is characterized as a low standard deviation (LowStd) family. Similarly a family is defined to be large (small) if its monthly average number of member funds in the previous 12 months is above (below) that of the median family. A family is defined as a star family if it has at least one star fund under management based on the monthly average of risk-adjusted returns in the previous 12 months. We denote all portfolios by the family characteristics defined above. LowStd-Small-Star refers to the portfolio consisting of all funds belonging to star families with high standard deviation and small size. Similar notation applies to other portfolios. For comparison purposes, we also construct a diversified portfolio that includes all funds in the sample. For each portfolio we use the monthly average of TNA-weighted risk-adjusted returns during the period 1992 to 1998 to measure performance. Panel A reports the performance difference between the diversified portfolio and the star (nonstar) portfolio. In panel B we compare the performance difference between the LowStd-Small-Star portfolio and other portfolios. In panel C we compare the performance difference between thee HighStd-Large-Star portfolio and other portfolios. To check for robustness we use alternative return measures (one-factor adjusted returns, three-factor adjusted returns, and four-factor adjusted returns) to identify star families and to measure portfolio performance difference. The *t*-statistics are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

the star portfolio does not outperform the diversified portfolio. Consistent with the portfolio results with annual rebalancing, the four-factor adjusted results suggest that star families with a lower ex ante probability of producing stars (LowStd-Small-Star portfolio) outperform the families with a higher ex ante probability of producing stars (HighStd-Large-Star and HighStd-Small-Star portfolios). However, the results for the

one- and three-factor models are similar but statistically insignificant. This is probably due to the fact that momentum factor plays a bigger role with monthly rebalancing. We find a similar pattern in panel C. There is still evidence using the four-factor adjusted returns that star families with a higher ex ante probability of creating stars (HighStd-Large-Star) underperform the LowStd-Star and nonstar families. Again, the results are not as strong as those with annual balancing, possibly due to the momentum effects on star performance.

Overall the portfolio results indicate that a star performance reflects superior investment ability only when the ex ante probability of producing stars is low.[15] Hence, to mutual fund investors that naively chase the glitter of stars — don't!

4. Conclusion

In this article we study the impact of family structure on fund strategy. Our results indicate that there is a strong positive spillover effect from a star performer: a star fund attracts money not only to itself but also to other funds in the family. Compared to a stand-alone star fund, an average-size family with seven funds receives an increase in fund inflow that is more than three times larger. We show that lower correlation between fund returns in a family contributes significantly to the probability of producing stars. Having a larger number of funds in the family has a positive but weaker impact.

We then investigate two related issues. The first issue we examine is whether the investment strategy adopted by a family, in particular a star-creating strategy, is associated with its investment ability. Using portfolio analysis, we find that factors that enhance the ex ante odds of producing stars, in particular the cross-fund return standard deviation, are associated with a significantly poorer family performance. This finding is consistent with lower-ability families pursuing strategies to take advantage of the cash flow response to a star performance.

The second issue is concerned with whether some families have superior investment ability. We document that a naive strategy of chasing families with star performers does not enhance investor return. However, when the ex ante probability of producing stars is accounted for, star families with a low ex ante probability of producing stars perform significantly better than other families.

[15] We check the possibility that the investment strategy is endogenously determined, for instance, that low cash inflows encourage families to follow star-creating strategies. The empirical findings do not support the existence of such a link. Specifically, we find no evidence that cross-fund return volatility is affected significantly by past cash flows. Nor do past flows have any incremental effect on the probability of generating stars.

Appendix: Morningstar Ratings

To determine the return component, Morningstar first defines a load-adjusted return as

$$MSRet_i = R_i L_i - RF, \tag{11}$$

where R_i is the cumulative fund return in the measurement period (3-, 5-, 10-year); RF is the cumulative Treasury-bill return in the corresponding period; L_i is the load adjustment. For example, if there is no load of any type, L_i is one; if there is a front-end load of 5%, L_i is 0.95; if there is a back-end load, L_i will be adjusted based on the measurement period, since back-end loads typically decline over time.[16] The $MSRet_i$ can be interpreted as a load-adjusted risk premium. The Morningstar return score is then calculated as

$$MSRetScore_i = MSRet_i / AvgMSRet, \tag{12}$$

where $AvgMSRet$ takes on one of the two values depending on the average of $MSRet_i$ over all funds: If this average is greater than RF, $AvgMSRet$ is set equal to this average value, otherwise it is set equal to RF.

The Morningstar risk component is determined by

$$MSRisk_i = \sum_{t=1}^{n} - \min(r_{it} - rf_t, 0)/n, \tag{13}$$

where $MSRisk_i$ measures deviations of returns from the risk-free returns only when fund returns are below the risk-free returns. It is similar to a semivariance. The Morningstar risk rating is then calculated as

$$MSRiskScore_i = MSRisk_i / AvgMSRisk, \tag{14}$$

where $AvgMSRisk$ is the average of $MSRisk_i$ over all funds.

The Morningstar star score is given by

$$MSStarScore_i = MSRetScore_i - MSRiskScore_i. \tag{15}$$

To assign star ratings, Morningstar ranks all funds in a category by the MSStarScore. The top 10% of funds receive five stars, the next 22.5% receive four stars, the middle 35% receive three stars, the next 22.5% receive two stars, and the bottom 10% receive a single star. The overall star rating, which is the rating that Morningstar highlights in its own publications, is a weighted average of the ratings for 3, 5 and 10 years. If a fund has been assigned stars only for three years, the overall star rating is set equal to the three-year star rating. If a fund has been assigned stars only for three and five years, the overall star rating is the rounded value of 0.4 times the number of stars for three years plus 0.6 times the number of stars for five years. If a fund has been assigned stars for 3, 5 and 10 years, the overall number of stars is the rounded value of 0.2 times the number of stars for 3 years plus 0.3 times the number of stars for 5 years plus 0.5 times the number of stars for 10 years.

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[16] For the three-year period, we define $Li = 1 - frontendload - 0.5 * backendload$. For the 5-year and 10-year period, we define $Li = 1 - frontendload$. The load adjustment factor we use may not be exactly the same as those used by Morningstar. However, the return rankings are not affected by the possible slight differences in the load adjustment factors as we compare the return scores we construct to those published in Morningstar Principia Pro.

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