Performance Persistence in Institutional Investment Management

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Abstract

Using new, survivorship-bias-free data, we examine performance persistence in 6,027 institutional portfolios managed by 1,475 investment management firms between 1991 and 2004. We find substantial differences in patterns of performance across three asset classes: domestic equity, fixed income, and international equity. Winner portfolios in domestic equity exhibit persistence for up to one year, and losers experience reversals in the second year. In fixed income, winner portfolios show persistence for up to three years, but international equity portfolios show no persistence. Where persistence exists, fees are not large enough to eliminate excess returns. Regression-based evidence suggests that patterns in persistence are related to flows into and out of institutional portfolios.

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1 Introduction

Performance persistence in delegated investment management represents a significant challenge to efficient markets. Academic opinion on whether performance persists evolves based on the most recent evidence incorporating either new data or improved measurement technology. Although Jensen's (1968) original examination of mutual funds concludes that funds do not have abnormal performance, later studies provide compelling evidence that relative performance persists over both short and long horizons (see, for example, Grinblatt and Titman (1992), Elton, Gruber, Das, and Hlavka (1993), Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), Elton, Gruber, and Blake (1996), and Wermers (1999)). Carhart (1997) shows that accounting for momentum in individual stock returns eliminates almost all evidence of persistence among mutual funds.[1] More recently, Bollen and Busse (2004), Cohen, Coval and Pástor (2005), Avramov and Wermers (2006), and Kosowski, Timmermann, Wermers, and White (2006) find predictability in performance even after controlling for momentum.

The attention given to persistence in retail mutual fund performance is entirely warranted. The data are good, and this form of delegated asset management provides millions of investors access to ready-built portfolios. As a result, at the end of 2004 there were 7,101 equity, bond, and hybrid mutual funds responsible for investing \$6.1 trillion in assets (Investment Company Institute (2004)). However, there is an equally large arm of delegated investment management that receives much less attention, but is no less important. At the end of 2004, over 50,000 plan sponsors (public and private retirement plans, endowments, foundations, and multi-employer unions) allocated over \$6 trillion in assets to about 1,500 institutional asset managers (Money Market Directory (2004)). In this paper, we examine the performance persistence of portfolios managed by institutional investment management firms for these plan sponsors.

Institutional asset management firms draw fixed amounts of capital (referred to as "mandates") from plan sponsors. These mandates span a variety of asset classes, including domestic equity, fixed income, international equity, real estate securities, and alternative assets (including hedge funds and private equity). We focus on the first three, and to our knowledge, we are the first to examine persistence in asset classes beyond domestic equity and alternative assets. Investment styles within these asset classes

[1] One exception is the continued underperformance of the worst performing funds. Berk and Xu (2004) argue that this occurs because of the unwillingness of investors to withdraw capital from these funds.

run the gamut in terms of size and growth-value gradations for equity portfolios, and credit and maturity dimensions for fixed income portfolios.[2]

We obtain our data from two independent sources: Informa Investment Solutions (IIS) and eVestment Alliance. Both firms collect self-reported returns and other information from investment management firms and provide data, services, and consulting to plan sponsors, investment consultants, and investment management firms. Our primary estimates of persistence come from IIS data because of its superior time series and cross-sectional coverage. Our sample consists of quarterly returns for 6,027 portfolios managed by 1,475 institutional asset management firms from 1979 to 2004. Since these data suffer from survivorship bias prior to 1991, we focus on the post-1991 sample period. We add texture to our analysis and sharpen inferences with respect to net-of-fee performance using fee information provided by eVestment Alliance.

We form deciles using benchmark-adjusted returns, and then estimate alphas over subsequent intervals for each decile using unconditional and conditional three- and four-factor models. This allows us to get a sense of the robustness of our results to alternative risk/factor adjustments and estimation methods, an issue that is particularly important when assessing excess performance. We calculate alphas over short horizons (one quarter and one year) to compare them to the retail mutual fund literature, and over long horizons to address the more important issue of whether plan sponsors can benefit from chasing winners and/or avoiding losers.

In domestic equity, portfolios in the extreme winner decile have large alphas one quarter after decile formation, varying from 0.46 percent to 2.42 percent per quarter. In comparison, for mutual funds, Bollen and Busse (2005) report a substantially smaller alpha of 0.39 percent in the post ranking quarter. The alphas in our winner portfolios continue for a year; our quarterly alpha ranges from 0.41 percent to 1.69 percent for the post-ranking period of one year. As another point of comparison in mutual funds, Kosowski *et al.* (2006) report a monthly alpha of 0.14 percent in the extreme winner decile for the first year, which is at the lower end of our estimates. Beyond the first year, the alphas of institutional portfolios in this decile are statistically indistinguishable from zero. Portfolios in the extreme loser decile experience a reversal which is most pronounced in the second year after decile assignment. For that decile, alphas in the

[2]Persistence in one major alternative asset, hedge funds, is studied by Brown, Goetzmann, and Ibbotson (1999), Agarwal and Naik (2000), Boyson and Cooper (2004), Baquero, Ter Horst, and Verbeek (2005), Kosowski, Naik, and Teo (2005), and Jagannathan, Malakhov, and Novikov (2006), among others. Although there is no unanimity of opinion regarding magnitudes, several of these studies find evidence of persistence in performance.

second year vary from 0.82 percent to 1.07 percent. In contrast, there is no evidence of reversal in mutual funds.

In fixed income, portfolios in the extreme winner decile have excess returns over both short and long horizons. Alphas generally increase up to the second year, and although they decline in magnitude in the third year, they remain statistically significant. For instance, the alpha generated from a four-factor model estimated using conditional methods is 0.42 percent per quarter in the second year, and declines to 0.23 percent in the third year.

The patterns in performance for international equity portfolios are quite different. In the extreme winner decile, point estimates of alphas one quarter after decile formation are quite high (2.29 and 1.74 percent depending on the specification), but statistical significance is marginal. These point estimates remain high the first year and steadily decline thereafter, but are statistically insignificant at all horizons.

Our results are based on returns that are net of trading costs but gross of fees, which vary by client. To determine if fees could wipe out excess returns, we use pro forma fee schedules from our second data source (eVestment Alliance). These schedules represent an upper limit on actual fees charged by investment management firms; individual fee arrangements between plan sponsors and investment managers typically include rebates, some of which can be quite large. We find that annual fees are a fraction of the alphas of the extreme winner portfolios and insufficient to eliminate excess returns.[3]

Our persistence (and reversal) results are of both economic and practical significance. Persistence amongst winners suggests that plan sponsors could benefit by conditioning their hiring decisions on superior returns, at least in domestic equity and fixed income. Reversals two years after decile formation in domestic equity suggests that plan sponsors who quickly terminate investment managers with poor performance forsake future positive returns. The results in Goyal and Wahal (2007) dovetail these findings and conclusions; they show that plan sponsors hire investment managers after large excess returns and that investment managers terminated by plan sponsors subsequently generate positive excess returns. Their results, in conjunction with evidence in Del Guercio and Tkac (2002) and Heisler, Knittel, Neumann, and Stewart (2006) suggest that flows follow performance. To assess the magnitude of this in our data, we examine flows

[3]There is other interesting heterogeneity in fee arrangements. Performance-based fees and most-favored nation clauses are more common among better performing portfolios. To the extent that the former aligns the interests of investment managers and plan sponsors, one might expect performance-based fees to be more common among better performing portfolios.

across deciles and over time. The variation in flows across performance deciles is almost monotonic. In domestic equity, flows for portfolios in the extreme winner decile in the first (third) post-ranking year are 27 (12) percent. Flows for the extreme loser decile are -11 (-7) percent, representing a spread of 38 (19) percentage points. Spreads in flows between winner and loser deciles are comparable for international equity (30 percentage points for the first year) but much smaller for fixed income (17 percentage points). We also estimate Fama-MacBeth regressions of flows on lagged returns and a host of control variables. The positive relation between flows and lagged returns is present in all three asset classes, although the sensitivities vary.

If winner portfolios are at or close to capacity, then inflows could drive down alphas because of diseconomies in investment ideas and/or execution costs. If that is the case, then we should observe a degradation in returns subsequent to large inflows. Similarly, outflows could relax capacity constraints, possibly improving future returns, and generating a return reversal.[4] Ideally, to measure such effects one would require detailed proprietary data to estimate returns to scale for each portfolio. In the absence of such data, we tackle the issue at a more aggregate level. Specifically, we estimate Fama-MacBeth regressions of future returns against lagged assets under management, flows and a set of control variables. The results are intriguing. In domestic equity, we find a strong negative relation between future returns and lagged assets. A two standard deviation change in assets results in a 3.2 percent decline in future returns. To put this in perspective, this estimate is more than three times larger than that reported by Chen, Hong, Huang, and Kubik (2004) for retail mutual funds, and could account for the degradation of alphas in winner portfolios after the first year. Our results suggest that supply-based equilibration at the heart of Berk and Green (2004) works in domestic equity, although not instantaneously – some persistence is necessary to draw the flows that subsequently extinguish persistence. In fixed income and international equity, however, there is no relation between future returns and flows, or between future returns and lagged assets. Thus, in these two asset classes, either portfolios are not at capacity, or there are no declining returns to scale, or our tests are simply not powerful enough to detect these effects.

In the presence of diseconomies, investment managers could simply refuse capital inflows by shutting winner portfolios to new investors in an effort to maintain their performance. In retail mutual funds, Bris, Gulen, Kadiyala, and Rau (2006) report that over

[4]There are other mechanisms that could generate return reversals in loser portfolios. For instance, losing assets could instill a disciplinary effect in portfolio managers and result in an improvement in performance. Another possibility is simply mean reversion.

a 10-year period, 143 equity funds that delivered positive excess returns subsequently closed to new investors. In our sample, 208 out of 2,881 domestic equity portfolios are closed to new investors, a rate that is higher than that for retail mutual funds. Portfolios that are closed to new investors have an average benchmark-adjusted quarterly return of 1.15 percent, compared to 0.65 percent for portfolios that are open, consistent with the idea that portfolio managers are cognizant of capacity and diseconomies. Another way to reduce flows in the presence of capacity constraints is to charge higher fees. Although we can only observe fee schedules (not actual fees), our data provide some weak evidence that marginal fees are higher for better-performing portfolios. To the extent that better-performing portfolios likely offer smaller rebates than portfolios in the loser decile, the spread in fees may in fact be larger than we can detect.

Our paper builds on the small but growing literature on institutional asset management. The progenitors in this area are Lakonishok, Shleifer, and Vishny (1992), who examine the performance of equity-only portfolios managed by 341 investment management firms between 1983 and 1989. They find that performance is poor on average, and, although there is some evidence of persistence, they conclude that survival bias and a short time series prevent them from drawing a robust conclusion. Coggin, Fabozzi, and Rahman (1993) also focus on equity portfolios and find that investment managers have limited skill in selecting stocks. Del Guercio and Tkac (2002) and Heisler *et al.* (2006) examine the relation between flows and performance and conclude that plan sponsors withdraw funds from poorly performing investment managers. Goyal and Wahal (2007) examine the selection and termination of investment managers by plan sponsors and find that investment management firms are hired after superior performance and, generally, but not exclusively, fired after poor performance. Ferson and Khang (2002) use portfolio weights to infer persistence, and Tonks (2005) examines the performance of UK pension fund managers between 1983 and 1997. Both find some evidence of excess performance. Perhaps the study closest to ours is Christopherson, Ferson, and Glassman (1998), who study persistence among 185 equity-only investment managers between 1979 and 1990. Although their sample suffers from survival bias, using a conditional approach they find some evidence of persistence, particularly among poorly performing investment managers.[5]

Our paper proceeds as follows. Section 2 discusses our data and methodology. Section

[5]Using the structural break in survivorship in our sample (1979-1990 and 1991-2004), we later show that the magnitude of the survivorship can be quite large. For example, the survivorship-biased alpha computed using Fama-French procedures in the extreme loser portfolio for domestic equity is 0.82 percent per quarter versus -1.19 percent in the non-survivorship-biased period, a spread of 2 percent per quarter.

3 presents results. We conclude in Section 4.

2 Data and Methodology

2.1 Data

We obtain data from two independent data providers: Informa Investment Solutions (IIS) and eVestment Alliance. Both firms provide data, services, and consulting to plan sponsors, investment consultants, and investment managers. Since differences exist in the composition of the databases, we describe them in detail below, noting issues that are relevant for our results.

IIS provides quarterly returns for 6,027 portfolios managed by 1,475 institutional asset management firms from 1979 to 2004. Panel A of Table 1 presents basic descriptive statistics of the IIS database. Prior to 1991, this database only contains "live" portfolios. Subsequently, data-gathering policies were revised such that investment management firms that exit the universe due to closures, mergers, and bankruptcies were retained in the database. Thus, data over the 1979-1990 sample period suffer from survivorship bias, while the sample thereafter is free of such problems. We report some basic results separately for the two subperiods (1979-1990 and 1991-2004) to illustrate the effects of survivorship bias, but focus most of our attention on the latter, unbiased subperiod. Not surprisingly, both the total and average number of firms (and portfolios) per year are much higher in the second part of the sample period. In general, coverage of the database is fairly comprehensive; we cross-check the number of firms with data contained in the Mercer Performance Analytics database (another popular source of data for investment mangement portfolio returns) and find that the coverage in our database is slightly better. Our coverage also corresponds favorably to that found in publications such as the Money Market Directory of Investment Advisors. As expected, the attrition rate of portfolios between 1979 and 1990 is zero. Carhart (1997) reports that one-third of all retail mutual funds disappear over a 31-year period, which corresponds to about 3 percent per year. Attrition in our non-survivorship biased sample period (1991-2004) is slightly higher and varies from 3.2 to 3.6 percent per year.

Several features of the data are important for understanding the results. First, since investment management firms typically manage more than one portfolio, the database contains returns for each portfolio. For example, Aronson+Johnson+Ortiz, an investment management firm with $22 billion in assets, manages 10 portfolios in a variety of capitalizations and value strategies. The returns in our database correspond to each of these 10 portfolios, and our unit of analysis is each portfolio return. Second, the database contains "composite" returns provided by the investment management firm. The individual returns earned by each plan sponsor client (account) may deviate from these composite returns for a variety of reasons. For example, a public defined benefit plan may ask an investment management firm to eliminate "sin" stocks from its portfolio. Such restrictions may cause small deviations of earned returns from composite returns. Third, the returns are net of trading costs but gross of investment management fees. Fourth, the data are self reported but there are countervailing forces that ensure accuracy. The data provider does not allow investment management firms to "amend" historical returns (barring typographical errors) and requires the reporting of a contiguous return series. Further, the SEC vets these return data when it performs random audits of investment management firms. However, this does not mean that we can eliminate the possibility of backfill bias. We address this issue in Section 3.7.

The identities of individual investment management firms are hidden to preserve confidentiality. The data contains style assignments and assets at the end of the year. For domestic and international equity portfolios, each portfolio is associated with a primary style and a market capitalization. Twenty-nine primary equity styles and four market capitalization categories exist. The majority of the data reside in value, growth, and core-diversified styles. The market capitalization categories include micro (<$500 million), small ($500 million–$2 billion), medium ($2 billion–$7 billion), and large (>$7 billion). For international equity portfolios, geographic parameters that report the fraction of assets in each country are also available. Twenty-eight primary fixed income styles exist, but again, most of the data reside in just a few categories, including core, maturity-controlled, government, and high-yield. Fixed income maturity breakpoints are 1, 3, and 7 years. Unlike returns, total assets in each portfolio are only recorded at the end of the year and are available for approximately 70 percent of the sample.

The database contains both active and passive portfolios, but since our interest is in the performance persistence of active managers, we remove all passive portfolios from the sample. We break statistics down by the three major asset classes - domestic equity (including all size and value-growth intersections), fixed income (domestic fixed income portfolios containing corporate and/or government debt securities), and international equity (removing global portfolios that include the US). This is in contrast to Lakonishok, Shleifer, and Vishny (1992), Del Guercio and Tkac (2002), and Christopherson, Ferson, and Glassman (1998), all of whom focus exclusively on domestic equity portfolios.

Our secondary data source, eVestment Alliance, provides quarterly composite returns, fee information, and an identifier that tags portfolios that are closed to new investors. Unlike IIS, eVestment Alliance includes the names of the investment management firms. Panel B of Table 1 provides descriptive statistics for the eVestment data. The time-series coverage is shorter, starting in 1991. The cross-sectional coverage is also smaller than the IIS database. For example, the IIS database covers 1,137 domestic equity investment management firms and 3,381 portfolios between 1991 and 2004. In contrast, eVestment provides data on 805 firms and 2,682 portfolios. The attrition rate is approximately 1 percent, substantially smaller than for the IIS database.[6] Because of these differences, we generate estimates of persistence from the IIS database, and use eVestment data to add texture to our analysis and sharpen inferences with respect to net of fee performance.

2.2 Methodological Approach

Our empirical approach to measuring persistence follows the mutual fund literature with minor adjustments to accommodate certain facets of institutional investment management. We follow Carhart (1997) and form deciles during a ranking period and examine returns over a subsequent post-ranking period. However, unlike Carhart (1997), we form deciles based on benchmark-adjusted returns rather than raw returns for two reasons. First, plan sponsors frequently focus on benchmark-adjusted returns, at least in part because expected returns from benchmarks are useful for thinking about broader asset allocation decisions in the context of contributions and retirement withdrawals. Second, sorting on raw returns could cause portfolios that follow certain types of investment styles to systematically fall into winner and loser deciles. For example, small cap value portfolios may fall into winner deciles in some periods, not because these portfolios delivered abnormal returns, but because this asset class generated large returns over that period (see Elton *et al.* (1993)). Using benchmark-adjusted returns to form deciles circumvents this problem.

Beginning at the end of 1979, we sort portfolios into deciles based on the prior annual benchmark-adjusted return.[7] We then compute the equal-weighted return for each decile

[6]A direct comparison of the attrition rates is not possible because the cross-sectional coverage is also smaller; attrition rates for the firms not sampled could be greater.

[7]We sort based on prior one-year returns for two reasons. First, this choice is consistent with that of the mutual fund literature and allows us to directly compare estimates of alpha. Second, longer ranking

over the following one quarter. As we expand our analysis to examine persistence over longer horizons, we compute this return over appropriate future intervals (for one-year results, we compute the equally weighted return over quarters 1 through 4, and so forth). We then roll forward, producing a non-overlapping set of post-ranking quarterly returns. Concatenating the post-ranking period quarterly returns results in a time series of post-ranking returns for each portfolio; we generate estimates of abnormal performance from these time-series.

We assess post-ranking abnormal performance by regressing the post-ranking returns on K factors as follows:

$$r_{p,t} = \alpha_p^U + \sum_{k=1}^{K} \beta_{p,k} f_{k,t} + \epsilon_{p,t}, \tag{1}$$

where r_p is the excess return on portfolio p, and f_k is the k^{th} factor return. For domestic equity portfolios we use the Fama and French (1993) three-factor model with market, size, and book-to-market factors. Since Carhart (1997) shows that incorporating momentum (Jegadeesh and Titman (1993)) removes most of the persistence evident in mutual funds, we also estimate models that include a momentum factor. We obtain these four factors from Ken French's web site. For fixed income portfolios, we again follow Fama and French (1993) and estimate a three-factor model with the Lehman Brothers Aggregate Bond Index return, a term spread return computed as the difference between the long-term government bond return and the T-bill return, and a default spread return computed as the difference between the corporate bond return and the long-term government bond return. Since the default spread does not include non-investment grade debt, but our institutional portfolios invest in such securities, we also estimate a four-factor model in which we augment the Fama-French three-factor model with a high yield index return series. We obtain aggregate bond index returns and the Merrill Lynch High Yield Index returns from Mercer Performance Analytics, available from 1981 onwards. We obtain the default and term spread returns from Ibbotson Associates, available from 1979 onwards. For international equity portfolios, we employ an international version of the three-factor model. The international market return and book-to-market factor are from Ken French. We compute the international size factor as the difference between the S&P/Citigroup PMI World index return and the S&P/Citigroup EMI World index return, both of which exclude the United States (see

periods are more likely associated with large differences in fund size, and, given the evidence in Chen *et al.* (2004) and our regressions results later in the paper (Table 7), we might not expect performance to persist across large variations in fund size (due to diseconomies).

http://www.globalindices.standardandpoors.com).

Christopherson, Ferson, and Glassman (1998) argue that unconditional performance measures are inappropriate for two reasons (see also Ferson and Schadt (1996)). First, they note that sophisticated plan sponsors presumably condition their expectations based on the state of the economy. Second, to the extent that plan sponsors employ dynamic trading strategies that react to changes in market conditions, unconditional performance indicators may be biased. They advocate conditional performance measures and show that such measures can improve inferences. We follow their prescription and estimate conditional models in addition to the unconditional models described above. We estimate the conditional models as:

$$r_{p,t} = \alpha_p^C + \sum_{k=1}^{K} \left(\beta_{p,k}^0 + \sum_{l=1}^{L} \beta_{p,k}^l Z_{l,t-1} \right) f_{k,t} + \epsilon_{p,t}, \quad (2)$$

where the Z's are L conditioning variables.

We use four conditioning variables in our analysis. We obtain the 3-month T-bill rate from the economic research database at the Federal Reserve Bank in St. Louis. We compute the default yield spread as the difference between BAA- and AAA- rated corporate bonds using the same database. We obtain the dividend-price ratio, computed as the logarithm of the 12-month sum of dividends on the S&P 500 index divided by the logarithm of the index level from Standard & Poor's. Finally, we compute the term yield spread as the difference between the long-term yield on government bonds and the T-bill yield using data from Ibbotson Associates.

There are two other methodological issues of note. First, to conduct statistical inference, we follow the bootstrapping procedure outlined in Kosowski *et al.* (2006). Specifically, we assume that the data generating process is described by equations (1)-(2) with zero alpha. We generate each draw by choosing at random (with replacement) the saved residuals. Alphas and their t-statistics are then computed from the bootstrapped sample. We repeat this procedure 1,000 times to obtain the empirical distribution of t-statistics. We base statistical significance reported in the tables on these empirical distributions. Second, for each asset class, we estimate alphas for each decile and horizon using three and four factors with unconditional and conditional methods. For example, for long horizon domestic equity alphas, 120 alphas (10x3x2x2) and their associated p-values exist. Since our interest is in the extreme deciles and we wish to avoid overwhelming the reader with a barrage of numbers, we only report statistics for deciles 1, 5, and 10. Statistics for intermediate deciles are available upon request.

3 Persistence

3.1 Return Statistics

Before we analyze persistence, we provide basic information on the distribution of returns in Table 2. We report this information separately for domestic equity, fixed income, and international equity asset classes. We calculate benchmark-adjusted returns as the raw return on the portfolio minus the return on a passive benchmark for the same investment style. Panel A shows mean and median benchmark-adjusted returns as well as the percentage of portfolios that have positive/negative benchmark-adjusted returns. For domestic equity portfolios, the mean quarterly benchmark-adjusted return is 0.58 percent. The data are skewed, as the median is 0.29 percent. Still, the data seem reasonably well distributed with only a little over half the portfolios (53.8 percent) delivering positive benchmark-adjusted returns. In international equity portfolios, the skewness is more apparent. The average benchmark-adjusted return for these portfolios is 0.24 percent, but the median is -0.57 percent, and only 47 percent have positive returns. The returns of fixed income portfolios display almost no skewness. The mean (median) benchmark-adjusted return for fixed income portfolios is 0.08 percent (0.06 percent), with 55 percent of the portfolios delivering positive benchmark-adjusted returns.

Panel B shows one quarter alphas from three- and four-factor models for each asset class for the survivorship-biased 1979-1990 subperiod, and Panel C shows equivalent statistics from the bias-free 1991-2004 subperiod. In both cases, we show alphas for all portfolios as well as extreme performance deciles formed on the previous year's raw return. Our purpose is two-fold: to provide a sense of average performance with factor models (rather than benchmark-adjusted returns) and to illustrate the magnitude of bias introduced by survivorship.[8]

With respect to the first objective, three-factor alphas across all portfolios in the 1991-2004 subperiod are positive and statistically significant. For domestic equity, the quarterly three-factor alpha is 0.45 percent and statistically significant. Using portfolio holdings, Wermers (2000) finds mean excess returns, gross of transactions costs, of approximately 1 percent per year. Consistent with Carhart (1997), the alpha for domestic equity portfolios declines to a statistically insignificant 0.34 percent after the addition of the momentum factor. The addition of a fourth (high yield) factor also shrinks the

[8] For this exercise only, we sort portfolios into deciles based on raw returns to allow for comparisons with prior studies. In the remainder of the paper, we assign deciles using benchmark-adjusted returns.

alpha on fixed income portfolios from 0.21 percent to 0.11 percent, but the latter remains statistically significant. The three-factor alpha of international equity portfolios is surprisingly large (1.97 percent) and marginally significant.

On the one hand, high attrition rates, as well as the relatively symmetric distribution of benchmark-adjusted returns in Table 2 is comforting and suggests that the data are well-behaved. On the other hand, some large alphas, particularly relative to the three-factor models, might lead to a concern that the database does not adequately cover portfolios with negative returns. Although we have no reason to believe that such systematic truncation occurs, we conduct a simple exercise to determine its potential impact. Specifically, we assume that the population alpha is normally distributed with mean zero and standard deviation σ_α. We then calculate the mean of a truncated normal distribution for various values of σ_α and degrees of truncation. The results of this exercise are reported in the appendix. Recall that the three-factor alpha for domestic equity for the entire database is 0.45 percent. If we assume a σ_α of 2 percent based on estimates from Bollen and Busse (2004), then the appendix shows that over 30 percent of the left tail of the distribution would have to be truncated to produce an alpha of 0.43 percent. Such a high degree of truncation seems unlikely.

Even though truncation may not exist, as mentioned earlier, survivorship bias clearly does exist in the early part of the sample period. This situation provides an opportunity to demonstrate the magnitude of the bias on estimated alphas. The alpha of decile 1 in domestic equity using the three-factor (four-factor) model over the survivor-biased 1979-1990 sample period is 0.84 (1.61) percent per quarter. The corresponding alpha in the non-survivorship-biased period of 1991-2004 is -1.10 (-0.08) percent, a differential of 1.94 (1.69) percent. The magnitude of the bias is higher than that for retail mutual funds. Elton, Gruber and Blake (1996), for instance, report that survivorship bias in equity funds increases returns by 0.7 to 0.8 percent per year. Given this effect, we conduct all of our persistence tests on the survivorship-bias-free subperiod.

3.2 Short-term Persistence

Panel A of Table 3 shows estimates of one-quarter post-ranking domestic equity alphas for deciles 1, 5, and 10 using both unconditional and conditional methods with three- and four-factor models. Although not reported in the table, the average $\overline{R}^2$ using the unconditional three-factor (four-factor) model is 0.91 (0.94). The corresponding average $\overline{R}^2$ for the conditional models are greater, 0.95 and 0.97, respectively. In general, the

$\overline{R}^2$'s are large and comparable to those in prior studies (Fama and French (1993) and Carhart (1997)). Persistence in the extreme winner decile appears to be quite large. The three-factor models have alphas that are over two percent per quarter. As in Carhart (1997), the addition of the momentum factor reduces the magnitude of the alpha substantially, to 0.46 (statistically insignificant) in the unconditional model and 1.03 percent (statistically significant) in the conditional model. In the loser decile, no robust evidence of persistence (or reversal) exists.

In fixed income (Panel B), the average $\overline{R}^2$ of the unconditional regressions is substantially lower than that of domestic equity portfolios, 0.79, but improves to 0.91 in the conditional regressions. This increase in $\overline{R}^2$ is perhaps not surprising since some of the conditioning variables capture the effects of variations in yields in fixed income securities. As with domestic equity, winners' performance persist. The four-factor alphas are substantially smaller than three-factor alphas but remain economically important (0.28 and 0.51 percent per quarter) as well as statistically significant. Weaker evidence of persistence exists in decile 5.

Even though we can only estimate three-factor alphas for international equity portfolios (Panel C), the results are similar to those for domestic equity. Alphas for extreme winner deciles are quite large (2.29 percent for the unconditional model and 1.74 percent for the conditional model), but loser decile alphas are indistinguishable from zero.

3.3 Longer-term Persistence

Persistence in performance one quarter after portfolio formation is economically meaningful. However, plan sponsors typically do not deploy capital in a portfolio for one quarter because the transaction costs from exiting a portfolio after one quarter and entering a new one are large and potentially prohibitive. Even if plan sponsors employ transition management firms to minimize such costs, the frictions are simply too large to justify such a short-term, performance-chasing strategy. In addition, adverse reputation effects likely exist from trading in and out of institutional portfolios. If excess returns remain high for a sufficient period of time after portfolio formation, however, then plan sponsors may be able to exploit the performance persistence. Accordingly, in this section, we examine persistence in institutional portfolios over longer horizons.

Methodologically, we follow the same procedure as before with one small adjustment. We roll forward annually and calculate post-ranking quarterly returns for three years following portfolio formation. Thus, we compute the alpha for the first year from the beginning of year 1 to the end of year 1, we compute the alpha for the second year from the beginning of year 2 to the end of year 2, and so forth. As before, we estimate three- and four-factor models, using both unconditional and conditional approaches.

Although this methodological approach is simple and powerful, it has one unfortunate property. Since our sample is not survivorship-biased, attrition rates are likely to be systematically related to ranking period returns. In other words, poorly performing portfolios are more likely to disappear, implying that the expected attrition rate in decile 1 is higher than in decile 10. Over long horizons (two or three years after decile assignment), alphas in those deciles are likely to be "biased" in the sense that they can only be computed from (better-performing) portfolios that remain in the sample.[9] To assess the potential magnitude of this problem, we calculate the average cumulative attrition rate for each decile over time and display the results in Table 4. We also present the average benchmark-adjusted excess return over the last year for portfolios that disappear. Panel A shows results for domestic equity. The difference in attrition rates between deciles 1 and 10 is readily apparent. By the third year after decile formation, decile 1 has lost 18 percent of its constituents whereas decile 10 has lost only 7 percent. Moreover, the average return in the last year before disappearing for portfolios in decile 1 is -6 percent and 2.7 percent for decile 10. Such patterns are also evident in fixed income (Panel B) and international equity (Panel C). However, the spread in attrition rates between deciles 1 and 10 is largest for domestic equity.[10] We return to the issue of whether differential attrition rates affect inferences in loser deciles later in this section.

Table 5 presents the results for persistence over long horizons. Panel A shows unconditional and conditional domestic equity alphas for deciles 1, 5, and 10 in years 1, 2, and 3. The superior performance of extreme winner deciles persists up to one year after decile formation. Of the four alpha estimates in the first year, three are highly significant and range in value from 0.72 to 1.69 percent per quarter. One estimate (from the four-factor unconditional model) has a value of 0.41 percent with a bootstrapped p-value of 0.12. After the first year, all alphas in the extreme winner deciles are indistin-

[9]This is not a bias in the classical sense of the word because omissions are not willful or due to selection. Indeed, if one is interested in the true investment experience of a plan sponsor investing with equal weights in portfolios in a performance decile, then the estimated alpha correctly captures that performance. On the other hand, if one is interested is measuring post-ranking performance of (say) loser portfolios, then the sample is truncated.

[10]We also compare these attrition rates and last year excess returns to those in mutual fund portfolios and find that both are higher for mutual funds than those for insitutional funds. For instance, the three year attrition rate in domestic equity mutual funds is 25 percent (versus 18 percent for our sample) and the last year excess return is -22 percent (versus -6 percent for our sample).

guishable from zero. Thus, performance persists in the extreme winner decile through the first year and disappears thereafter. In the extreme loser decile, three-factor alphas in the first year are statistically indistinguishable from zero, but four-factor alphas are marginally significant. In the second year, however, strong evidence of a reversal exists – all four estimates of alphas are positive and highly statistically significant, ranging in value from 0.82 to 1.07 percent per quarter. In the third year, the three-factor alphas remain significantly positive, but the four-factor alphas lose their statistical significance.

Recall that the truncation bias in alphas due to differential attrition rates primarily affects the extreme loser decile. To determine if this second year reversal is due to this bias, we return to the appendix. Under a true null of zero alpha, and again assuming a σ_α of 2 percent, the degree of truncation necessary to observe an alpha of 0.8 percent (slightly below the observed 0.82 percent in the four-factor unconditional model) is almost 50 percent. The attrition rates documented in Table 4 fall well below this level of truncation, indicating that this is a true reversal.

Alphas in fixed income (Panel B of Table 5) are quite different from those in domestic equity. The extreme winner decile shows persistence up to three years after decile formation. Across all models, the alphas of past winners rise in the first two years, and although they decline in the third year, they remain positive and statistically significant. In the extreme loser decile, we observe a reversal in the very first year after decile formation; three out of four alphas are significantly positive in the first year, and the remaining one has a p-value of 0.06. This reversal is weaker in the second year and is sensitive to the number of factors as well as the estimation method. For instance, the alphas are much smaller in the four-factor models, and lose statistical significance when estimated using conditional methods. This sensitivity, especially to conditional estimation, is even more pronounced in the third year; the decline in alpha is quite substantial and conditional alphas lose all statistical significance. Once again, to determine if the reversal in decile 1 is due to differential attrition rates, we use the calculations in the appendix. Based on Elton, Gruber, and Blake (1995), the σ_α of fixed income mutual funds is approximately 0.35 percent. If we use a more conservative estimate of 0.5 percent, then the appendix implies that to generate an alpha of 0.18 percent (the smallest of the first year decile 1 alphas in Panel B of Table 5), between 45 to 50 percent of the left tail must be truncated. Not only is such truncation unlikely, it is also inconsistent with actual attrition rates in Panel B of Table 4.

Finally, for international equity portfolios, despite the fact that some of the point estimates of alphas in the first year are quite high, none are reliably statistically significant. Thus, performance does not persist in international equity portfolios over these horizons.

3.4 Persistence and Flows

The evidence thus far suggests that performance persistence varies across asset classes. In domestic equity, extreme winner portfolios persists up to one year and disappears thereafter. Extreme losers reverse two years after decile formation. In international equity, the performance of winners and losers neither persists nor reverses. In fixed income, performance persists in extreme winners up to three years after decile formation, and reversal in extreme losers lasts one to two years depending on the specification.

To understand such disparate results, it is important to recognize that prior performance is a screen used by plan sponsors in selecting investment management firms and allocating capital. Del Guercio and Tkac (2002) report a linear flow-performance relation in institutional investment management and Goyal and Wahal (2007) show that plan sponsors hire (fire) investment managers after superior (inferior) performance. If decreasing returns to scale exist in investment management, then capital flows could account for the degradation in performance in winner portfolios after the first year and potentially the reversal in returns in loser portfolios.

We measure fractional asset flows, $Cf_{p,t}$, for each portfolio p during the year t as:

$$Cf_{p,t} = \frac{A_{p,t} - A_{p,t-1} \times (1 + r_{p,t})}{A_{p,t-1}}, \tag{3}$$

where $A_{p,t}$ measures the dollar amount of assets in portfolio p at the end of year t, and $r_{p,t}$ is the gross return on portfolio p during the year (not quarter) t. Measurement of flows in this manner is analogous to that typically employed in the mutual fund literature. We set fractional flows to a maximum of 1 so that small asset values in the denominator do not produce large outlier flows that could distort our results. Since total asset data are available for a smaller sample than that of returns, we create deciles based on all portfolios that report returns and then calculate the mean flow for each decile portfolio with available data.

Table 6 shows average capital flows into domestic equity, fixed income, and international equity portfolios one, two, and three years following decile formation. Although we only show results for deciles 1, 5, and 10, a monotonic relation exists in domestic equity between flows in year 1 and decile ranking based on the prior-year return. In year 1, decile 10 receives a flow of over 27 percent of assets, whereas decile 1 loses 11 percent of assets, a difference of 37 percentage points. Since the average portfolio in decile 1 (10) has total assets of $466 million ($420 million), this implies a loss (gain) of $48 million ($116 million). These flow patterns appear to be correlated with changes in alphas. Recall from Table 5 that in the following year (year 2), the alphas revert; decile 10 alphas (which received high flows) become statistically insignificant, and decile 1 alphas (which lost assets) turn positive.

In fixed income, winner alphas persist over longer horizons. Capital flows are smaller in percentage terms than domestic equity, but the difference between winner and loser deciles remains. Perhaps even more interesting is the fact that *changes* in flows over time are not as dramatic. For instance, in the extreme winner decile, the change in flow from year 1 to year 2 is only 4 percentage points, less than half the 9 percentage points for domestic equity. The flow patterns for international equity portfolios are similar to those of domestic equity, but the alphas over longer horizons are not statistically significant.

It is appropriate at this point to examine our results in the context of the assumptions and implications of Berk and Green (2004). In Berk and Green's model, performance does not persist, even though differential ability across fund managers exists. Capital flows into superior performers, which, in conjunction with assumed diseconomies of scale, causes future excess returns to disappear. In our data, we observe persistence. We cannot directly measure diseconomies of scale, although some evidence indicates that such diseconomies exist (Perold and Salomon (1991)). We also observe flows that appear to follow performance after which excess returns disappear. Thus, the individual moving parts of the evidence are consistent with flows affecting future persistence.

To establish a clear causal link, one would need to know the capacity of an existing portfolio and then the impact of flows on future returns through diseconomies in investment ideas and/or execution costs, which would require proprietary data.[11] In the absence of such detailed information, we make an attempt at understanding the linkage using aggregate data in two ways. First, we separate the extreme winner decile into four groups at the end of the first year based on total assets and the degree of capital

[11] If capacity is influenced by both the size of the portfolio and the use of momentum as a screen (i.e. if capacity is smaller for portfolios that trade on momentum), then this could account for the decline in alphas in years 2 and 3. In unreported results, we check the distribution of momentum betas and portfolio size across the deciles for domestic equity. We find that momentum betas steadily increase from decile 1 through 10, in manner and magnitude similar to that of Carhart (1997). But, no systematic pattern in average portfolio size exists across the deciles.

flows. Effectively, we do a double-sort on the winner decile using assets and flows. Our hope is that total assets provide a crude measure of capacity, and that if diseconomies of scale reduce future alphas, then changes in alpha should be larger for big portfolios that experience larger inflows. We find that the decline in alpha is indeed greater for the high-assets/high-flow group than for the low-assets/low-flow group. In domestic equity, using a four-factor model, the decline in alpha is -0.53 percent for the former and -0.21 percent for the latter.

Second, we estimate a sequence of flow and return regressions in the spirit of Chen *et al.* (2004). Our purpose is to (a) confirm the impact of positive returns on future cash inflows, and (b) estimate the effect of cash inflows on future returns. We estimate the following cross-sectional regressions using the Fama-MacBeth approach.

$$Y_{p,t+1} = \alpha_t + \beta_t'[R_{p,t},\ Cf_{p,t},\ A_{p,t},\ A_{p,t}^2,\ AFirm_{p,t},\ \text{Style Dummies}] \qquad (4)$$

where $R_{p,t}$ is the raw or benchmark-adjusted return on portfolio p during year t (depending on the specification), $Cf_{p,t}$ is the percentage cash flow into portfolio p during year t, $A_{p,t}$ is the log of the size of portfolio p at the end of the year t, $AFirm_{p,t}$ is the size of all portfolios under the same investment management firm at the end of year t, and Style Dummies are dummies for small/large and value/growth (domestic equity) and municipal, high yield, mortgages, and convertibles (fixed income). Panel A of Table 7 shows the time-series averages of the coefficients (with t-statistics corrected for serial correlation in parentheses) for domestic equity. Panels B and C show the same results for fixed income and international equity respectively. We also show the average $\overline{R}^2$ from each regression specification.

We use two sets of dependent variables to achieve the purposes described above. The first set of specifications in each panel use $Cf_{p,t+1}$ as the dependent variable and show that in all asset classes, higher benchmark-adjusted returns are associated with large future cash inflows even after controlling for the size of the existing asset base both at the portfolio and investment-management firm level. In domestic equity, a two standard deviation change in lagged returns leads to an 17.6 percent increase in cash flows. In comparison, Gruber (1996) reports that a movement from the 6th to the 10th decile in performance results in cash inflows of 31 percent.

In the second set of regression specifications, the dependent variable is the raw return of the portfolio $R_{p,t+1}$.[12] Like Chen *et al.* (2004), we model returns as a function of lagged

[12]When the dependent variable is $Cf_{p,t+1}$ we use benchmark-adjusted returns as an independent

portfolio assets, the assets under management at the investment management firm (the equivalent of family size in retail mutual funds), style dummies, and lagged returns. In addition, we also use the square of asset size to capture non-linear effects and lagged flows to determine the incremental impact of flows on future returns.

It is useful to juxtapose our results for domestic equity (Panel A) with those for mutual funds reported by Chen *et al.* (2004). In our sample as well as in mutual funds, total assets of the portfolio (or fund) are negatively related to future returns. In mutual funds, a two standard deviation change in assets results in a 1 percent decline in returns, but in our sample the equivalent economic effect is three times as large (3.2 percent). Also, in mutual funds, lagged flows for the fund are unrelated to future returns. In our sample, the coefficient on lagged flows is statistically significant. However, a two standard deviation change in lagged flows decreases returns by only 0.01 percent. Finally, Chen *et al.* report that controlling for fund size, greater assets under the management of other funds in the family increases a fund's performance. In our regressions, the coefficient on assets under management of the entire firm is also positive but statistically insignificant. These contrasting results are likely due to differences in organizational structure between the institutional investment management industry and retail mutual funds. Asset flows in the institutional business are "lumpy" because mandates provided by plan sponsors are in the order of millions of dollars, considerably larger than inflows or redemptions from retail investors. This flow pattern could account for the negative coefficient on flows in the return regression and for the larger economic effect of assets on future returns.

In fixed income (Panel B), the cash flow regressions are similar to those for domestic equity, with one exception. The exception is that future cash flows are positively related to the prior size of the portfolio – apparently, large portfolios receive larger flows, suggesting that capacity constraints may be less binding for fixed income. In the return regressions, neither assets under management nor flows in the prior year are related to future returns. An interpretation of these results is that fixed income portfolios are generally not capacity constrained (since flows are positively related to lagged asset size), and as a result, further flows are not detrimental to future performance.

The results for international equity (Panel C) are somewhere in between domestic equity and fixed income. In the flow regressions, the coefficients on lagged assets are

variable since Del Guercio and Tkac (2002) show that excess returns, rather than raw returns, influence flows in institutional investment management. When the dependent variable is $R_{p,t+1}$, we use raw rather than benchmark-adjusted returns because our interest is in the degradation of performance. Regardless, the results are qualitatively unchanged if we use benchmark-adjusted returns as the dependent variable.

negative (like domestic equity) but insignificant. In the return regressions, the coefficients on lagged assets and flows are also statistically insignificant (like fixed income). Since performance does not appear to persist in international equity to begin with, it is perhaps not surprising that flows have little to speak to future performance.

3.5 Fee Arrangements

We base our results thus far entirely on returns that are net of trading costs but gross of fees. The possibility exists that investment management fees eliminate the post-ranking period excess returns. Cross-sectional variation in fees could also be so large that it swamps alphas in winner portfolios; in other words, average fees may not be high enough to eliminate excess returns across all portfolios, but only in the extreme winner deciles. In this section, we analyze fees charged by investment management firms for institutional portfolios.

As noted earlier, to study fees we employ quarterly fee and return data from eVestment Alliance. The proto-typical fee structure is such that management fees decline as a step function of the size of the mandate assigned to the investment management firm by the plan sponsor. Although variation undoubtedly exists in the breakpoints, eVestment collects marginal fee schedules using "standardized" breakpoints. Specifically, each investment manager identifies fees for \$10, \$25, \$50, \$75, and \$100 million mandates. These marginal fees are based on fee *schedules*; actual fees are individually negotiated between investment managers and plan sponsors. Such individual negotiations involve rebates to the marginal fees as well as other structural fee arrangements (e.g., performance linkages). To our knowledge, no available database details individual fee arrangements. As a result, we regard our analysis as exploratory in nature and designed only to address issues pertaining to persistence. While our data are new and unique, they are not rich enough to provide a comprehensive understanding of actual fee arrangements in institutional investment management.

Table 8 provides descriptive information on fee arrangements. In Panel A, we report the percentage of portfolios that offer performance-based fee clauses in contracts across each asset class and decile.[13] Performance-based fees often have no minimum fee and link actual fees to performance above a prescribed benchmark. To the extent that performance fees are a contracting device that align the interests of investment managers

[13]The sum of the "Yes" and "No" columns does not add up to 100 percent because this information is missing for a small number of portfolios.

and plan sponsors, one might expect better-performing portfolios to offer performance-based fees. For domestic equity and fixed income portfolios, we find substantial variation in the percentage of portfolios that offer performance-based fees across the deciles. In domestic equity, for example, only 47 percent of the portfolios in the loser decile offer performance-based fees while almost 55 percent in the winner decile offer such an arrangement. By comparison, the use of incentive fees is less common in mutual funds (see Elton, Gruber and Blake (2003) and Golec and Starks (2004)). The corresponding percentages for fixed income are 38 percent for decile 1 and 46 percent for decile 10. Little variation exists in international equity portfolios.

Panel B of Table 8 shows the percentage of portfolios that offer most-favored-nation (MFN) clauses by asset class and decile. MFN provisions typically state that the investment manager will charge the plan sponsor a fee that is the lowest of that charged for similar mandates from other plan sponsors. If properly enforced, an MFN clause benefits incumbent plan sponsors in the sense that the investment manager is required to match lower fees provided to a new plan sponsor.[14] Again, some evidence suggests that portfolios in winner deciles have greater propensity to offer MFN clauses compared to portfolios in loser deciles. The difference in the propensity to offer MFN clauses between extreme winner-loser deciles for domestic equity, fixed income, and international equity are 5, 4, and 3 percentage points respectively.

Table 9 shows the distribution of annual fees across deciles for domestic equity, fixed income, and international equity (Panels A, B, and C respectively). For each decile, we show the average annual marginal fee (in basis points) in each breakpoint described above. Since fees vary widely across investment styles within domestic equity, we show four major intersections of the size and growth-value grid: large cap growth, large cap value, small cap growth, and small cap value. Similarly, for fixed income we only show fees for four styles: municipal, high-yield, intermediate term, and mortgage-backed securities.

The results in Table 9 show that the magnitude of fees is not large enough to eliminate alphas. Take domestic equity, for example. The largest fee reported in the table is 100 basis points for the extreme winner decile corresponding to the smallest ($10 million)

[14] As with most such contracts and clauses, many of the benefits depend on the details of the contract and its enforcement. For instance, the investment management firm and plan sponsor might reasonably disagree on whether mandates from two different plan sponsors are comparable because of size or specific portfolio restrictions (e.g., no sin stocks or use of directed brokerage). The economics of MFNs are widely studied in the international trade literature. However, as Horn and Mavroidis (2001) point out in their survey of this literature, models that endogenize MFN contracts and examine the incentives to commit to an MFN do not exist.

mandate in small cap growth. The quarterly conditional alpha one year after decile formation using a three- (four-) factor model is 1.69 (0.72) percent, implying an annual alpha of almost 6.76 (2.88) percent. The results for fixed income and international equity are similar in that fees are a small fraction of annual alphas. It is worth noting that we have been quite conservative in assessing the impact of fees on two accounts. First, fees are based on reported schedules. Actual fees involve significant rebates and are likely to be lower. Second, we use the largest fees in an asset class to gauge the impact on alphas.

One might legitimately ask whether better-performing portfolios charge more in fees than worse-performing portfolios. An examination of the variation in fees across deciles in each of the panels shows some evidence that this is the case. Reported fees are higher for portfolios in decile 10 than in decile 1; the differentials are modest in domestic equity and fixed income, but larger in international equity. To the extent that investment managers are likely to offer larger rebates for worse-performing portfolios and less likely to offer large rebates for better-performing portfolios, the differences may in fact be larger than can be estimated using these data.

3.6 Mechanisms to Control Flows

Portfolio managers are cognizant of capacity, diseconomies of scale, and the potential deleterious impact of flows on their ability to generate superior performance. To the extent that the present value of fees from a smaller but stickier asset base is larger than the present value of fees from a larger asset base that might potentially suffer a decline in performance (and subsequent loss in assets), portfolio managers may *ex ante* rationally restrict capital inflows. Several mechanisms could be used to restrict flows. One obvious mechanism is to raise the price: fee increases could be used to control asset flows, preserving performance and persistence. In retail mutual funds, fees and loads vary widely, affecting redemptions and capital inflows (see Nanda, Narayanan, and Warther (2000) for a model in which heterogeneous fees appear endogenously). If one believes that better-performing investment managers charge higher fees, some circumstantial evidence exists that managers use fees to control flows. However, as noted earlier, actual fee arrangements between institutional investment management firms and plan sponsors are private. As a result, we cannot detect fee increases or cleanly observe the use of heterogenous negotiated fees to discourage asset inflows from particular types of (perhaps short-term) plan sponsors.

Another more direct way to control asset flows is simply to stop accepting new money. Bris *et al.* (2006) find that 143 retail equity mutual funds closed to new investors over a 10-year period and document that these funds delivered positive excess returns prior to closing. We are anecdotally aware of some investment advisors that have followed this approach in the institutional marketplace. For example, Aronson+Johnson+Ortiz, an investment management firm recently closed its flagship large cap value portfolio to new capital under the belief that it could not continue to generate superior returns with a larger asset base. More recently, Wrighton (2007) reports that Goldman Sachs Asset Management also closed some institutional portfolios to new investors under capacity concerns.

Data from eVestment tags portfolios that have been closed to new investors, and we can use these data to see if institutional investment managers employ this mechanism. Out of 5,122 portfolios, eVestment reports that 277 are closed to new investors, a rate that appears higher than that for mutual funds. The majority of these closures (270) are in domestic and international equity portfolios (208 and 62 respectively, out of 2,881 and 910 portfolios in each of these asset classes). The database identifies only 7 out of 1,331 fixed income portfolios as closed. More interestingly, returns are substantially higher for closed portfolios than portfolios that are open to new investors. The average quarterly raw returns for closed portfolios are 4.9 percent, 3.2 percent, and 3.8 percent for domestic equity, fixed income, and international equity respectively. The corresponding returns for portfolios open to new investors are lower in each case: 3.9, 1.9, and 3.0 percent respectively. These differentials are also evident in benchmark-adjusted returns, which can be computed for domestic equity and fixed income only. The average quarterly benchmark-adjusted return in closed domestic equity portfolios is 1.15 percent, compared to 0.65 for open portfolios. The comparable and corresponding returns for fixed income portfolios are 1.05 and 0.13 percent respectively.[15]

3.7 Robustness and Other Issues

Backfill bias could influence our results, similar to many hedge fund studies (Liang (2000)). To determine how this bias may affect our results, we follow Jagannathan, Malakhov, and Novikov (2006) and eliminate the first 3 years of returns for each portfolio

[15] Ideally, we would like to know the date on which a portfolio was closed to new investors so that we can compute returns before and after closure. Unfortunately, our data do not include closure dates. If investment management firms do in fact avoid diseconomies by closing portfolios, then our computed return differentials are downward-biased.

in our sample and then re-estimate our regressions. We use a three-year elimination period because that is the typical performance evaluation horizon used by plan sponsors. The results of this exercise are not reported in the paper, but our basic estimates of persistence are similar.

Another possibility is that a selection bias exists in the investment management firms that report total assets under management per portfolio. Although *ex ante* the source of such a bias is hard to identify, it is a possibility that could cloud our inferences. In a perfect world, we would be able to observe characteristics of firms that report assets and those that do not and then examine whether their flow-performance relations differ. Unfortunately, this is not possible, particularly since we do not know firm identities. We can, however, examine whether our persistence results differ for the subsample of firms that include both assets and returns data. We replicate our results for this subsample and find that the alpha estimates do not differ materially from those reported in Table 5, and in some cases are larger.

Since the database used to generate estimates of fees differs from the data on which we base persistence estimates, the two databases may not be comparable. To examine this possibility, we estimate one-year alphas (equivalent to those reported in Table 5) using the eVestment database. Those alphas are very similar to those estimated with IIS data.

4 Conclusion

In this paper, we examine the persistence in performance of 6,027 portfolios managed by 1,475 investment management firms between 1991 and 2004. These portfolios provide exposure to domestic equity, fixed income, and international equity asset classes to public and private defined-benefit retirement plans, endowments, foundations, multi-employer unions, and trusts. A large number of active investment styles and strategies are included; for equity strategies, all size and growth-value gradations are represented, and all maturity and credit risk dimensions are included in fixed income portfolios. To our knowledge, we are the first to examine persistence beyond the traditionally-studied domestic equity funds.

We sort portfolios into deciles using benchmark-adjusted returns over one year and examine the persistence in performance thereafter using a variety of unconditional and conditional three- and four-factor models. The factor models do a good job of explaining the return series, but we find significant abnormal returns in the post-decile formation period in domestic equity and fixed income. Unlike retail mutual funds, however, these excess returns are largely concentrated in winner deciles, and some evidence of reversals exists in loser deciles. The magnitudes of the alphas are economically large and typical fees are not large enough to eliminate them.

From a practical perspective, our results suggest that the widespread practice of hiring investment managers who have delivered superior returns is both rational and potentially profitable. Indeed, the organizational structure of institutional investment management and, in particular, the use of consultants to pick investment managers are conducive to this effort. However, in domestic equity, the persistence that is the source of potential gains for plan sponsors appears to be its very own death knell: we find that portfolios in the winner deciles draw an influx of capital from plan sponsors, and in the year following this capital inflow, the excess returns disappear. This suggests that plan sponsors that chase historical winners should be cognizant and wary of large inflows from other sponsors as well.

Appendix
Mean of a Truncated Normal Distribution of Alphas

The population α is assumed to be distributed normally with mean zero and standard deviation σ_α. The table reports the mean of a truncated distribution where the left tail of the distribution is truncated (unobserved).

	Fraction of population that is left-truncated										
σ_α	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
0.5%	0.00	0.01	0.02	0.04	0.06	0.07	0.10	0.12	0.14	0.17	0.20
1.0%	0.00	0.02	0.05	0.08	0.11	0.15	0.19	0.24	0.29	0.34	0.40
1.5%	0.00	0.03	0.07	0.12	0.17	0.22	0.29	0.35	0.43	0.51	0.60
2.0%	0.00	0.04	0.09	0.16	0.22	0.30	0.38	0.47	0.57	0.68	0.80
2.5%	0.00	0.05	0.12	0.19	0.28	0.37	0.48	0.59	0.71	0.85	1.00
3.0%	0.00	0.06	0.14	0.23	0.33	0.45	0.57	0.71	0.86	1.02	1.20
3.5%	0.00	0.07	0.17	0.27	0.39	0.52	0.67	0.82	1.00	1.19	1.40
4.0%	0.00	0.08	0.19	0.31	0.45	0.60	0.76	0.94	1.14	1.36	1.60
4.5%	0.00	0.09	0.21	0.35	0.50	0.67	0.86	1.06	1.28	1.53	1.80
5.0%	0.00	0.10	0.24	0.39	0.56	0.75	0.95	1.18	1.43	1.70	2.00

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Table 1: Descriptive Statistics

This table presents descriptive statistics on the sample of institutional investment management firms and their portfolios. Statistics are presented for the survivorship-biased sample period of 1979 to 1990 and survivorship-bias-free sample period of 1991 to 2004. Firm and portfolio size is in millions of dollars. The attrition rate is calculated by summing the number of portfolios that disappear from the database during a year and scaling by the total number of portfolios at the beginning of the year.

	Domestic Equity	Domestic Fixed Income	International Equity
Panel A: Data source: IIS			
Sample: 1979–1990			
Total # Firms	670	397	133
Total # Portfolios	1123	742	259
Avg. # Firms per year	359	204	51
Avg. # Portfolios per year	516	309	84
Avg. Size of Firm	839	1456	775
Avg. Size of Portfolio	517	803	410
Attrition Rate	0.00	0.00	0.00
Sample: 1991-2004			
Total # Firms	1137	602	307
Total # Portfolios	3381	1683	963
Avg. # Firms per year	873	470	222
Avg. # Portfolios per year	2146	1192	606
Avg. Size of Firm	2545	3811	3068
Avg. Size of Portfolio	986	1436	1081
Attrition Rate	3.08	3.18	3.57
Panel B: Data source: eVestment Alliance			
Sample: 1991-2004			
Total Number of Firms	805	356	237
Total Number of Portfolios	2682	1290	821
Avg. Number of Firms per year	630	292	169
Avg. Number of Portfolios per year	1657	914	491
Attrition Rate	1.01	1.02	1.21

Table 2: Return Statistics

This table presents descriptive statistics on the returns of portfolios of institutional investment management firms. Benchmark-adjusted returns are calculated by subtracting the raw return from the matched benchmark provided by IIS. Three- and four-factor models are estimated for the entire time series using the factor model

$$r_{p,t} = \alpha_p^U + \sum_{k=1}^{K} \beta_{p,k} f_{k,t} + \epsilon_{p,t},$$

where f's are K factors. The factors for domestic equity are the three Fama and French (1993) factors and the Carhart (1997) momentum factor. The factors for domestic fixed income are the Lehman Brothers Aggregate Bond Index returns, term spread return, and default spread return, and the Merrill Lynch High Yield Index returns. The factors for international equity are the international versions of Fama and French (1993) factors. Alphas for the row titled "All" are calculated using equal-weighted quarterly returns for all portfolios in an asset class. Decile assignments are done using raw returns for all portfolios in an asset class in each year. Deciles are rebalanced at the end of every year and are held for one post-ranking quarter. Decile 1 contains the worst-performing portfolios, and decile 10 contains the best-performing portfolios. All returns and alphas are in percent per quarter and p-values are reported in parentheses next to alphas. Statistical significance is evaluated using the bootstrap procedure described in the text.

	Domestic Equity	Domestic Fixed Income	International Equity
Panel A: Benchmark-adjusted returns in 1991-2004 sample			
Mean	0.58	0.08	0.24
Median	0.29	0.06	-0.57
Percent Positive	53.8	55.6	47.0
Percent Negative	46.1	44.4	53.0
Panel B: Alphas in 1979-1990 sample			
3-factor alphas			
All	0.98 (0.00)	0.18 (0.02)	2.39 (0.03)
Decile 1	0.84 (0.02)	-0.57 (0.03)	1.83 (0.16)
Decile 10	2.05 (0.00)	0.84 (0.00)	3.16 (0.16)
4-factor alphas			
All	0.84 (0.00)	0.20 (0.01)	
Decile 1	1.61 (0.00)	-0.50 (0.08)	
Decile 10	1.13 (0.01)	0.47 (0.08)	
Panel C: Alphas in 1991-2004 sample			
3-factor alphas			
All	0.45 (0.01)	0.21 (0.00)	1.04 (0.04)
Decile 1	-1.10 (0.06)	0.24 (0.16)	-0.16 (0.44)
Decile 10	2.79 (0.00)	1.02 (0.00)	2.48 (0.02)
4-factor alphas			
All	0.34 (0.06)	0.11 (0.00)	
Decile 1	-0.08 (0.45)	-0.06 (0.39)	
Decile 10	1.01 (0.04)	0.74 (0.00)	

Table 3: Post-ranking One-quarter Alphas

This table lists the post-ranking alphas for deciles of portfolios sorted according to the benchmark-adjusted return during the ranking period of one year. The portfolio deciles are re-balanced at the end of every quarter and are held for one post-ranking quarter. Unconditional alphas are calculated from the factor model

$$r_{p,t} = \alpha_p^U + \sum_{k=1}^{K} \beta_{p,k} f_{k,t} + \epsilon_{p,t},$$

while the conditional alphas are calculated from the factor model

$$r_{p,t} = \alpha_p^C + \sum_{k=1}^{K} \left(\beta_{p,k}^0 + \sum_{l=1}^{L} \beta_{p,k}^l Z_{l,t-1} \right) f_{k,t} + \epsilon_{p,t},$$

where f's are K factors and Z's are L instruments. Instruments include the 3-month T-bill rate, the dividend price ratio for the S&P 500, the term spread and the default spread. The factors for domestic equity are the three Fama and French (1993) factors and the Carhart (1997) momentum factor. The factors for domestic fixed income are the Lehman Brothers Aggregate Bond Index returns, Term Spread Return, and Default Spread Return, and the Merrill Lynch High Yield Index returns. The factors for international equity are the international versions of Fama and French (1993) factors. All alphas are in percent per quarter and p-values are reported in parentheses next to alphas. Statistical significance is evaluated using the bootstrap procedure described in the text. Decile 1 contains the worst-performing portfolios, and decile 10 contains the best-performing portfolios. The sample period is 1991 to 2004.

	Unconditional		Conditional	
Decile	3-factor	4-factor	3-factor	4-factor
	Panel A: Domestic Equity			
1	-0.00 (0.50)	0.79 (0.01)	0.03 (0.45)	0.50 (0.05)
5	0.08 (0.31)	0.13 (0.25)	0.15 (0.13)	0.27 (0.04)
10	2.11 (0.00)	0.46 (0.11)	2.42 (0.00)	1.03 (0.01)
	Panel B: Domestic Fixed Income			
1	0.35 (0.01)	0.13 (0.10)	0.15 (0.12)	-0.19 (0.09)
5	0.07 (0.04)	0.05 (0.08)	0.09 (0.01)	0.06 (0.05)
10	0.68 (0.01)	0.28 (0.04)	0.78 (0.00)	0.51 (0.00)
	Panel C: International Equity			
1	-0.07 (0.54)		0.13 (0.46)	
5	0.94 (0.04)		0.91 (0.05)	
10	2.29 (0.02)		1.74 (0.10)	

Table 4: Post-ranking Attrition Rates and Last Year Returns

This table reports attrition rates and the benchmark-adjusted excess returns in the last year of the portfolios existence. Deciles are created by sorting portfolios according to benchmark-adjusted returns during the one year ranking period. Deciles are rebalanced at the end of every year and are held for one to three post-ranking years. Decile 1 contains the worst-performing portfolio, and decile 10 contains the best-performing portfolios. The sample period is 1991 to 2004.

	Cumulative Attrition Rate			Last Year Excess Return		
Decile	Year 0-1	Years 0-2	Years 0-3	Year 0-1	Year 0-2	Year 0-3
Panel A: Domestic Equity						
1	7.4	12.8	18.0	-10.6	-7.2	-6.0
5	3.4	6.7	10.6	-0.2	-0.9	-1.2
10	1.9	4.6	7.7	23.8	9.3	2.7
Panel B: Domestic Fixed Income						
1	4.6	8.6	12.0	-2.8	-1.5	-1.3
5	3.6	5.7	8.5	0.3	-0.3	-0.1
10	2.6	4.6	7.7	5.4	2.6	1.0
Panel C: International Equity						
1	6.9	11.0	15.5	-25.2	-19.2	-16.6
5	3.5	8.3	11.3	2.0	10.0	-1.3
10	2.2	5.3	10.0	6.1	0.4	-4.0

Table 5: Post-ranking One- to Three-year Alphas

This table lists the post-ranking alphas for deciles of portfolios sorted according to the benchmark-adjusted return during the ranking period of one year. Deciles are rebalanced at the end of every year and are held for one to three post-ranking years. Alphas and their p-values are calculated in the same way as in Table 3. All alphas are in percent per quarter and p-values based on the bootstrapping procedure described in the text are reported in parentheses. Decile 1 contains the worst-performing portfolio, and decile 10 contains the best-performing portfolios. The sample period is 1991 to 2004.

	First Year		Second Year		Third Year	
Decile	3 factor	4 factor	3 factor	4 factor	3 factor	4 factor
			Panel A: Domestic Equity			
			Unconditional alphas			
1	0.14 (0.31)	0.53 (0.04)	0.90 (0.00)	0.82 (0.00)	0.64 (0.02)	0.28 (0.20)
5	0.16 (0.16)	0.25 (0.07)	0.30 (0.02)	0.31 (0.04)	0.15 (0.14)	0.25 (0.04)
10	1.50 (0.00)	0.41 (0.12)	0.07 (0.45)	-0.31 (0.23)	0.18 (0.34)	-0.04 (0.47)
			Conditional alphas			
1	0.37 (0.09)	0.61 (0.02)	1.07 (0.00)	0.88 (0.00)	0.76 (0.01)	0.50 (0.10)
5	0.17 (0.11)	0.28 (0.04)	0.42 (0.00)	0.46 (0.00)	0.29 (0.03)	0.43 (0.00)
10	1.69 (0.00)	0.72 (0.01)	0.09 (0.42)	-0.05 (0.44)	0.23 (0.30)	0.30 (0.24)
			Panel B: Domestic Fixed Income			
			Unconditional alphas			
1	0.54 (0.00)	0.36 (0.00)	0.27 (0.01)	0.13 (0.05)	0.26 (0.00)	0.22 (0.01)
5	0.08 (0.01)	0.06 (0.04)	0.07 (0.02)	0.04 (0.08)	0.04 (0.05)	0.02 (0.14)
10	0.60 (0.00)	0.21 (0.08)	0.66 (0.01)	0.34 (0.00)	0.49 (0.01)	0.27 (0.00)
			Conditional alphas			
1	0.42 (0.00)	0.18 (0.06)	0.36 (0.00)	0.11 (0.16)	0.15 (0.11)	0.02 (0.41)
5	0.11 (0.00)	0.08 (0.02)	0.09 (0.01)	0.05 (0.10)	0.04 (0.05)	0.03 (0.20)
10	0.59 (0.01)	0.14 (0.19)	0.62 (0.00)	0.42 (0.01)	0.47 (0.01)	0.23 (0.09)

	Unconditional alphas			Conditional alphas		
Decile	First Year	Second Year	Third Year	First Year	Second Year	Third Year
			Panel C: International equity			
1	0.42 (0.35)	1.54 (0.03)	-0.05 (0.49)	1.11 (0.21)	2.03 (0.03)	0.70 (0.29)
5	0.59 (0.13)	0.53 (0.17)	0.76 (0.06)	0.72 (0.12)	0.64 (0.18)	1.01 (0.06)
10	2.12 (0.04)	0.72 (0.24)	0.39 (0.34)	0.79 (0.29)	0.32 (0.37)	0.17 (0.42)

Table 6: Post-ranking Flows

Deciles are formed using benchmark-adjusted returns during the ranking period of one year. Deciles are rebalanced at the end of every year and are held for one, two or three years. Decile 1 contains the worst-performing portfolio, and decile 10 contains the best-performing portfolios. Average net flows to portfolios (in percent per year) in these deciles are reported. The sample period is 1991 to 2004.

	Domestic Equity			Domestic Fixed Income			International Equity		
Decile	First Year	Second Year	Third Year	First Year	Second Year	Third Year	First Year	Second Year	Third Year
1	-11.43	-7.99	-7.76	-4.83	-0.17	-2.80	-5.89	-4.31	-1.26
5	3.48	2.98	0.99	0.53	0.34	0.99	11.32	4.93	0.88
10	27.74	18.63	12.30	13.95	9.07	7.26	25.87	16.19	10.65

Table 7: Flow/Return Regressions

This table presents the results of the following Fama-Macbeth cross-sectional regressions:

$$Y_{p,t+1} = \alpha_t + \beta_t'[R_{p,t},\ Cf_{p,t},\ A_{p,t},\ A^2_{p,t},\ AFirm_{p,t}, \text{Style Dummies}]$$

where $R_{p,t}$ is the raw or benchmark-adjusted return on portfolio p during year t, $Cf_{p,t}$ is the percentage cash flow into portfolio p during year t, $A_{p,t}$ is the (log) of the size of portfolio p at the end of year t, $AFirm_{p,t}$ is the size of all portfolios under the same investment management firm at the end of year t, and Style Dummies are dummies for small/large and value/growth (domestic equity) and municipal, high yield, mortgages, and convertibles (fixed income) [There are no style dummies in international equity regressions]. When the dependent variable is $Cf_{p,t+1}$, $R_{p,t}$ is the benchmark-adjusted return. When the dependent variable is $R_{p,t+1}$, the returns are raw (not benchmark-adjusted). The regressions are estimated annually and the table presents the time-series averages of the coefficients (beta coefficients on style dummies are not reported). Fama-Macbeth p-values, corrected for serial correlation in time-series estimates, are reported in parenthesis below the coefficient. The last column reports the average $\overline{R}^2$ from each of the regressions. The sample period is 1991 to 2004.

	CNST	$R_{p,t}$	$Cf_{p,t}$	$A_{p,t}$	$A^2_{p,t}$	$AFirm_{p,t}$	ave-$\overline{R}^2$
	Panel A: Domestic Equity						
	Dependant variable is $Cf_{p,t+1}$, Returns are benchmark-adjusted						
1.	-0.081	0.821	0.296				0.113
	(0.00)	(0.00)	(0.00)				
2.	-0.059	0.830	0.296	-0.005			0.116
	(0.06)	(0.00)	(0.00)	(0.25)			
3.	-0.068	0.830	0.297	-0.001	-0.000		0.117
	(0.02)	(0.00)	(0.00)	(0.89)	(0.41)		
4.	-0.094	0.833	0.298	-0.006	-0.001	0.009	0.119
	(0.00)	(0.00)	(0.00)	(0.32)	(0.18)	(0.00)	
	Dependant variable is $R_{p,t+1}$, Returns are raw						
1.	0.111	0.130	-0.014				0.312
	(0.00)	(0.02)	(0.02)				
2.	0.129	0.129	-0.012	-0.004			0.317
	(0.00)	(0.02)	(0.03)	(0.00)			
3.	0.141	0.128	-0.012	-0.009	0.001		0.319
	(0.00)	(0.02)	(0.03)	(0.00)	(0.01)		
4.	0.137	0.128	-0.012	-0.010	0.001	0.002	0.322
	(0.00)	(0.02)	(0.04)	(0.00)	(0.02)	(0.05)	

	CNST	$R_{p,t}$	$Cf_{p,t}$	$A_{p,t}$	$A^2_{p,t}$	$AFirm_{p,t}$	ave-$\overline{R}^2$
Panel B: Domestic Fixed Income							
Dependant variable is $Cf_{p,t+1}$, Returns are benchmark-adjusted							
1.	-0.067	1.043	0.175				0.040
	(0.00)	(0.00)	(0.00)				
2.	-0.124	1.047	0.165	0.010			0.043
	(0.00)	(0.00)	(0.00)	(0.02)			
3.	-0.169	1.047	0.164	0.029	-0.002		0.044
	(0.00)	(0.00)	(0.00)	(0.02)	(0.03)		
4.	-0.217	1.036	0.166	0.017	-0.002	0.017	0.048
	(0.00)	(0.00)	(0.00)	(0.15)	(0.02)	(0.00)	
Dependant variable is $R_{p,t+1}$, Returns are raw							
1.	0.064	-0.084	-0.001				0.506
	(0.00)	(0.65)	(0.53)				
2.	0.063	-0.083	-0.001	0.000			0.508
	(0.00)	(0.65)	(0.48)	(0.37)			
3.	0.065	-0.083	-0.001	-0.001	0.000		0.508
	(0.00)	(0.65)	(0.52)	(0.46)	(0.18)		
4.	0.065	-0.081	-0.001	-0.001	0.000	-0.000	0.509
	(0.00)	(0.66)	(0.45)	(0.50)	(0.21)	(0.86)	
Panel C: International Equity							
Dependant variable is $Cf_{p,t+1}$, Returns are benchmark-adjusted							
1.	-0.049	0.342	0.232				0.056
	(0.14)	(0.03)	(0.00)				
2.	-0.083	0.343	0.228	0.006			0.057
	(0.12)	(0.04)	(0.00)	(0.28)			
3.	-0.055	0.341	0.228	-0.006	0.001		0.055
	(0.48)	(0.05)	(0.00)	(0.73)	(0.34)		
4.	-0.107	0.345	0.229	-0.009	0.001	0.011	0.058
	(0.18)	(0.05)	(0.00)	(0.60)	(0.57)	(0.15)	
Dependant variable is $R_{p,t+1}$, Returns are raw							
1.	0.119	0.250	-0.007				0.200
	(0.03)	(0.11)	(0.24)				
2.	0.136	0.257	-0.006	-0.003			0.210
	(0.01)	(0.10)	(0.23)	(0.18)			
3.	0.129	0.257	-0.005	0.001	-0.000		0.214
	(0.02)	(0.10)	(0.27)	(0.92)	(0.69)		
4.	0.100	0.263	-0.002	-0.002	-0.001	0.007	0.231
	(0.04)	(0.08)	(0.74)	(0.84)	(0.65)	(0.08)	

Table 8: Fees Characteristics

Deciles are formed using benchmark-adjusted returns (for domestic equity and domestic fixed income) or raw returns (for international equity) during the ranking period of one year. Deciles are rebalanced at the end of every year and are held for one year. Decile 1 contains the worst-performing portfolio, and decile 10 contains the best-performing portfolios. Panel A lists the fraction of funds that either charge or do not charge performance-based fees (the remainder is fraction of funds for which information is not available). Panel B lists the fraction of funds that either do or do not have most-favored-nation clause in fee schedules (the remainder is the fraction of funds for which information is not available). The sample period is 1991 to 2004.

	Domestic Equity		Domestic Fixed Income		International Equity	
Decile	Yes	No	Yes	No	Yes	No
Panel A: Performance-based fees						
1	47.5	40.5	37.6	42.2	64.6	20.2
5	51.2	37.0	39.3	45.2	61.3	24.9
10	54.6	36.4	46.2	35.9	65.6	21.0
Panel B: Most-favored-nation clause						
1	32.2	31.8	29.4	28.9	42.8	21.0
5	31.8	31.9	34.8	28.5	49.7	16.9
10	37.2	30.7	33.4	21.8	44.5	22.2

Table 9: Distribution of Fees

Deciles are formed using benchmark-adjusted returns (for domestic equity and domestic fixed income) or raw returns (for international equity) during the ranking period of one year. Deciles are rebalanced at the end of every year and are held for one year. Decile 1 contains the worst-performing portfolio, and decile 10 contains the best-performing portfolios. Fees are based on schedules and are reported for mandate amounts of $10 million to $100 million. The fees are given separately for selected styles within domestic equity, fixed income, and international equity and are classified by deciles. The sample period is 1991 to 2004. The fees are in basis points per year.

Decile	$10M	$25M	$50M	$75M	$100M	$10M	$25M	$50M	$75M	$100M
Panel A: Domestic Equity										
	Large Cap Growth					Large Cap Value				
1	77	71	66	63	62	80	73	67	64	62
5	71	65	59	55	53	68	62	57	53	51
10	78	72	67	63	61	82	77	74	71	69
	Small Cap Growth					Small Cap Value				
1	98	96	91	87	86	96	92	88	85	83
5	94	92	89	85	84	94	91	86	82	81
10	100	98	94	91	89	98	95	92	90	89
Panel B: Domestic fixed Income										
	Municipal					High Yield				
1	37	33	31	28	27	56	54	53	51	49
5	33	31	29	27	27	53	52	50	48	48
10	35	33	31	29	29	59	57	55	52	51
	Interm Term					Mortgages				
1	39	36	34	32	30	40	39	38	37	37
5	35	33	30	28	27	26	25	24	23	23
10	44	42	39	37	36	56	56	55	56	56
Panel C: International Equity										
1	81	80	75	70	68					
5	75	73	68	63	61					
10	88	86	82	78	76					