Survival and Performance of Pension Fund Money Managers

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Abstract: This paper examines the first survivorship bias-free panel dataset of equity portfolio managers who manage portfolios primarily for pension funds. We find that portfolios cease to exist at an average rate of 1.63% per quarter from June 1993 to December 2003. Survival bias is 31.4 basis points per quarter using average returns but only 6.4 basis points in asset weighted returns. The survival probabilities form a non-stationary process and depend on the quarter that a portfolio is started. Using gross returns, the average alpha of these portfolios is positive for all benchmarks except the Fama French four factor model.

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Measuring the risk-adjusted performance of a managed portfolio has long been an objective of financial economists and practitioners. Published studies have generally focused on mutual funds because data limitations have kept researchers from examining other types of money managers. The pension fund and endowment segment of the business, commonly referred to as "institutional" money management, has more assets than mutual funds and hedge funds combined and is less regulated than mutual funds. The studies of institutional managers that do exist use much smaller samples, are subject to more severe biases and come to different conclusions than mutual fund studies. Christopherson, Ferson and Glassman (1998) [CFG] and Coggin, Fabozzi, and Rahman (1993) [CFR] find that pension fund/endowment money managers earn positive abnormal returns while Lakonishok, Shleifer and Vishny (1990) [LSV] finds they do not. In contrast, mutual fund research using databases with fewer sampling problems has generally concluded that mutual fund managers on average do not earn abnormal returns. Given the size of the industry, the lack of regulation, the conflicting results and the data problems with previous studies, there is a strong case for a more careful examination of institutional portfolio management.

The purpose of this study is to present the results of analyzing institutional money managers using a large sample with minimal selection and survivorship bias. We have obtained 43 quarterly surveys from June 1993 to December 2003 from the Mobius Group which reports returns and numerous other characteristics of institutional managers. We started receiving the survey in June 1993 and continue to present. Mobius is one of the primary vendors of money management data and these data are used by most large pension fund sponsors and endowment funds to determine who will manage their money. We cross-check the returns with another commercially available database and a private source of return data. We examine the returns and longevity of every money manager in these data who had full discretion over their accounts. In general, we find attrition rates higher than the mutual fund industry. On average, 1.63% of all portfolios cease to exist each quarter. Examining the average return, we find a 20.8 basis point bias per quarter due to survivorship and revision of previous returns. However, the survival bias in asset-weighted returns is 6.4 basis points per quarter. We find that the conditional probability of survival varies over time, implying that the birth and death stochastic processes are not stationary. We find that there is a positive Jensen alpha but a four factor Fama French model produces zero alphas. We find that there is substantial variation in Jensen alphas

over time, whether value weighted or equally weighted and that the time-variation in the Fama-French alphas is about a tenth of the variation in the Jensen alphas.

The next section briefly describes the institutional money management industry and develops several hypotheses. Section III describes the data and our efforts at verification. Section IV presents our findings on survivorship bias. Section V presents performance results and section VI presents various cross-sectional tests of the impact of the agency relationship on performance.

II. The Institutional Money-Management Industry

We define institutional money managers as those managers who are not covered by the Investment Company Act of 1940. The clients of these managers include foundations, high net worth individuals and defined-benefit pension funds. Unlike mutual fund shareholders, the client of an institutional money manager owns the securities directly and managers typically are responsible for a small number of accounts. In 2003, the average manager in our sample of managers likely to be hired by institutions managed $1,455M million in 240 accounts; the median manager had $345 million in 17 accounts. In general, the average account size for a mutual fund is about one-thousand times smaller than the average or median account size for an institutional money manager.[1]

These managers are not subject to mutual fund regulations since they do not own the securities. Unlike the mutual fund business, their clients typically have many more assets than the manager and directly control the manager. It is common for these managers to give quarterly reports of their performance and other aspects of their business. Unlike mutual funds they do not have to determine the daily value of an NAV since there are no shares to value and the clients can always determine the value of the account. Beyond what is imposed by the clients there are no liquidity requirements, no diversification requirements, no restrictions on leverage or fees, no reporting rules or advertising rules. Most institutional money is from defined-benefit pension funds and is tax-exempt. In our database about 79% of the dollars under management is tax-exempt. The fiduciary standards of ERISA affect these managers since most money is from pensions but the ERISA rules apply to the client not to the manager. All these managers are registered

investment advisors with the Securities and Exchange Commission. The SEC has authority to monitor the softdollar brokers used by many in this industry but the securities laws place no restrictions on the portfolio decisions of these money managers. In short, these money managers are virtually unregulated.

The structure of the institutional money management business is different from the mutual fund business. Using the jargon of LSV, the institutional money management business looks like a "cottage industry". This is partially because pension fund sponsors typically allocate money in a pension plan among many different managers. LSV argue that the allocation decision gives rise to an agency relationship between the individual responsible for the decision and the beneficiaries of better management, which, in turn, affects the performance of the managers. There are several sources of this agency cost. First, the decision-maker will have a bias against passive management because passive management reduces the demand for services produced by the decision-maker. Second, the decision-maker will have a bias toward delegation of assets to external managers since external managers may acquire skills in manufacturing convincing stories and the decision-maker can use the manager as a convenient scapegoat for poor performance. Third, decision-makers try to reduce the risk of delegating assets by hiring consultants who supply analysis based on proprietary manager databases. Mutual fund investors do not typically delegate decision-making to an agent. Indeed, the purpose of a mutual fund is to provide a "retail" finance product that investors can directly use.

The basic hypothesis of this paper, first suggested by Jensen (1968) and formalized by Grossman and Stiglitz (1980), is that, in a competitive market, managers with information not known by other market participants are rewarded by superior performance. Jensen's conjecture is that managers with more assets under their control are able to acquire superior information. If this is not true of the managers in our sample, it casts doubt on the ability of any manager to do so. The argument by LSV that there are agency costs in the relationship between manager and client, suggest two additional hypothesis. First, manager survival may depend on factors that are not related to performance. This suggests the hypothesis that survivorship bias is negligible. Second, manager performance may be non-stationary since managers are trying to construct portfolios that match stories believed by clients. The non-stationarity may occur across time for a given manager, or cross-sectionally for the industry. We examine both sources.

III. Data

A. Institutional Manager Databases

As discussed above, there are no government-mandated reporting requirements for institutional managers. All databases are the result of managers deciding to answer a survey. Since clients routinely prohibit disclosure about individual accounts, managers advertise their track records by advertising the returns on "composite accounts". A composite account is intended to represent the return of a group of account that was managed according to a investment approach often referred to as a "style". The rules for developing an audited composite account are published by the *Association of Investment Management and Research* (AIMR). The returns on the composites are used by clients and their consultants to judge the track record of the managers and they treat a composite as equivalent to a portfolio.[2] Several vendors sell databases of these manager returns and we were able to obtain quarterly reports from June 1993 to December 2003 collected by the Mobius Group. These are the same data as used by Del Guercio and Tkac (2002) who examine a Mobius survey from 1995 to study asset flows. When we refer to a manager, we mean a manager in charge of one portfolio. Individual managers form investment management companies. There are companies with as few as one portfolio and as many as thirty portfolios in our sample.

B. The Mobius Survey

The criteria for being included into the Mobius database is having money under management and being willing to answer the survey[3]. Money managers answer the survey when their clients request it or when they wish to become better known by potential clients. Our sample consists of all managers who identified themselves as domestic equity money managers having full discretion over their accounts and who said they included terminated accounts in their gross return. We call this the "money manager universe". Meeting these criteria were 549 portfolios managing $.57 trillion in June 1993 and 1,782 portfolios managing $2.29 trillion in December 2003.

C. Comparison with Other Samples and Checks on Quality

These data differ from previous studies in several ways. The Mobius Group is primarily in the business of

supplying data and sells its data publicly. Previous studies used consultant data. CFG and CFR use a sample of composite returns from the Frank Russell Company and LSV use composite returns from the SEI Corporation. Neither consultants offers data separately from their consulting service, and it is therefore difficult for other researchers to use these data. Both of these firms supply consulting services to their clients and are not primarily in the business of supplying data. It is their consulting services that must meet a market test and not necessarily their data. In contrast, the Mobius Group must meet a market test with its data since this is its primary product. While consulting data and Mobius data receive internal scrutiny, only data sold on the market meets external scrutiny. Furthermore, the SEI and Russell data are subject to more selection bias than the Mobius data since consultants will screen managers before they allow them into the database. Indeed, selection bias is the reason why consultants can charge fees.

As Brown, Goetzman and Ross [1992] observe, survivorship bias can occur because dead portfolios are excluded from the sample or because the methodology requires funds to exist for a specified period of time. Carhart [1997] calls the former problem *survivor bias* and the later *look-ahead bias*. Our data are free from both sources of bias, but when we report alphas we will be subject to look-ahead bias. Previous studies by CFG, CFR and LSV samples suffer from both sources of survivorship bias.

The Mobius data are collected by a survey and there is no guarantee that the universe of managers will be covered or even that individual managers will report accurately. To check the accuracy, we subjected the Mobius data to two tests. First, ten managers in the Mobius data also managed money for the Virginia Retirement System (VRS). We compared internal records of the VRS to 41 quarters of total returns for the ten managers in the Mobius data. Nine managers reported the same returns to Mobius that they did to the VRS and one manager had discrepancies in two quarters.[4] Second, the managers with the most incentive to misreport are the managers with poor performance. We cross-checked the Mobius data with data produced by the Piper Corporation, a completely independent source. In March 1993 there were 239 managers in the Piper data with ten years (41 quarters) of data and 68 of these managers had the lowest ranking (a ranking of 8, 9, or 10). Of these 68 managers, 50 were in the Mobius data and all fifty had identical returns on each database.

It is worth repeating that in spite of these data checks we are not certain that any data collected by private

firms about institutional money managers will have the same quality as the data reported for mutual funds. If a pension-fund money manager misreports data he risks his reputation but there are few legal consequences[5]. Nevertheless, pension fund money managers must make quarterly reports and presentations to the sponsors of the funds and sponsors hire consultants, such Frank Russell and SEI, who carefully screen managers. Neither practice exists in the mutual fund business. The consulting services offered to clients of institutional investors are prohibited by law in the mutual fund industry.[6] As a result the monitoring activities by mutual fund investors are likely to be less intensive than monitoring by plan sponsors. Since Mobius sells its data to sponsors who also hire consultants it seems reasonable that managers will have the same returns across all databases.

One further data issue concerns the date that the manager entered the database. Ideally we would like to only use return data after the manager entered the database since at this point the track record is coming under increased scrutiny. Elton and Gruber [1992] found that commodity fund returns were higher on average before the inclusion in public databases. Unfortunately, we do not know when the managers first entered the database. Consequently, we do not use data before June 1993, and in tables I and II we focus on data after June 1993. In only using returns after the manager joins the database we appear to be the first study that avoids the problem of using back-filled money manager data.

IV. Returns and Survivorship Bias of the Money Manager Universe

A. Survival Rates

Table I and Figure 1 show the survival rates for the entire database of domestic equity money managers who met the criteria of reporting gross returns (equity plus cash) for a portfolio that includes terminated accounts where the manager has full discretion[7]. A portfolio ceases to exist when it fails to appear in three consecutive surveys.[8] We focus on gross returns because net returns are not reliable. Only about 1/7 of all managers report net returns and it is not clear what it means even when they do. Clients will pay different fees depending on assets and negotiating power. Fees on accounts are not disclosed and it is common in the industry to report "fee schedules" based with breakpoints based on assets. Clients with $25 million accounts pay a much higher fee than clients with $500 million. Given this

lack of data, we only use gross returns in this paper.

[Place Table I here]

As mentioned above, we obtained our first survey in June 1993 and we do not know the inception date of the portfolio. Therefore the birth dates in Table I are only accurate for the reports we received after June 1993. Taken as a whole, the table shows that the number of portfolios is growing over time. The database starts with 549 portfolios and grows to 1,782 portfolios in December 2003. There are 2,148 portfolios created after June 1993 (i.e. the sum of Table I's diagonal cells after 6/93). The largest number of portfolios created in any quarter is 94 in the June 2002 survey, the smallest is 19 in March of 1995. The growth in the database is matched by growth in competitor's databases and is consistent with two facts. First, this industry has maintained its share of the equity market over this time while the equity market experienced an increase in market value. Second, the clients of these managers are continually seeking new ways to build portfolios and this industry has responded to the increased demand for equity "products" or "styles". The increased demand occurs because pension funds are larger and "WRAP" accounts have caused money to move out of mutual funds and into separately managed accounts.

We define "cohort *t*" as the portfolios created in quarter *t*. Table I follows each cohort through December 2003. There is considerable volatility in the survival rates of each cohort. The lowest survival percentage is the March 1994 cohort where 23 of the original 33 portfolios ceased to exist. The highest in Table I are the most recent four cohorts which have a 100% survival rate and the survival rates for the youngest eight cohorts are 90% or greater. Clearly the clients of these managers give the managers some time to show their abilities. Informal conversations with managers and clients reveal that the industry has a practice of giving a manager at least 12 quarters to perform. Table 1 confirms this conjecture. If we look at cohorts with more than 12 quarters, the cohort with the greatest survival rate is March of 2000 with an 80% survival rate followed by December 1997 with a 70% survival rate. When viewed by cohort, the survival rates through December 2003 show considerable volatility.

This is also true of the change in the survival rate which is clearly shown in Figure 1. The data in Table I is

graphed where the Y-axis is the number of portfolios, the X-axis is time and the Z-axis is the quarter that the portfolio is created. Figure 1 demonstrates that cohorts have very different rates of decline across the same time period. The slope of each cohort's surviving portfolios graphed against time in Figure 1 can be estimated by regressing the number of portfolios against a time trend. Every cohort has a negative slope coefficient, significant from zero at the .01 level, and all but seven slope coefficients are statistically different from the *adjacent* quarter's slope[9]. This non-stationarity can be seen in Figure 2 which shows the slope coefficients estimated using all data available for each cohort (in Figure 2A) and the slope coefficients using the first twelve quarters (Figure 2B). The portfolios formed in the period March 1996 through June 1997 survive longer than portfolios formed both before and after. There is considerable volatility in the survival rates for the cohorts formed in 1999 and later. Figures 1 and 2 clearly demonstrate that when a portfolio is formed is an important determinant of the survival rate even though the market return is virtually identical. For example, portfolios formed in March 1994 declined at a rate of half portfolio per quarter (-.49) over the next twelve quarters, while portfolios formed one quarter later (June, 1994) declined at twice this rate (-1.02) over the next twelve quarters, even though eleven of the quarters were common. Taken as a whole, Table I and Figures 1 and 2 demonstrate that survival rates are non-stationary.

Previous studies have reported attrition rates (one minus the survival rate). To allow comparisons, Table II and Figure 3 show the attrition rates per quarter. The average attrition rate per quarter is 1.63% or 6.68% per year. This is larger than the reported mutual fund attrition rates. Carhart, Carpenter, Lynch and Musto (2002) find that the average annual attrition rate for mutual funds is 3.6% from 1962 to 1995 but the attrition rate is probably higher in the later part of their sample. Lunde, Timmerman and Blake (1999) report an attrition rate of 7.5% for UK funds in 1995.

[Place Table II here]

The problem with average quarterly attrition rate per year is that the years are unequal. If we simply divide all the portfolios that exited the sample by all the portfolios that were created, we get an attrition of 42.6 % (From Table I, starting with September 1993 2,148 portfolios were created and 915 portfolios exited). In a sample of U.S. mutual

funds close in time to ours, Zhao (2003) reports that 2,036 portfolios out of 7,500 exited from 1992 to 2001, an attrition of 27%. Regardless of which metric we use, the institutional universe appears to have a higher attrition rate than the US mutual fund industry.

Not surprisingly, the data in Table II show the same non-stationarity as Table I and Figure 1. The largest average attrition rate occurred in the June 2003 cohort (3.7%), the smallest in September 1993 and December 1993 (0.0%). Attrition rates clearly grow over time.[10] The volatile attrition rates over time again suggest that the probability of survival is not stationary. To examine this further we compute the attrition rates by birth quarter. We average the rate down the columns of Table II. Figure 2A shows the results of averaging through December 2003 and Figure 2B shows the results of averaging over the three years following the birth quarter.

The non-stationarity in survival rates is consistent with growing competition in the money management business during the sample period. More portfolios are created, consulting services are growing in importance and the industry is managing more assets during the sample period. Attrition rates tend to be larger in down markets than up markets but the regression of the attrition rates on market excess return is not significant. The largest attrition month (June 2003) has one of the largest quarterly market returns (16.6%).

B. Gross Returns

Table III shows the average gross return of each portfolio by date of the report (rows) and by quarter the portfolio is born (columns). To construct this table we ignored the history of the portfolio before June 1993 and we also ignored returns before the first time a portfolio appeared in the survey. When managers fill out the survey for the first time they commonly bring a track record into the database. We only included data in the quarter that the manager is reporting. This is the data that any purchaser of the survey will see in the quarter that they purchase the data. What they will not see is the history of this number unless they keep old surveys.

[Place Table III here]

The average gross return of all portfolios created (average of the diagonal) is 3.67%. To summarize these data we averaged the return by time across the rows and by birth month down the columns. Figure 4 shows the result. The correlation between these two series is 30.6%. Not surprisingly, the average gross return in each quarter is much more volatile. The quarter ending September 1998 had the highest return, 19.77% while the quarter ending September 2002 had the lowest, -16.92%. June of 2003 had the second best gross return of 17.65%. The average return by birth quarter is influenced by the age of the fund and clearly is higher the more recent quarters. Looking at birth dates from 1993 to 2001, allows portfolios to live three years or more, there is little difference in the average gross return. It appears that, in terms of gross returns, there was no best year to start a portfolio but it was obviously difficult starting portfolios during the bear market of 2000.

We computed the value weighted returns by using the total assets under management in the portfolio. The results were not materially different and we do not report them. The value weighted average return over time had a 99.4% correlation with the equally weighted and the value weighted return by birth month had a 98.3% correlation with the equally weighted series.

To see the effect of survivorship bias on data that clients of this survey use, we computed the bias per quarter in Table IV. We assume that the analyst uses the December 2003 survey and compute the return in each quarter for all funds that survived until December 2003. We then subtract the return of all funds including those that did not survive. Across the whole sample, the bias based on equally-weighted returns is 31.4 basis points. It varies from a high of 109.1 basis points in December 1999 to -33.1 in March 1994. A negative survivorship bias means that the portfolios ceasing to exist have a higher return than the portfolios surviving to December 2003. The survivorship bias is higher than found by Carhart, Carpenter, Lynch and Musto (2002) who compute 8 basis points a month for a one-month survival rule for mutual funds.[11] This is about 96 basis points per year while we find that our sample has a survivorship bias of 126 basis points per year based on a one-quarter survival rule.

[Place Table IV here]

Table IV shows that the value weighted averages display a much smaller survivorship bias than the equally weighted. In all but four out the forty-three quarters (94-03, 96-09, 99-03 and 03-03) the asset-weighted averages are smaller and the average over time is 6.4 basis points whether the average is over time or by birth quarter. Finding that the asset weighted averages show much less survivorship bias than the equally weighted indicates that small exiting composites have considerably smaller returns than small survivors, but large exiting portfolios have returns close to the surviving large portfolios. Clearly the clients of these large managers are eliminating portfolios for reasons other than gross return. This is consistent with the LSV hypothesis that agency costs are important in the industry.

C. Alphas

The key question in this paper is whether institutional equity managers can produce a positive risk-adjusted return excess return. It is well-established that most mutual fund managers cannot. Using an extensive, survivorship-bias free sample Carhart (1997a, 1997b) finds little evidence of positive excess returns. Other recent studies such as Ferson and Schadt (1996), Malkiel (1995), Elton, Gruber and Blake (1996a, 1996b) and many not-so- recent studies going back to Jensen (1965) confirm this general conclusion. However, Wermers (1996), Grinblatt, Titman and Wermers(1995) and Grinblatt and Titman(1993) take issue with the conclusion that no decision rule results in abnormal returns by examining mutual fund portfolio weights under the assumption that they are constant over a quarter. These studies generally find that the best performers persist and that active management adds value. This is also the conclusion of all previous studies of pension fund money managers.

We choose three sets of benchmarks for this study. First, we compute the Jensen alpha using the SP500 since this is a benchmark commonly used in the industry. Second, managing a portfolio according to an investment "style" first became popular in this industry so we measure the returns relative to the style indices proposed by Gruber (1996). Third, following Fama and French (1993), Carhart (1997), and numerous others we use the Fama-French benchmark portfolios. The exact models are listed below:

Jensen model:

(1) $$r_{pt} - rf_t = \alpha + \beta(SP500_t - rf_t) + \varepsilon_t$$

Style model *(see Gruber [1996]):*

(2) $$r_{pt} - rf_t = \alpha + \beta_1(SP500_t - rf_t) + \beta_2(Size_t) + \beta_3(Value_t) + \beta_4(Bond_t) + v_t$$

Fama-French

(3) $$r_{pt} - rf_t = \alpha + \beta_1(R_{mt} - rf_t) + \beta_2(SMB_t) + \beta_3(HML_t) + \beta_4(momentum_t) + v_t$$

where

r_{pt} = the total return for portfolio *p* over quarter *t*

rf_t = the total return for Merrill Lynch 91 T-bill return over quarter *t*

$SP500_t$ = the total return for the SP500 over quarter *t* (dividends reinvested when paid.)

$Size_t$ = the total return of the Russell 1000 less the Russell 2000 over quarter *t*

$Value_t$ = the total return of the Russell 3000 Value less the Russell 3000 Growth over quarter *t*

$Bond_t$ = *Lehman Brothers Government Corporate Index*$_t$ - rf_t

R_m = return on the value weighted CRSP index

SMB, HML, and momentum are the returns on a value-weighted, zero-investment portfolio representing size, book to market equity, and one year momentum in stock returns. We separate the effects of momentum from the other Fama-French variables since some readers may not believe that managers should be penalized for momentum.

Table V shows the average alpha of all funds using five benchmarks. The highest alphas are the Jensen alpha using the SP500. The funds earned a mean 65 basis points per quarter and a median 36.1 basis points per quarter. Looking at Jensen alphas that are significant at the 10% level, the average is 31.5 basis points and a median is zero. LSV stated that institutional managers are often judged against the SP500 and this is the reason that LSV used the index as their sole benchmark. Given the intense monitoring of these managers it is not surprising that they find ways to beat this index. The next few indices show how they do this.

[Place Table V here]

The mean alphas using FF3 are less than half of the mean SP500 alphas indicating that these managers are

using both size and book-to-market to earn a higher return than the benchmark they are measured against. The largest change is with FF4 which shows that size, book-to-market and momentum taken together completely eliminate the value added of these portfolios. If net returns were disclosed, these alphas would be negative[12]. Clearly, the answer to the key question on whether these managers add value depends on whether they should be penalized for taking momentum bets.

The table also shows that the kurtosis and skewness of the FF3 and FF4 alphas is higher than the SP500 alphas. This is also consistent with the SP500 being an important index for monitoring the portfolios while FF3 and FF4 are not. The managers are taking bets that influence the distribution of FF3 and FF4 alphas without having as large an effect on SP500 alphas. The SP500 alphas have a cross-sectional correlation of about 58% with FF3 alphas and a 40% correlation with FF4. The SP500 alphas clearly represent different factors.[13] Taken as a whole, these managers are clearly producing returns that beat the SP500 by using well-known asset pricing factors.

Figure 5 shows the frequency and cumulative distribution of the FF4 alphas. The alphas are centered on zero and most managers cannot beat a FF4 benchmark but the tails are large. For example 19% of the sample earned more than 96 basis points per quarter after taking the market, size, book-to-market and momentum – and survivorship bias- into account.

D. Time Variation

One of the hypotheses of this paper is that the institutional structure of this industry implies that the history of the industry will matter and the key variables will not follow a stationary process. We find substantial evidence of this in survival rates. This suggests that there will be time variation in the alphas. In estimating time variation, we cannot use statistical techniques that rely on large samples since we only have 43 quarters. Moreover conditional alphas require specification of variables that investors consider relevant. To account for non-stationarity, we use a time-varying regression technique called "flexible regression" (FLS) developed by Kalaba and Tesfatsion (1989) and Lutkepohl and Herwartz (1996) that avoids these problems. In the terminology of Lutkepohl and Herwartz (1996) we use the "standard form" of the model which assumes that the regression coefficient vector, b_t, evolves continuously over time in the linear model $y_t = x_t'\beta_t + \varepsilon_t$ where x_t is the $K \times 1$ vector of values of the independent variable at

time t and ε_t is the error term with $E[\varepsilon_t] = \text{cov}(\varepsilon_t, \varepsilon_{t-j}) = 0$, and $\text{var}(\varepsilon_t) = \sigma^2$. There are two sources of error: *measurement error* is the (usual) difference between the dependent variable at time t, y_t, and its predicted value defined as:

$$sse = \sum_{t=1}^{T} [y_t - x_t' \beta_t]^2 \tag{4}$$

dynamic error is the sum of squared changes in the coefficient vector from time t to time $t + 1$.

$$ssd = \sum_{t=1}^{T} [\beta_{t+1} - \beta_t]' [\beta_{t+1} - \beta_t] \tag{5}$$

To estimate the model they propose minimizing a weighted sum, $\gamma sse + (1 - \gamma) ssd$, where the user supplies the weight $\gamma \in (0, 1)$. Following Lutkepohl (1993) and Tesfatsion and Viech (1990), we weight the two sources of error equally, $\gamma = .5$. Our purpose is to estimate the time-varying regression coefficients as a description of how the coefficient vector evolves over time in a manner that equally balances the two types of errors.[14]

Kalaba and Tesfatsion show that the collection of all possible weighted sums attainable at time N, {sse, ssd $|\beta, N$}, is contained by a lower envelope that is bounded away from the origin. If time variation in betas exists, there is an optimal combination of the two errors that will minimize the variation below the standard OLS solution. Nevertheless, Lutkepohl and Herwartz (1996) demonstrate that the model will find variation in betas when the true betas are constant since specifying the second error term forces periodicity on to constant betas (Also see Rao (2000)). Thus, if there are no *a priori* reasons to believe that coefficients vary, the technique may reduce the explanatory power of a regression model. However, there is no shortage of studies that show that mutual fund betas and alphas are time-varying and tables I-III clearly suggest that time-variation exists in the institutional management industry. Lutkepohl and Herwartz (1996) show that if the betas are periodic, the second error term will capture it well even if the periodicity is combined with a discontinuous shift.

Table VI shows the average flexible alphas for each of the models. We estimated the models for portfolios with at least 11 observations which gave us a sample size of 1,836. The flexible regression model gives us as many alphas as time periods so we averaged the alphas for each portfolio by using equal weights (EW) or asset weights (VW). For brevity we report only SP500, FF3 and FF4 results.

[Place Table VI here]

Mobius only collects assets as of December so we used the annual assets in the year before the alpha occurred. Using the assets in the same year over-weights the alphas because of a positive flow-performance relationship. Table VI shows that the average flexible alpha is smaller than the corresponding OLS alpha in Table V whether value weighted or equally weighted. This is especially true of the FF3 alphas which are insignificant from zero in Table VI while significantly positive in Table V. The FF3 and FF4 alphas are smaller than their standard errors whether equally weighted or value-weighted. The EW and VW time-varying Jensen alphas are significantly different from zero and from the OLS alphas for the entire sample period[15]. VW time-varying alphas are significantly smaller than EW time-varying alphas. The largest of the Fama French four factor model betas is beta one. It is close to one as expected for the population of equity managers.

It is clear from Table VI that alphas are time varying. In each quarter we average 1,836 alphas for each definition of alpha and then graph them along with the cumulative return of the SP500. Figure 6 shows the result. The most striking feature of Figure 5 is the variation in the Jensen alpha versus the comparable flatness of the Fama-French alphas. The Fama French alphas are close to zero while the Jensen alphas vary from -3.08% in March 1998 to 3.28% in September 2000. This is a range that is ten times the variation of the Fama French alphas. The Fama French alphas are highest in June 1993 (40 basis points for FF3 EW and 26 basis points for FF4 EW) and lowest in March 2003 (-28 basis points for FF3 EW and -21 basis points for FF4 EW). For all alphas, the equally-weighted alphas are always larger (in absolute terms) than the value weighted indicating that small portfolios are earning higher returns than the larger.

Figure 5 corroborates the finding of Table VI showing that alphas have substantial time variation. The average over time of each alpha is insignificant from zero but the average masks the obvious fact that in the mid 1990's managers did poorly relative to the SP500. When the market boomed, managers had trouble keeping up. But when the market crashed, managers did very well relative to SP500 by using the factors SMB, HML and momentum.

To determine whether the managers of the $2.5 trillion in these portfolios added value, we suppose that clients do not believe that SMB, HML and momentum should be included in the benchmarks used to judge managers

and that they judge managers based on their Jensen alpha. We go long on the value-weighted average of all managers and short on the SP500. The cumulative difference is shown in Figure 7. The solid line is the cumulative return on this portfolio. [16] The line is approximately zero until December 1996 and then increasingly falls until December 1999 when it begins to rise as managers begin to outperform the SP500. The net result is about zero. This implies that the value added over the SP500 at the end of the sample is roughly equal to the value subtracted by the average manager at the beginning.

V. Conclusions

With few exceptions, published studies of delegated portfolio management have focused on the mutual fund and hedge fund segments of the money management industries. The lack of data has prevented researchers from examining the pension fund/endowment fund portion of the business. The studies that do exist use much smaller samples than in the mutual fund industry and are subject to more severe biases than mutual fund data. These studies come to different conclusions than studies of the mutual fund industry. Three of the four existing studies find that pension fund/endowment money managers earn abnormal returns. In contrast, no mutual fund has concluded that the industry on average earns abnormal returns.

The purpose of this study is to present the results of analyzing a large survivorship-bias free sample of money managers comparable in size and biases to the studies of mutual funds. We have obtained 43 surveys from June 1993 to December 2003 from the Mobius Group, one of the primary vendors of money management data, which reports returns and numerous other characteristics of institutional managers. As far as we can tell neither the consultants for pension funds nor the pension funds themselves have data that are survivorship bias free. We cross-check the returns with another commercially available database and a private source of return data. We examine the returns and longevity of every money manager in these data who had full discretion over their accounts.

On average, 1.63% of all portfolios cease to exist each quarter. The survival rate, defined as the number of quarters a portfolio exists, is lower than in the mutual fund industry depends on the date the portfolio is created. This implies that the probability of survival varies over time, indicating that the birth and death stochastic process is not

stationary. Examining the average gross return, we find a 31.4 basis point bias per quarter due to survivorship. When portfolios are weighted by their assets, this number reduces to 6.4 basis points.

We use the SP500 and the Fama-French three and four-factor model to compute alphas of all funds. The highest alphas are the Jensen alpha using the SP500 with the portfolios earning a mean 65 basis points per quarter and a median 26 basis points per quarter. Given the intense monitoring of these managers who are often measured against the SP500, it is not surprising that they find ways to beat this index. The mean alphas using the Fama French three factor model are less than half of the mean SP500 alphas indicating that these managers are using both size and book-to-market to earn a higher return than the benchmark they are measured against. The largest change is with FF4 which shows that size, book-to-market and momentum taken together completely eliminate the value added of these portfolios. If net returns were disclosed, these alphas would be negative. Clearly, the answer to the key question on whether these managers add value depends on whether they should be penalized for taking momentum bets.

We examine the time variation of the alphas for each model using a technique that allows alphas to continuously change each quarter. We find the average alpha falls for each model, using equally-weighted and asset-weighted averages for each firm. If we average the alphas cross-sectionally for each quarter, the average alpha over time is insignificant for each model. The pattern of the average cross-sectional alphas shows that these managers had positive alphas when the return on the SP500 was negative. We show that the cumulative return of a simple arbitrage portfolio of going long on the asset-weighted manager and short on the SP500 is roughly zero, although if the portfolio started in 2000 the strategy would produce positive returns.

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Table I: Porfolio Creation and Survival

The number of portfolios counted are domestic equity portfolios where the managers report gross returns, have included terminated accounts and have full discretion over the assets.
The columns are the dates the portfolios first appear in the Mobius survey. The rows are the dates of the survey.

| | Date a Portfolio is Created | | |

Table II: Attrition Rates

The attrition rates below are for domestic equity portfolios where the manager has full discretion, reports gross returns and includes terminated accounts. The columns are dates that the portfolio first appears in the Mobius survey. The rows are the dates of the survey .

| | Date a Portfolio is Created | | |

Table III: Equally Weighted Gross Returns

These the average gross return for domestic equity portfolios have included terminated accounts and have full discretion over the assets.

The columns are the dates the portfolios first appear in the Mobius survey. The rows are the dates of the survey.

| | Date a Portfolio is Created | | |

Figure 1: Portfolio Creation and Survival

This is a graph of Table I showing the number of portfolios remaining by each "cohort" at each date. We define "cohort *t*" to be the portfolios created in quarter *t*. We start with the September 1993 cohort (quarter 1) and follow the portfolio until December 2003 (period 42).

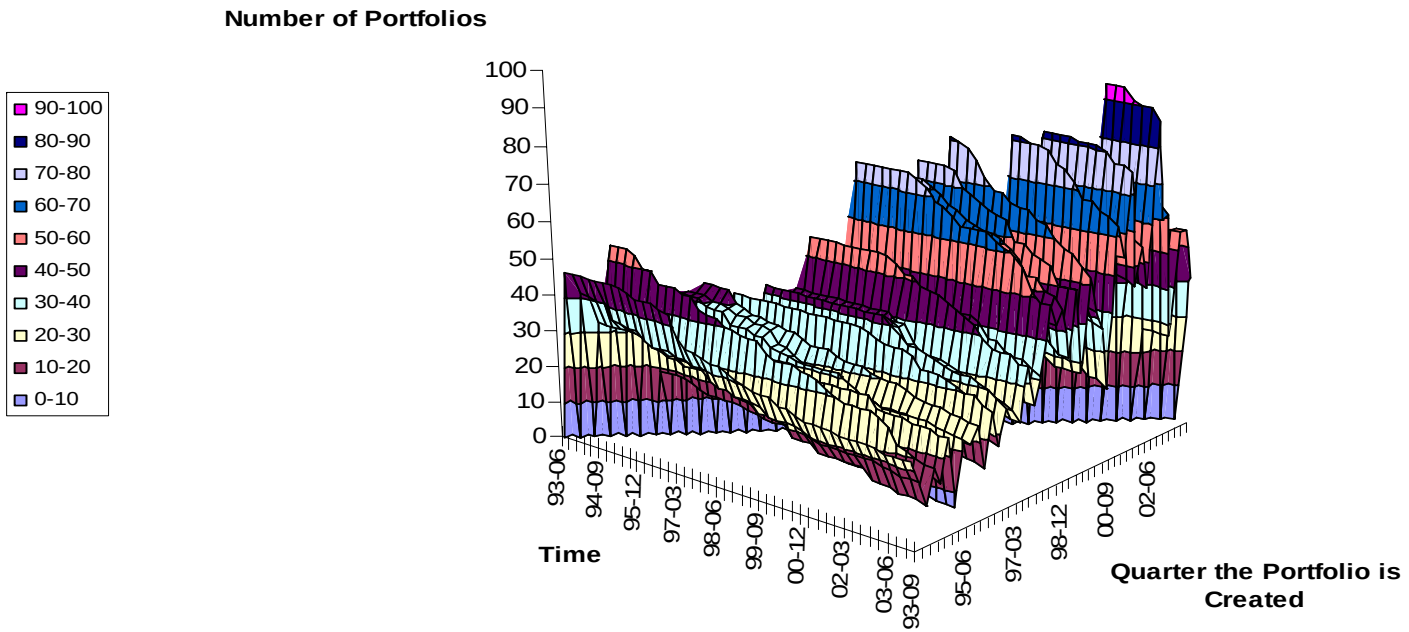
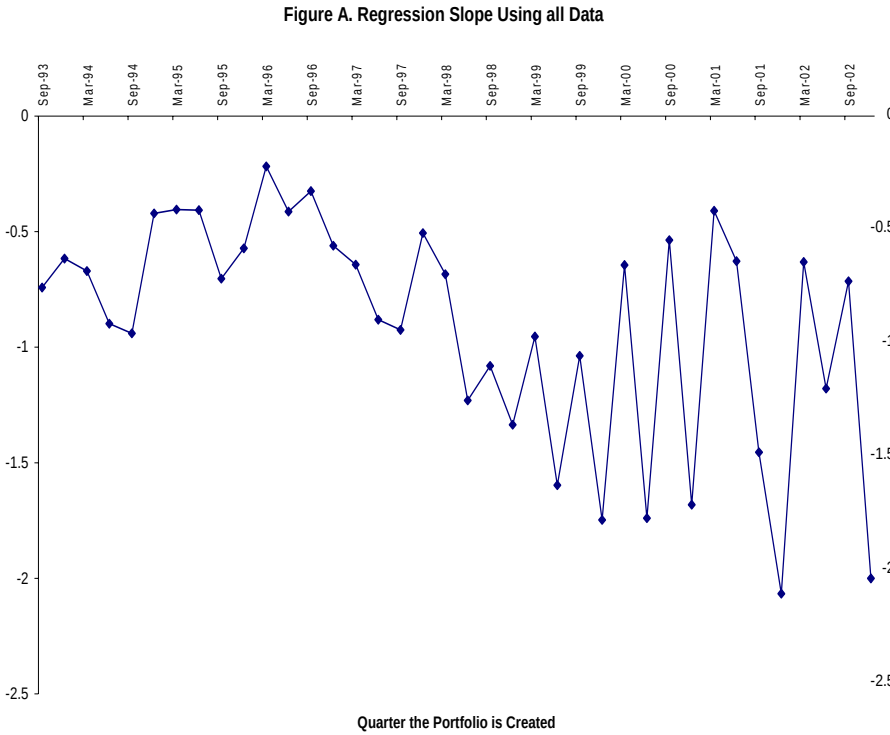


Figure 2: Regression Slope of the Number of Portfolios Against Time

These figures report the slope of a regression using the columns of Table I as the dependent variable and a time trend as the independent variable. Figure A uses all the data available for each cohort. Figure B uses only the first twelve quarters. For both figures, all non-zero numbers are statistically significant from zero at the .01 level. For Figure A all numbers are significantly different (at the .01 level) from the adjacent coefficient except for December 1994, March 1995, June, 1995, June 1996, Sept 1997, June 1998 and September 1998.



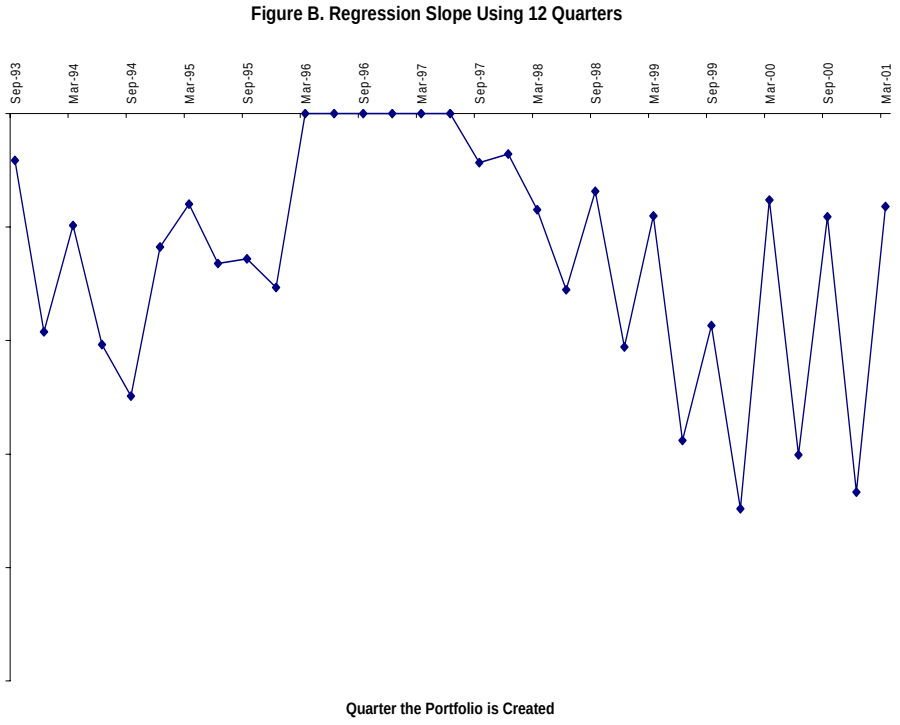


Figure 3: Attrition Rates by Birth Quarter

The attrition rate for quarter *t* is all portfolios lost divided by all portfolios that existed in t-1. Below are attrition rates over time for domestic equity portfolios that report a gross return, include terminated accounts and have assets that the manager has full discretion. For Figure A we averaged the values of the *columns* of Table II and report the averages by birth quarter. The number of quarters in the average declines with each birth quarter. In Figure B we averaged the columns of Table II for *12 quarters only* holding constant the number of quarters. The most recent birth quarter in Figure B is December 2000.

Figure A: Attrition Rates through Dec. 2003 by Birth Quarter

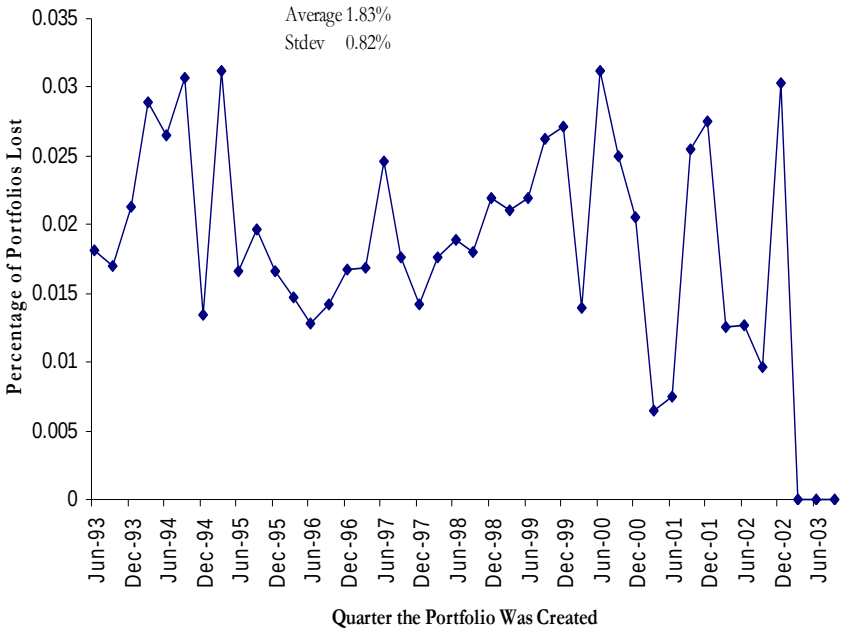


Figure B: Attrition Rates through First 12 Quarters by Birth Quarter

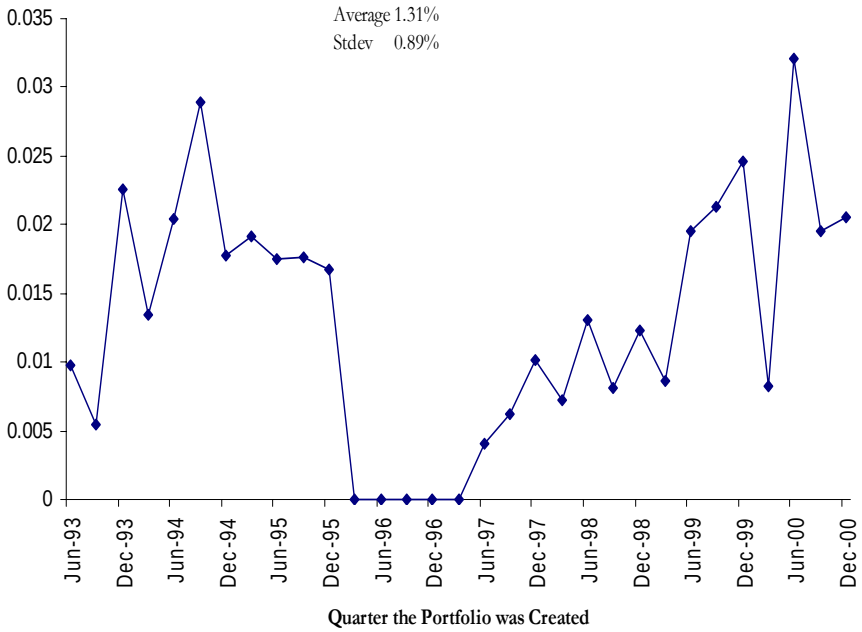


Figure 4: Average Gross Returns

The averages are of the columns (average return by birth quarter) and rows (average return per quarter) of Table III. The criteria for inclusion are domestic equity portfolios that report a gross return, include terminated accounts and have assets that the manager has full discretion. The data are scaled in percent per quarter.

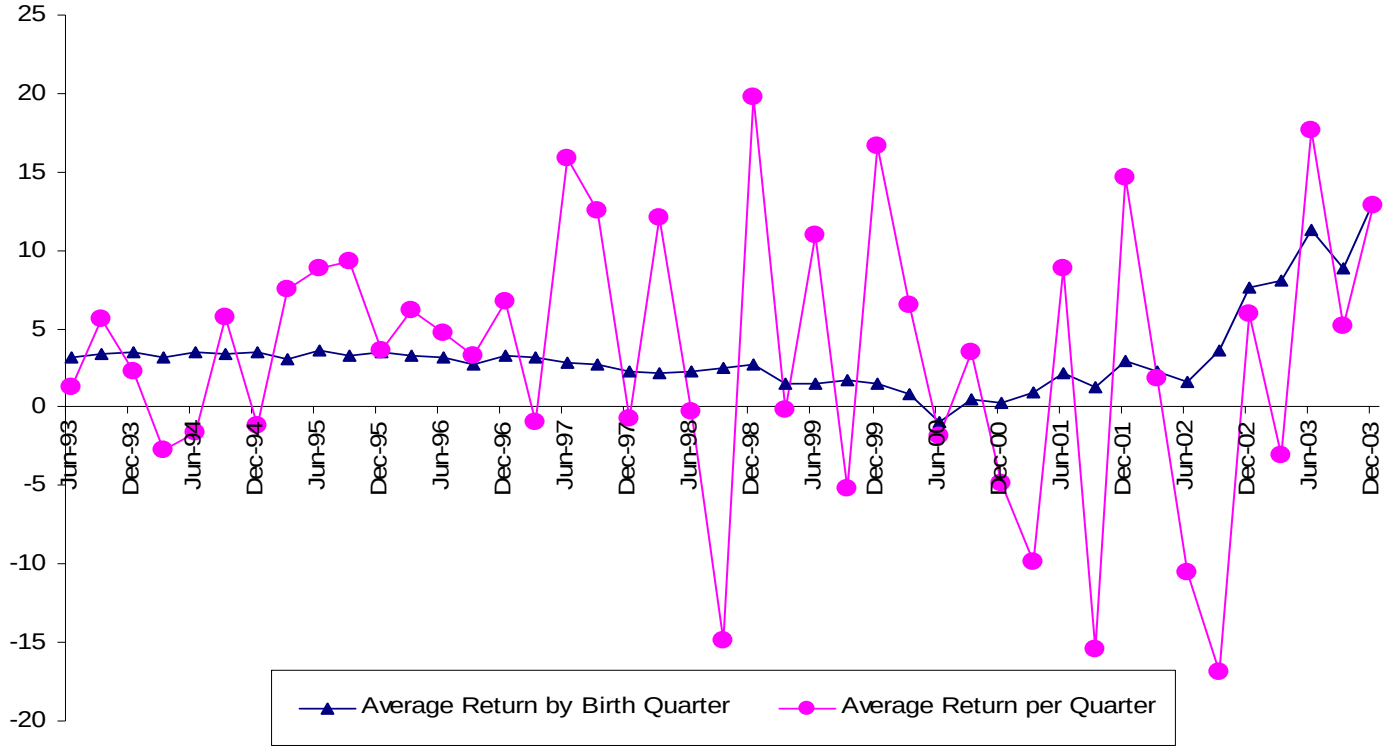


Table IV: Survivorship Bias in Gross Returns

Average survivorship bias per quarter is defined as biased average less unbiased average. Using gross returns for portfolios that managers have full discretion and include terminated accounts. The bias is computed as of December 2003. The return of the portfolios that ceased to exist is subtracted from the return of the surviving portfolio.

Date	Equally Weighted Average Over Time	Asset Weighted Average Over Time	Equally Weighted Average Over Birth Quarter	Asset Weighted Average Over Birth Quarter
93-06	0.347	0.003	0.191	0.087
93-09	0.754	-0.019	0.279	0.048
93-12	0.351	-0.012	0.239	0.119
94-03	-0.331	0.001	0.146	0.147
94-06	0.566	0.082	-0.009	-0.036
94-09	0.711	-0.090	0.685	0.371
94-12	0.330	0.036	0.248	0.169
95-03	0.626	0.081	0.671	0.226
95-06	0.916	0.029	0.512	-0.021
95-09	0.738	0.081	0.071	0.051
95-12	0.250	0.108	0.099	0.025
96-03	0.304	0.050	0.203	0.456
96-06	0.316	0.017	0.174	0.219
96-09	0.036	0.053	0.344	0.177
96-12	0.226	0.072	0.176	0.084
97-03	-0.029	-0.077	0.185	0.016
97-06	0.660	0.137	0.213	0.285
97-09	0.389	0.106	0.392	0.136
97-12	0.006	-0.035	0.191	0.042
98-03	0.317	0.165	-0.004	-0.256
98-06	0.157	0.040	0.374	-0.056
98-09	-0.117	-0.129	0.285	0.079
98-12	0.714	0.144	0.275	-0.207
99-03	0.168	0.186	0.327	0.017
99-06	0.497	0.048	0.121	-0.024
99-09	0.336	0.154	0.067	0.002
99-12	1.091	0.740	0.219	0.106
00-03	0.508	0.143	0.480	0.092
00-06	0.118	-0.012	0.319	0.143
00-09	0.427	0.009	0.445	0.125
00-12	0.367	0.112	0.244	0.005
01-03	0.300	0.199	0.053	0.005
01-06	0.334	0.039	0.061	0.003
01-09	0.121	0.043	0.185	0.010
01-12	0.137	0.086	0.166	0.053
02-03	0.280	0.046	0.054	-0.002
02-06	0.227	0.038	0.062	0.001
02-09	0.017	-0.021	0.014	-0.001
02-12	-0.007	0.036	-0.036	-0.003
03-03	-0.031	0.000	0.000	0.000
03-06	0.041	0.001	0.000	0.000
03-09	0.006	0.000	0.000	0.000
Average	0.314	0.064	0.208	0.064
Median	0.310	0.041	0.188	0.033

Table V: Alphas of All Portfolios

The statistical models for determining the quarterly alphas are as follows.

SP500: $R_{it} - R_{91DayTbill,t} = \alpha + \beta(R_{SP500,t} - R_{91DayTbill,t}) + \varepsilon_t$

Style: $R_{it} - R_{91DayTbill,t} = \alpha + \beta(R_{SP500,t} - R_{91DayTbill,t}) + b_2(Size_t) + b_3(Value_t) + b_4(Bond_t) + \varepsilon_t$

FF2: $R_{it} - R_{91DayTbill,t} = \alpha + \beta(R_{SP500,t} - R_{91DayTbill,t}) + b_2(SMB_t) + \varepsilon_t$

FF3: $R_{it} - R_{91DayTbill,t} = \alpha + \beta(R_{SP500,t} - R_{91DayTbill,t}) + b_2(SMB_t) + b_3(HML_t) + \varepsilon_t$

FF4: $R_{it} - R_{91DayTbill,t} = \alpha + \beta(R_{SP500,t} - R_{91DayTbill,t}) + b_2(SMB_t) + b_3(HML_t) + b_4(Momentum_t) + \varepsilon_t$

"FF" refers to Fama French. The "Size", "Value" and "Bond" variables are defined in Elton-Gruber. All numbers are quarterly. There are 2,133 portfolios with at least 8 quarters of returns. In panel B alphas insignificantly different from zero (at 10 percent) are replaced by zero.

Panel A: All Equally Weighted Alphas

	SP500	Style	FF2	FF3	FF4
Mean	0.650	0.499	0.350	0.273	0.037
Standard Error	0.040	0.032	0.034	0.030	0.034
Median	0.361	0.285	0.281	0.192	0.016
Mode	4.169	3.223	2.143	2.028	0.587
Standard Deviation	1.855	1.494	1.561	1.366	1.550
Kurtosis	2.836	4.806	3.807	5.692	4.597
Skewness	0.744	0.780	0.234	0.680	0.581
Minimum	-6.555	-6.121	-7.480	-7.388	-7.276
Maximum	12.384	10.788	10.260	9.629	10.761

Panel B: Equally Weighted Alphas Significantly Different From zero

	SP500 _sig	Style_sig	FF2_sig	FF3_sig	FF4_sig
Mean	0.391	0.235	0.151	0.135	0.029
Standard Error	0.033	0.023	0.022	0.021	0.020
Median	0	0	0	0	0
Mode	0	0	0	0	0
Standard Deviation	1.510	1.066	1.011	0.972	0.939
Kurtosis	8.628	18.688	22.064	24.426	26.483
Skewness	2.052	2.976	2.179	2.778	1.786
Minimum	-6.555	-6.121	-7.480	-7.388	-7.276
Maximum	12.384	10.788	10.260	9.629	10.761

Panel C: Asset Weighted (VW) Alphas for All portfolios

	SP500	Style	FF2	FF3	FF4
Avg Asset Weighted Mean	0.521	0.421	0.504	0.368	0.309
First Asset Weighted Mean	0.425	0.334	0.374	0.226	0.186
Last Asset Weighted Mean	0.799	0.620	0.738	0.568	0.432

Figure 5: Cross-Sectional Distribution of FF4 Alphas

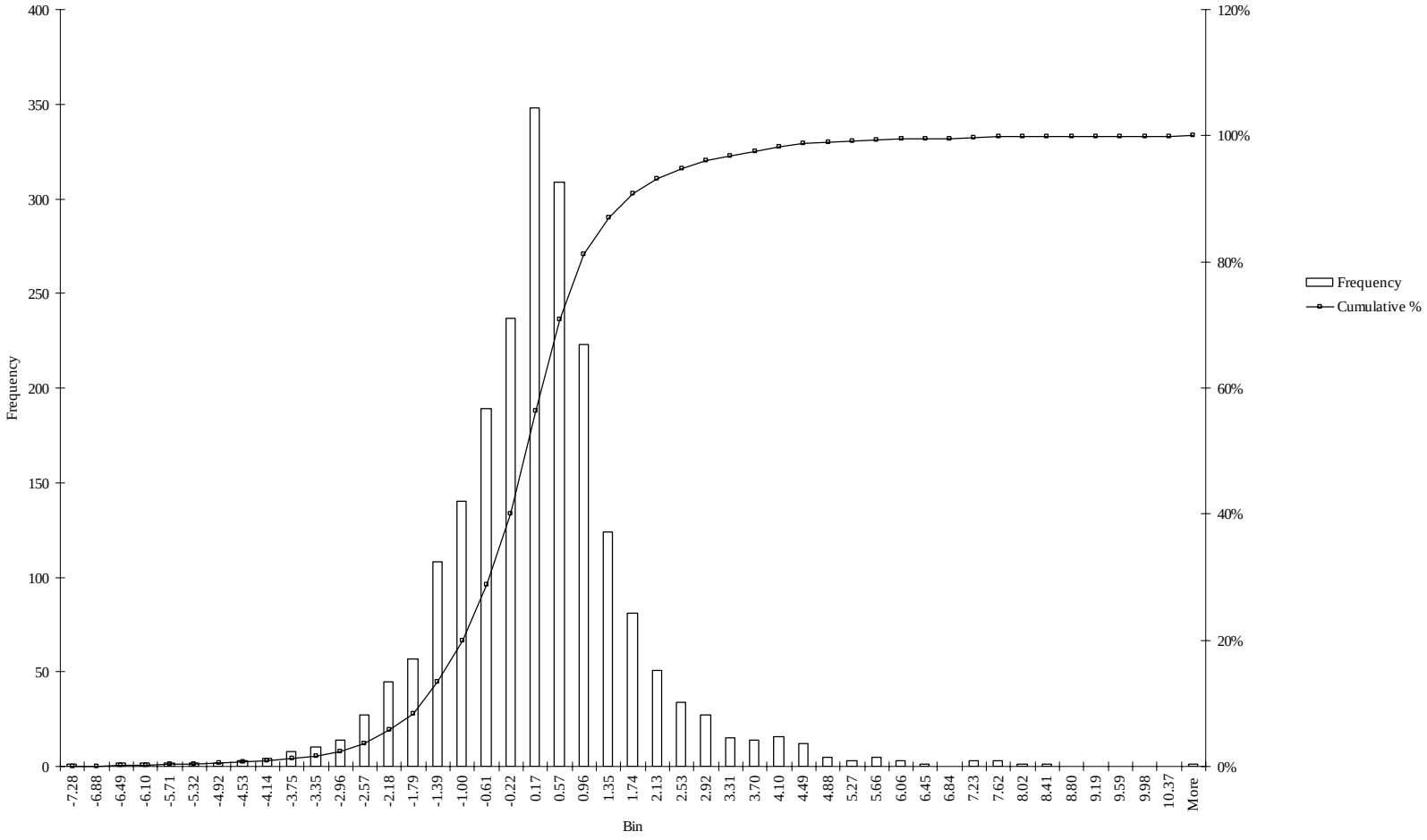


Table VI: Flexible Alphas

The models used to compute alphas are for portfolio *i* :

SP500: $R_{it} - R_{91DayTbill,t} = \alpha_{it} + \beta_{it}(R_{SP500,t} - R_{91DayTbill,t}) + \varepsilon_t$

FF2: $R_{it} - R_{91DayTbill,t} = \alpha_{it} + \beta_{it}(R_{SP500,t} - R_{91DayTbill,t}) + b_{2it}(SMB_t) + \varepsilon_t$

FF3: $R_{it} - R_{91DayTbill,t} = \alpha_{it} + \beta_{it}(R_{SP500,t} - R_{91DayTbill,t}) + b_{2it}(SMB_t) + b_{3it}(HML_t) + \varepsilon_t$

FF4: $R_{it} - R_{91DayTbill,t} = \alpha_{it} + \beta_{it}(R_{SP500,t} - R_{91DayTbill,t}) + b_{2it}(SMB_t) + b_{3it}(HML_t) + b_{4it}(Momentum_t) + \varepsilon_t$

Flexible regression is used for each portfolio to estimate the time-vaying parameters. There are as many coefficients as there are time periods and we average the resulting alphas first across time series, then across portfolios using equal weights (EW) and assets (VW). There are 1,836 portfolios with 11 or more observations. The statistics for alphas below are cross-sectional with 1,836 observations. We report the OLS Jensen alpha (SP500) for comparison.

Panel 1: Alphas

	SP500 EW FLS	SP500 VW FLS	OLS SP500	FF3 EW FLS	FF3 VW FLS	FF4 EW FLS	FF4 VW FLS
Mean	0.547	0.227	0.676	0.048	0.127	-0.014	0.161
standard error	0.062	0.064	0.042	0.035	0.035	0.037	0.037
min	-13.47	-13.47	-6.56	-11.96	-11.96	-7.27	-7.25
1 percentile	-6.08	-7.02	-3.56	-3.86	-3.83	-4.37	-4.38
25 percentile	-0.74	-0.84	-0.30	-0.68	-0.75	-0.75	-0.81
Median	0.20	0.23	0.36	0.03	0.00	0.03	0.00
75 percentile	1.49	1.90	1.43	0.69	0.64	0.65	0.63
99 percentile	8.80	8.20	6.26	4.31	4.32	4.87	4.84
Maximum	16.83	14.54	12.38	11.20	11.21	11.83	11.83

Panel 2: Fama-French-4 (FF4) AverageBetas

	Beta1	Beta2	Beta3	Beta4
EW Betas	0.9286	0.2130	0.0497	0.0561
VW Betas	0.9544	0.0157	0.0225	-0.0002

Figure 6: Average Flexible Alphas Over Time

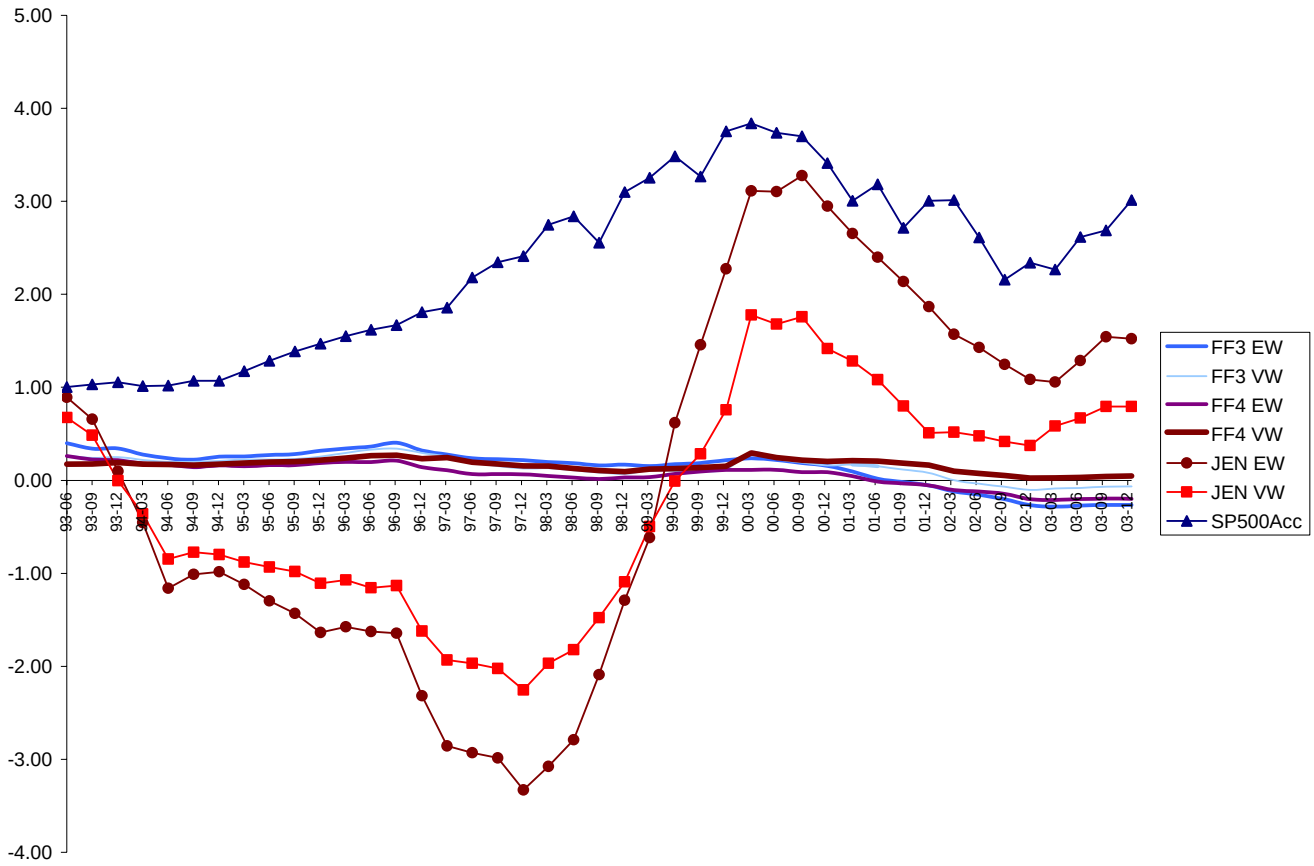
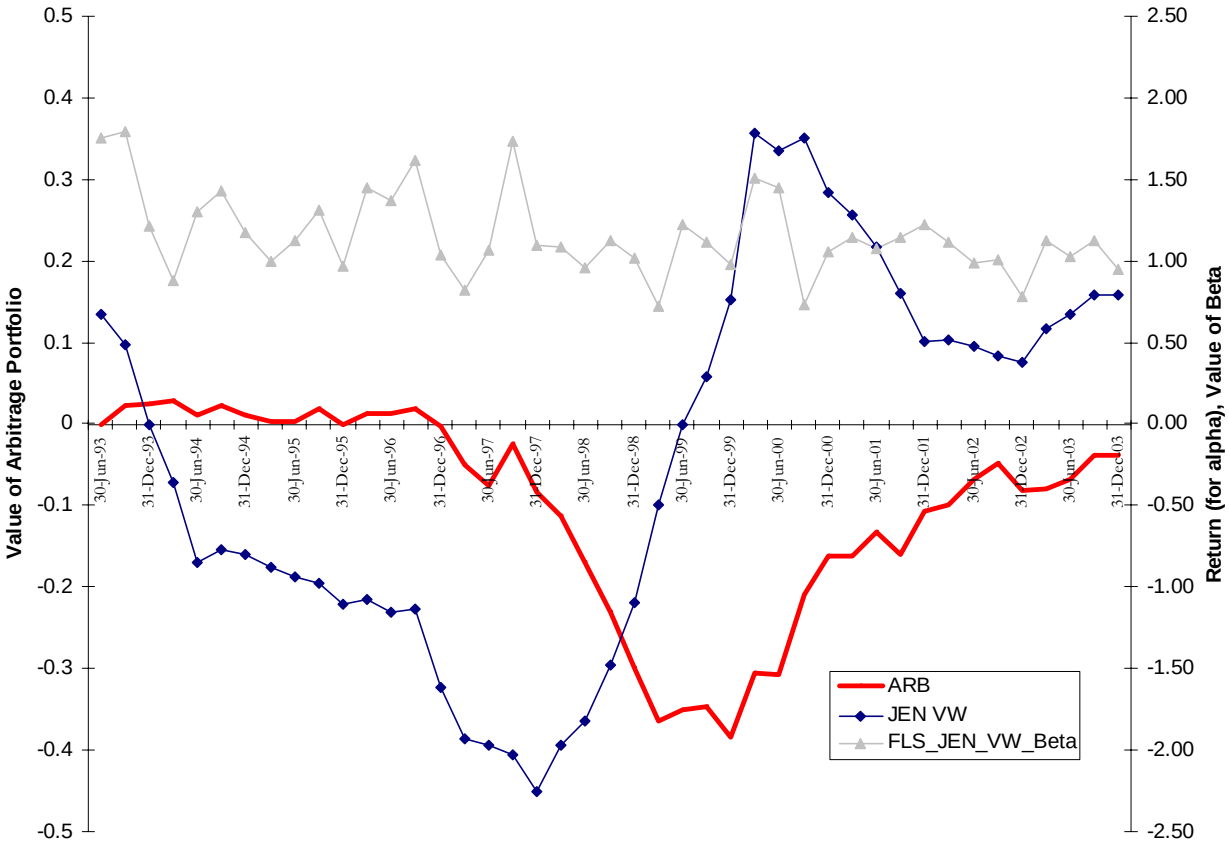


Figure 7: Arbitrage Portfolio Return: Long Value Weighted Managers, Short SP500



Endnotes

[1]The average (median) minimum investment in 2003 for our sample is $8.9 ($5M). While the average account size for a mutual fund is about $28,000 in 2003 according to the *Mutual Fund Factbook,* Investment Company Institute.

[2] Since 1993, it has been the practice of all large pension sponsors to require that managers are "AIMR compliant" but we do not know the percentage of composites that actually are. Mobius asserts that "83% follow AIMR rules". The fact that clients in this industry do not force all managers to follow rules in constructing the composites is evidence that agency costs are important in the client-manager relationship.

[3] Mobius Group, Inc., now wholly owned by Checkfree Investment Services, Inc. was founded in 1989 by Robert Padgette, who previously ran the Consulting Services Group for Kidder Peabody, Inc. Mobius Group currently has about 1,500 subscribers including the NYNEX, Air Products & Chemicals, BellSouth, the Virginia Retirement System; and the consulting groups of the brokerage firms Wheat First Securities, Legg Mason, and Kemper Securities. Mobius Group is located in Research Triangle Park, NC.

[4]Neither the manager nor Mobius could identify the source of the error. Mobius asks managers for their most current numbers but managers will occasionally revise their data. The manager admitted that this may have happened. Finally, note that these ten managers are probably not a random sample. We thank the Virginia Retirement System for their cooperation. It is worth noting that the Virginia Retirement System attempts to choose the best managers and if their selection process has some information content their managers will not be randomly selected from the population of all managers.

[5] We also have examined the internal consistency of the database by calculating a revision statistic for the reported returns. Mobius publishes a panel data every quarter, in which each manager enters time series of returns. By

examining returns reported in consecutive panels we can see if a manager revises a previously published return. We find very few clerical errors among revisions. The median (average) revision is 0.3 basis points (2.4 basis points). If we count all returns ever published for our sample including the duplicate returns from later panels, we find that about five percent of these returns are revised.

[6]Section 22d of the Investment Advisers Act of 1940 prohibits mutual fund share from being sold at different prices. This prohibits investors from negotiating the price of a broker's service and makes the broker a client of the mutual fund not of the investor. See Protecting Investors: A Half Century of Investment Company Regulation, United States Securities and Exchange Commission, 1992, chapter 8 for a discussion of this section of the Act and a recommendation (on page 291) to eliminate it. The Commission has not acted on this recommendation as of this writing.

[7] We eliminated portfolios in the Mobius surveys that identified themselves as a mutual fund, co-mingled fund, representative account, model portfolio, or back-tested portfolio. This constraint eliminated about 13% of the responses.

[8] Managers who miss a survey for three consecutive quarters are assumed to exit at the end of the quarter of the last reported return. We use the Mobius "FPVR"- a unique identifier which ends when the portfolio liquidates, merges or is split off. Mobius makes the decision to whether the FPVR ends. We rely on Mobius because these decisions must meet the market test. If clients do not think their decisions accurately represent the attrition rates in the industry, they will use a competing database.

[9] The slope coefficients for the following cohorts are statistically the same as the adjacent slope: December 1994, March 1995, June 1995, September 1997, June 1998 and September 1998.

[10] Regressing attrition rates on time, the R^2 is 45%, the slope is significantly positive with a p value of .00001.

[11] A m-period survival rule causes portfolios of at least m-periods old to disappear if the sum of their returns over the preceding m years falls below some threshold value. Note that using this rule for the whole sample of portfolios assumes that the return process is stationary which is clearly not the case with our data.

[12] A conservative estimate of fees for our sample is 58 basis points per year.

[13] The first eigen value of the matrix is 3.1, the second is .47, the third is .30 and the fourth is .12, indicating there is one large factor and several small ones. The elements of the eigenvectors indicate that the second factor is momentum.

[14] Flexible regression is not a random coefficient model. Kalaba and Tesfatsion (1989) argue that random coefficients are explicitly excluded from the development of the model. However, Lutkepol (1993) shows that the solution algorithm may be interpreted as the coefficient values that maximize the conditional density $g(\beta_1, ..\beta_T | y_1,\ldots,y_T)$ assuming that $g(\beta_1)$ is a constant.

[15] For robustness test we split out sample in two parts. The first sample runs before the quarter three 1999, while the other sample runs after the quarter three, 1999. We calculated the OLS Jensen alphas for the two samples separately and found that split sample alphas on average have the same sign as an average FLS Jensen's alpha for either of the two split periods.

[16] For quarter M, the cumulative return from the first quarter is $\sum_{t=1}^{M}\left(\alpha_t - \beta_t r_F + (\beta_t - 1)R_{SP500,t}\right)$.