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# The Effects of Mutual Fund Managers' Characteristics on Their Portfolio Performance, Risk and Fees

Joseph H. Golec

*The purpose of this study is to test whether a mutual fund managers' characteristics help to explain fund performance, risk and fees. The statistical tests consider performance, risk and fees simultaneously to avoid biased results produced by earlier studies that ignore simultaneity. Results show that a fund's performance, risk and fees are significantly impacted by its manager's characteristics. All else equal, investors can expect better risk-adjusted performance from younger managers with MBA degrees who have longer tenure at their funds. Also, funds with low fees and more diversified portfolios perform better. The most significant predictor of performance is the length of time a manager has managed his or her fund (tenure). Funds that keep administrative expenses low also perform relatively well, but large management fees do not necessarily imply poorer performance. Apparently, a large management fee signals superior investment skill which leads to better performance.*

## I. INTRODUCTION

Managers make investment decisions based upon their personal abilities and risk preferences. This paper models a simultaneous system for a large sample of mutual fund managers in order to determine the effects that human capital characteristics have on fund return performance, risk and fees.

That fund managers' characteristics simultaneously determine their portfolio return performance and risk as well as their own compensation is not surprising; yet, earlier studies have not accounted for this simultaneity. For example, it follows from human capital theory that managers with greater human capital (intelligence, etc.) should produce better performance and receive better compensation. Similarly, agency models, such as those of Barry and Starks (1984), Starks (1987), Cohen and Starks (1988), and Golec (1988, 1992) show that a manger's portfolio risk choices will partly depend upon his or her risk-taking preferences because the volatility of a manager's pay is affected by the portfolio's perfor-

**Joseph H. Golec** • Associate Professor of Finance, Clark University, Graduate School of Management, 950 Main Street, Worcester, MA 01610.

mance. This study's statistical approach accounts for the fact that performance, risk, and fees are interdependent.

Mutual fund performance alone is an important and popular finance topic because funds positive risk-adjusted returns has implications for market efficiency. Most early studies, such as Jensen (1968) and Sharpe (1966), report that funds provide inferior performance partly because of management fees and other expenses. Recently, however, Ippolito (1989), Lee and Rahman (1990), Grinblatt and Titman (1989, 1992), and Hendricks, Patel, and Zeckhauser (1993) show that mutual funds can generate systematic positive risk-adjusted returns. Although Ippolito's sample of funds earned sufficient risk-adjusted returns to cover fees, Elton, Gruber, Das, and Hlavka (1993) question Ippolito's methods and suggest that funds do not exhibit positive risk-adjusted returns.

Whether mutual fund managers produce superior returns is controversial because most studies' funds, sample periods, or performance measures are not comparable. Unlike earlier studies that try to determine if the average risk-adjusted fund performance is positive, this study only requires that a performance measure rank funds appropriately. For example, if longer tenure implies greater human capital which, in turn, generates better performance, then job tenure should be positively related to performance. This positive relationship can be present even if all funds have negative risk-adjusted performance; long-tenured managers will simply have less negative performance.

Earlier studies consider relatively long time periods during which some funds change managers, risk, fees or objective, or liquidate. Here, the cross-sectional data and shorter sample period reduce the degree of fund changes and survivorship bias (Brown, Goetzmann, Ibbotson, & Ross, 1992).

The paper is organized as follows. Section I discusses the statistical procedure used to account for simultaneity and defines the study's endogenous and exogenous variables. Section II describes the data. Section III presents each structural equation along with the results for each equation. Section IV considers the issues of survivorship bias and performance measurement. Section V summarizes the results that have the most significant implications for investors' choice among mutual funds and their managers.

## II. THREE-STAGE LEAST SQUARES

Many earlier studies, such as Sharpe (1966), Jensen (1968), Friend and Blume (1970), Ippolito (1989), Grinblatt and Titman (1989, 1992), Hendricks, Patel, and Zeckhauser (1993) and Elton et al. (1993), compare mutual funds' risk-adjusted performance, as well as other endogenous variables (risk or fees), but ignore the fact that changes in performance, risk, and fees tend to impact each other contemporaneously. For example, a fund that increases fees will tend to have poorer performance, all else equal. In this case, fees enter as an independent variable in an equation explaining performance. Clearly, errors in explaining fees will feed into errors in explaining performance. That is, a fund with unexplained large fees will have a large fee error, producing a relatively large performance error. This means that an independent variable (fees) will be correlated with the error term in the performance equation. Ordinary least squares (OLS) assumes independent variables and errors are uncorrelated; otherwise, OLS coefficient estimates will be biased and inconsistent.

Three-stage least squares (3SLS) offers consistent estimates and the large sample used in this study takes full advantage of this consistency. For example, 3SLS eliminates the correlation between fees and errors in the performance equation by replacing actual fees by their estimated values obtained by regressing fees on fixed exogenous variables only. In other words, errors in fees do not feed into the performance regression because the fee errors are eliminated before the performance regression is estimated.

In this study, the endogenous or simultaneously determined variables include portfolio yield and alpha (performance); portfolio beta and the standard deviation of residual portfolio returns (risk); and expenses exclusive of management fees, management fees, and portfolio turnover (fees). Exogenous variables include manager age, tenure with the fund, years of education, whether or not the manager has an MBA degree, management team size (usually one), fund age, fund assets, load charge, and fund objective.

Yield measures a manager's propensity to choose high-dividend stocks. Because management fees are paid as a proportion of fund assets, the more a fund pays out, the smaller its asset base and management fees, all else equal. Managers may choose stocks with large dividends as a consequence of a "value" investing style or because they believe they can attract investors who prefer large dividends. Conversely, a "growth" style or investors who prefer small dividends (tax avoidance) may imply small dividends.

Alpha is Jensen's measure of return performance adjusted for systematic risk. Alpha measures the portfolio return attributable to the manager's skill (or luck). Systematic risk is measured by beta. Unsystematic risk is the residual variation in portfolio return after accounting for variation due to beta risk. It measures the degree of portfolio diversification and beta stability. Managers must deviate from a perfectly diversified fixed-beta portfolio if they wish to obtain a nonzero alpha.

Expenses exclusive of management fees measure administrative, operating, and customer service expenses including 12b-1 fees. Management fees are charged by the fund's management company to cover the portfolio manager's compensation, as well as their operating expenses, research support, and profit. Although manager pay is not separately available, it is assumed that larger pay leads to larger fees.

Portfolio turnover measures the manager's trading propensity. Trueman (1988) suggests that trading is a signal that a manager is gathering and trading on information. Like management fees and expenses, increased turnover increases costs which are paid out of returns. On the other hand, management fees and turnover costs are presumably paid to facilitate return-producing input by fund managers.

Manager age measures experience but also gauges stamina for a demanding job. Many in the mutual fund industry believe that investment management is so demanding that the negative impact of age on stamina leads to poorer performance. In addition, age indirectly measures time until retirement and, hence, the importance of future job income to the manager. If tenure is a better measure of experience than age, age may largely capture the negative stamina effect. Tenure measures the manager's survivorship at the job. Long tenure implies that the management company finds the manager's ability and performance satisfactory but may also indicate that the manager has few better opportunities because of specialized skills or an unspectacular performance record.

Years of education measures accumulated general knowledge while MBA measures business-specific knowledge. An MBA should know some basic tenets of investing as well as how to recognize firms with good management. Team size will measure whether more heads are better than one or if investment decisions made by committee are ineffective.

Fund age measures a fund's survivorship, its prestige, and the loyalty of its investors. Fund assets measure a fund's market acceptance, past growth, and economies of scale. Load is an additional expense paid by investors of some funds and, thus, load funds may have to reduce other fees in order to compete. Finally, the funds used in this study are primarily stock funds with objectives including growth, aggressive growth, growth and income, small stocks, specialized, balanced, asset allocation, option equity, and international. These fund variables will pick up average effects, such as the higher yields expected for growth and income funds.

## III. THE DATA

The data sample spans 1988-1990 and is composed of 530 of the 979 mutual funds listed in the 1991 issue of Mutual Fund Sourcebook Volume I, published by Morningstar Inc. The distribution of funds by objective is 181 growth, 105 growth and income, 67 special, 50 small stock, 43 international, 41 balanced, 30 aggressive growth, 7 option equity, and 6 asset allocation. Funds were excluded from the sample if Morningstar did not report information for them on the variables mentioned in the previous section; however, most of the funds excluded were eliminated because they had fewer than three years of performance history.

The variables were calculated in the following ways:

1. Alpha, beta, and residual return standard deviation are calculated for each fund with monthly return data over 1988-1990 using the Capital Asset Pricing Model with treasury bills as the risk-free asset and the Standard and Poor's 500 Stock Index (S&P 500) return as the market portfolio.
2. Yield is defined as annual fund income excluding capital gains divided by year-end assets.
3. Expense ratio is the percentage of fund assets spent on operating expenses (excluding management fees and brokerage costs).
4. Management fee is the percentage of assets paid as management fees.
5. Turnover is the percentage of total assets sold during a year.
6. Fund assets are net year-end assets measured in millions.
7. Fund load is the percentage of new investments that must be paid to the fund as a sales charge.
8. Team size is the number of managers who make investment decisions for the fund (usually one).
9. Manager age, tenure, education, and fund age are measured in years, with 1990 as the end-year. When more than one manager is involved in the fund, the lead or more senior manager's characteristics are used.
10. Dummy variables represent MBA (MBA=1, other=0) and fund objectives, where growth is the comparison type.

Table 1 lists the sample statistics for the variables. Noteworthy is the fact that the average beta is less than one (0.84) and the average alpha is –2.83 percent per year. Average

turnover is nearly 100 percent (91.72%) with a maximum turnover of almost 800 percent. The average fund manager is 46 years old, holds an MBA (64 percent) and has seven years tenure. The typical fund is 16 years old, has $280 million of assets, charges a 3.14 percent load, and has a growth objective (34%). The relatively large proportion of growth funds included in the sample reflects investor preference for such funds.

## IV. RESULTS

The specification of each structural equation and its statistical results are presented together in order to focus the presentation. Both the 3SLS structural and reduced form coefficients are reported in the tables and statistically significant coefficients are starred (*t*-statistics are available upon request).

The reduced form coefficients will be discussed when they differ significantly from the structural coefficients. The structural coefficients represent the direct effects of the included right-hand-side exogenous and endogenous variables on the left-hand-side dependent endogenous variable. By comparison, the reduced form coefficients combine the direct effect of an exogenous variable on the dependent variable, with the indirect effects implied by the endogenous variables that are included in the structural form but excluded from the reduced form.

**TABLE 1**
Sample Statistics for the Variables Used in Simultaneous Regression Analysis

| | *Mean* | *Standard Deviation* | *Minimum* | *Maximum* |
|---|---|---|---|---|
| *Endogenous variables* | | | | |
| Yield (%) | 2.59 | 2.21 | 0.00 | 13.10 |
| Alpha (%) | –2.83 | 4.49 | –23.80 | 16.05 |
| Beta | 0.84 | 0.29 | –0.12 | 1.67 |
| Residual S. Dev. (%) | 7.25 | 3.84 | 0.00 | 20.56 |
| Expense Ratio (%) | 0.79 | 0.76 | 0.00 | 10.10 |
| Management Fee (%) | 0.73 | 0.22 | 0.05 | 2.00 |
| Turnover (%) | 91.72 | 89.37 | 0.00 | 789.00 |
| *Exogenous variables* | | | | |
| Manager age (years) | 45.96 | 10.33 | 26.00 | 82.00 |
| Tenure (years) | 6.95 | 6.14 | 1.00 | 51.00 |
| Years of education | 17.54 | 0.89 | 16.00 | 19.00 |
| MBA degree | 0.64 | 0.48 | 0.00 | 1.00 |
| Team size | 1.23 | 0.63 | 1.00 | 5.00 |
| Fund age (years) | 16.27 | 15.94 | 3.00 | 87.00 |
| Fund assets (millions) | 280.37 | 769.60 | 1.00 | 11980.00 |
| Load (%) | 3.19 | 2.76 | 0.00 | 8.50 |
| *Fund objectives* | | | | |
| Growth | 0.34 | 0.47 | 0.00 | 1.00 |
| Aggressive growth | 0.06 | 0.23 | 0.00 | 1.00 |
| Growth and income | 0.20 | 0.40 | 0.00 | 1.00 |
| Small stock | 0.09 | 0.30 | 0.00 | 1.00 |
| Special | 0.13 | 0.33 | 0.00 | 1.00 |
| Balanced | 0.08 | 0.26 | 0.00 | 1.00 |
| Asset allocation | 0.01 | 0.10 | 0.00 | 1.00 |
| Option equity | 0.01 | 0.11 | 0.00 | 1.00 |
| International | 0.08 | 0.27 | 0.00 | 1.00 |

### A. The Performance Equations

Yield is included as a performance measure because many investors consider yield in their selection of a fund and because managers through stock selection have significant control of a fund's yield. The structural equation for yield is:

$$\text{Yield} = (\text{Expense, Fee, Turnover, Manager age, Tenure, Fund age, Assets, Objectives}) \quad (1)$$

Expenses, management fee and turnover should be negatively related to fund yield, all else equal. They represent costs that may be paid out of a fund's cash flow which would otherwise go to shareholders. Results for the yield regression reported in Table 2 show that fund yield is significantly negatively related to management fees, as expected, while the expense ratio and turnover coefficients are insignificant.

Yield may be negatively related to manager age because older managers nearing retirement can boost fees somewhat by reducing payouts and growing assets. Such short-run behavior by older managers is documented in Gibbons and Murphy (1992) and Dechow and Sloan (1991). Results, however, show no significant relationship between age and yield.

Yield may be positively related to tenure for precisely the opposite reason that age was predicted to be negatively related to yield. That is, long tenure may imply greater job security, and hence, less short-run behavior by the manager. Indeed, while selecting stocks paying high dividends reduces management fees now, high dividend yield may attract more investors to the fund in the future, increasing assets and fees. As predicted, results show that yield and tenure are significantly positively related.

The relationship between fund age and yield may be positive. To the extent that investors prefer funds with larger dividends, funds providing larger dividends survive longer. Table 2 reports a positive fund age coefficient, but the coefficient is statistically insignificant.

As funds grow, managers typically invest in larger companies that usually pay relatively large dividends. On the other hand, this effect could be offset because a larger dividend payout means less assets, all else equal. The positive asset coefficient indicates that the effect of investing in larger companies dominates. Furthermore, the 3SLS structural coefficient (0.217) is smaller than the reduced form coefficient (0.283), indicating that large funds probably have proportionately smaller expenses which, in turn, lead to larger yields as well. This point illustrates the value of the simultaneous model. Because fees enter the structural model, there will be an indirect effect of assets on yield through fees. As shown below, more assets lead to lower fees and, as noted above, lower fees lead to larger yields. The reduced form assets coefficient picks up both effects; hence it is larger than the structural coefficient.

Fund objective will impact yield since yield requirements may be written into a fund's charter. The coefficients on the fund objective dummies are all as one might expect; for example, growth and income funds provide a 1.874 percentage point greater yield than growth funds (the comparison group) on average. Note that the larger reduced form coefficient implies a 2.002 percentage point greater yield for growth and income funds because of the indirect effect of growth and income funds' smaller expenses on yield.

Overall, the most notable result from the yield equation is that long-tenured managers tend to boost fund yield. Investors who prefer larger yields, all else equal, should find them at funds with managers with relatively long tenure (greater than seven years).

The alpha equation is:

$$\text{Alpha} = (\text{Beta, Residual, Expense, Fee, Turnover, Manager age, Tenure, Education, MBA, Team size, Fund age, Assets}) \quad (2)$$

Friend and Blume (1970) show that alpha and beta are weakly negatively related. Residual standard deviation coefficient may be negatively related to alpha because noise trading by fund managers has negative performance consequences (see Black, 1986). Misspecification of the asset-pricing model can also lead to cross-sectional correlation between alpha, beta, and residual standard deviation. As expected, Table 2 shows that alpha is negatively related to beta and residual standard deviation although the beta relationship is not significant.

At a basic level, expense ratio, management fee and turnover should all be negatively related to alpha because the costs are deducted from shareholder returns. But the manage-

**TABLE 2**
Yield and Alpha 3SLS Structural and Reduced Form Regressions

| | *Yield Regressions* | | *Alpha Regressions* | |
|---|---|---|---|---|
| | *Structural* | *Reduced* | *Structural* | *Reduced* |
| *Endrogenous Variables* | | | | |
| Intercept | 2.618* | 2.559 | 1.210 | –2.269 |
| Yield (%) | — | — | — | — |
| Alpha (%) | — | — | — | — |
| Beta | — | — | –0.469 | — |
| Residual St. Dev. (%) | — | — | –0.410* | — |
| Expense Ratio (%) | –0.014 | — | –1.178* | — |
| Management Fee (%) | –1.590* | — | 5.092* | — |
| Turnover (%) | 0.003 | — | 0.006 | — |
| *Exogenous variables* | | | | |
| Manager age (years) | 0.001 | –0.003 | –0.076* | –0.083* |
| Tenure (years) | 0.053* | 0.052* | 0.165* | 0.185* |
| Years of education | — | –0.047 | –0.084 | 0.165 |
| MBA degree | — | 0.065 | 0.943** | 0.599 |
| Team size | — | –0.070 | –0.337 | –0.141 |
| Fund age (years) | 0.001 | 0.005 | –0.012 | –0.011 |
| Fund assets[a] (millions) | 0.217* | 0.283* | –0.010 | 0.013 |
| Load (%) | — | 0.012 | — | –0.068 |
| *Fund objectives* | | | | |
| Growth | — | — | — | — |
| Aggressive growth | –1.043* | –0.900* | — | –2.152* |
| Growth and income | 1.874* | 2.002* | — | 0.258 |
| Small stock | –1.034* | –0.986* | — | –1.429* |
| Special | –0.449** | –0.321 | — | –1.913* |
| Balanced | 3.279* | 3.469* | — | 0.585 |
| Asset allocation | 2.880* | 2.872* | — | 1.542 |
| Option equity | 2.129* | 2.057* | — | 0.863 |
| International | –0.237 | –0.332 | — | –2.481* |
| R-squared | 0.42 | 0.43 | 0.12 | 0.10 |

*Notes:* [a]Divide coefficients by 1000.*(**)Significant at least at the 5 (10) percent level using a two-tailed test.

ment fees and turnover costs are presumably paid to facilitate productive input from the manager. Trueman (1988) suggests that turnover is a positive information signal. Holmstrom and Ricart I Costa (1986) and Lambert (1986) suggest corporate managers try to signal their skill through the volume of capital investments.

Table 2 shows a strong positive relationship between alpha and management fee. The management fee coefficient is 5.092, indicating that a one basis point increase in management fee increases fund alpha by about five basis points. The negative relationship between alpha and expense ratio indicates administration expenditure reduces alpha. Each basis point increase in expenses leads to about a basis point (1.178) decrease in alpha. Turnover is positively, but insignificantly, related to alpha. Apparently, the positive information signaling effect suggested by Trueman (1988) is not strong enough to fully overwhelm the negative effect of trading costs.

The standard human capital investment model, established by Becker (1964), Mincer (1973), and Topel (1991), implies a positive relationship between measures of human capital such as tenure and education, and alpha. Like years of education, MBA should be positively related to alpha because specialized business education should lead to better performance. Finally, if age largely measures stamina, then manager age and alpha should be negatively related.

Results show that education does not have the positive direct effect expected although the reduced form coefficient is positive. The positive MBA coefficient is significant at the 10 percent level; the MBA increases alpha by nearly one percentage point annually. When indirect effects are considered, the reduced form coefficient is smaller and statistically insignificant, indicating that the MBA effect is somewhat weak.

Manager age is negatively related to alpha, supporting industry claims that younger managers cope more easily with the job's demands. Tenure and alpha are strongly positively related, indicating that experience pays and perhaps that poor performers are quickly eliminated. Tenure is the strongest human capital measure; an additional year of tenure leads to a direct 0.165 increase in annual alpha. The full impact (measured by the structural coefficient) is 0.185, which means that tenured managers also keep costs or noise trading low, indirectly increasing alpha.

Team size has an indeterminate effect on alpha. Perhaps funds with more than one manager may find two heads are better than one. Alternatively, conflicts among managers may negatively impact alpha. While the team structural coefficient is negative, it is statistically insignificant.

Do older funds produce better alphas? More established funds should be more experienced at selecting better managers or keeping costs low. Table 2 does not support this contention. In fact, the fund age coefficient is negative, although statistically insignificant.

Many believe that as funds grow assets, performance suffers because larger assets reduce managers' trading flexibility. Nevertheless, Grinblatt and Titman (1989), after controlling for expense and fee differences, find that assets and performance are unrelated. Similarly, Table 2 shows no significant relationship between assets and alpha. Perhaps because some managers close funds to new investors when assets increase to a target (see McGough, 1993b), few funds reach the point at which asset growth reduces performance.

Investors are often counseled that they will get better performance from a fund with low fees. The most important results from the alpha equation are that this statement is true for operating expenses but not management fees. Indeed, management fees and performance are strongly positively related. In addition, results show that investors should get

better performance from well-diversified funds managed by younger, longer-tenured managers with MBA degrees.

### B. The Risk Equations

The beta and residual standard deviation equations are:

$$\text{Beta} = (\text{Residual, Turnover, Manager age, Tenure, MBA, Fund age, Objectives}) \quad (3)$$

$$\text{Residual} = (\text{Beta, Turnover, Manager age, Tenure, MBA, Team, Fund age, Assets, Objectives}) \quad (4)$$

Many of the same independent variables are included in these two equations and are chosen for similar reasons. Beta and residual risk may be positively related to one another because aggressive managers may try to reap high returns both by increasing beta and by concentrating their investments in fewer, well-researched stocks. Therefore, residual risk appears in the beta regression and beta appears in the residual risk equation. Table 3 shows that beta and residual return standard deviation are positively, although not statistically significantly related.

Trueman (1988) suggests risk and turnover are likely to be positively related because high-risk stocks offer greater opportunity for gain (i.e., accurate information about their prospects is more valuable). As expected, Table 3 shows turnover and both risk measures are positively related, but the turnover-residual standard deviation relationship is statistically insignificant.

According to Gibbons and Murphy (1992) and Fama (1980), manager age and risk should be positively related. Poor performance hurts one's reputation and reduces future job prospects and fees. Younger managers with more time left in the labor market will want to avoid large negative outcomes more than managers approaching retirement. Results show that manager age is positively but insignificantly related to risk except for the beta reduced form coefficient which is negative and insignificant.

Tenure should be negatively related to both risk measures if managers protect against losing a stable position by reducing risk. Amihud and Lev (1981) use such agency arguments to explain conglomerate mergers and Amihud, Kamin, and Ronen (1983) show that manager-controlled (as opposed to owner-controlled) firms choose investment projects with less systematic and unsystematic risk. Brown, Harlow, and Starks (1996) show that fund managers have compensation incentives to manipulate their risk levels. Results show a negative, but statistically insignificant relationship.

MBA may be positively related to beta but not residual standard deviation because MBAs are taught that only beta risk receives compensation in the market. Hence, MBAs are more likely than other managers to try to outperform the market index by increasing beta rather than residual risk. As predicted, MBA and beta are significantly positively related although MBA and residual standard deviation are not significantly related.

Team size has no clear impact on beta but one might expect that as the number of managers grows, residual risk would fall because each individual in a team may wish to include his or her favorite stocks in the fund. Results show a positive but insignificant relationship between residual risk and team size, however.

**TABLE 3**

Beta and Residual Standard Deviation 3SLS Structural and Reduced Form REGRESSIONS

| | *Beta Regressions* | | *Standard Deviation Regressions* | |
|---|---|---|---|---|
| | *Structural* | *Reduced* | *Structural* | *Reduced* |
| *Endogenous variables* | | | | |
| Intercept | 0.780* | 0.952* | 4.832* | 5.941* |
| Yield (%) | — | — | — | — |
| Alpha (%) | — | — | — | — |
| Beta | — | — | 0.695 | — |
| Residual St. Dev. (%)[a] | 0.761 | — | — | — |
| Expense Ratio (%) | — | — | — | — |
| Management Fee (%) | — | — | — | — |
| Turnover[b] (%) | 0.759* | — | 2.680 | — |
| *Exogenous variables* | | | | |
| Manager[b] age (years) | 0.017 | –0.800 | 20.30 | 16.44 |
| Tenure[b] (years) | –2.878 | –3.430** | –19.80 | –23.55 |
| Years of education | — | 0.000 | — | 0.000 |
| MBA degree | 0.051* | 0.044* | 0.071 | 0.072 |
| Team size | — | 0.002 | 0.137 | 0.140 |
| Fund age[b] (years) | 2.314* | 1.684* | –24.80* | –25.13* |
| Fund assets[b] (millions) | — | –0.004 | –0.299* | –0.306* |
| Load (%) | — | –0.002 | — | –0.006 |
| *Fund objectives* | | | | |
| Growth | — | — | — | — |
| Aggressive growth | 0.087 | 0.164* | 3.634* | 3.916* |
| Growth and income | –0.148* | –0.167* | –1.607* | –1.740* |
| Small stock | 0.099* | 0.130* | 3.259* | 3.368* |
| Special | –0.288* | –0.229* | 4.461* | 4.393* |
| Balanced | –0.377* | –0.392* | –2.255* | –2.511* |
| Asset allocation | –0.377* | –0.399* | –2.624* | –2.901* |
| Option equity | –0.402* | –0.410* | –0.713 | –1.002 |
| International | –0.318* | –0.282* | 6.200* | 5.980* |
| R-squared | 0.35 | 0.34 | 0.58 | 0.57 |

*Notes:* [a(b)]Divide coefficients by 100 (1000). *(**) Significant at least at the 5 (10) percent level using a two-tailed test.

Funds that provide more systematic risk and less residual risk should earn larger average returns with relatively less noise trading, thereby improving their survival chances. Consequently, fund age and beta (residual standard deviation) should be positively (negatively) related. Structural coefficients in Table 3 show that fund age is positively related to beta and negatively related to residual standard deviation, as expected. This interpretation gains further support from the reduced form coefficients. The indirect effect of less noise trading is less turnover and less residual risk, both of which imply a smaller reduced form coefficient (1.684) than the structural coefficient (2.314) in the beta equation. In the residual standard deviation equation, the indirect positive effect of fund age on beta partly offsets the negative indirect effect of less turnover so that the reduced form coefficient is only a bit smaller (–25.13 vs. –24.80).

Fund asset size should have a negative effect on residual standard deviation because more assets require managers to invest in more companies. Most funds have limitations on how much they can invest in any one stock. As predicted, results support a strong negative relationship between assets and residual risk.

The coefficients on the objectives are all as one would expect. For example, aggressive growth funds have relatively large betas and residual standard deviations while specialized funds which hold securities in one industry have relatively large residual standard deviations.

Overall, the most notable result from the beta equation is that larger portfolio turnover, fund age and a manager with an MBA are associated with a larger fund beta. Older, larger funds can be expected to deliver smaller residual risk.

### C. The Fee Equations

Fees are broken down into three main components and examined separately because earlier studies such as Ippolito (1989) have done so. Although each represents a cost to fund shareholders and are affected by some of the same variables, there are important differences as well. The equations for expense ratio, management fee, and turnover are:

$$\text{Expenses} = (\text{Turnover, Manager age, Tenure, Education, MBA, Team, Fund age, Assets, Load, Objective}) \quad (5)$$

$$\text{Management Fees} = (\text{Beta, Residual, Turnover, Manager age, Tenure, Education, MBA, Team, Fund age, Assets, Load, Objective}) \quad (6)$$

$$\text{Turnover} = (\text{Manager age, Tenure, MBA, Team, Fund age, Assets, Load, Objective}) \quad (7)$$

Manager age, tenure, MBA, team size, fund age, assets, load, and fund objective enter each equation. One would expect managers to improve their tenure chances and fund survival rates by reducing all types of expenses. McGough (1993a) reports that older, tenured fund managers have reputations for keeping expenses low. Similarly, MBAs are often taught in investments classes that costs should be kept low to boost performance. On the other hand, human capital theory suggests that management fees should be positively related to age and tenure because age and tenure are measures of human capital.

Table 4 reports the regression results for expense ratio, management fee, and turnover. As expected, manager age is significantly negatively related to turnover but is not significantly related to either expense ratio or management fee. Also as expected, tenure is significantly negatively related to expense ratio but not significantly related to management fee or turnover. MBA is negatively related to all three fee variables as predicted, although only the management fee coefficient is significant. This means that fund managers with MBAs may accept lower compensation, perhaps reflecting strong competition among MBAs for fund manager positions. The corresponding reduced form MBA coefficient is larger than the 3SLS structural coefficient due to the indirect impact on management fees through beta; that is, MBAs choose larger portfolio betas on average and are compensated for bearing the additional risk.

A larger team size means more salaries, expenses and turnover; therefore, team should be positively related to all the fee variables. Results show team size is significantly positively related to management fee as expected, but the other two coefficients are insignificant.

Older funds may purposely chose low fees as a means to survive. For example, the established Vanguard funds have been successful by touting their low costs. Indeed, Table

**TABLE 4**
Expense Ratio, Management Fee and Portfolio Turnover 3SLS Structural and Reduced Form Regressions

| | *Expense Ratio Regressions* | | *Management Fee Regressions* | | *Portfolio Turnover Regressions* | |
|---|---|---|---|---|---|---|
| | *Structural* | *Reduced* | *Structural* | *Reduced* | *Structural* | *Reduced* |
| *Endogenous variables* | | | | | | |
| Intercept | 2.607* | 2.600* | –0.044 | 0.281 | 167.2* | 167.2** |
| Yield (%) | — | — | — | — | — | — |
| Alpha (%) | — | — | — | — | — | — |
| Beta | — | — | 0.122** | — | — | — |
| Residual St. Dev. (%)[a] | — | — | 2.765* | — | — | — |
| Expense ratio (%) | — | — | — | — | — | — |
| Management Fee (%) | — | — | — | — | — | — |
| Turnover[b] (%) | –0.046 | — | 0.265 | — | — | — |
| *Exogenous variables* | | | | | | |
| Manager age (years) | –0.004 | –0.004 | 0.001 | 0.001 | –1.242* | –1.242* |
| Tenure (years) | –0.011** | –0.011** | 0.001 | –0.001 | –0.493 | –0.493 |
| Years of education | –0.081** | –0.081** | 0.030* | 0.030* | — | 0.000 |
| MBA degree | –0.054 | –0.054 | –0.062* | –0.057* | –10.66 | –10.67 |
| Team size | –0.018 | –0.018 | 0.041* | 0.045* | 0.675 | 0.675 |
| Fund age (years) | –0.010* | –0.010* | –0.003* | –0.003* | –0.578* | –0.578* |
| Fund assets[a] (millions) | –0.108* | –0.108* | –0.034* | –0.043* | –1.760 | –1.756 |
| Load (%) | 0.005 | 0.005 | –0.010* | –0.010* | –1.940 | –1.940 |
| *Fund objectives* | | | | | | |
| Growth | — | — | — | — | — | — |
| Aggressive growth | 0.748* | 0.746* | –0.141* | 0.004 | 62.79* | 62.80* |
| Growth and income | 0.027 | 0.027 | –0.020 | –0.091* | –6.464 | –6.464 |
| Small stock | –0.056 | –0.057 | –0.130* | –0.019* | 6.925 | 6.925 |
| Special | 0.243* | 0.241* | –0.131* | –0.028 | 33.84* | 33.84* |
| Balanced | 0.091 | 0.091 | 0.005 | –0.110* | 6.311 | 6.311 |
| Asset allocation | –0.109 | –0.110 | 0.135 | 0.007 | 0.178 | 0.178 |
| Option equity | –0.037 | 0.043 | 0.122 | 0.044 | –1.270 | –1.271 |
| International | 0.235* | 0.236* | –0.090 | 0.038 | –12.24 | –12.24 |
| R–squared | 0.19 | 0.19 | 0.19 | 0.21 | 0.11 | 0.11 |

*Notes:* [a] [(b)]Divide coefficients by 100 (1000). *(**) Significant at least at the 5 (10) percent level using a two–tailed test.

4 shows that fund age is significantly negatively related to expense ratio, management fee, and turnover.

Scale economies should produce a negative relationship between the fees and assets. As expected, results show that assets are negatively related to all three fee types, although the turnover coefficient is statistically insignificant. This means that funds tend to charge smaller fees as they grow in size, spreading costs over more assets.

Because fund load is an extra marketing expense, load funds may have to keep other fees relatively low in order to compete. In addition, some no-load funds include 12b-1 marketing fees in their expense ratio. Thus, load funds may have smaller expense ratios by definition since their largest marketing expense is broken out separately as a load. Table 4 shows that load is negatively related to management fees and turnover, although only the management fee coefficient is significant. Apparently, load funds trade off lower management fees for up-front load fees.

Some of the fund objective coefficients are significant and have intuitively appealing signs. For example, aggressive growth funds' annual turnover rate is 62.8 percentage points greater than that of ordinary growth funds. Most fees for aggressive growth, specialized, and international funds tend to exceed those of growth funds. This is expected because these funds may require specialized management skills and more expensive administration.

Assuming that managers are risk averse, Golec (1992) shows that management fees and risk should be positively related. Because management fees are a percent of assets, high-risk funds will have more volatile management fees. Managers require greater average compensation in exchange for riskier fees. The management fee regression in Table 4 supports this prediction; both beta and residual standard deviation coefficients are significant and positive.

Turnover and expense ratio may be negatively related because competition between funds based on cost implies relatively high turnover costs must be offset by relatively low expenses. Indeed, some funds avoid paying research costs by receiving their research from brokerage companies. They compensate brokers by directing more trades ("soft dollars") to the brokers who supply research. Results show a negative relationship, but the coefficient is insignificant.

As noted above, turnover may signal management effort. Assuming managers require compensation for this effort, turnover should be positively related to management fee. Although the management fee regression shows turnover and management fees are positively related, the relationship is statistically insignificant.

Years of education should be positively related to management fee according to human capital theory, assuming that funds use education as a measure of human capital. Indeed, Table 4 shows that years of education and management fees are significantly positively related. In addition, assuming better educated managers can produce their own research or that they economize on other expenses, years of education and expense ratio may be negatively related. The significant negative coefficient for years of education in the expense ratio regression supports this claim.

The most notable result from the fee regressions is that older and larger funds can be expected to deliver lower fees. In addition, older managers tend to trade less while long-tenured managers tend to keep expenses low.

## V. CONSIDERATION OF SURVIVORSHIP BIAS AND PERFORMANCE MEASUREMENT

Performance evaluation of mutual fund managers is subject to a survivorship effect since very poor performers are likely to be fired and very good performers may leave voluntarily for better opportunities. The survivorship effect may be relatively small in this study because of the short sample period. The relative numbers of good and poor performers who exit the industry along with the level of their performance will determine the net effect on the sample's average alpha. Either way, managers exiting the tails of the distribution will reduce the sample's alpha variation and make it more difficult to find significant structural relationships. Indeed, the R-squared for the alpha equation is relatively low. This reduction of variance is of greater concern than the potential effect on average alpha because this

study only requires alpha to rank performance of managers in a cross-section. By contrast, most other mutual fund performance studies are interested in using their performance measures as absolute measures of whether fund managers "beat the market" (i.e., whether the measure is positive).

One drawback of this study is that the data source only provides alpha measured using the S&P 500. Some recent studies have used alphas measured with multiple indexes, although Ippolito (1989) and Goetzmann and Ibbotson (1994) use the S&P 500. Many studies find that average fund performance changes with the index. Average performance differences are less important to the cross-sectional analysis in this study because it relies on relative performance between managers. Results may be affected if performance ranks are not stable over indexes and the wrong index is used.

Hendricks, Patel, and Zeckhauser (1993), who tried numerous single-index and multi-index models, found little effect on rankings. On the other hand, Grinblat and Titman (1994) show that multiple-index characteristics-based models produce substantially different performance rankings than single-index models. Hence, the evidence on ranking stability is mixed. This study's results partly control for potentially misspecified alpha because the other components of the CAPM (beta and residual standard deviation) appear in the alpha equation. If the ranking is still improper, the results could be spurious, although it is also possible that improper ranking will produce noise and less significant results.

## VI. SUMMARY AND CONCLUSION

This study analyzes mutual fund portfolio performance (yield and alpha), risk (beta and residual return standard deviation) and fees (expense ratio, management fees, and turnover) as endogenous variables in a system of simultaneous equations. Earlier studies typically focus on only one or two of these variables using single equation methods.

Results of this study are summarized in light of their implications for investors choosing among funds and fund managers. Most investors are primarily concerned with the return they receive for bearing risk. One can expect better risk-adjusted performance (alpha) from a fund manager who is relatively young (less than 46 years old) yet has managed a fund for a relatively long time (more than 7 years). Results also show managers with MBAs outperform those without. Funds that keep administrative expenses low (less than 0.80 percent) produce better performance. But larger management fees (above 0.73 percent) are associated with better performance, perhaps because larger fees are paid to better skilled managers. This means that investors should avoid funds with large operating expenses but not necessarily those with large management fees.

Results also show that investors should avoid funds whose portfolios contain much residual risk (more than 0.075 residual return standard deviation) because they tend to under-perform. A fund's beta, turnover, team size, age and asset size as well as a manager's years of education have no significant impact on risk-adjusted performance.

Investors seeking high yield, all else equal, should avoid funds with large fees, especially management fees, and choose larger (more than $280 million) funds managed by long-tenured managers. Of course, such investors should also select funds with high-yield objectives, such as balanced funds.

With regard to risk, investors should realize that by selecting high beta funds (greater than 0.84), they often receive more residual risk and portfolio turnover as well. One way to

limit this problem is to select managers with MBAs because MBAs provide relatively large betas without increasing residual risk significantly. Another way to reduce the problem is to select older (older that 16.27 years) and larger funds because they tend to provide larger betas together with smaller residual risk, all else equal.

Managers apparently charge more to manage higher risk funds as compensation for more volatile fees. This result may have important implications for asset pricing since it may imply that investment managers require stock market compensation for holding portfolios with unsystematic risk. This could explain why Levy (1978) and Tinic and West (1986) find unsystematic risk priced in securities markets. Managers of load funds apparently charge smaller management fees to partially compensate shareholders for load charges. Load funds do not perform significantly better or worse than noload funds, however.

Strong competition among MBAs for fund management jobs could explain why MBAs charge smaller management fees even though they deliver larger alphas and betas and smaller expenses and turnover than other managers. Apparently, successful funds recognize the bargain since even though fund managers with MBAs are on average younger (45 vs. 48 years old) and less tenured (5.5 vs. 6.8 years), they manage larger ($302 vs. $228 million) and older (16.7 vs. 15.5 years old) funds. Indeed, the competitive strength of MBAs probably explains why they manage 64 percent of all funds.

Older and larger funds economize on expenses, management fees, and trading costs while keeping beta up and residual return variance down, all of which enhance fund survival and growth. Finally, fund objective has a significant impact on many of the endogenous variables, hence, controlling for fund type is important.

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