Promotion or Demotion? An Empirical Investigation of the Determinants of Top Mutual Fund Manager Change

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Abstract

We provide the first study of mutual fund management change that attempts to classify the reason for change. Our analysis of 307 manager changes separates promotions from demotions. In contrast to previous research that simply looks at changes, we find a richer set of variables that explain the probability of fund manager replacement. Indeed, our results suggest that a pooled regression that does not attempt to discern between promotion and demotion is misspecified.

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1 Introduction

A number of empirical studies have attempted to examine the relation between a firm's stock performance and the likelihood of subsequent change in its top management. These include Coughlan and Schmidt (1985), Warner, Watts and Wruck (1988), Weisbach (1988) and Khorana (1996). All these papers find an inverse relation between the probability of managerial replacement and fund performance and conclude that control mechanisms within a corporation are effective. However, management changes occur for different reasons, and they differ in their relation to prior performance: some could follow bad performance, some could follow good performance and some could be unrelated to prior performance. Underperforming managers can be fired, forced to leave or demoted, while outperforming managers can be promoted to a new mutual fund within a family or bid away by other fund families. So, if monitoring mechanisms are effective and if stock performance reflects information on managers' efficiency, then there should be a negative relationship between the probability of top management demotion and performance, and a positive relationship between the probability of top management promotion and performance.

One common difficulty experienced in past studies is the lack of publicly available information of the exact sequence of events responsible for managerial replacement. No attempt is made to distinguish between replacement induced by underperforming managers or overperforming managers.

Our paper differs from the previous literature by its attempt to identify management promotions and demotions. We use a unique set of historical mutual fund manager replacement data from Morningstar Inc. provide fund names, manager names, starting and ending date of each appointment for those mutual funds which returned the manager information survey conducted by Morningstar Inc. Although these data contain no information on replacement reasons, this management turnover information makes it possible to follow the employment of a manager as he or she moves from one fund to another.

It is well known that managerial compensation is directly linked to the size of fund. To identify management promotions and demotions, it is assumed that a move into a larger

fund is a promotion and a move into a smaller fund is interpreted as a demotion. Utilizing this information, we can estimate both the management replacement probability and the promotion and demotion probabilities.

Our evidence suggests that the probability that a manager is likely to be fired or demoted is negatively correlated with the fund's current and past performance and the promotion probability is positively related with the fund's current and past performance. In contrast to Khorana (1996), who finds that the portfolio returns are the dominate performance measure, our research suggests that objective adjusted net inflows growth rate and fund size independently contribute to explaining the likelihood of managerial replacement.

The paper is organized as follows: Section 2 discusses the managerial replacement data and manager identification procedure. Section 3 describes methodology and the explanatory variables used in the study. Section 4 reports the empirical results and section 5 offers some concluding remarks.

2 Replacement Data and Top Management Changes

2.1 *Replacement Data*

The sample consists of 216 growth mutual funds with an inception date prior to January 1989.[1] The historic replacement data from Morningstar Inc. provides each manager's name, names of funds he or she managed or is managing and starting dates and ending dates of tenures through June 30, 1996. Based on data availability of mutual fund size and therefore inflow growth rates, annual data will be used in this paper.

A top management change is defined as any change in the fund's portfolio manager or management team. There are a total of 307 fund managers, managing 141 mutual funds who left or changed offices during the 1976-1996 sample period. There are a total of 75 mutual funds that did not have any managerial replacement during the same period. This group of funds are used as a control sample for logistic regressions. Only manager departures

[1]There are a total of 248 growth mutual funds in the Morningstar database. 216 of them returned the manager information survey conducted by Morningstar Inc.

are treated as managerial replacement events. If new managers are added to an existing management team we do not consider this managerial turnover.

Table 1 shows the number of sample funds in existence at the end of each year, the number of changes in each year and the number of changes per fund from 1976 to 1996. It is unlikely that survivorship bias will be important for our analysis. While it is possible that those funds that have dropped out of the mutual fund industry could have less effective management monitoring mechanisms, an effective monitoring mechanism alone is not sufficient to keep funds in business. Therefore, it seems reasonable to assume that the effect of fund returns and money flows on the replacement probability in the existing mutual fund sample is close to that in funds that have already dropped out of the sample. In fact, Warner, Watts and Wruck (1988) follow a sample of 269 firms listed on the New York Stock Exchange from 1962 to 1978, during which only 143 firms are left. They find that the ratio of the number of top management changes to the number of firms remaining in the sample is relatively stable over time.

Table 1 shows that there are more manager changes in later years than in earlier years. Especially in the 1990s, the change per fund ranges from 0.11 to 0.16, compared to the average change per fund of 0.07 in the 1970s and 1980s.

2.2 *Portfolio managers turnover*

Management changes fall into the following categories: promotion due to good performance; demotion due to poor performance; retirement or ill health; voluntary departures and the normal reshuffle within mutual fund families. The data from Morningstar contain no information on replacement reasons. However, with information of fund names, managers' names and tenure, it is possible to follow the employment of managers as they move from one fund to another. If a manager no longer stays in the mutual fund industry, the *Wall Street Journal Index* and Lexis/Nexis are searched for additional information.

Baumol (1967) and Marris (1963) assert that a top manager is often more concerned with the size of the firm than with profitability because compensation plans link pay to firm size and also because management within a large firm represents greater prestige. Murphy

(1985) provides evidence of a positive correlation between changes in the compensation of top managers and the rate of growth of firm sales. We assume that a manager who moves into a larger fund is promoted and a manager who moves into a smaller size fund is demoted. This is not a perfect classification scheme. It is possible that a manager might choose to go to a smaller sized fund because of a different compensation scheme. However, we do not have detailed information on the manager compensation mechanisms and we are unable to make this finer level of distinction.

Out of total 307 manager changes in the sample, 122 managers only changed offices, which means those managers remained in mutual fund industry and the names of their new funds can be found in the replacement data. There are several different change patterns. Some managers left their old funds and started immediately to manage new funds, or with a very short overlapping period, worked for both funds. For these manager changes, the size of the outgoing and incoming funds are used to determine change characteristics. For instance, on May 1, 1990, Morris J. Smith left the Fidelity Advisor Institutional Equity Growth fund and on June 1, 1990 he took over the position Peter Lynch left at the Magellan fund. In 1990, the total asset value of Fidelity Advisor Institutional Equity Growth was \$29.8 million and the total asset value of Magellan was $\$2,325.7$ million. So Mr. Morris is considered to have been promoted in 1990.

Some managers took a long leave before they went back to manage another fund. For instance, Wendell E. Mackey managed American National Growth from 1981 to 1983 and then went back to manage Dreyfus Third Century in 1994. In 1983, the total asset value of American National Growth was \$96.4 million, and in 1994, the total asset value of Dreyfus Third Century was \$419.3 million. Although even in 1994 the total asset value of American National Growth was \$113.3 million, still less than that of Dreyfus Third Century, it is difficult to justify that Mr. Mackey was promoted in 1983. It is not likely that his employment with Dreyfus Third Century had any relationship with his performance at American National Growth about ten years ago. After searching the *Wall Street Journal index 1983* and finding no departure stories associated with Mr. Mackey, his departure reason in 1983 is treated as unknown. The general rule adopted here is that for any manager who takes

less than two years to start managing a new fund, the size of the funds are compared to determine whether it is a promotion or demotion. If it is longer than two years, the *Wall Street Journal Index* and Lexis/Nexis are searched for additional information.

Some managers run several funds and may leave one or two funds while continuing to manage the rest. The general rule is that if a manager left a smaller fund and continued to manage a larger size fund, he is assumed to be concentrating on the more demanding management job and this change is treated as a normal reshuffle. On the other hand, if a manager left a larger fund but still worked on a smaller fund, he is treated as being demoted. If a portfolio management team change involves two or more individuals, it is treated as one change. Among those simultaneous changes, if one is identified as a promotion (demotion) and one is reason unknown, the change will be treated as a promotion (demotion).

For those 179 managers who no longer manage any funds, the *Wall Street Journal Index* and Lexis/Nexis are searched around the departure date. For instance, after Morris J. Smith took over Magellan in June 1990, he managed the fund for two years and left. Since he is no longer managing any other funds, he has no record in the replacement data after July of 1992. An article about Mr. Smith in the *Wall Street Journal* (WSJ) reveals that Mr. Smith had been very successful and proved that people would still buy Magellan even without Peter Lynch. But, due to the intense demands of the job, he resigned. Based on this article, Morris J. Smith's 1992 leave is treated as a voluntary leave. However, for Jeffrey N. Vinik, the successor to Morris J. Smith at Magellan, his leave is treated differently. Mr. Vinik also resigned from his position, but a lot of articles in the WSJ indicating that he left under the pressure from Magellan's three years of underperformance, $506 million capital outflows and Fidelity chairman Edward Johnson's criticism. Therefore, in this sample, he is treated as being demoted in 1996.[2]

For those managers who no longer manage any funds, their ages are also investigated through *Standard and Poor's Register of Corporations, Directors and Executives.* Eleven birth dates are identified in there. If a manager was in his 60's when he left his last position, he is considered to be retired. For those managers whose ages are not available, but they

[2]His previous two changes are treated as promotions.

started to manage their first funds before 1970 and their stay in the mutual fund industry were 20 years or so, they are classified as being retired.

In total, 44 fund manager changes are classified as promotions; 44 changes as demotions; 25 as retirements; 61 as normal management reshufflings and 133 as reasons unknown. Table 2 presents the time distribution of reasons for fund managers turnover.

3 The probability model and the sample construction

In this study, we estimate the probability of management turnover using a logistic regression framework. The model takes the form:

$$logit(p) = ln(\frac{p}{1-p}) \; = \; x'\theta \tag{1}$$

where x is a vector of explanatory variables which determine the probability, p, of the event in question occuring. We consider three types of events: manager promotion, manager demotion and manager replacement. The last category consists of all possible types of change and so includes not only promotion and demotion but also voluntary leave and normal management reshuffle, retirement and reasons unknown. As remarked in the introduction, previous studies have modeled the probability of manager replacement and so we include it here for the purposes of comparison. Although each type of manager turnover is modeled separately,[3] it is assumed that the probability of each is determined by the same set of explanatory variables. Specifically, we assume the probability of the particular type of management turnover in year, τ, is given by

$$logit(p) \; = \; \alpha \; + \; \sum_{j=0}^{2} \gamma_j R_{\tau-j} \; + \; \sum_{k=0}^{2} \delta_k I_{\tau-k} + \eta ln(S_\tau) \; + \; \phi D_\tau \tag{2}$$

where $\theta = (\alpha, \gamma_0, \gamma_1, \gamma_2, \delta_0, \delta_1, \delta_2, \eta, \phi)$ represent the vector of unknown parameters and the explanatory variables are defined as follows: R_τ is the fund return in year τ, I_τ is net fund

[3]One natural alternative is to estimate an ordered logit model for the probabilities of promotion, no change and demotion. Hu (1997) estimates such a model for this data using the explanatory variables described below. However, she finds that the data is inconsistent with proportional odds assumption inherent in the model. This suggests that the risk factors have different effects on the probabilities of promotion and demotion, and so the these types of turnover should be modeled separately. See Hu (1997) for further details.

inflows growth rate in year τ relative to the average growth rate of all growth mutual funds in that year, S_τ is the log of the fund size in year τ, and D_τ is a dummy variable which takes the value one if the fund is managed by a team and zero otherwise. The dynamic structure of the model is guided by previous studies which indicate a two year lag between performance and management change. Two aspects of the model should be noted. First, if a management change occurs in year τ then the explanatory variables for that year depend in part on the actions of his/her successor in the job. Second, it is assumed that observations are independent across funds and time.

The basic idea behind this specification is that returns and relative inflows provide two indicators of fund performance. The returns provide an absolute measure of fund performance. It is hypothesized that contemporaneous and lagged values of return are positively associated with managerial promotion probability but negatively related with managerial demotion probability. The overall impact of returns on replacement is hard to predict *a priori* but Khorana (1996) found this relationship to be negative. However, a low return *per se* may not lead to dismissal. Rather it may be relative performance that matters. For example, Ippolito (1992) and Hendricks, Patel and Zeckhauser (1994) find that investors tend to move cash into the funds which have done relatively better. In other words, a money manager whose fund performed badly but relatively better than others, might still bring in new sales.

This notion of bringing in new sales is captured by the inclusion of the relative inflow variables, I_τ which are anticipated to be positively related to the probability promotion but negatively related to the probability of demotion. The size of fund variable and team management dummy are included to capture two aspects of the institutional structure of the fund which may be relevant to manager turnover. Warner, Watts and Wruck (1988) find that larger firms have higher management turnover and argue that larger firms have designed their promotion and retirement policies to ensure shorter tenures in top management positions. For this reason, total asset value is also included in the analysis via $ln(S_\tau)$.[4] The management dummy is included to allow for the possibility that the management structure

[4]Total annual asset value data are collected from Morningstar Inc.

effects the probability of turnover. Some funds are managed by an individual and some are managed by a team. Furthermore, some funds moved from a single manager to a team or vice versa during the sample period. It is anticipated that being part of a team implies no one individual is held responsible for performance and that this translates into a negative effect on the probabilities of both promotion and demotion. However Warner, Watts and Wruck(1988) find the coefficient of this dummy variable to be positive.

We now discuss the construction of the return and inflow variables in more detail. Following Khorana (1996), we consider two measures of fund performance, R_τ. The first is the total annual fund return. The second is a risk-adjusted return. The risk adjustment is undertaken using the Capital Asset Pricing Model (CAPM) because it is the most widely adopted in the industry. The risk adjusted excess return is:

$$\mathrm{A}dj.R_\tau = \bar{r}_\tau - \hat{\beta}[\bar{r}_{m,\tau} - \bar{r}_{f,\tau}] \tag{3}$$

where $\bar{r}_\tau$ is the average of 24 monthly fund returns from year $\tau-1$ to year τ, β is the estimate from the CAPM using 24 periods of monthly returns. $\bar{r}_{m,\tau}$ and $\bar{r}_{f,\tau}$ are the average of 24 monthly returns of the $S\&P500$ and the 30 day Treasury-bill rate from year $\tau-1$ to year τ, respectively.

Since net inflows data are unavailable, this measure must be imputed. Following Hendricks, Patel and Zeckhauser (1994), a net fund inflows growth rate is defined as

$$\tilde{I}_{\tau+1} = \frac{S_{\tau+1} - S_\tau(1+r_{\tau+1})}{S_\tau} \tag{4}$$

where $\tilde{I}_{\tau+1}$ is a fund's net inflows at the end of time $\tau+1$ and $S_{\tau+1}$ and $r_{\tau+1}$ are the size and annual return of the fund at the end of time $\tau+1$, respectively. This formula is based on the twin assumptions that investors buy the fund and then hold it, and that existing shareholders reinvest all distributions in the fund. $\tilde{I}_\tau$ captures all size fluctuations in year τ. However, as mentioned above, it is anticipated that it is the relative inflow which is important. Therefore, the average growth rate of all funds in the same category is subtracted from $\tilde{I}_\tau$ to give the relative net inflow, I_τ.

The estimation of the logit model is based on a comparison of funds in an *event* sample with those in a *control* sample. The event sample consists of observations on those funds

which experienced a particular type of managerial change, and the control sample consists of funds which experienced no managerial change during the same time period. We construct three event samples: (i) a replacement sample which includes all manager changes; (ii) a demotion sample; and (iii) a promotion sample. Within our original data set, there are 307 managerial changes and these are accounted for by 141 funds. We excluded any changes from the sample for which the associated explanatory variables are missing. This leaves a total of 275 managerial changes in our replacement sample. Of these changes, 41 are demotions and 41 are promotions.[5]

The control sample is based on the 75 mutual funds that did not experience any managerial replacement during the sample period. The exact construction of the control sample depends on the event sample in question. To illustrate, suppose the event of interest is a promotion. If the promotion sample contains an observation for 1985 then the control sample contains an observation for 1985 from every one of the 75 funds which both experienced no managerial change throughout the sample period and was also in existence in 1985.[6] Thus, all information on control funds are matched to those on the funds with managerial changes replacement funds by event years. As it turns out, there are manager changes in every year, and so the control sample for the replacement sample consists of 805 observations, which is just the total available number of observations for those 75 funds. Since demotions only occurred in 1983, 1985-88, 1990-96, this reduces the control sample (for demotions) to a total of 648 observations. Promotions occurred in every year except 1976-78 and 1984-86, and so the control sample (for promotions) contains a total of 720 observations.

Table 3 contains summary statistics for the event and control samples. A dummy variable is used to indicate whether the event occurs: $y = 1$ indicates event sample and $y = 0$ the control sample. Panel A, B and C correspond respectively to the cases where the event is replacement, demotion and promotion. It is interesting to note that the excess net inflows growth rate is lower in all the event samples than the corresponding control sample. However,

[5]The remaining observations in the replacement are made up of 24 retirements, 54 voluntary leaves or normal reshufflings and 115 for which the reason is unknown.

[6]The number of funds in the control sample to match this turnover in 1985 might be less than 75, because some funds' inception dates are later than 1985.

the mean of all performance measures is larger in the promotion sample than its control, whereas the reverse is the case for the replacement and demotion events.

4 Results

Tables 4, 6 and 8 contain the main results based on the replacement, demotion and promotion samples respectively. Since previous studies have estimated the probability of replacement, we begin by reporting those results for our data set. These serve as a benchmark both to these earlier studies and also to the corresponding results for the demotion and promotion samples.

4.1 *Prediction of manager replacement*

As mentioned above, we report results with two definitions of fund returns. Model 1 uses total annual fund returns; Model 3 uses risk-adjusted returns. We also report the case in which the second lag of the variables and the team dummy are omitted. Models 2 and 4 involve this restricted specification with respectively R_τ and $Adj.R_\tau$ used to capture returns.

In general, our results corroborate evidence reported by Coughlan and Schmidt (1985), Khorana (1996), Warner, Watts and Wruck (1988). The likelihood ratio statistic indicates that the probability of replacement is significantly related to the explanatory variables with a p-value of 0.0001 regardless of the definition of the returns variable. We also find an inverse relation between the probability of managerial replacement and fund performance.

In Model 1, the signs of the coefficients on the total annual fund return variables and excess inflow growth rate variables are all negative. In Model 2, the estimated coefficients on risk-adjusted return variables are negative, except for lagged adjusted returns, but the latter is insignificant.

To provide some measure of the impact of an explanatory variable on the probability, we calculate the percentage change in the odds ratio resulting from a 1% change in the variable in question. This statistic has a convenient form:

$$\% \text{ change in odds ratio following 1\% change in } x_i = e^{0.01\hat{\theta}_i}$$

where $\hat{\theta}_i$ is the estimated coefficient on x_i.[7]

When total annual fund return is used (Model 1), the results indicate that a 1% decrease in annual fund return will increase the odds ratio by approximately 1.25% one year later.[8] For this model, the estimated coefficients on the lagged inflows growth rate variables suggest that a 1% decrease in the current excess net inflows growth rate, relative to the average growth rate of all growth funds, will increase the replacement odds ratio by approximately 0.37% in the next year. Using risk adjusted-annual excess return from Model 3, a coefficient on $Adj.R_{\tau-1}$ is positive but insignificant. If Model 4 is used, then the coefficient on this variable is negative and implies an increase of 2.9%. The coefficients on the fund size are significantly positive which is consistent with the hypothesis that larger funds have higher unconditional management turnover rates. Given the same level of management performance, a $10 million increase in fund size will increase the odds ratio by nearly 40%. The coefficient on the team management dummy variables are positive but insignificant.

We now consider how well these models predict manager replacement. Hosmer and Lemeshow (1989) propose a statistic for assessing the goodness of fit of logistic regression models. This statistic is calculated as follows. The observations are sorted in increasing order on the basis of their estimated event probability to form a distribution of empirical probabilities. The ordered observations are then divided into g groups. We set $g = 10$ so that the distribution is divided using its deciles. The Hosmer and Lemeshow goodness-of-fit statistic compares the actual and predicted number in each decile range, that is

$$HL = \sum_{i=1}^{10} \frac{(O_i - N_i\bar{\pi}_i)^2}{N_i\bar{\pi}_i(1-\bar{\pi}_i)} \tag{5}$$

where N_i is the total frequency of subjects in the ith group, O_i is the total frequency of event outcomes in the ith group, and $\bar{\pi}_i$ is the average estimated probability of an event outcome for the ith group. If the model is correctly specified then HL is asymptotically distributed χ^2_{g-2}. The test is one sided and so the specification is rejected only if HL is too large to be

[7]The odds ratio is $OR = P(y=1)/P(y=0) = e^{x^{\mathbf{0}}\theta}$. Therefore the percentage change in OR following a 1% change in x_i conditional on $x = \bar{x}$, say, is $e^{\bar{x}^{\mathbf{0}}\theta + 0.001\theta_i}/e^{\bar{x}\theta} = e^{0.01*\hat{\theta}_i}$.

[8]The percentage response in OR to a 1% decrease is $e^{-0.01*\hat{\theta}_i}$.

plausibly generated from a correctly specified model. In our case, the statistic is insignificant for all four models.

Table 5 provides a more detailed examination of the goodness-of-fit of Model 1.[9] Observations are sorted in increasing order of the estimated event probability and are divided into ten groups of roughly the same size. Within each group, the observed and expected number of observations, the average estimated probability in each group and the average one lag fund return are reported. These results suggest the model performs equally well in all parts of the empirical distribution of event probabilities.

4.2 *Prediction of manager demotion*

The logistic regression results for the demotion sample are reported in Table 6. As hypothesized above, the coefficients on fund return variables and inflows growth rate variables are negative for models (1) and (2). The same is true when the adjusted return is used except for the coefficient on $Adj.R_{\tau-1}$ in Model 3. A comparison of Tables 4 and 6 suggests that fund performance exhibits a stronger inverse relationship with manager demotion than with manger replacement. As an illustration, consider the coefficients on current and lag one fund returns in Model 1. For the demotion sample (Table 6) these coefficients are respectively -2.7 and -1.9, whereas for the replacement sample (Table 4) they are only -1.6 and -1.2. One measure of the size of this difference is its impact on the event probability. Using the demotion sample, the results imply a 1% decrease in annual fund returns implies a 2.66% increase in the odds ratio compared to a 1.59% using the replacement sample. The same pattern emerges if the adjusted returns are used. Based on the results in Table 6, Models 3 and 4 predict that a 1% decrease in current year return risk adjusted annual excess return will increase the odds ratio by about 7.0% and 5.3%, respectively. Whereas, the corresponding increases are only 4.9% and 2.9% in the replacement sample.

In contrast to the replacement sample, the excess fund inflow growth rate does not appear to have statistically significant power in explaining the probability of demotion. The

[9]Regression diagnostics for other models in Table 4 are omitted for brevity.

inflow growth variables are insignificant in all models. Compared to other performance measures, excess net fund inflow growth rates appear to play a relatively unimportant role in management demotion decisions. The coefficient on the fund size variable is positive and statistically significant in all four models. It also exhibits a stronger effect on the probability of demotion than it did on the probability of replacement. The coefficients on the team management dummy variable are negative but insignificant.

The HL statistic is insignificant in all four models, and so the logistic model appears to provide a reasonable explanation of the observed data (see Figure 1). As with the replacement sample, we report more detailed goodness of fit diagnostics for Model 1; see Table 7. While there is no actual manager demotion in the first two groups, the mean predicted demotion probability is only about 1%. The expected manager demotion number is 0.42 and 0.94 respectively. In the last group, there are a total of 14 managers demoted and the expected number is 13.18, which matches the observed demotion frequency well. While the mean predicted demotion probability increases monotonically with decile, the mean annual lag one fund returns decreases from 16.3% in the first group to 11.9% in the last group. However, the mean annual lag one returns across groups do not decrease monotonically. Managers in the poorest performance group have an estimated demotion probability of 4.4% which is just over two times the corresponding figure in the best performance group for whom the probability is 1.9%. Overall, the estimated demotion probability is not high, ranging from 0.0% to 35.3%, with mean as 6.0%. The average estimated demotion probability is 11.5% for those observations in which demotion actually occured.

4.3 *Prediction of manager promotion*

The results in Table 8 indicate a positive relationship is found between the probability of managerial changes and fund performance. The signs of the coefficients on all fund return variables are positive. The estimated coefficients on the contemporaneous and lag one risk adjusted return variables in Model 3 are also positive, but the sign on the lag two adjusted return is negative. The likelihood ratio statistic indicates that all explanatory variables are jointly significant (p-value < 0.05). However, individually, the current annual

fund returns, all risk adjusted excess returns and current and lag one excess inflow growth rates are statistically insignificant. Thus, the risk adjusted return does not predict manager promotions well. This suggests that either fund trustees and investment advisors make their management placement decision based on annual fund return itself, instead of risk-adjusted excess returns, or the risk adjustment measure used in this study is not the one they have adopted.

The estimated coefficient on lag one fund return is 2.6 in Model 1, and this implies that a 1% increase in lagged fund annual returns will increase the odds ratio by approximately 2.63%. Using Model 3, a 1% increase in fund annual risk-adjusted return increases the odds ratio by about 2.1%. The estimated coefficients on the contemporaneous and lagged net fund inflow variables are negative in all models. This finding is surprising because most would think that a manager who brings in relatively more new investment is more likely to be promoted. For all models, the fund size variables are positive and statistically significant which indicates a higher chance of promotion in a larger fund. The coefficients on the team management dummy variable are negative and insignificant. The latter agrees with our findings based on the demotion sample. Taken together, these results suggest the chance of being demoted or promoted is unaffected by whether or not a manager is part of a team.

Table 9 contains the goodness-of-fit diagnostics for Model 2. The expected promotions match the actual promotions well (see Figure 1). These results corroborate our earlier comments about the positive relationship between promotion probability and lagged fund return. As an illustration, managers in the decile with the lowest lagged return have a 1.4% probability of promotion. Whereas the corresponding probability is 12.8% for managers of funds in the decile with the highest lagged returns. The associated lagged returns are 4.1% and 33.5%. The average estimated promotion probability is 7.3% for those observations in which a promotion actually occured .

5 Conclusion

Utilizing a unique set of historical mutual fund manager replacement data for 216 growth mutual funds in 1976-1996 and various performance measures, this paper confirms that there is an inverse relationship between mutual fund performance and subsequent changes in mutual fund managers. However, our paper takes this analysis to a deeper level - we classify the reason for changes in mutual fund managers. Based on the fact that managerial compensation is directly linked to the fund size, we assume that a manager moving into a larger fund is being promoted and a manager moving into a smaller fund is being demoted.

The results indicate that there is a negative relationship between performance and the likelihood of being replaced or demoted. This finding is robust to various measures of performance, including total annual fund return, risk-adjusted annual fund return and net excess fund inflow growth rate. Our results suggest that the probability of a manager being promoted is positively correlated with his current and past performance. A 1% decrease in lagged annual fund returns will increase the demotion probability by about 2.60% and will decrease his promotion probability by approximately 2.63%.

While risk adjusted returns contribute to explaining management replacement probability, they have much less power in predicting demotion or promotion probabilities. The excess growth rates of fund inflows fail to predict the positive relation between good performance and promotion probability. The fund size variable is positive and statistically significant for all models. This result is consistent with related research by Warner, Watts and Wruck (1988) who find that larger corporations have higher management turnover. The coefficients on the team management dummy variable are insignificant.

Previous studies have estimated models for manager replacement alone, and so assume explanatory variables effect all types of managerial turnover in the same way. Our results indicate that this assumption is incorrect, and may lead to biased inference about the role of factors which determine managerial turnover. Overall, the paper provides evidence that current monitoring mechanisms remove inefficient managers and reward well performing managers.

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Table 1: **Fund managerial replacement: January 1976 to June 1996**

Manager relacement distribution information on a sample of 216 growth mutual funds with inception dates before January 1989. A top management change is defined as any change in the fund's portfolio manager or management team. There are a total of 307 management changes. The replacement data are from Morningstar Inc. The figure for 1996 only partially represents this year's turnover rate.

Year	Number of funds	Number of changes	Changes per fund
1976	87	2	0.023
1977	91	3	0.033
1978	94	1	0.011
1979	96	5	0.052
1980	97	8	0.082
1981	103	5	0.049
1982	108	5	0.046
1983	115	8	0.070
1984	128	6	0.047
1985	141	4	0.028
1986	159	14	0.088
1987	178	17	0.096
1988	201	17	0.085
1989	214	23	0.107
1990	214	30	0.140
1991	215	24	0.112
1992	215	29	0.135
1993	216	31	0.144
1994	216	34	0.157
1995	216	29	0.134
1996	216	12	0.056

Table 2: **Distribution of classified replacements: January 1976 to June 1996**

A promotion is defined as a manager moving to manage a larger-size fund. A demotion is defined as a manager moves to manage a smaller size fund or forced out of the mutual fund industry. Retirement is for a manager over 60 when he left his last position, or for those managers who started to manage their first funds before 1970 and their stays in the mutual fund industry were nearly 20 years. Normal reshuffle includes management reshuffling and voluntary leaves.

Year	Promotion	Demotion	Retirement	Normal reshuffle	Reason unknown
1976	-	-	-	-	2
1977	-	-	-	-	3
1978	-	-	-	-	1
1979	1	-	-	-	4
1980	1	-	2	1	4
1981	1	-	2	-	3
1982	2	-	-	-	3
1983	1	2	-	-	5
1984	-	-	1	1	4
1985	-	2	-	1	1
1986	-	1	1	3	8
1987	1	3	2	3	8
1988	1	3	1	4	8
1989	2	-	-	5	16
1990	6	4	1	4	15
1991	5	6	2	3	8
1992	8	3	6	6	6
1993	5	5	5	5	11
1994	4	5	-	11	14
1995	2	5	2	11	9
1996	4	5	-	3	-
Total	44	44	25	61	133

Table 3: **Summary statistics for the explanatory variables**

Replacement sample consists of all management replacement, including promotion, demotion, retirement, normal reshuffle and those reasons unknown. Demotion sample only includes those managerial changes identified as demotions. Promotion sample only includes promotions. S_τ is the log of fund's total asset value at the end of event year; I_τ is net fund inflows growth rate relative to the average growth rate of all growth mutual funds; R_τ is annual return; $R_{\tau-1}$ and $R_{\tau-2}$ are lagged annual returns of event year; A$dj.R_\tau$ is risk-adjusted excess return at the end of event year. A$dj.R_{\tau-1}$ and A$dj.R_{\tau-2}$ are lagged risk-adjusted excess returns.

Variables	$Mean$	SD	Min	Max	$Mean$	SD	Min	Max
Panel A: Replacement sample								
	$y=1$ (obs.= 275)				$y=0$ (obs.=805)			
S_τ	5.422	1.586	0.463	9.194	4.554	1.791	-0.693	9.195
I_τ	-0.203	0.459	-1.271	4.042	0.013	2.310	-1.525	59.991
R_τ	0.135	0.160	-0.203	0.684	0.161	0.159	-0.251	0.991
$R_{\tau-1}$	0.145	0.175	-0.252	0.888	0.158	0.163	-0.251	0.991
$R_{\tau-2}$	0.134	0.161	-0.252	0.690	0.138	0.159	-0.251	0.991
A$dj.R_\tau$	-0.069	0.059	-0.237	0.107	-0.055	0.069	-0.322	0.191
A$dj.R_{\tau-1}$	-0.065	0.062	-0.277	0.121	-0.054	0.072	-0.299	0.191
A$dj.R_{\tau-2}$	-0.065	0.072	-0.277	0.189	-0.051	0.075	-0.299	0.271
Panel B: Demotion sample								
	$y=1$ (obs.=41)				$y=0$ (obs.=648)			
S_τ	6.124	1.528	2.525	9.194	4.690	1.799	-0.693	9.195
I_τ	-0.178	0.549	-1.264	1.812	0.033	2.569	-1.648	59.811
R_τ	0.130	0.166	-0.128	0.669	0.151	0.156	-0.251	0.991
$R_{\tau-1}$	0.141	0.198	-0.252	0.668	0.151	0.170	-0.251	0.991
$R_{\tau-2}$	0.133	0.163	-0.142	0.505	0.133	0.156	-0.251	0.991
A$dj.R_\tau$	-0.069	0.056	-0.187	0.087	-0.050	0.068	-0.322	0.191
A$dj.R_{\tau-1}$	-0.068	0.056	-0.277	0.024	-0.055	0.070	-0.299	0.191
A$dj.R_{\tau-2}$	-0.064	0.066	-0.223	0.072	-0.055	0.070	-0.299	0.191
Panel C: Promotion sample								
	$y=1$ (obs.=41)				$y=0$ (obs.=720)			
S_τ	5.519	1.572	1.539	9.170	4.586	1.805	-0.693	9.195
I_τ	-0.113	0.470	-0.701	2.001	0.029	2.433	-1.525	59.991
R_τ	0.169	0.184	-0.066	0.684	0.162	0.162	-0.251	0.991
$R_{\tau-1}$	0.210	0.180	-0.118	0.684	0.157	0.165	-0.251	0.991
$R_{\tau-2}$	0.145	0.179	-0.106	0.596	0.137	0.158	-0.251	0.991
A$dj.R_\tau$	-0.034	0.059	-0.128	0.101	-0.050	0.068	-0.322	0.191
A$dj.R_{\tau-1}$	-0.041	0.058	-0.146	0.094	-0.049	0.069	-0.299	0.191
A$dj.R_{\tau-2}$	-0.057	0.055	-0.196	0.061	-0.049	0.073	-0.299	0.271

Table 4: **Estimated logistic results for replacement sample**

Estimated logistic results for replacement sample: dependent variable is 1 for total 275 change events, including promotion, demotion, retirement, normal reshuffle and those reasons unknown. dependent variable is 0 for total 805 nonchange events matched by the calendar years. p-value in parentheses. Likelihood ratio statistic tests the null hypothesis that all explanatory variables are not jointly significant. Goodness-of-fit test is the Hosmer and Lemeshow χ^2 test.

	Coefficients (p-value)			
Variable/model	(1)	(2)	(3)	(4)
Intercept	-2.323	-2.432	-3.423	-3.139
	(0.000)	(0.000)	(0.000)	(0.000)
R_τ	-1.614	-1.362		
	(0.003)	(0.009)		
$R_{\tau-1}$	-1.244	-0.988		
	(0.023)	(0.046)		
$R_{\tau-2}$	-0.630			
	(0.223)			
I_τ	-0.372	-0.422	-0.304	-0.410
	(0.028)	(0.014)	(0.067)	(0.017)
$I_{\tau-1}$	-0.111	-0.196	-0.135	-0.222
	(0.397)	(0.171)	(0.338)	(0.142)
$I_{\tau-2}$	-0.270		-0.239	
	(0.059)		(0.097)	
S_τ	0.332	0.325	0.356	0.339
	(0.000)	(0.000)	(0.000)	(0.000)
D_τ	0.037		0.128	
	(0.812)		(0.412)	
$Adj.R_\tau$			-4.983	-2.909
			(0.001)	(0.032)
$Adj.R_{\tau-1}$			1.788	-1.736
			(0.298)	(0.187)
$Adj.R_{\tau-2}$			-4.146	
			(0.003)	
Likelihood ratio, p-value	0.0001	0.0001	0.0001	0.0001
Goodness of fit, p-value	0.767	0.736	0.146	0.238

Table 5: **Logistic regression goodness-of-fit diagnostics for replacement sample**

Observations are sorted in an increasing order of the estimated event probability and are divided into 10 groups of roughly the same size. Within each group, the observed, expected number of replacements and the average estimated probability in each group and the average lag one period fund return are reported. Results are for Model 1.

			$y = 1$		
Decile	No.funds	Mean lag 1 return	Mean prob.	Observed change	Expected change
1	108	0.189	0.075	11	8.06
2	108	0.185	0.129	10	13.96
3	108	0.171	0.162	17	17.54
4	108	0.161	0.192	21	20.71
5	108	0.174	0.223	21	24.12
6	108	0.131	0.254	26	27.43
7	108	0.133	0.291	34	31.42
8	108	0.138	0.338	42	36.47
9	108	0.138	0.396	43	42.75
10	108	0.127	0.486	50	52.53

Table 6: **Estimated logistic results for demotion sample**

Estimated logistic results for demotion sample: dependent variable is 1 for total 41 identified demotion events, dependent variable is 0 for total 648 nonchange events matched by the calendar years. p-value in parentheses. Likelihood ratio statistic tests the null hypothesis that all explanatory variables are not jointly significant. Goodness-of-fit test is the Hosmer and Lemeshow χ^2 test.

	Coefficients (p-value)			
Variable/model	(1)	(2)	(3)	(4)
Intercept	-5.128 (0.000)	-5.332 (0.000)	-6.719 (0.000)	-6.364 (0.000)
R_τ	-2.703 (0.044)	-2.396 (0.061)		
$R_{\tau-1}$	-1.895 (0.183)	-1.604 (0.228)		
$R_{\tau-2}$	-0.958 (0.504)			
I_τ	-0.390 (0.329)	-0.409 (0.289)	-0.219 (0.502)	-0.255 (0.396)
$I_{\tau-1}$	-0.193 (0.599)	-0.333 (0.331)	-0.203 (0.527)	-0.313 (0.337)
$I_{\tau-2}$	-0.155 (0.582)		-0.077 (0.762)	
S_τ	0.574 (0.000)	0.560 (0.000)	0.599 (0.000)	0.563 (0.000)
D_τ	-0.148 (0.678)		-0.04 (0.912)	
A$dj.R_\tau$			-7.287 (0.027)	-5.399 (0.083)
A$dj.R_{\tau-1}$			1.250 (0.754)	-2.334 (0.459)
A$dj.R_{\tau-2}$			-5.107 (0.114)	
Likelihood ratio, p-value	0.0001	0.0001	0.0001	0.0001
Goodness of fit, p-value	0.529	0.178	0.822	0.841

Table 7: **Logistic regression goodness-of-fit diagnostics for demotion sample**

Observations are sorted in increasing order of the estimated event probability and divided into 10 groups of roughly the same size. Within each group, the observed demotions, the expected number of demotions, and the average estimated probability in each group and the average lag one period fund return are reported. Results are for Model 1.

			$y = 1$		
Decile	No.funds	Mean lag 1 return	Mean prob.	Observed change	Expected change
1	69	0.163	0.006	0	0.42
2	69	0.151	0.013	0	0.94
3	69	0.178	0.019	3	1.33
4	69	0.166	0.025	2	1.77
5	69	0.161	0.033	3	2.28
6	69	0.125	0.044	1	3.07
7	69	0.133	0.058	6	4.00
8	69	0.152	0.082	8	5.67
9	69	0.157	0.121	6	8.33
10	68	0.119	0.194	14	13.18

Table 8: **Estimated logistic results for promotion sample**

Estimated logistic results for promotion sample: dependent variable is 1 for total 41 identified promotion events, dependent variable is 0 for total 720 nonchange events matched by the calendar years. p-value in parentheses. Likelihood ratio statistic tests the null hypothesis that all explanatory variables are not jointly significant. Goodness-of-fit test is the Hosmer and Lemeshow χ^2 test.

	Coefficients (p-value)			
Variable/model	(1)	(2)	(3)	(4)
Intercept	-5.250	-4.894	-4.492	-4.287
	(0.000)	(0.000)	(0.000)	(0.000)
R_τ	0.825	0.916		
	(0.453)	(0.413)		
$R_{\tau-1}$	2.600	1.955		
	(0.015)	(0.043)		
$R_{\tau-2}$	1.483			
	(0.160)			
I_τ	-0.108	-0.233	-0.116	-0.237
	(0.689)	(0.458)	(0.676)	(0.449)
$I_{\tau-1}$	-0.097	-0.173	-0.059	-0.096
	(0.681)	(0.561)	(0.719)	(0.691)
$I_{\tau-2}$	-0.553		-0.335	
	(0.180)		(0.359)	
S_τ	0.315	0.294	0.332	0.299
	(0.000)	(0.000)	(0.001)	(0.002)
D_τ	-0.346		-0.380	
	(0.350)		(0.305)	
$Adj.R_\tau$			1.668	3.551
			(0.614)	(0.235)
$Adj.R_{\tau-1}$			2.090	-0.739
			(0.570)	(0.798)
$Adj.R_{\tau-2}$			-3.404	
			(0.282)	
Likelihood ratio, p-value	0.0109	0.0086	0.0346	0.0229
Goodness of fit, p-value	0.149	0.795	0.130	0.665

Table 9: **Logistic regression goodness-of-fit diagnostics for promotion sample**

Observations are sorted in an increasing order of the estimated event probability and are divided into 10 groups of roughly the same size. Within each group, the observed, expected number of promotions and the average estimated probability in each group and the average lag one period fund return are reported. Results are for Model 2.

			$y = 1$		
Decile	No.funds	Mean lag 1 return	Mean prob.	Observed change	Expected change
1	76	0.041	0.014	1	1.11
2	76	0.084	0.024	1	1.85
3	76	0.110	0.030	1	2.30
4	76	0.109	0.035	3	2.69
5	76	0.157	0.041	2	3.13
6	76	0.177	0.049	6	3.77
7	76	0.174	0.059	6	4.46
8	76	0.197	0.070	7	5.31
9	76	0.209	0.086	5	6.57
10	77	0.335	0.128	9	9.83

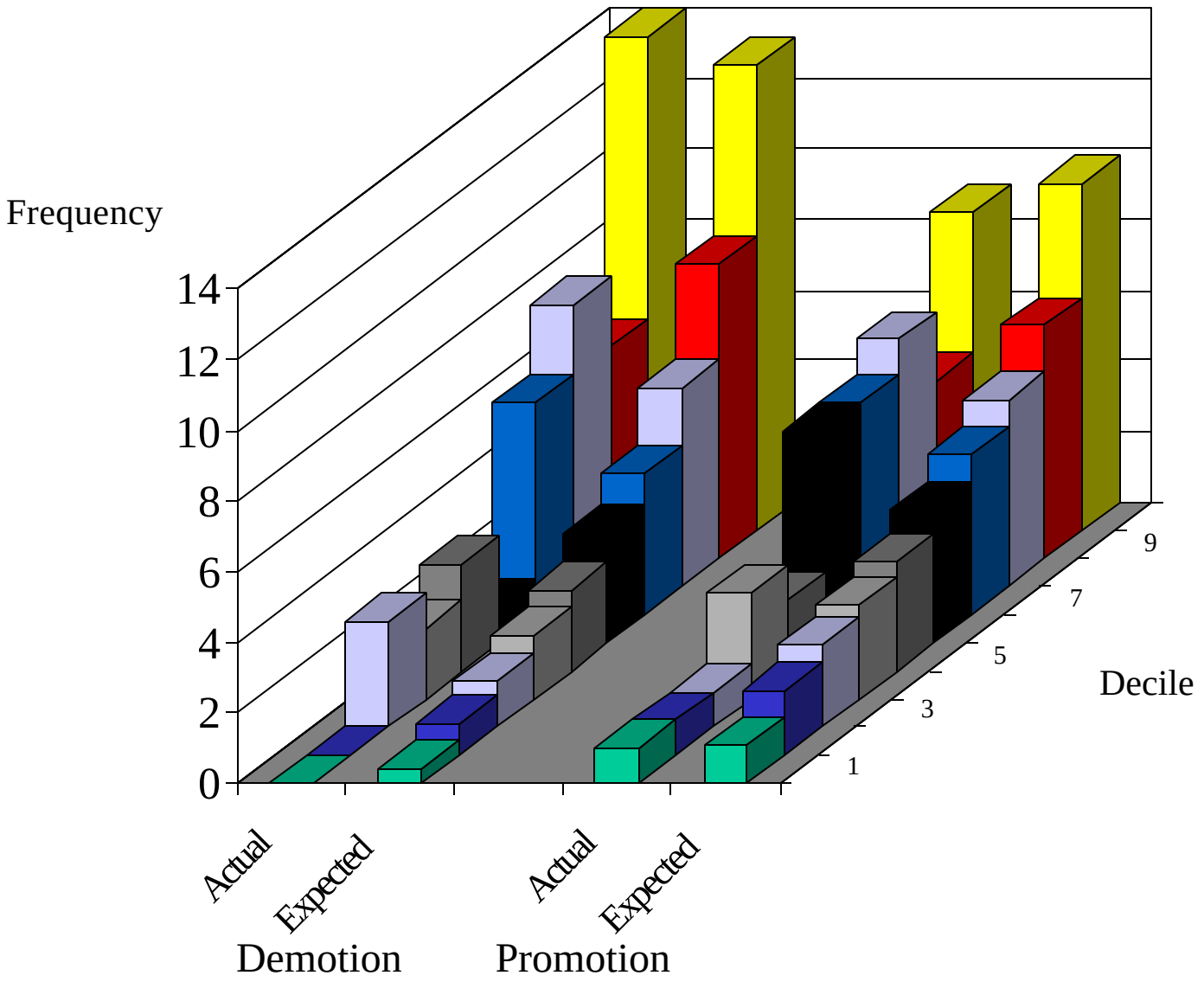

Fig. 1 The goodness of fit of the prediction models for demotion and promotion. The predictions from the logistic regression models are sorted into ten deciles. The figure compares the actual frequency of promotion demotion to the expected frequency.