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# Active Timing Decisions of Equity Mutual Funds

Robert Radcliffe
Robert Brooks
Haim Levy

*In this paper we examine an aspect of professional investment management which has not been adequately documented and studied; the extent to which equity mutual fund managers actively adjust their portfolio's equity risk exposure over time. Estimates of a portfolio's quarter-end beta are developed using the actual stock holdings of the portfolio at the quarter-end. Changes in these beta estimates from one quarter to the next are shown to arise from both passive and active asset allocation. We find that active risk adjustment dominates passive rebalancing and that equity risk exposure is quite variable over time. Thus, individual investors who estimate the equity risk inherent in a portfolio based on a single time series return beta might seriously misestimate the portfolio's current equity risk. We also test whether active risk management is better characterized as anticipatory of future market events or reactive to past market events.*

## I. INTRODUCTION

Active investment managers attempt to provide excess risk adjusted returns by a combination of judicious security selection and asset class timing. This paper deals with the extent to which equity mutual fund managers engage in active timing of their portfolio's equity risk exposure.

What sets the study apart from previous studies of investment managers is that we are able to accurately measure a portfolio's equity risk exposure at a given point in time by observing the security holdings of the portfolio at that time. Using security holdings, we calculate cross-sectional portfolio betas at each quarter-end during our sample period. Previous studies have not used quarter-end security holdings but, instead, have used the time series of portfolio returns during the period studied to

**Robert Radcliffe** • Department of Finance, University of Florida, Gainesville,FL 32611-2017.
**Robert Brooks** • Department of Economics, University of Alabama, Tuscaloosa, AL 35487-0224.
**Haim Levy** • Department of Finance, University of Florida, Gainesville.

estimate the portfolio's equity risk exposure. Although most prior studies estimate a single beta for a portfolio, a few researchers have examined whether portfolio betas appear to change over time. But because their tests were based solely on a portfolio's time series returns, they were unable to clearly document the intertemporal variability in equity risk exposure within a given portfolio. This is the first study to empirically document the extent to which active asset allocation is used by professional equity managers.[1]

The basic data used in this study consist of cross-sectional betas on 94 equity mutual funds for each quarter-end during the period March, 1977 through December 1988. Our measure of active asset allocation during a given quarter is equal to the difference between the actual quarter-end beta of a fund and the expected quarter-end beta if the manager had not engaged in active asset allocation.

Our principle conclusion is that most mutual fund managers do not maintain a static level of equity risk exposure in their portfolios. Instead, they engage in active market timing activities by adjusting both the percentage of the fund invested in equities and the average beta of any equities held.[2] This means that single estimates of a fund's beta which are based on a time series of past fund returns are poor estimates of current equity risk exposure and provide no information about past timing activities of the portfolio manager.

This finding has important implications for individual investors. Single time series regression betas (which are commonly provided in public sources of information about mutual funds) provide no information about the timing activities of a portfolio manager and can seriously misrepresent the current equity risk exposure of a portfolio. When selecting one or more managers, the investor should have a good understanding of how actively the manager adjusts portfolio risk exposure. Unfortunately, such information is not publicly available at present.[3]

We also examine whether active equity risk management is better characterized as reactive or anticipatory. Reactive decisions are defined as those which can be traced to past aggregate market returns or past portfolio returns. Anticipatory decisions are defined as those which are unrelated to past market or portfolio returns.

The results suggest that most active asset allocation decisions are better characterized as anticipatory in nature. There is, however, some weak evidence of reactive decisions in that active changes in equity positions are statistically related to current and past aggregate stock returns. In addition, we find evidence suggesting that manager's whose year-to-date returns have been poor relative to the S&P500 at a September quarter-end tend to incur increased equity risk during the fourth quarter of the year.

The implication of this finding for individual investors is obvious. If an equity mutual fund whose year-to-date return in September is poor relative to the S&P500, the investor should obtain current information about the portfolio's equity risk exposure to be sure that it does not exceed the investor's tolerance for risk.

## II. ACTIVE ASSET ALLOCATION

Active investment managers make two types of decisions in their attempt to achieve portfolio returns in excess of a passively managed portfolio with similar risk:

1. decisions to maintain or change the portfolio's percentage investment in various asset classes, and
2. within each asset class, decisions about the weights of individual securities.

The first decision has historically been referred to as a timing decision. More recently, it has come to be known as Tactical Asset Allocation. The second is known as the Security Selection decision. If security markets are informationally efficient, active managers will not be able to win from either decision. In fact, they would loose due to transaction costs. Yet it is clear that active managers do not believe that security markets are informationally efficient and that they attempt to provide excess returns by engaging in both timing and selection activities.

The extent to which managers employ timing and security selection decisions has never been clearly documented. Some managers state that they make extensive use of timing in their portfolio management whereas others shun the value of timing and concentrate almost exclusively on Security Selection decisions. Later in the paper, we present statistics on the extent to which active timing is used.

Knowledge of a portfolio's current equity risk exposure is important for at least two reasons. First it provides important information to individuals who are invested in the portfolio or are considering an investment in it. Second, it is potentially important when one attempts to evaluate the historical return performance of the portfolio. Investment scholars have focused mainly on the second issue.

Jensen (1972) was the first to note errors which can arise in performance studies which rely on a single time series return beta. He showed analytically that single time series betas can overstate the average equity risk exposure of a portfolio and understate the portfolio's alpha (constant risk adjusted return) when managers are successful in their timing abilities. Since Jensen's observation, many researchers have attempted to measure the extent and success of manager timing abilities. For example, Kon and Chen (1978) applied a switching regression model to the time series returns of 49 mutual funds and found that at least two different "beta regimes" were statistically present for most funds in their sample. They concluded that their "evidence should be regarded as a severe violation of model specification for those studies that employ O.L.S. to estimate mutual fund performance."[4] Other studies of mutual fund timing also suggest that mutual fund managers do not maintain constant equity risk exposure over time. See for example, Bauer, Hays and Upton (1987), Chang and Lewellan (1984), Fabozzi and Francis (1979), Henriksson (1984), Jagannathan and Korajczyk (1986), Kon (1983), Kon and Chen (1979) and Lee and Rahman (1990). However, none of these studies were able to calculate a portfolio's beta at a given point in time since they relied solely on the portfolio's time series returns.

Although an investment manager could conceptually time across a large variety of asset classes, in practice they tend to specialize in only two asset classes; typically maintaining positions in money market securities and only one of a variety of other asset classes. We have chosen a sample of mutual funds which invest almost exclusively in money market securities and U.S. equities.[5]

*A. Measurement of Equity Risk Exposure at Quarter t*

The equity risk exposure of a portfolio can be measured in two different ways. The approach which has been employed in most prior studies of equity managers calculates a single estimate of a portfolio's equity risk exposure by regressing the time series of portfolio returns on a proxy for aggregate equity market returns. The advantage of this approach is its ease. Historical fund returns are available at low cost from a variety of sources. The disadvantage of the approach is that it provides only a single estimate of a portfolio's equity risk exposure over a time period during which equity risk might have been constantly changing.

The approach used in this study calculates a portfolio's equity exposure at each quarter-end based on the security holdings within the portfolio at that quarter-end. A market model beta is first calculated for each security held and then weighted by the percentage of the portfolio's total market value which the security represents. Defining $B_t$ as the beta (or effective equity position) of a portfolio at the end of quarter $t$, then:

$$B_t = \sum_{i=1}^{n_t} b_{it}[(N_{it}P_{it}/\text{TMV}_t] \tag{1}$$

where:

$n_t$ = number of securities held at the end of quarter $t$,
$b_{it}$ = beta of security $i$ at the end of quarter $t$,
$N_{it}$ = number of shares of $i$ held at end of quarter $t$,
$P_{it}$ = price per share of $i$ at end of quarter $t$, and
$\text{TMV}_t$ = total market value of the portfolio at end of quarter $t$.

To illustrate how the single time series beta can differ from the sequence of actual quarter-end fund betas, consider Figure 1. The horizontal line shows the single beta estimate for American Mutual Fund (AMF) based on quarterly AMF returns from March, 1977 through December, 1988. The solid line which varies over time shows the actual quarter-end betas of AMF using equation (1) and the security holdings of AMF at each quarter-end. Although the single time series beta (equal to 0.70) was close to the average of the cross-sectional portfolio betas (equal to 0.71),

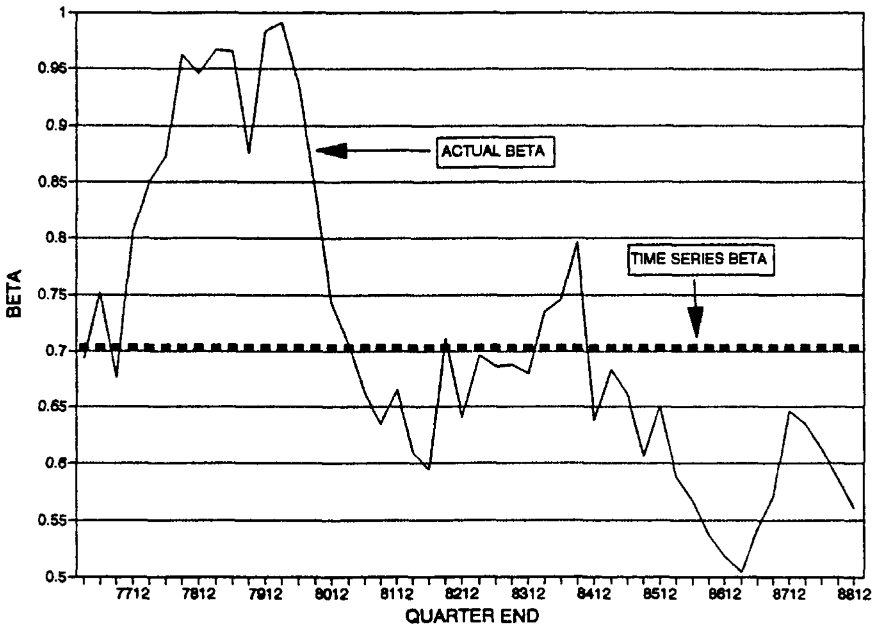



***Figure 1.*** Beta Estimates for American Mutual Fund.

considerable variability existed over time in the fund's actual equity risk exposure. Cross-sectional betas ranged from a high of 0.99 in March, 1980 to a low of 0.51 in March, 1987. In short, although betas which are based on a fund's historical returns during a given period of time might be a reasonable estimate of the average equity risk exposure of the fund during that time period, they can be poor indicators of equity risk at given dates within the interval.

### *B. Measurement of Active Asset Allocation in Quarter t*

The major variable of interest in this study is a fund manager's Active Asset Allocation decision during quarter $t$, $AAA_t$. This variable is calculated by subtracting a fund's expected equity allocation at the end of quarter $t$ if no active asset allocation decisions had been made during the quarter, $E(B_t)$, from the actual equity allocation at the end of the quarter, $B_t$.

$$AAA_t = B_t - E(B_t) \qquad (2)$$

In this section we discuss how the expected equity allocation is calculated.

Given a fund's equity allocation at the start of a quarter, an estimate of expected fund returns during the quarter can be calculated. Assuming that there are no consistent excess returns from security selection decisions during quarter $t$ and that all non-equity securities are Treasury Bills, then the return expected during quarter $t$ would be:[6]

$$E(R_t) = B_{t-1}RM_t + (1 - B_{t-1})RT_t \tag{3}$$

where $RM$ refers to the return on a reasonable proxy for aggregate equities and $RT$ is the return on Treasury Bills.

If the manager does not make any active asset reallocations during quarter $t$, the expected end of quarter portfolio beta would be:

$$E(B_t) = B_{t-1}[(1 + RM_t) / (1 + E(R_t))] \tag{4}$$

and the Passive Asset Allocation during quarter $t$, $\text{PAA}_t$, would be:

$$\text{PAA}_t = E(B_t) - B_{t-1} \tag{5}$$

For example, assume that the portfolio beta at the start of a quarter is 0.56 and that during the quarter $RM$ is equal to 10 percent and $RT$ is 2 percent. Then the expected portfolio return for the quarter would be 6.48 percent and the expected equity risk exposure, $E(B_t)$, would be 0.5785. Thus, the Passive Asset Allocation decision would be equal to +0.0185. Even though the manager might not actively change the portfolio's equity risk exposure, the portfolio beta will change passively due to relative returns on equities versus Treasury Bills.

We measure the degree of Active Asset Allocation, $\text{AAA}_t$, by subtracting the expected portfolio beta, $E(B_t)$, from the actual quarter-end beta, $B_t$.

$$\text{AAA}_t = B_t - E(B_t) \tag{6}$$

### *C. Determinants of Reactive Allocation Decisions*

An Active Asset Allocation decision is made by a manager based on information known to the manager at time $t$. We classify such information into two general categories: (1) information which is observable in past stock market and manager returns and (2) information which is not related to past returns. If Active Asset Allocation decisions are related to past market or manager returns, we say that the timing decision is reactive. If the decision can not be traced to past returns, we say that the decision is anticipatory. Given these definitions, anticipatory decisions can be based on observation of events which occur in both current and past quarters. But as long as such information is not related to historical rates of return of either the manager or the aggregate stock market, then we classify the decision as anticipatory.[7]

Past manager and equity market returns which are used in the study include:[8]

| | | |
|---|---|---|
| $SP_t$ | = | return on the S&P500 index during quarter $t$, |
| $F_t$ | = | return on the fund during quarter $t$, |
| $XF_t$ | = | excess return on the fund in quarter $t$, |
| | = | $F_t - SP_t$, |
| $CSP_{t-k}$ | = | cumulative return on the S&P500 from $k$ quarters back through the end of quarter $t$, |
| | = | $(1 + SP_{t-k})(1 + SP_{t-k+1}) \cdots (1 + SP_t)$, and |
| $CXF_{t-k}$ | = | cumulative excess returns on fund from $k$ quarters back through the end of quarter $t$ |
| | = | $(1 + XF_{t-k})(1 + XF_{t-k+1}) \cdots (1 + XF_t)$. |

These five variables are used to examine whether Active Asset Allocations are related to either: (1) past aggregate stock market returns or (2) to past excess manager returns.

Consider first the case of aggregate stock market returns. Reactive decisions based on past aggregate stock returns could arise from a variety of possible motives. For example, the manager might have a long-run portfolio beta target and desire to rebalance any passive changes in the portfolio's equity risk exposure towards this target. If this is true we would expect to find a negative relationship between PAA and AAA. In quarters in which common stock returns are large, the value of PAA would be large and positive. If the manager rebalances the equity risk exposure towards a long-run target, AAA would be negative in such a quarter. Another motive is often referred to as trend following. If AAA is positively related to returns on the S&P500 in the current or previous quarters, it is likely that the manager believes that current and past market returns can be extrapolated to future quarters. An alternative to trend following is referred to as a contrarian strategy. In this case the manager actively adjusts the equity risk exposure in a direction opposite to current and past market returns. If a contrarian strategy is used, AAA should be negatively related to current and past S&P500 returns.

Reactive asset allocation decisions could also arise if manager returns have been substantially different from returns on the aggregate stock market. Managers having high relative returns might choose to reduce their equity exposure since they have already "beat the market" in the eyes of the mutual fund owners. Similarly, managers with low relative returns might increase their equity exposure in the hopes of offsetting past relative returns.[9]

We label one variant of such reactive allocations the *September Hypothesis*. There are two aspects to this hypothesis. First, managers are hypothesized to be more concerned about their calendar year returns than any other yearly return (say, for example the yearly return ending in June). The manager is said to believe that investors judge the manager's performance based primarily on yearly returns calculated as of the December quarter-end of each year. Second, prior to the last quarter of the year, managers who have done poorly relative to an equity market index such as the S&P500 are hypothesized to have little to loose if they take on extra equity risk but a lot to gain. If managers increase equity risk exposure and the equity market declines, they are not harmed since they have already been labeled as "losers" for the year-to-date. But if the equity market rises, they have a greater chance of offsetting previous poor relative returns. If this hypothesis is true, we should find that past relative returns are important determinants of AAA mainly for managers with poor relative performance and that the relationship becomes stronger for each successive quarter within a year. During any year, the strongest relationship between past relative returns and the current quarter's AAA should occur among managers with the poorest relative performance and should occur at the end of September.

The notion that active investment managers with poor historical returns have nothing to lose from increasing equity risk exposure but, instead, can only gain has been discussed in the theoretical literature. For example, see Grinblatt and Titman (1988). This is the first paper to empirically test the hypothesis.

If AAA's are not related to past S&P500 or manager returns, we categorize the active asset allocation decision as anticipatory. An examination of the variables which managers might consider in such anticipatory decisions is beyond the scope of this study. We concentrate solely on the extend to which active asset allocations can be described as reactive or anticipatory.

### *D. Prior Research*

The finance literature which examines timing decisions of fund managers is extensive. Many of these studies were noted above. However all of this literature examines whether fund timing decisions are successful; an issue which is quite different from the subject of this paper. In this paper we do not ask whether fund managers are able to earn abnormal returns due to their active asset allocation decisions but, instead, examine the extent to which active asset allocation is used and whether such decisions are best characterized as reactive or anticipatory.

## III. Empirical Results

### *A. Sample Description*

The sample was restricted to equity mutual funds for which quarter-end security holdings were available from March 31, 1977 through December 31, 1988 and which invested predominantly in U.S. money market securities and U.S. equities. This resulted in 94 funds with 48 quarterly observations each.

Quarterly fund returns were obtained from CDA Investment Technologies, Inc.. Quarterly portfolio betas of equation (1) were calculated using CDA Spectrum tapes and the CRSP daily returns tapes. For each quarter-end, the Spectrum tape provides a listing of all stocks held by each mutual fund as well as the number of shares held. Quarterly mutual fund betas were based on the betas of stocks held by

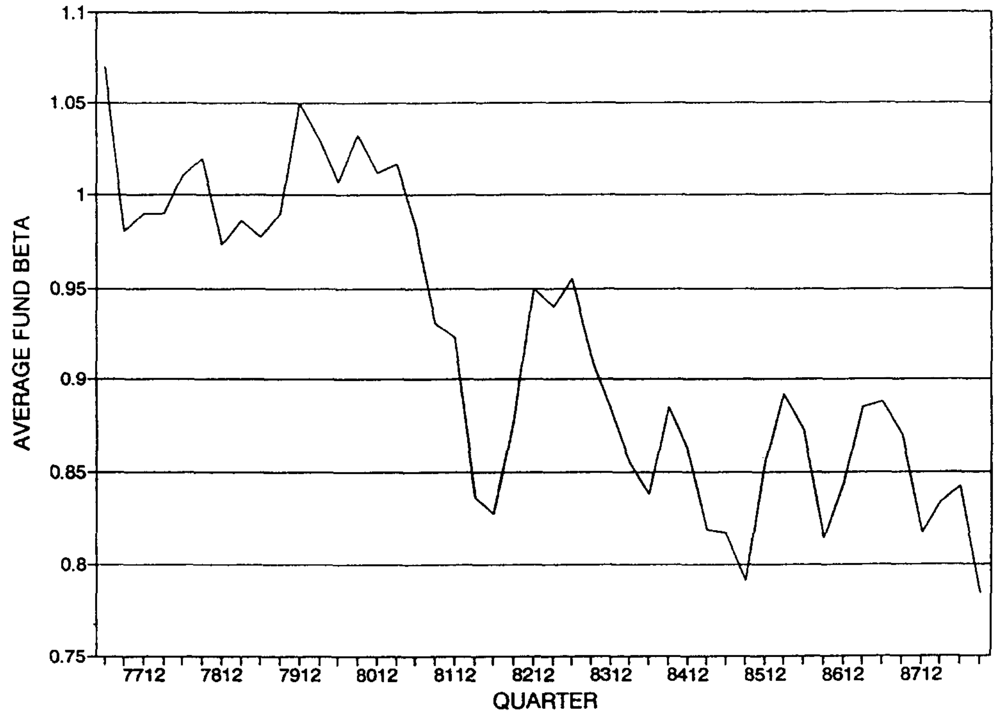



***Figure 2.*** Average Fund Beta by Quarter.

the fund. CRSP tapes were used to estimate the beta on all stocks which had at least 30 monthly returns during the 60 months prior to a given quarter.[10] Stock betas were estimated for each quarter starting with March 31, 1977 and ending on December 31, 1987. Standard market model regressions were performed using monthly stock returns in excess of 90-day Treasury Bills. The S&P500 was used as the market portfolio proxy.

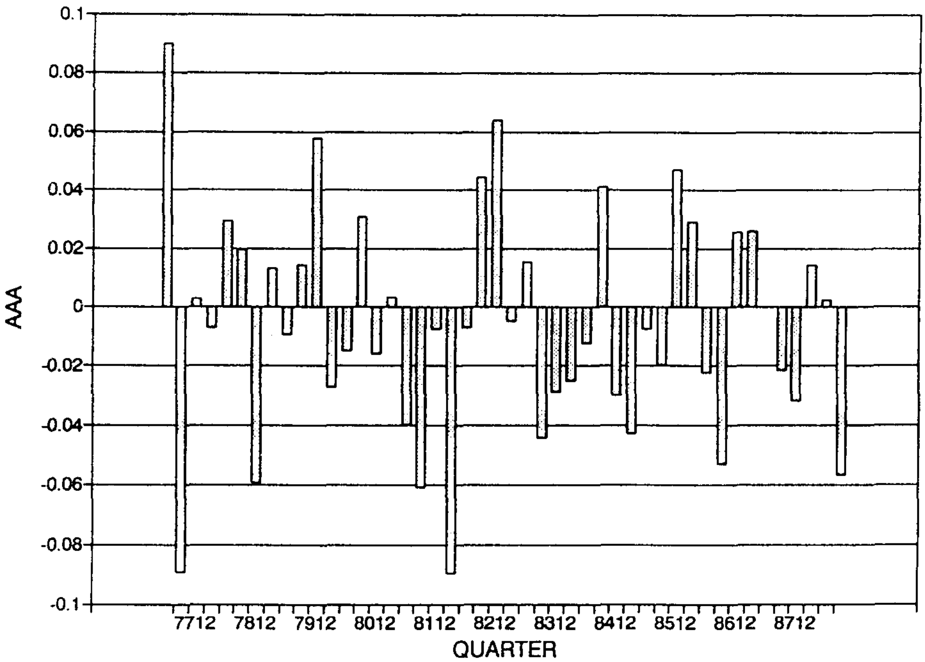
The average beta of the 94 mutual funds is shown in Figure 2 for each quarter-end in our sample period. During the late 1970's, the equity risk exposure of the average fund was about 1.0. However, during the early 1980's, average fund betas declined to about 0.85 and (with some variability) remained below 1.0 through 1988.

### *B. The Extent of Active Asset Allocation*

To evaluate the extent to which managers employ Active Asset Allocation in portfolio management, we first examine data for each quarter across all managers and then examine data for each manager across all quarters.

Consider the two panels of Figure 3. In Panel A, average Active Asset Allocation (AAA) is shown for each quarter in the sample. In Panel B, the average Passive Asset Allocation (PAA) is shown.[11] Vertical scales of both panels are

Panel A.




Panel B.

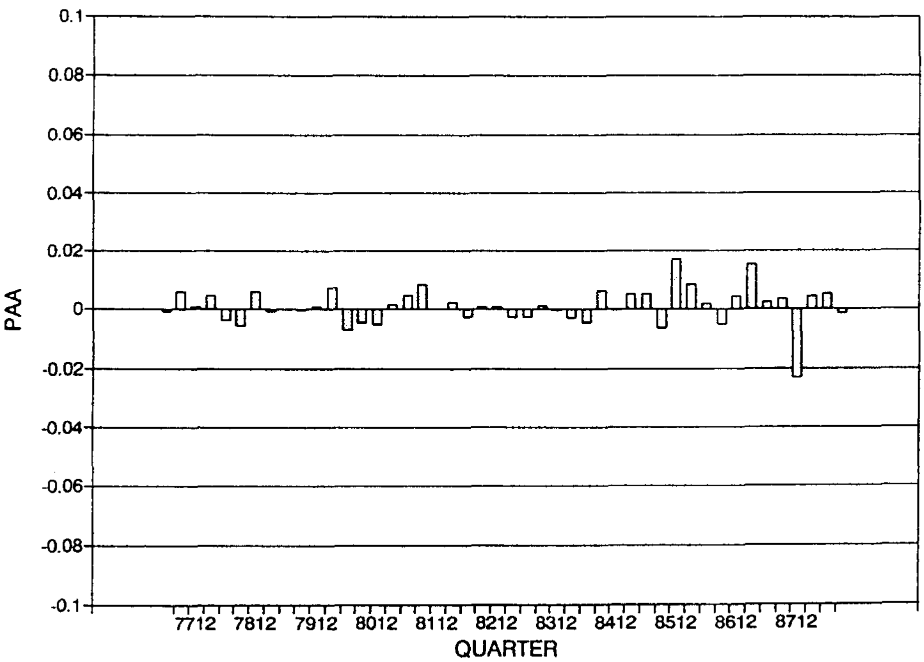



***Figure 3.*** Panel A: Average Active Asset Allocation. Panel B: Average Passive Asset Allocation.

identical. The average AAA was negative in twenty-six quarters versus nineteen positive quarters. Average quarterly AAA values ranged from +0.09 to −0.089. Recall that an AAA value of +0.09 means that the equity risk exposure (fund beta) was actively increased by 0.09. During the quarter in which Black Monday occurred, AAA was not unusually different from other quarters. As would be expected, the Black Monday quarter displays the largest negative Passive Asset Allocation. However, the important point communicated by the panels in Figure 3 is that Active Asset Allocation by mutual fund managers clearly dominates Passive Asset Allocation. Managers do engage in active asset allocation.

The degree to which managers engage in Active Asset Allocation is even better seen in the data displayed in Table 1. For example, during the quarter ended June 30, 1977, the average AAA was +0.09. But the standard deviation of AAA across all managers was 0.115. The largest active decrease in a fund's beta during this quarter was a negative 0.118 and the largest increase was +0.683. The data in this table show clearly that Active Asset Allocations within a single quarter can be sizeable.

Information about each manager over time is shown in Table 2. For each manager, the average and standard deviation of their quarterly AAA variable is shown. For presentation purposes, the data are sorted by standard deviations of AAA.[12] Standard deviations range from 0.361 to 0.039. For comparison with Figure 1, AMF is fund number 3 with an average AAA of −0.0042 and a standard deviation of 0.0595. Two conclusions are evident from this data. First, the extent to which managers engage in active management of portfolio risk exposure varies. Second, for the typical manager, portfolio risk exposure is actively managed and can change substantially over the course of only three months.

Although not shown here, most of the changes in portfolio betas are due to changes in a portfolio's stock to total assets ratio. The beta of equity securities held is much less variable; managers seemed to maintain fairly constant equity portfolio betas and altered portfolio equity risk by increasing or decreasing the percentage of assets held in equities. We find this comforting for two reasons. First, although we might estimate stock betas with an error since they are based on prior 5-year returns, there is virtually no error in measuring the stock to asset ratio. Second, although equity betas might change by pure chance as a manager engages in stock selection activities, changes in stock to asset ratios are closely monitored by managers and made largely for the purpose of market timing.[13]

### *C. Determinants of Active Asset Allocation Decisions*

Five regression models are shown in Table 3 which use a standardized measure of Active Asset Allocation as the dependent variable. All observations were pooled. Thus, it is possible that strategies used by certain managers might offset opposite strategies used by others. Our results apply to the group as a whole. Earlier we defined AAA as the difference at the end of a quarter between the actual portfolio beta of a manager and the expected beta if no active allocation had occurred. Because managers engage in varying degrees of active asset allocation, we standardized each

**TABLE 1**
**Active Asset Allocation by Quarter**

| *Quarter* | *Average* | *Standard Deviation* | *Minimum* | *Maximum* |
|---|---|---|---|---|
| 7706 | 0.090 | 0.115 | –0.118 | 0.683 |
| 7709 | –0.089 | 0.102 | –0.492 | 0.159 |
| 7712 | 0.003 | 0.091 | –0.267 | 0.251 |
| 7803 | –0.007 | 0.126 | –0.659 | 0.544 |
| 7806 | 0.029 | 0.172 | –0.879 | 0.562 |
| 7809 | 0.020 | 0.147 | –1.090 | 0.350 |
| 7812 | –0.059 | 0.124 | –0.590 | 0.126 |
| 7903 | 0.013 | 0.083 | –0.200 | 0.346 |
| 7906 | –0.009 | 0.097 | –0.410 | 0.244 |
| 7909 | 0.014 | 0.074 | –0.190 | 0.363 |
| 7912 | 0.058 | 0.127 | –0.210 | 0.508 |
| 8003 | –0.028 | 0.115 | –0.390 | 0.276 |
| 8006 | –0.015 | 0.121 | –0.458 | 0.241 |
| 8009 | 0.031 | 0.112 | –0.258 | 0.368 |
| 8012 | –0.016 | 0.142 | –0.443 | 0.461 |
| 8103 | 0.003 | 0.117 | –0.468 | 0.399 |
| 8106 | –0.039 | 0.109 | –0.412 | 0.158 |
| 8109 | –0.061 | 0.123 | –0.316 | 0.387 |
| 8112 | –0.007 | 0.126 | –0.432 | 0.339 |
| 8203 | –0.089 | 0.184 | –0.925 | 0.485 |
| 8206 | –0.007 | 0.138 | –0.537 | 0.452 |
| 8209 | 0.045 | 0.120 | –0.246 | 0.623 |
| 8212 | 0.064 | 0.162 | –0.346 | 0.494 |
| 8303 | –0.005 | 0.195 | –0.825 | 0.789 |
| 8306 | 0.015 | 0.165 | –0.735 | 0.451 |
| 8309 | –0.044 | 0.175 | –0.944 | 0.343 |
| 8312 | –0.029 | 0.166 | –0.734 | 0.837 |
| 8403 | –0.025 | 0.111 | –0.561 | 0.363 |
| 8406 | –0.012 | 0.089 | –0.248 | 0.280 |
| 8409 | 0.041 | 0.147 | –0.238 | 0.881 |
| 8412 | –0.030 | 0.089 | –0.355 | 0.247 |
| 8503 | –0.042 | 0.091 | –0.310 | 0.400 |
| 8506 | –0.007 | 0.111 | –0.523 | 0.369 |
| 8509 | –0.020 | 0.110 | –0.430 | 0.571 |
| 8512 | 0.047 | 0.134 | –0.540 | 0.530 |
| 8603 | 0.029 | 0.104 | –0.191 | 0.435 |
| 8606 | –0.022 | 0.092 | –0.405 | 0.245 |
| 8609 | –0.053 | 0.121 | –0.522 | 0.155 |
| 8612 | 0.026 | 0.084 | –0.178 | 0.477 |
| 8703 | 0.026 | 0.114 | –0.363 | 0.567 |
| 8706 | 0.000 | 0.101 | –0.284 | 0.329 |
| 8709 | –0.021 | 0.103 | –0.385 | 0.208 |
| 8712 | –0.032 | 0.160 | –0.516 | 0.626 |
| 8803 | 0.014 | 0.107 | –0.258 | 0.543 |
| 8806 | 0.002 | 0.083 | –0.429 | 0.197 |
| 8809 | –0.057 | 0.087 | –0.373 | 0.205 |

AAA observation. The standardized value of AAA was calculated by dividing the raw AAA measure for a given manager in a given quarter by the standard deviation of the given manager's raw AAA over the sample period.[14]

Model 1 regresses the standardized AAA against events which occurred during the quarter in which AAA is observed. All independent variables are statistically

**TABLE 2**
**Analysis of AAA by Fund Sorted by Standard Deviation of Quarterly AAA**

| *Fund Number* | *Average Quarterly Change in AAA* | *Standard Deviation of AAA* | *Fund Number* | *Average Quarterly Change in AAA* | *Standard Deviation of AAA* |
|---|---|---|---|---|---|
| 62 | –0.0333 | 0.3613 | 49 | 0.0003 | 0.0977 |
| 6 | –0.0108 | 0.2628 | 66 | –0.0099 | 0.0977 |
| 73 | –0.0049 | 0.2572 | 87 | 0.0005 | 0.0976 |
| 30 | 0.0002 | 0.2421 | 11 | –0.0024 | 0.0961 |
| 61 | –0.0063 | 0.2417 | 8 | 0.0002 | 0.0961 |
| 78 | –0.0092 | 0.2239 | 42 | –0.0074 | 0.0948 |
| 59 | –0.0084 | 0.2185 | 41 | –0.0074 | 0.0947 |
| 56 | 0.0069 | 0.2122 | 48 | –0.0122 | 0.0944 |
| 28 | 0.0054 | 0.2117 | 58 | –0.0073 | 0.0932 |
| 64 | –0.0033 | 0.1993 | 34 | –0.0022 | 0.0932 |
| 92 | –0.0133 | 0.1949 | 27 | –0.0031 | 0.0915 |
| 37 | –0.0091 | 0.1939 | 71 | –0.0096 | 0.0913 |
| 74 | –0.0062 | 0.1924 | 7 | –0.0056 | 0.0894 |
| 53 | 0.0002 | 0.1905 | 18 | –0.0171 | 0.0893 |
| 35 | –0.0021 | 0.1684 | 81 | –0.0117 | 0.0879 |
| 91 | –0.0095 | 0.1623 | 86 | –0.0077 | 0.0871 |
| 88 | –0.0078 | 0.1623 | 44 | –0.0104 | 0.0862 |
| 63 | 0.0037 | .01536 | 80 | –0.0059 | 0.0854 |
| 69 | –0.0088 | 0.1513 | 10 | –0.0034 | 0.0804 |
| 29 | 0.0043 | 0.1493 | 26 | –0.0059 | 0.0792 |
| 19 | –0.0208 | 0.1489 | 83 | –0.0065 | 0.0782 |
| 60 | –0.0123 | 0.1485 | 4 | –0.0100 | 0.0779 |
| 76 | –0.0064 | 0.1468 | 75 | –0.0012 | 0.0768 |
| 47 | –0.0010 | 0.1443 | 15 | –0.0009 | 0.0743 |
| 2 | –0.0049 | 0.1426 | 55 | –0.0050 | 0.0735 |
| 14 | –0.0054 | 0.1423 | 89 | –0.0045 | 0.0734 |
| 72 | 0.0011 | 0.1414 | 1 | –0.0151 | 0.0733 |
| 23 | –0.0003 | 0.1406 | 90 | –0.0037 | 0.0723 |
| 79 | –0.0014 | 0.1385 | 68 | –0.0123 | 0.0705 |
| 46 | 0.0078 | 0.1303 | 38 | –0.0065 | 0.0702 |
| 24 | –0.0022 | 0.1284 | 43 | –0.0095 | 0.0678 |
| 22 | –0.0014 | 0.1274 | 67 | –0.0023 | 0.0669 |
| 31 | 0.0005 | 0.1253 | 5 | –0.0061 | 0.0654 |
| 40 | –0.0032 | 0.1238 | 39 | –0.0043 | 0.0653 |
| 45 | –0.0099 | 0.1227 | 93 | –0.0007 | 0.0646 |
| 12 | –0.0068 | 0.1227 | 52 | –0.0048 | 0.0645 |
| 13 | –0.0142 | 0.1211 | 21 | –0.0077 | 0.0632 |
| 54 | –0.0043 | 0.1204 | 3 | –0.0042 | 0.0595 |
| 50 | –0.0042 | 0.1112 | 16 | –0.0035 | 0.0566 |
| 94 | –0.0093 | 0.1111 | 32 | –0.0031 | 0.0532 |
| 84 | –0.0043 | 0.1099 | 65 | –0.0070 | 0.0506 |
| 36 | –0.0125 | 0.1082 | 70 | –0.0053 | 0.0481 |
| 20 | –0.0031 | 0.1055 | 82 | –0.0066 | 0.0456 |
| 57 | 0.0029 | 0.1034 | 33 | –0.0045 | 0.0428 |
| 9 | –0.0035 | 0.0991 | 85 | –0.0055 | 0.0400 |
| 51 | –0.0046 | 0.0989 | 17 | –0.0058 | 0.0393 |
| 77 | –0.0074 | 0.0988 | 25 | –0.0038 | 0.0391 |

**TABLE 3**
**Active Asset Allocation Regressions Standardized AAA as Dependent Variable**

| *Model* | *1* | *2* | *3* | *4* | *5* |
|---|---|---|---|---|---|
| Intercept Term | − 2.34 | −1.89 | −0.07 | −0.89 | −0.28 |
| | (−11.65) | (−6.88) | (−0.31) | (−3.55) | (−1.03) |
| $PAA_t$ | −4.08 | −4.16 | −3.79 | −3.31 | −3.46 |
| | (−4.99) | (−5.08) | (−4.66) | (−4.08) | (−4.28) |
| $SP_t$ | 2.21 | 2.23 | | | |
| | (11.39) | (11.51) | | | |
| $XF_t$ | 1.59 | 1.66 | | | |
| | (4.94) | (5.12) | | | |
| $SP_{t-1}$ | | −0.46 | | | |
| | | (−2.37) | | | |
| $XF_{t-1}$ | | −0.62 | | | |
| | | (−1.95) | | | |
| $CSP_{t-1}$ | | | 0.81 | | |
| | | | (6.48) | | |
| $SP_{t-2}$ | | | −0.83 | | |
| | | | (−4.29) | | |
| $CXF_{t-1}$ | | | 0.51 | | |
| | | | (2.49) | | |
| $XF_{t-2}$ | | | −0.42 | | |
| | | | (−1.32) | | |
| $CSP_{t-2}$ | | | | 0.31 | |
| | | | | (2.98) | |
| $SP_{t-3}$ | | | | 0.47 | |
| | | | | (2.37) | |
| $CXF_{t-2}$ | | | | 0.29 | |
| | | | | (1.90) | |
| $CSP_{t-3}$ | | | | | 0.31 |
| | | | | | (3.33) |
| $SP_{t-4}$ | | | | | −0.14 |
| | | | | | (−0.63) |
| $CXF_{t-3}$ | | | | | 0.15 |
| | | | | | (1.22) |
| $XF_{t-4}$ | | | | | −0.28 |
| | | | | | (−0.87) |
| $R$-Square | 3.77% | 3.91% | 1.92% | 0.78% | 0.69% |

*Note: T*-statistics are shown in parentheses.

significant. The intercept terms were negative; consistent with Figure 2 which shows a long-term decline in the beta of the average manager. The passive change in equity allocation which would result from relative returns on stocks and T-bills (PAA) is negatively related to active equity asset allocation decisions. In fact, this is true for each of the models shown in Table 3 as well as for all other models which we examined in the study. This negative relationship is consistent with managers following an active rebalancing strategy — a rebalancing to a desired target equity allocation. Quarters in which passive equity allocation increases (decreases), due to relative stock and Treasury Bill returns, result in active decreases (increases) in equity allocations by the managers.

Model 1 also suggests that, for the average fund, AAA is positively related to returns on the S&P500 as well as excess fund returns during the contemporaneous quarter. The positive sign on $SP_t$ could reflect an opinion by managers that recent market trends will persist. The positive relationship between excess returns on the manager's portfolio and AAA suggests that, across the full sample, managers with current quarterly returns in excess of the S&P500 tend to increase their commitment to equities. Similarly, managers with current quarterly returns less than the S&P500 tend to actively reduce their equity positions.

But even though each of the variables in Model 1 are statistically significant, the explanatory power of the model is low — having an $R$-square of 3.77 percent. This suggests that anticipatory decisions are much more important to active asset allocation than reactive decisions.

In Model 2, returns from the previous quarter are included in the regression. The return on the S&P500 in quarter $t-1$ is negatively related to active changes in equity in quarter $t$. Similarly, excess returns of the manager in quarter $t-1$ are also negatively related to active equity changes in quarter $t$. This negative relationship contrasts with the positive relationship in the contemporaneous quarter. The best explanation we can offer is that asset rebalancing is conducted over more than one quarter. For example, if returns on the S&P500 or excess manager returns are large, the equity commitment is reduced during the subsequent quarter.

In Models 3–5, the affects of quarterly returns lagged 2 through 4 quarters are examined. In none of the cases are quarterly excess manager returns significant. However, lagged S&P500 returns for two and three quarters are significant. The negative sign on the two quarter lag is similar to the one quarter lag. We have no explanation for the positive sign on the three quarter lag.

### *D. The September Hypothesis*

To test the *September Hypothesis*, the sample was first split into four groups; one for each quarter-end in a year, March, June, September and December. Next, the excess return of each manager was calculated from the start of the calendar year through the end of the given quarter. We refer to this year-to-date cumulative excess fund return as YCXF. Finally, each of the four quarterly groups were sorted into quintiles based on the levels of YCXF. Funds in Rank 1 had the lowest YCXF and funds in Rank 5 had the highest YCXF.

Illustrative regressions results are shown in Table 4 using PAA and YCXF as independent variables and AAA as the dependent variable. When regressions are run on the unranked groups, only PAA is significant, the year-to-date cumulative excess fund return is not significant. And when regressions are run on each of the YCXF quintile rankings, YCXF is again usually insignificant. However, there is one major exception. In September, the funds in Rank 1 have a statistically significant

TABLE 4
Tests of the September Hypothesis Dependent Variable = AAA

| | *March* | | *June* | | *September* | | *December* | |
|---|---|---|---|---|---|---|---|---|
| | *PAA* | *YCXF* | *PAA* | *YCXF* | *PAA* | *YCXF* | *PAA* | *YCXF* |
| All | –4.57 | 0.53 | –1.14 | –1.33 | –2.40 | 0.40 | –4.47 | 0.56 |
| Rank 1 | 3.19 | 0.57 | –1.39 | 1.08 | –4.29 | –3.54 | –4.42 | 0.94 |
| Rank 2 | 1.77 | –0.43 | –2.70 | –2.30 | 3.65 | 0.37 | –4.26 | –2.40 |
| Rank 3 | –0.35 | –1.93 | –1.40 | 2.20 | 0.75 | 0.81 | –1.80 | –1.57 |
| Rank 4 | –7.20 | –0.94 | 0.49 | 0.27 | 1.40 | 0.97 | –2.75 | 1.01 |
| Rank 5 | –4.68 | 1.67 | 0.57 | –0.77 | –6.50 | –1.12 | 0.22 | 1.17 |

*Note:* Entries in Table are *T*-statistics.

negative sign on YCXF. This is consistent with the hypothesis that, late in the year, managers with low returns relative to the S&P500 take on greater amounts of equity risk exposure. Although this can also be seen in June and December for other low ranked YCXF groups, the significance level is smaller.

## IV. CONCLUSIONS

Previous studies have found evidence that portfolio managers attempt to anticipate future relative returns on aggregate equities versus risk-free securities and alter the portfolio's equity risk exposure to profit from the manager's predictions. These studies were unable, however, to accurately measure portfolio risk at specific points in time since they relied solely on the time series returns of a portfolio. In this study we calculate cross-sectional portfolio betas using the security holdings of a portfolio at a given quarter-end. As such we are able to accurately measure changes in equity risk exposure.

Using a sample of 94 U.S. equity mutual funds over the period March 31, 1977 through December 31, 1988, we examine the extent to which portfolio managers engage in active management of their portfolios' equity risk exposure. Active management is measured as the difference between a portfolio's cross-sectional beta at the end of a quarter and the beta which would have been expected if no active asset allocation had been used.

Observation shows that cross-sectional portfolio betas can differ significantly from single time series beta estimates. The time series beta is a poor predictor of a portfolio's current equity risk exposure and provides no information about the extent to which the manager engages in active asset allocation.

The change in a manager's beta from one quarter to the next arises from both an active and a passive asset allocation. Active asset allocation is defined as the actual beta of a portfolio at a given quarter end minus the expected beta (given the prior quarter beta and relative returns on equities and risk free securities during the quarter). Passive asset allocation is defined as the expected beta minus the prior quarter's beta. The dominant cause for changes in portfolio betas is active allocation. For example, it is not unusual to find managers who actively increase or decrease their portfolio beta by 0.5 between two quarters. And the median standard deviation of quarterly active changes in beta was 0.098.

We also examine whether active asset allocation decisions are better characterized as reactive or anticipatory. Reactive decisions are said to be traceable to current and past equity returns of either the aggregate stock market or the individual manager. Although most decisions appear to be best classified as anticipatory, there is some weak evidence of reactive decisions. Finally, we find evidence that managers who experience poor year-to-date returns relative to the S&P500, increase their equity risk exposure in the last quarter of the calendar year.

What do these results mean to the individual investor? First, given the large variability in a portfolio's beta which is possible over time, it is unfortunate that individual investors are not provided with information about a mutual fund's current and past cross-sectional betas. Without this information, it is very difficult to judge the extent to which a manager engages in timing activities and the portfolio's current equity risk exposure. Although this data is provided by consultants to large investors such as pension funds and endowment funds, it is not available to individual investors. Second, if a fund which has poor yearly returns as of September is being considered for purchase, the investor should check to see that the manager has not recently increased equity risk beyond the investor' risk tolerance.

## NOTES

1. The most recent study discussing problems inherent in measuring the performance of professional managers when they engage in active management of equity risk can be found in Grinblatt and Titman (1989). They demonstrate that informed managers who have positive timing abilities can appear to uninformed investors as having negative timing ability and larger calculated betas than actually present in the portfolio. This can happen if performance measures are calculated using the time series of the portfolio's returns instead of examining changes over time in a portfolio's cross-sectional beta.
2. We do not examine whether market timing activities of fund managers are successful. Instead, we focus on the extent to which timing decisions cause changes in a portfolio's equity risk exposure over time and the determinants of such decisions.
3. Consultants to large portfolio owners such as pensions and endowment funds regularly track and report on the level of equity risk exposure of portfolio managers employed by their clients. Unfortunately, similar information is not currently provided to public investors in mutual funds.
4. Kon and Chen (1978) p. 471.
5. Occasionally the funds in our sample did have small positions (5 percent or less) in fixed income securities. We do not believe that such small positions seriously damage any results of the study.
6. This calculation, of course, assumes that no active asset reallocations are made during quarter $t$.
7. We admit that this classification scheme is quite broad and that more precise knowledge of the factors which should cause specific managers to alter their equity risk exposure should be researched. However, this is the first study to examine identifiable changes in equity risk exposure. As such, we believed that it was important to frame the issue in as fundamental a manner as possible.

8. We choose the S&P500 index for two reasons. First, it is the most easily accessed index to the general public and is, thus, the most widely used index to compare equity mutual fund returns against. Second, we wanted to include data extending through the end of 1988 and the CRSP indexes were not available for 1988. A regression of S&P500 returns against CRSP returns for the period in our sample for which both series were available resulted in an S&P500 beta of 1.01 and an $R$-square of 99.4 percent.
9. Relative returns are calculated by substracting returns on the S&P500 from returns on the fund. This implicitly assumes that mutual fund owners believe the Beta of the fund to be 1.0. Although not reported here, we also tested excess fund returns based on each fund's actual Beta. Results were no different from those reported here. This could be due to a number of reasons: (1) mutual fund investors were unable to differentiate between fund Beta levels, (2) they were unconcerned about Beta levels and made relative fund comparisons solely against the S&P500 or (3) sample error.
10. CRSP data for 1988 was not available. Stock betas calculated for December, 1987 were used for all quarters in 1988. The beta for asset holdings in excess of the cumulative value of stock holdings were assigned a beta of 0.00. In virtually all cases, non-stock holdings were money market securities.
11. The accuracy of both AAA and PAA depend on the accuracy of expected portfolio returns as calculated in equation (5). We conducted a variety of tests comparing the sequence of expected returns generated by equation (5) and actual fund returns. Detailed results are available from the authors. It is our opinion that equation (5) does not impart a significant bias to the calculation of either PAA or AAA.
12. A list of funds used in this study is available from the authors.
13. Our analysis does not consider the extent to which cash inflows or outflows to the portfolio might be the cause for changes in a portfolio's stock to asset ratio. This is an interesting issue and deserves study. However, in conversations with a number of the mutual fund managers covered in our sample, they stated that only about two percent of assets are necessary to maintain liquidity for net redemptions and that cash from net new sales is invested within a day.
14. Results were very similar when the raw AAA variables were used.

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