Does Asset Allocation Policy Explain 40%, 90%, or 100% of Performance?

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Abstract

Disagreement about the importance of asset allocation policy stems from differences in what is considered important. Using data on balanced mutual funds and pension funds, we explore the ability of asset allocation policy to explain variability of returns across time, variation in return across funds, and the average level of return. We find that about 90% of the variability of returns of a typical fund *across time* is explained by policy; about 40% of the variation of returns *across funds* is explained by policy; and that on average, about 100% of the return *level* is explained by policy return.

I. Introduction

How important is asset allocation policy? The answer depends on how you ask the question and what it is that you are trying to explain. According to the well known studies by Brinson et al.[1], more than 90% of the variability of a typical plan sponsor's performance over time is due to asset allocation policy. So if you are trying to explain the variability of returns *over time*, asset allocation is very important.

Unfortunately, the Brinson studies are often misinterpreted and the results are applied to questions that the studies never intended to answer. For example, you might want to know how important asset allocation is in explaining the variation of performance *across funds*. Since the Brinson studies do not address this question, you can neither look to them to find the answer nor fault them for not answering it correctly.[2] A different study is required.

Finally, you might want to know what percentage of the *level* of typical fund's return due to asset allocation policy. Again, the Brinson studies do not address this question. A different study is needed.

Thus we have three distinct questions about the importance of asset allocation:

1) How much of the variability of returns *across time* is explained by policy? (This is the question that Brinson et al. asked.)
2) How much of the variation of returns *across funds* is explained by differences in policy?
3) What portion of the return *level* is explained by policy return?

Much of the recent controversy about the importance of asset allocation is due to treating the answer that Brinson et al. provided to question (1) as an answer to questions (2) and (3).

The purpose of this paper is to ask and answer all three questions. To do this, we look at ten years of monthly returns on 94 balanced mutual funds and five years of quarterly returns on 58 pension funds. We perform a different analysis for each question and find that:

1) About 90% of the variability of returns of a typical fund *across time* is explained by policy.
2) About 40% of the variation of returns *across funds* is explained by policy.
3) On average, about 100% of the return *level* is explained by the policy return.

The remainder of this paper is organized as follows: section II presents the framework that we used to analyze the data; section III discusses the data; section IV discusses each of the three questions and the corresponding answers; section V summarizes our results.

II. Framework

Our data consist of the total return for each fund for each period of time (a month or a quarter). The first step in our analysis is to decompose each total return into two components, policy return and active return, as follows:

$$TR_i(t) = [1 + PR_i(t)] \cdot [1 + AR_i(t)] - 1$$

where

$TR_i(t)$ = total return of fund i in period t;

$PR_i(t)$ = policy return of fund i in period t;

$AR_i(t)$ = active return of fund i in period t;

Policy return is the part of the total return that is due to the asset allocation policy. Active return is the remainder. Active return depends upon both the manager's ability to actively over- or underweight asset classes and securities relative to the policy and the magnitude and timing of those bets.

The asset allocation policy of each fund can be represented as a set of asset class weights that sum to one. For the pension funds in this study, these weights are known in advance. For the mutual funds, the policy weights were determined by returns-based style analysis, which is described in the Data section below. The policy return of the fund over a given period of time can be computed from the policy weights and returns on asset class benchmarks as follows:

$$PR_i(t) = w1_iR1(t) + w2_iR2(t) + \ldots + wk_iRk(t) - c$$

where

$w1_i, w2_i, \ldots, wk_i$ are the policy weights of fund i;

R1(t), R2(t), ..., Rk(t) are the returns on the asset classes in period t; and

c = the approximate cost of replicating the policy mix through indexed mutual funds as a percentage of assets.

Thus, in addition to fund returns, we need policy weights for each fund and total returns on asset class benchmarks. Given the total returns on the funds and the estimated policy returns of the funds, we solve for the active returns.

In our time series analysis, we use the period by period returns. In our cross-sectional analysis, we use the compound annual rates of return over the period of analysis. For each fund, we compute the compound annual total return over the entire period as follows:

$$TR_i = \sqrt[N]{(1+TR_i(1))(1+TR_i(2))\cdots(1+TR_i(T))} - 1$$

where

TR_i = compound annual total return on fund i over the entire period of analysis;

$TR_i(t)$ = total return of fund i in period t;

T = number of period returns; and

N = length of the entire period of analysis.

Similarly, we compute the compound annual policy return over the entire period as follows:

$$PR_i = \sqrt[N]{(1+PR_i(1))(1+PR_i(2))\cdots(1+PR_i(T))} - 1$$

where

PR_i = compound annual policy return on fund i over the entire period of analysis; and

$PR_i(t)$ = policy return of fund i in period t;

III. Data

For the mutual fund portion of this study, we use ten years of monthly returns for 94 domestic balanced funds. The 94 funds represent all of the balanced funds in the Morningstar universe that had at least ten years of data ending March 31, 1998. Policy weights for each fund were estimated by performing return-based style analysis[3] over the entire 120-month period using the asset class benchmarks shown in Exhibit 1. Exhibit 1 also shows the average fund exposure to each asset class.

In calculating the policy returns for each fund, we assumed that the cost of replicating the policy mix through index mutual funds is two basis points per month (approximately 25 basis points annually).

Dale Stevens provided the same type of analysis on quarterly returns of 58 pension funds over the five-year period 1993-1997.[4] However, rather than using estimated policy weights and the same asset class benchmarks for all funds, the actual policy weights and asset class benchmarks of the pension funds were used. In each quarter, the policy weights were known in advance of the realized returns.[5] We report the pension fund results along with our analysis of the mutual fund returns in the next section.

IV. Questions and Answers

Question 1: How much of the variability of returns across time is explained by policy?

The Brinson studies from 1986 and 1991 answer this question, which asks how much of the *variability* of fund returns is explained by the *variability* of policy returns. The result is calculated by regressing each fund's total returns ($TR_i(t)$ in our notation) against its policy returns ($PR_i(t)$), reporting the R-squared value for each fund in the study, then examining the average, median, and distribution of these results.

Exhibit 2 illustrates the meaning of the time series R-squared of a single fund from our sample. In this example, the 120 monthly returns of a particular balanced mutual fund are regressed against the corresponding monthly returns of the fund's estimated policy benchmark. Since most of the points cluster around the fitted regression line, the R-squared is quite high. About 90% of the variability of the monthly returns of this fund can be explained by the variability of the fund's policy benchmark.

In the first Brinson study, quarterly returns over the period 1974-1983 on 91 large U.S. pension funds were studied. The average R-squared was 93.6%. In the second Brinson study, quarterly returns over the period 1978-1987 on 82 large U.S. pension funds were studied. The average R-squared was 91.5%. Based on these results, the authors say that over 90% of the variability of the average single fund's return across time is explained by that fund's policy mix.

What the Brinson results show is that strategic asset allocation explains much of the variability of pension fund returns because plan sponsors select a long-term strategic target and tend to stick to it. If plan sponsors were more active, the R-squareds would be lower.

The results from the analysis of both the mutual fund and the pension data sets are presented in Exhibit 3 along with the Brinson results. Our results confirm the Brinson result that approximately 90% of the variability of a fund's return across time is explained by the variability of policy returns. The result for the median mutual fund was 87.6%, and the result for median pension was 90.7%. The mean results were slightly lower (81.4% and 88.0%, respectively), as they were skewed by the effect of a few outlier funds. These results are consistent with the notion that pension funds, as a group, are less active then balanced mutual fund managers.

Exhibit 4 displays the range of outcomes and shows that the mutual funds are more active than the pension funds. The mutual fund at the 5th percentile of R-squared had only 46.9% of the variability of returns explained by the variability of returns of the policy, while for the fund at the 95th percentile, the R-squared is 94.1%. For the pension funds, the R-squareds are in the tighter range of 66.2% at the 5th percentile and 97.2% at the 95th percentile.

The time-series R-squareds might be high simply because funds participate in the capital markets in general and not because they follow a specific asset allocation policy. We explore this idea by regressing each mutual fund's total returns against the total returns on a common benchmark rather than each against the returns on its own policy benchmark. For common benchmarks, we use the S&P 500 and the average of all of the policy benchmarks shown in Exhibit 1.

The results are shown in Exhibit 5. With the S&P 500 as the benchmark for all funds, the average R-squared is over 75% and the median is nearly 82%. With the average policy across funds as the benchmark, the average R-squared is nearly 79% and the median is more than 85%. These results are realatively close to those using the specific fund's benchmark. Hence, the high R-squareds in the time-series regressions are mostly due to the funds' participation in the capital markets in general, not the specific asset allocation policies of each of the funds. In other words, the results of the Brinson studies as well as our results presented in Exhibit 3 are a case of a rising tide raising all boats.

Hensel, Ezra, and Ilkiw [1991] made a similar point in their study on the importance of asset allocation policy. In their framework, a naïve portfolio must be chosen as a baseline in order to evaluate the importance of asset allocation policy. They point out that in the Brinson studies, the baseline portfolio is in 100% cash. In other words, the Brinson studies are written as if the alternative to selecting an asset allocation policy is to avoid risky assets altogether. When we use a more realistic beaseline, such as the average policy across all funds, we find that the specific policies explain far less than half of the remaining time series variation of the funds' returns.

In order to assess the importance of differences in asset allocation policy, we must compare funds to each other using cross-sectional analysis. We do this in answering the second of our three questions below.

Question 2: How much of the variation of returns across funds is explained by the differences in policy?

To answer this question, we need to compare each fund return to each other and determine how much of the return variation across funds is explained by the policy variations across the funds. This is the question many people mistakenly thought the Brinson studies answered. If all funds were invested passively with the same asset allocation policy, there would be no variation across funds (even though 100% of the variability of returns across time of each fund would be due to asset allocation policy). However, if all funds were invested passively but had a wide range of asset allocation policies, all of the variation of returns would be due to policy.

To answer the question, we did a cross-sectional regression of entire-period compound annual total returns (TR_i) on entire-period compound annual policy returns (PR_i). The R-squared statistic of this regression is the result. For the mutual funds studied, 40% of the return difference was explained by policy, while for the pension fund sample the result was 35%.

Exhibit 6 shows the plot of the 10-year compound annual total returns against the 10-year compound annual policy returns for the mutual fund sample. This chart demonstrates visually the relationship between policy and total returns. The mutual fund result shows that since policy explains only 40% of the variation of returns across funds, the remaining 60% is explained by other factors such as asset class timing, style within asset classes, security selection, and fees. For pension funds, the variation of returns across funds not explained by policy is due to the same factors mentioned above along with manager selection.

The cross-sectional R-squared depends both on how much the asset allocation policies of funds differ from one another and how much the funds engage in active management. To see how much asset allocation policies differ across the balanced mutual funds, we examine the cross-sectional distributions of the style weights.

Exhibit 7 presents the cross-sectional averages, standard deviations, and various percentiles of the style weights of the mutual funds. The last column presents these statistics for the total style allocation to equity. The large standard deviations and spreads between the percentiles indicate a large variation in asset allocation policy among the funds.

Given how diverse the asset allocation policies are among the funds, the relatively low R-squared of 40% must be due a large degree of active management. To see how the degree of active management can affect the cross-sectional R-squared, we calculate the cross-sectional R-squareds between the 10-year annual returns of the policy benchmarks and the 10-year annual returns of a set of modified fund returns. Each modified fund return is a weighted average of the actual fund return with the return on the policy benchmark so that the degree of active management is adjusted:

$$\tilde{TR}_i(t) = xTR_i(t) + (1-x)PR_i(t)$$

The value of x sets the level of active management. Setting $x = 1$ gives us our sample result. Setting $x < 1$ reduces the level of active management below what the funds actually did. Setting $x > 1$ shorts the benchmark and takes a levered position in the fund, thus increasing the level of active management beyond what the funds actually did.

The compound annual return of modified fund returns, $\tilde{TR}_i$, is calculated the same way as the compound annual return of actual fund returns; i.e. as the geometric mean of the modified annual returns.

Exhibit 8 shows the cross-sectional R-squared from regressing the modified compound annual returns ($\tilde{TR}_i$) on compound annual policy returns for various values of x. At x = 1, the cross-sectional R-squared is our original result, 40%. If the funds had been half as active (x = 0.5), the R-squared would have been much higher, 81%. On the other hand, if the funds were one-and-a-half times as active (x = 1.5), the R-squared would have been only 14%. Thus we can see how the degree of active management impacts the cross-sectional R-squared.

Question 3: What portion of the return level is explained by policy return?

Many people also mistakenly thought this was the question the Brinson study was answering with the R-squared value near 90%. We can, however, answer this question using both the Brinson data and the new data from our pension fund and mutual fund studies. The percent of fund return explained by policy return was calculated for each fund as the ratio of compound annual policy return (PR_i) divided by the compound annual total return (TR_i). This ratio of compound returns is really just a performance measure. A fund that stayed exactly at its policy mix and invested passively will have a ratio of 1.0 or 100%; while a fund that outperformed its policy will have a ratio less than one.

Exhibit 9 shows the percent of fund return explained by policy return for the Brinson studies and the two data sets used in this study. On average, policy accounts for a little more then all of total return. The one exception is the pension fund sample in this study, where the mean result is 99%. However, the pension data did not have any expenses subtracted, so after external manager fees, pension staff costs, and other expenses are included, the result is likely to be near 100%, meaning no value was added above the benchmark. On average, the pension funds and balanced mutual funds are not adding value above their policy due to their combination of timing, security selection, management fees, and expenses. Results for both groups may even be better than expected because the timing component could include some benefit from not rebalancing (letting equities run), which would have helped returns in the sample period ŝ nearly continuous U.S. equity bull market period.

The range of percent of fund return explained by policy return is shown in Exhibit 10. There is a wider range for the mutual funds, as they are more willing to make timing and selection bets against the benchmark.

These results were anticipated by Sharpe [1991]. Sharpe pointed out that since the aggregation of all investors is the market, the average performance before costs of all investors must equal the performance of the market. Since costs do not net out across investors, the average investor must underperform the market on a cost-adjusted basis. This implies that on average, more than 100% of the level of fund return would be expected from policy return. Of course, this is not assured for subsamples of the market such as balanced mutual funds or pension funds.

In our analysis, a fund's policy return measures the performance of the asset classes in which that fund invests. Therefore, based on Sharpe's thesis, we would predict that on average, a little more than 100% of the level of total return is due to policy return.[6] Our results confirm this prediction.

This is not to say that active management is useless. An investor who has the ability to select superior managers before committing funds can earn above average returns. If as Goetzmann and Ibbotson [1994] suggest, superior and inferior performance persists over time, one need only invest in the funds that outperformed in the past. However, it would still be impossible for the average return across all funds in the market to be greater than the return on the market.

V. Summary

In this paper, we have sought to answer the question "what part of fund performance is explained by asset allocation policy?" As shown in Exhibit 11, we can think of this as a multiple-choice question, with 40%, 90%, 100%, and "all of the above" as choices. Our analysis shows that while asset allocation explains about 90% of the variability of a fund's returns *over time,* it explains only about 40% of the variation of returns *across funds*. Furthermore, on average across funds, asset allocation policy explains a little more than 100% of the *level* of returns. Since the question can be interpreted in any or all of these ways, we would answer "all of the above."

[1] Brinson, Hood, and Beebower [1986] and Brinson, Singer, and Beebower [1991].

[2] The essence of Jahnke's [1997] critique of the Brinson studies is that they used time-series R-squareds to address the question of cross-sectional variability. This is an unfair critique since Brinson et al. never addressed the cross-sectional question in their studies.

[3] Return-based style analysis was first proposed by Sharpe [1992]. See Lucas [1998] for a detailed discussion.

[4] Stevens's results are reported in Stevens, Surz, and Wimer [1998] along with the mutual fund results reported here.

[5] The average allocations among the general asset classes used are in the pension fund study are 43.7% U.S. stocks, 38.0% U.S. bonds, 5.0% cash, and 13.3% other asset classes.

[6] Since we have taken out the cost of indexing from the policy return, the average underpeformance of the fund is less than what Sharpe's analysis would suggest.

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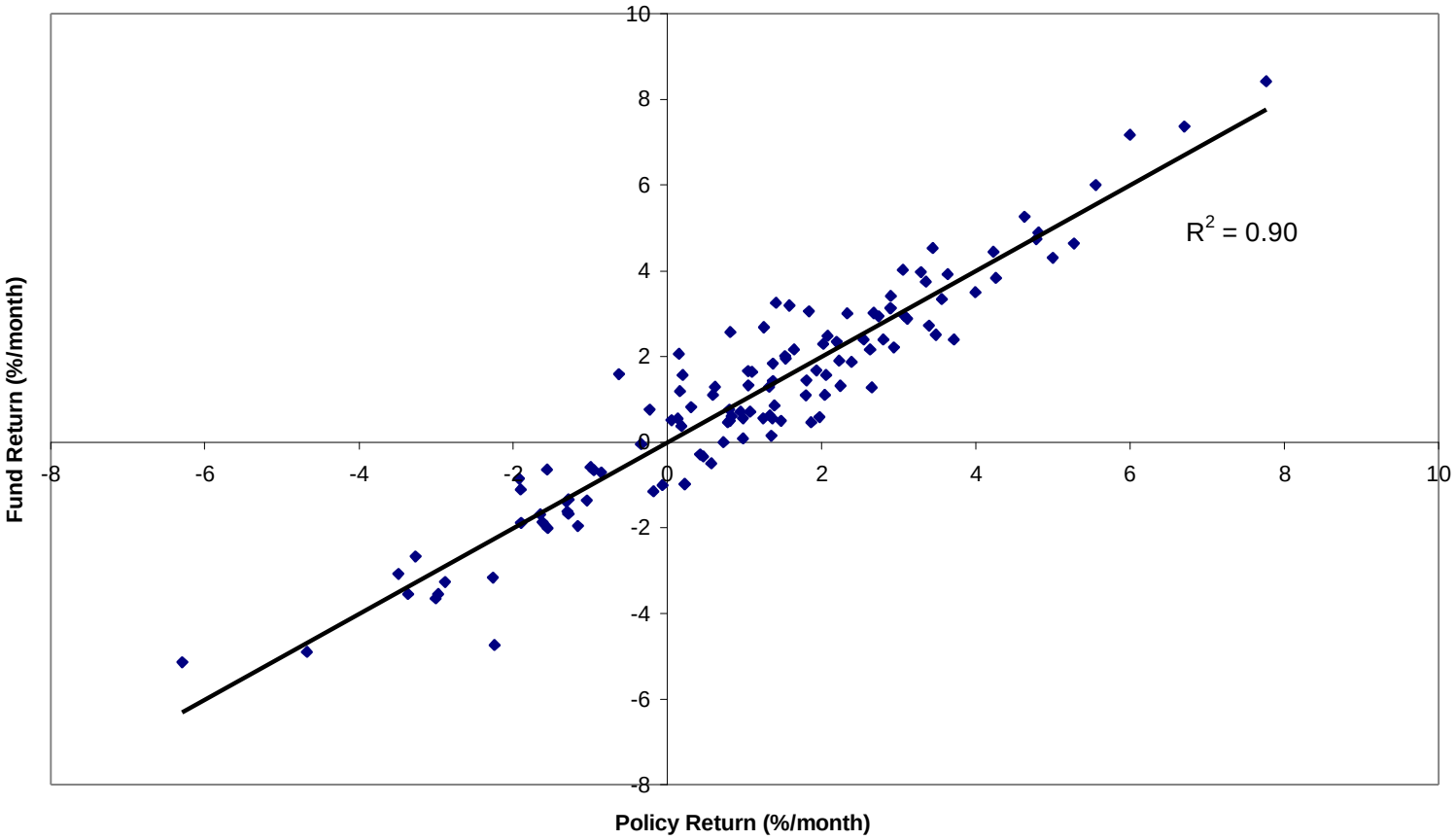
Exhibit 1: Asset Classes and Benchmarks for Balanced Mutual Funds

Asset Class	Benchmark	Average Allocation
Large-Cap U.S. Stocks	CRSP 1-2 portfolio[1]	37.4%
Small-Cap U.S. Stocks	CRSP 6-8 portfolio[1]	12.2
Non-U.S. Stocks	MSCI EAFE index	2.1
U.S. Bonds	Lehman Brothers Aggr. Bond index	35.2
Cash	30-day U.S. Treasury Bills[2]	13.2

1. Constructed by the Center for Research in Security Prices (CRSP). CRSP excludes unit investment trusts, closed-end funds, real estate investment trusts, Americus trusts, foreign stocks and American depository receipts from the portfolios. Moreover, CRSP uses NYSE firms only to determine the size breakpoints for the portfolios. Specifically, all eligible NYSE stocks are ranked by firm size (market value of outstanding equity) and then split into ten equally populated groups, or deciles. The largest companies are put into decile 1 and the smallest are put into decile 10. The capitalization for the largest company in each decile serves as the breakpoint for that decile. Breakpoints are rebalanced on the last day of trading in March, June, September, and December of each year. NYSE/ASE/NASDAQ firms are then assigned to the portfolios using the decile breakpoints. Monthly portfolio returns are market capitalization weighted averages of the individual returns within each of the ten portfolios. The 1-2 portfolio is the combination of deciles 1 and 2 and the 6-8 portfolio is the combination of deciles 6, 7, and 8.

2. From Ibbotson Associates [1998].

Exhibit 2: Time Series Regression of Monthly Fund Return vs Policy Return for a Single Fund



Sample Fund Policy

Large-Cap Stocks	52.4%
Small-Cap Stocks	9.8%
Non-U.S. Stocks	3.2%
U.S. Bonds	20.9%
Cash	13.7%

Exhibit 3: Comparison of Time Series Regression Studies

	Study			
	Brinson 1986	Brinson 1991	Mutual Funds	Pension Funds
R^2				
Mean	93.6%	91.5%	81.4%	88.0%
Median			87.6	90.7
Active Return*				
Mean	-1.10%	-0.08%	-0.27%	-0.44%
Median			0.00	0.18

* Active return is expressed as a percent per year.

Exhibit 4: Range of Time-Series Regression R^2 Values

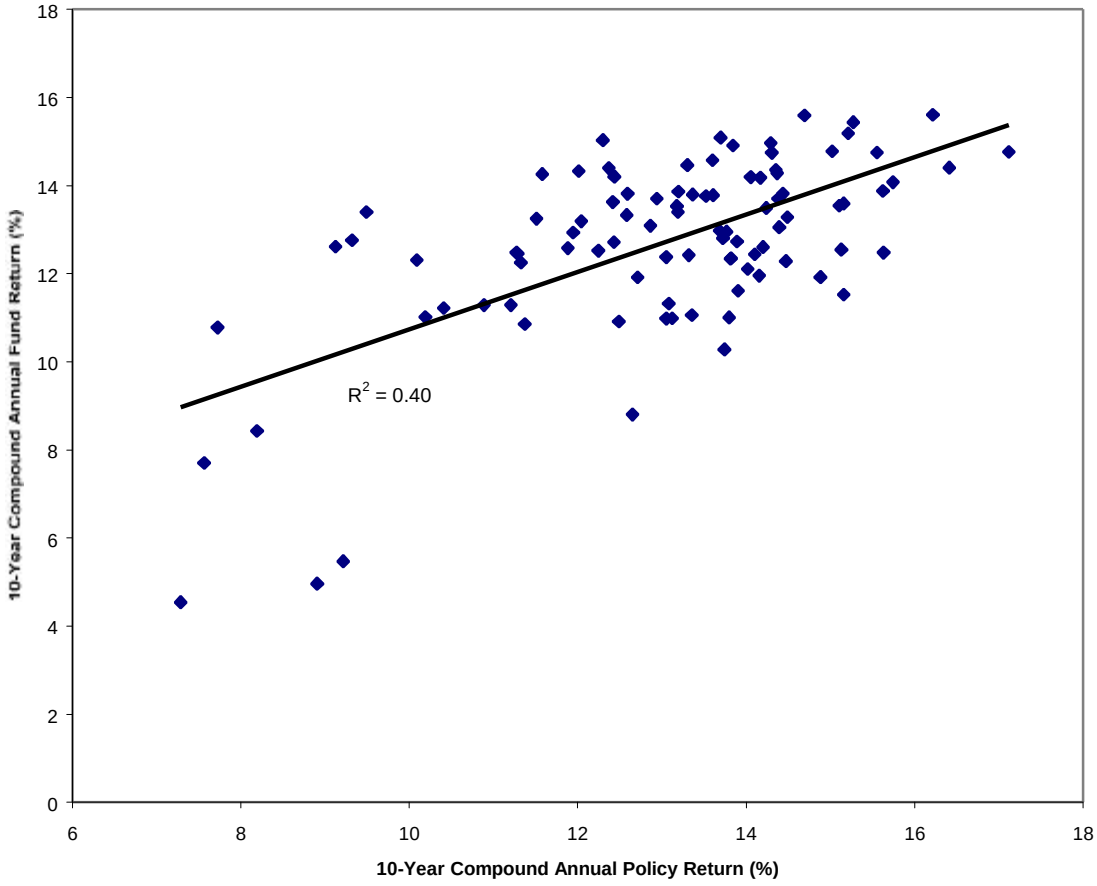
Percentile	Mutual Funds	Pension Funds
95th	46.9%	66.2%
75th	79.8	84.1
50th	87.6	90.7
25th	91.4	94.7
5th	94.1	97.2

Exhibit 5: Explaining a Mutual Fund's Time Series of Returns Using Different Benchmarks

	Benchmark		
	S&P 500	Average Policy	Fund's Policy
R^2			
Mean	75.2%	78.8%	81.4%
Median	81.9	85.2	87.6

Exhibit 6: Fund vs Policy 10-Year Compund Annual Return Across Funds*

(94 Balanced Mutual Funds, 10 Years Ending March 31, 1998)



* This is a plot from the mutual fund sample. Across the pension fund sample the $R^2 = 0.35$.

Exhibit 7: Cross-Sectional Distributions of Balanced Mutual Fund Policy Weights

	Large-Cap U.S. Stocks	Small-Cap U.S. Stocks	Non-U.S. Stocks	U.S. Bonds	Cash	Total Equities
Average	37.4%	12.2%	2.1%	35.2%	13.2%	51.6%
Std. Dev.	17.0	7.6	2.3	14.4	15.9	16.0
Percentile						
95th	56.2%	24.8%	6.4%	56.7%	47.3%	74.1%
75th	48.8	16.5	3.1	45.1	17.5	62.0
50th	40.2	11.0	1.5	35.2	7.7	54.5
25th	29.9	7.1	0.0	26.6	1.0	44.5
5th	1.2	1.1	0.0	12.8	0.0	23.3

Exhibit 8: Degree of Active Management vs. Cross-Sectional R-Squared

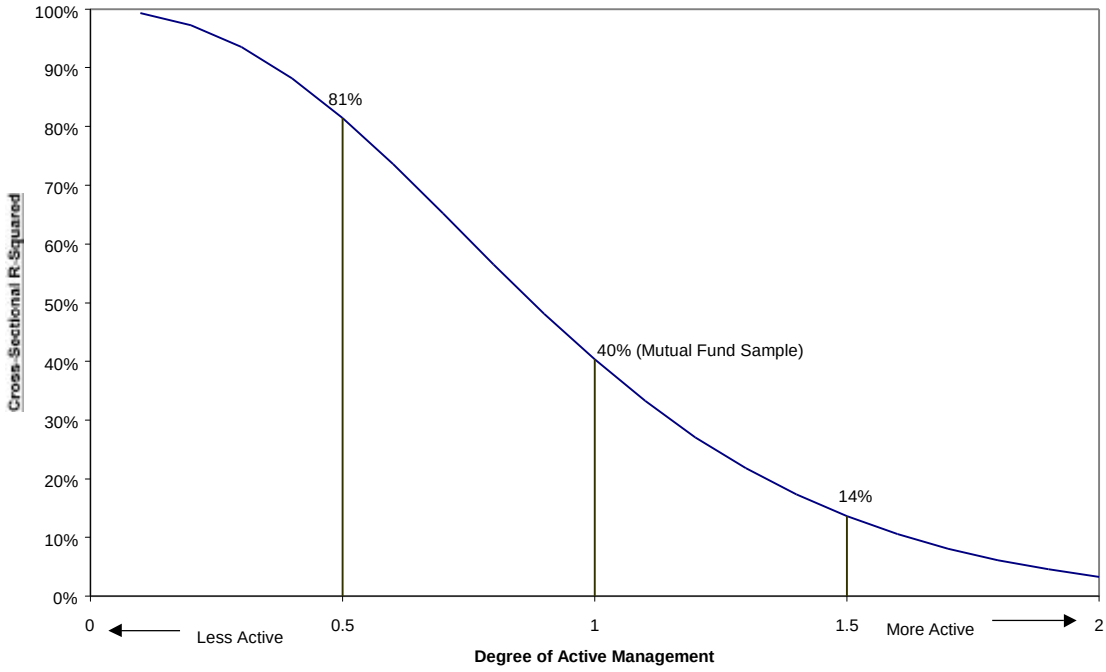


Exhibit 9: Percent of Total Return Level Explained by Policy Return

Study	Average	Median
Brinson 1986	112%	
Brinson 1991	101	
Mutual Funds	104	100%
Pension Funds	99	99

Exhibit 10: Range of Percent of Total Return Level Explained by Policy Return

Percentile	Mutual Funds	Pension Funds
5th (best)	82%	86%
25th	94	96
50th	100	99
75th	112	102
95th (worst)	132	113

Exhibit 11

What part of fund performance is explained by asset allocation policy?

a) Approximately 40%
b) Approximately 90%
c) A little over 100%
d) All of the above