Determinants of Portfolio Performance

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A recent study indicates that more than 80 per cent of all corporate pension plans with assets greater than $2 billion have more than 10 managers, and of all plans with assets greater than $50 million, less than one-third have only one investment manager.[1] Many funds that employ multiple managers focus their attention solely on the problem of manager selection. Only now are some funds beginning to realize that they must develop a method for delineating responsibility and measuring the performance contribution of those activities that compose the investment management process-investment policy, market timing and security selection.'

The relative importance of policy, timing and selection can be determined only if we have a clear and relevant method of attributing returns to these factors. This article examines empirically the effects of investment policy, market timing and security (or manager) selection on total portfolio return. Our goal is to determine, from historical investment data on U.S. corporate pension plans, which investment decisions had the greatest impacts on the magnitude of total return and on the variability of that return.

A FRAMEWORK FOR ANALYSIS

We develop below a framework that can be used to decompose total portfolio returns. Conceptually valid, yet computationally simple, this framework has been used successfully by a variety of institutional pension sponsors, consultants and investment managers; it is currently being used to attribute performance contributions in actual portfolios.

Performance attribution, while not new, is still an evolving discipline. Early papers on the subject, focusing on risk-adjusted returns, suggested the initial framework, but paid little attention to multiple asset performance measurement.[3] Our task is to rank in order of importance the decisions made by investment clients and managers, and then to measure the overall importance of these decisions to actual plan performance.

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Table 1 illustrates the framework for analyzing portfolio returns. Quadrant I represents policy. Here we would place the fund's benchmark return for the period, as determined by its long-term investment policy.

A plan's benchmark return is a consequence of the *investment policy* adopted by the plan sponsor. Investment policy identifies the long-term asset allocation plan (included asset classes and normal weights) selected to control the overall risk and meet fund objectives. In short, policy identifies the entire plan's normal portfolio.[4] To calculate the policy benchmark return, we need (1) the weights of all asset classes, specified in advance, and (2) the passive (or benchmark) return assigned to each asset class.[5]

Quadrant II represents the return effects of policy and timing. Timing is the strategic under or overweighting of an asset class relative to its normal weight, for purposes of return enhancement and / or risk reduction. Timing is undertaken to achieve incremental returns relative to the policy return.

Quadrant III represents returns due to policy and security selection. Security selection is the active selection of investments *within* an asset class. We define it as the portfolio's actual asset class returns (e.g., actual returns to the segments of common stocks and bonds) in excess of those classes' passive benchmark returns and weighted by the normal total fund asset allocations.

Quadrant IV represents the actual return to the total fund for the period. This is the result of the actual portfolio segment weights and actual segment returns.

Table 2 presents the methods for calculating the values for these quadrants. Table 3 gives the computational method for determining the *active* returns (those returns due to investment *strategy*).

Our framework clearly differentiates between the effects of investment policy and investment strategy. Investment strategy is shown to be composed of timing,, security (or manager) selection, and the effects of a cross-product term. We can calculate the exact effects of policy and strategy using the algebraic measures given.

Table 1. A Simplified Framework for Return Accountability

		Selection: Actual	Selection: Passive
Timing	Actual	(IV) Actual Portfolio Return	(II) Policy and Timing Return
Timing	Passive	(III) Policy and Security Selection Return	(I) Policy Return (Passive Portfolio Benchmark)

Active Returns Due to:	
Timing	II − I
Selection	III − I
Other	IV − III − II + I
Total	IV − I

Table 2. Computational Requirements for Return Accountability

		Selection: Actual	Selection: Passive
Timing	Actual	(IV) $\Sigma_i(Wai \cdot Rai)$	(II) $\Sigma_i(Wai \cdot Rpi)$
Timing	Passive	(III) $\Sigma_i(Wpi \cdot Rai)$	(I) $\Sigma_i(Wpi \cdot Rpi)$

Wpi = policy (passive) weight for asset class i
Wai = actual weight for asset class i
Rpi = passive return for asset class i
Rai = active return for asset class i

Data

To test the framework, we used data from 91 pension plans in the SEI Large Plan Universe. SEI has developed quarterly data for a complete 10-year (40-quarter) period beginning in 1974; this was chosen as the beginning of the period for study.

In order to be selected, a plan had to satisfy several criteria. Each plan had to have been a corporate pension trust with investment discretion solely in the hands of the corporation itself (i.e., no employee-designated funds). Large plans were used because only those plans had sufficient return and investment weight information to satisfy our computational needs. Public and multi-employer plans were excluded, because legislative, legal or other constraints could have dramatically altered their asset mixes from what might have obtained.

The sample represents a major portion of the large corporate pension plans of SEI's clients over the lo-year period_ The market capitalization of individual plans in the universe ranges from approximately $100 million at the beginning of the study period to well over $3 billion by its end.

Table 4 summarizes the data collected from each plan. Normal weights for each asset class for each plan were not available. We thus assumed that the lo-year mean average holding of each asset class was sufficient to approximate the appropriate normal holding.[6] Portfolio segments consisted of common stocks, marketable bonds (fixed income debt with a maturity of at least one year, and excluding private placements and mortgage-backed securities), cash equivalents (fixed income obligations with maturities less than one year) and a miscellaneous category, "other," including convertible securities, international holdings, real estate, venture capital, insurance contracts, mortgage-backed bonds and private placements.

Because a complete history of the contents of the "other" component is not available for many plans, we elected to exclude this segment from most of the analysis. We instead calculated a common stock/bonds/cash equivalent subportfolio for use in all quadrants except the total fund actual return; here we used the actual return as reported (including "other")_ We constructed the subport-

Table 3. Cakulatlon of **Active Contributions to Total Performance**

Return Due to:	Calculated by:	Expected Value
Timing	$\Sigma[(Wai \cdot Rpi) - (Wpi \cdot Rpi)]$ (Quadrant II − Quadrant I)	>0
Security selection	$\Sigma[(Wpi \cdot Rai) - (Wpi \cdot Rpi)]$ (Quadrant III − Quadrant I)	>0
Other	$\Sigma[(Wai - Wpi)(Rai \cdot Rpi)]$ [Quadrant IV − (Quadrant II + Quadrant III + Quadrant I)]	N/A
Total	$\Sigma[(Wai \cdot Rai) - (Wpi \cdot Rpi)]$ (Quadrant IV − Quadrant I)	>0

Table 4 Summary of Holdings of 91 Large Pension Plans, 1974-1993

Holdings	Average	Minimum	Maximum	Standard Deviation	Policy Benchmark
All holdings					
Common stock	57.5%	32.3%	86.5%	10.9%	S&P 500 Total Return Index (S&P 500)
Bonds	21.4	0.0	43.0	9.0	Shearson Lehman Government/Corporate Bond Index (SLGC)
Cash equivalents	12.4	1.8	33.1	5.0	30-Day Treasury Bills
Other	8.6	0.0	53.5	8.3	None
Total	100.0%				
Stocks, bonds and cash only					
Common stock	62.9%	37.9%	89.3%	10.6%	
Bonds	23.4	0.0	51.3	9.4	
Cash equivalents	13.6	2.0	35.0	5.2	
Total	100.0%				

folio by eliminating the "other" investment weight from each plan in each quarter and calculating new weights and portfolio returns for the components that remained; this had the effect of spreading the "other' weight proportionally across the remaining asset classes The bottom panel of Table 4 gives the weighting information.

Table 4 also gives the market indexes used as passive benchmark returns.' For common stocks, we used the S&l? 500 composite index total return The S&P comes under frequent attack for not being representative of the U.S. equity market; we nevertheless selected it, for several reasons. First, the S&P is still quoted and used as a benchmark by many plan sponsors; this indicates its continued acceptance. Second, it is one of the few indexes known over the entire study period, and actually available for investment by plan sponsors via, for example, index funds. Third, the S&P 500 does not suffer from the lack of liquidity that affects some segments of the broader market indexes. For completeness, however, we recomputed all the calculations performed below using the Wilshire 5000 Capitalization Weighted Total Return Index in place of the S&P; the results were virtually identical.

We chose the Shearson Lehman Government/ Corporate Bond Index (SLGC) for the bond component passive index; this is representative of all publicly traded, investment-grade bonds (excluding mortgage-backed securities) with a maturity of at least one year and a minimum par amount outstanding of $1 million We used the total return on a 30-day Treasury bill for cash equivalents.

RESULTS

To analyze the relative importance of investment policy versus investment strategy, we began by calculating the total returns for each of our 91 portfolios. Table 5 repeats the framework outlined in Table 1 and provides a mean of 91 annualized compound total lo-year rates of return for each quadrant.

Table 5. **Mean Annualized** Mums by **Activity, 91 Large Plans, 1974–1983**

		Selection: Actual	Selection: Passive
Timing	Actual	(IV) 9.01%	(II) 9.44%
	Passive	(III) 9.75%	(I) 10.11%

Active Returns Due to:	
Timing	-0.66%
Security selection	−0.36
Other	-0.07
Total active return	-1.10%

The mean average annualized total return over the lo-year period (Quadrant IV) was 9.01 per cent. This is the return to the entire plan portfolio, not just the common stock/bonds/cash equivalents portion of the plan.[8] The average plan lost 66 basis points per year in market timing and lost another

36 basis points per year from security selection. The mean average annualized total return for the normal plan policy (passive index returns and average weighting) for the sample was 10.11 per cent (Quadrant I).

Table 6 provides more detail on the various effects of active management and investment policy at work. The effect of market timing on the compound annual return of individual plans ranged from +0.25 to -2.68 per cent per year over the period. The effect of security selection ranged from +3.60 to -2.90 per cent per year. On average, total active management cost the average plan 1.10 per cent per year. Its effects on individual plans varied, however, from a low of -4.17 per cent per year to a high of +3.69 per cent per year-a range of 7.86 per cent.

decision, we would see less of a tendency to cluster asset mix policy according to "peer imitation" or "conventional" investment postures.

ReturnVariation

The ability of investment policy to dictate actual plan return requires further analysis. Table 7 examines the relative amount of variance contributed by each quadrant to the return to the total portfolio. It thus addresses directly the relative importance of the decisions affecting total return.

The figures here represent the average amounts of variance of total portfolio return explained by each of the quadrants. They were calculated by regressing each plan's actual total return (Quadrant IV) against, in turn, its calculated common stocks / bonds / cash equivalents investment policy return (Quadrant I), policy and timing return (Quadrant II) and policy and selection return (Quadrant III). The value in each quadrant thus has 91 regression equations behind it, and the number shown is the average of 91 unadjusted R-squares of the regressions.[9]

Table 6. Annualized 10-Year Returns of 91 Large Plans, 1974-1993

Total Returns	Average Return	Minimum Return	Maximum Return	Standard Deviation
Portfolio returns				
Policy	10.11%	9.47%	10.57%	0.22%
Policy and timing	9.44	7.25	10.34	0.52
Policy and selection	9.7s	7.17	13.31	1.33
Actual portfolio	9.01	5.85	13.40	1.43
Active returns				
Timing only	-0.66%	-2.68%	0.25%	0.49%
Security selection only	*-0.36*	*-2.90*	*3.60*	*1.36*
Other	−0.07	-1.17	2.57	0.45
Total active return	-1.10%	−4.17%*	3.69%*	1.45%*

* Not additive.

Active management (and therefore its control) is clearly important. But how important is it relative to investment policy itself? The relative magnitudes indicate that investment policy provides the larger portion of return. This is not surprising in itself, and most would not disagree that the "value added" from active management is small (though important) relative to asset class returns as a whole. However, what does this imply? It implies that it is the normal asset class weights and the passive asset classes themselves that provide the bulk of return to a portfolio.

Note that the range of outcomes and standard deviations of policy returns is small, reflecting the historical tendency of similar (large, corporate) plans to gravitate toward the same policy mix. We would expect that, over time, as plan sponsors dedicate more resources to the policy allocation

The results are striking. Naturally, the total plan performance explains 100 per cent of itself (Quadrant IV). But the investment policy return in Quadrant I (normal weights and market index returns) explained on average fully 93.6 per cent of the total variation in actual plan return; in particular plans it explained no less than 75.5 per cent and up to 98.6 per cent of total return variation. Returns due to policy and timing added modestly to the explained variance (95.3 per cent), as did policy and security selection (97.8 per cent). Tables 6 and 7 clearly show -that total return to a plan is dominated by investment policy decisions. Active

Table 7. Percentage of Total Return Variation Explained by Investment Activity, Average of 91 Plans, 1973–1985

		Selection: Actual	Selection: Passive
Timing	Actual	(IV) 100.0%	(II) 95.3%
Timing	Passive	(III) 97.8%	(I) 93.6%

	Variance Explained			
	Average	Minimum	Maximum	Standard Deviation
Policy	93.6%	75.5%	98.6%	4.4%
Policy and timing	95.3	78.7	98.7	2.9
Policy and selection	97.8	80.6	99.8	3.1

management, while important, describes far less of a plan's returns than investment policy.

IMPLICATIONS

Design of a portfolio involves at least four steps:

- deciding which asset classes to include and which to exclude from the portfolio;
- deciding upon the normal, or long-term, weights for each of the asset classes allowed in the portfolio;
- strategically altering the investment mix weights away from normal in an attempt to capture excess returns from short-term fluctuations in asset class prices (market timing); and
- selecting individual securities within an asset class to achieve superior returns relative to that asset class (security selection).

The first two decisions are properly part of investment policy; the last two reside in the sphere of investment strategy. Because of its relative importance, investment policy should be addressed carefully and systematically by investors.

Future attempts to quantify the importance of investment management decisions to portfolio performance would benefit from an examination of the integration of investment policy and investment strategy. An explicit delineation and recognition of the links between investment policy and investment strategy would help to clarify further the role of both activities in the investment process. A simple and accurate, yet complete and measurable, representation of the investment decision-making process would further our understanding of the importance of the various components of investment activity and, we hope, lead to a concise and integrated framework of investment responsibility.

FOOTNOTES

1. SEI Corporation, *Number of* Managers *by Plan Size* (Wayne, Pennsylvania, 1985):1.
2. See W.R. Good, "Accountability for Pension Performance," Financial *Analysts Journal* (January / February 1984):39–42.
3. Early works include E.F. Fama, "Components of Investment Performance," *The Journal* **of** *Finance* (June 1972):551–67, and M.C. Jensen, "The Performance of Mutual Funds in the Period 1945-1964," *The Journal* **of** *Finance* (May 1968):389–416. Some more recent works have clearly forged ahead. As an excellent example, see J.L. Farrell, Jr., *Guide to Portfolio Management (New York* McGraw-Hill, 1983):321–39.
4. For a clear treatment of policy **versus strategy, see** D.A. Love, "Editorial Viewpoint," *Financial Analysts Journal* (March / April 1977):22. For a discussion of normal portfolios, see A. Rudd and H.K. Clasing, Jr., *Modern Portfolio Theory* (Homewood, Ill.: Dow Jones-Irwin, 1982):71–72.
5. We say "specified" even though the actual weights may not be known in advance; this accounts for those who wish to use portfolio insurance techniques. In our *view,* these techniques are more ones of active asset allocation (market timing) than investment policy. We view investment policy as having an indefinite time horizon, as opposed to a specific, though extendable, one.

   Throughout this article we will use the words "normal," "benchmark" and "passive" interchangeably. For a detailed description on how an investment policy can be derived, see G.P. Brinson, J.J. Diermeier, and G.G. Schlarbaum, "A Composite Portfolio Benchmark for Pension Plans," *Financial Analysts Journal* (March / April 1986):15–24.
6. While this is clearly a simplification, we are unable to address more accurately the problem of normal weights. Since 10 years covers several business cycles, and since the average standard deviation of asset class holdings for common stocks and bonds is not high relative to the average amounts held, this is probably not a serious problem in the analysis.
7. Data for benchmark returns were provided by R.G. Ibbotson & Associates (Chicago, Ill.) and Shearson/Lehman American Express (New York).

8. We also calculated the stock/bonds/cash equivalents return series and, in all of the analysis that follows, also used that calculated return wherever we used the actual fund return; results were similar in all cases.
9. By "unadjusted," we mean that the R-squared measures are not adjusted for degrees of freedom; thus, for our three simple regression models, the R-squared represents a square of the correlation coefficient, and represents the amount of variance of total return explained in excess of the average. While the average of the quarterly total returns may not be predictable, it is nonetheless of interest *ex post* and, in essence, can be specified by the passive portfolio that, when established, becomes the relevant benchmark for any further comparison.