RockCreek

Strategic Asset Allocation

A Modified Efficient Frontier Analysis

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The strategic asset allocations for large institutional portfolios remain anchored on the efficient frontier methodology. The traditional approach for implementing this methodology faces many issues. The more important of these are determining the appropriate and internally consistent set of capital market assumptions, as well as explicitly accounting for transition costs associated with moving to a new strategic asset allocation. This paper addresses these issues and illustrates how the modified approach was used to determine the strategic asset allocation for a large U.S. public pension plan.

1. Introduction

Markowitz pioneered the use of quantitative methods to help with portfolio construction. His mean-variance framework optimized portfolio weights for assets by maximizing returns for a given level of volatility. In his paradigm, volatility of returns is synonymous with risk. While this assumption has many detractors, Markowitz found it to be necessary to ensure mathematical tractability.

His framework optimized portfolios in a one-step process that considered all assets simultaneously to maximize diversification benefits. In practice, portfolio construction tends to be a two-step process especially for institutional investors; the first involving allocation across asset classes and the second involving the selection of individual securities within each asset class. The first step, also known as the strategic asset allocation, is a top-down process. It involves choosing suitable asset classes for a portfolio, setting the future capital market assumptions for these asset classes,; developing an efficient frontier, and finally choosing the asset class weights for an acceptable level of volatility. The second step, which is a bottom-up process, involves choosing a set of suitable securities for each of the asset classes and assigning the appropriate weights to these securities. The process of setting the strategic asset allocation rests with the boards of most institutional investors, while security selection is generally delegated to external money managers.

Practitioners that accept volatility as the risk measure and adopt the two-step process for optimization face two issues in determining the optimal strategic asset allocation. First, setting future capital market expectations, i.e. future returns and volatilities for the asset classes as well the future correlations between these asset classes, that are both reasonable and internally consistent. Second, determining a strategic asset allocation that rests on the efficient frontier, has the appropriate level of volatility acceptable to the investor, and that also minimizes the allocation changes needed from that of the current portfolio. The minimizing of allocation changes is particularly important as it minimizes transaction costs and large allocation changes are generally not feasible for less liquid asset classes. This paper presents a modified approach to address these two issues and illustrates how the approach may be used to determine the strategic asset allocation of a large U.S. public pension plan.

The traditional approach for setting future capital market assumptions is to use their historical values. More specifically, realized volatility and correlations are used as anchors to predict the future values of these variables. At the same time, future returns are predicted using a mix of historical returns and a building-block approach using guesstimates of inflation and risk premiums. Although the use of historical values is perhaps reasonable for forecasting future correlations across asset classes and the volatilities of liquid asset classes, using historical values to forecast future volatilities of less liquid assets is less appropriate because of the inherent measurement problems. Using historical values is even less appropriate for predicting the future returns of asset classes. Return distributions are non-stationery and almost impossible to predict with any degree of accuracy. Moreover, the relationship between historical returns and volatility of asset classes is seldom a convex function as required by a paradigm in which higher returns can only be generated by taking on higher volatility. Finally, the forecasted returns and volatility will not, in general, be consistent with the forecasted correlations between asset classes, a point that most practitioners ignore. Given the sensitivity of the mean variance of optimized portfolios to capital market expectations and a less-than-rigorous approach to setting these expectations, it is not surprising that determining the strategic asset allocation for a portfolio tends to be more art than science.

In the traditional approach, the new strategic asset allocation that is chosen is one that rests on the efficient frontier and has the acceptable level of risk or volatility. This may lead to a strategic asset allocation that has asset class weights that are quite different from those of the current invested portfolio. In short, the sum of the absolute differences in the asset class weights between the current portfolio allocation and the proposed strategic asset allocation could be quite large. Portfolios on the efficient frontier with risk levels that are similar (but not identical) can have very different asset class weights. Consequently, to reduce transaction costs and ensure ease of implementation, it is important to consider both the level of risk and the allocation changes needed when determining the new strategic asset allocation.

The difficulty of developing a robust strategic asset allocation has by no means reduced the need for one. In fact, the need to partition the overall risk of a portfolio into components and then assign the responsibility of these risk components to specific groups in an incentive-based culture is as strong as ever. What most decision makers are grappling with is the best way of getting this done. The rest of this paper is organized as follows:

- section 2 details an approach for forecasting volatility for illiquid assets and future returns;
- section 3 describes the use of the minimum torsion methodology to ensure that forecasted returns are consistent with the correlation structure;
- section 4 describes how the current allocation of an investment portfolio impacts the strategic asset allocation;
- section 5 outlines how the strategic asset allocation was developed for a U.S. public pension plan;
- section 6 explains how this strategic asset allocation was modified to incorporate the impact of active management;
- section 7 provides concluding remarks and an overview of the benefits realized by the U.S. public pension plan in adopting this modified methodology.

2. Capital Market Assumptions: Volatilities and Returns

The first step in any strategic asset allocation exercise is forecasting the long-term future values of returns, volatility, and correlations for the individual asset classes. Given the relative stability of cross correlations between asset classes, using historical correlations as the predictor of future correlations appears reasonable. The same argument also applies for using historical volatilities as predictors of future volatilities for publicly traded asset classes such as U.S. equity and U.S. bonds. However, this does not apply for less liquid asset classes such as private equity or private real estate because of measurement problems associated with calculating the volatility of these asset classes.

The calculated volatilities of illiquid asset classes tend to be lower than their true volatilities because of "smoothening". The underlying assets of these asset classes, e.g. private companies in the case of private equity or buildings in the case of real estate, are only valued periodically. As a result, monthly returns of these asset classes exhibit strong autocorrelation with a 12-month lag. De-smoothening, i.e. eliminating the autocorrelations in the return stream[1] before calculating the volatilities, is a necessary step for all illiquid asset classes (e.g. private equity, private real estate, infrastructure, opportunistic credit and hedge funds).

Forecasting returns over the long term for asset classes is perhaps the most difficult step in the strategic asset allocation process. The forecasted returns must possess three desirable characteristics. First, they must ensure that the returns forecasted for any single or group of asset classes do not unduly influence the strategic asset allocations. Second, the relationship between risk and return for asset classes is convex, implying higher volatility asset classes have higher returns but with diminishing returns per unit of additional volatility. And third, the returns are consistent with the forecasted correlation structure.

Using historical returns as a predictor of future returns has only one benefit: they ensure that the forecasted returns are consistent with the forecasted correlation structure. This assumption, however, tends to tilt the strategic asset allocation towards asset classes with high historical Sharpe ratios. Moreover, the relationship between historical returns and historical volatility for asset classes is seldom convex.

A better approach to forecasting returns is to assume that all asset classes have the same Sharpe ratio. Moreover, that this Sharpe ratio is equal to that of the most dominant asset class in the portfolio, usually U.S. equities. And finally, for ease of exposition (as this assumption does not affect the strategic asset allocation) we set the forecasted return for the dominant asset class, i.e. U.S. equities, equal to its historical returns. With this set of limited assumptions, we can forecast the future returns of all asset classes.

This approach is intuitively appealing because in a frictionless market, in which volatility is the only measure of risk, investors will bid up the prices of higher Sharpe ratio asset classes and will bid down the prices of lower Sharpe ratio asset classes until all asset classes have the same Sharpe ratio. Moreover, it has the advantage of meeting the first two desirable characteristics of forecasted returns. The relationship between risk and return across asset classes is a straight line which meets the convexity requirement. And the equality of Sharpe ratios ensures that all asset classes are equally desirable from a risk return tradeoff point of view. However, these forecasted returns will not be consistent with the forecasted correlation structure. To ensure that the forecasted returns pass the correlation test, we will need to adopt changes to this forecasting approach.

3. Capital Market Assumptions: Correlations and Return

In a market environment in which all asset classes have the same Sharpe ratio and are perfectly correlated to one

[1] Andrew Lo, The Statistics of Sharpe Ratios

another, the portfolio's Sharpe ratio would equal that of the individual asset classes. The strategic asset allocation would, in this case, be dictated by the investor's preferred risk preference. However, if the assets are not perfectly correlated (and are in some cases negatively correlated), the diversification benefit of an asset class can require its inclusion in a portfolio even if its forecasted future returns result in a Sharpe ratio that is lower than those of its peers.

Consider two asset classes. For the first, we fix the forecasted future return (8%) and volatility (15%); for the second, we let these values vary for the second asset class. The correlation of the two asset classes is also varied. We plot asset class returns of the second asset class on the y-axis and the correlation between the asset classes on the x-axis. We draw the plots in Figure 1 for various levels of portfolio volatility.

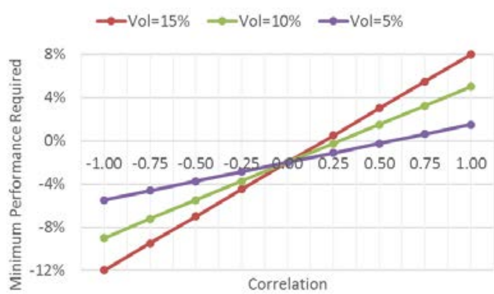

Figure 1 : Minimum Required Return vs Correlation

These plots show an upward sloping curve from left to right, indicating that as correlation between the asset class rises, the return required from the second asset class for it to be included in an efficient portfolio increases. Moreover, these curves move up for higher levels of volatility, implying that the benefit of diversification is lower when the portfolio volatility is higher. These results hold for multi-asset class portfolios and the diversification benefits for an individual asset class tend to be even higher than for a two-asset class portfolio. Consequently, the slope of the plot in Figure 1 will tend to be steeper for multi-asset class portfolios.

The diversification gap is the difference in returns for an asset class on the efficient frontier portfolio under two sets of assumptions: one in which the Sharpe ratios of all asset classes are equal and perfectly correlated with one another; and the second in which the Sharpe ratios of asset classes are unequal, but their future correlations mirror historical correlations. It is measure of the return an investor in an asset class is willing to forgo because of its diversification benefits. From Figure 1 it is clear that asset classes, which have negative correlation to U.S. equities (like U.S. fixed income), can have very large diversification gaps. As a result, the nominal return of these asset classes can be negative and still be attractive to investors.

We accomplish our goal of forecasting returns of asset classes that are consistent with the correlation structure by transforming the set of correlated asset classes into a set of uncorrelated risk factors and then assuming an equality in Sharpe ratios in these uncorrelated factors.

There are an infinite number of transformations of correlated asset classes to uncorrelated risk factors. We choose the minimum torsion approach[2] that minimizes the tracking error between the vectors representing the asset classes and the risk factors. The most common approach to transformation of correlated asset classes into uncorrelated risk factors is the principal component method. We prefer the minimum torsion approach because the vectors determined by the principal component method tend to be sub-optimal since they are statistical in nature and not related to the investment process. On the other hand, uncorrelated risk factors derived using the minimum torsion approach are easily identifiable with the asset classes used by investment managers.

The uncorrelated risk factors determined using the minimum torsion approach are a linear function of the correlated asset classes with heavier loadings on the asset class most closely related to the risk factor and with much smaller loadings on other asset classes. We calculate the volatility of the risk factors using this linear relationship and the volatility and correlations of the asset classes. Assuming equality of Sharpe ratios for all risk factors and setting them to, for example, 1 (the level of the Shape ratio is a scaling factor and set for ease of exposition), it is possible to determine the forecasted returns of the uncorrelated risk factors. The forecasted returns of individual asset classes are then re-calculated using the linear relationship between individual asset classes and the risk factors. These individual asset class returns can then be recalibrated up or down by the ratio of the pre-set return of the dominant asset class (e.g. U.S. equities) to the return of this asset class calculated using the risk factor approach.

An efficient frontier is constructed with the forecasted set of returns, volatilities and correlations. In this framework, we use benchmark historical returns for calculating the volatilities and correlations for the different asset classes. We could, quite easily, incorporate active management into this framework by making three assumptions. First, the incremental volatility of the excess returns from active management. Second, the correlation between the excess returns and the benchmark returns for each asset class. And finally, the information ratio for these excess returns.

To maintain consistency with assumption made earlier, we used historical volatilities of excess returns as the predictor of their future volatility in our case study

[2] A. Meucci, A. Santangelo, R. Deguest; Risk Budgeting and Diversification Based on Optimized Uncorrelated Factors.

illustration. Moreover, that these excess returns were uncorrelated with benchmark returns. And finally, the information ratio of the excess returns of an asset class was equal to the asset class's Sharpe ratio. With these assumptions, it was possible to calculate the total returns and volatility of individual asset classes with active management. These returns and volatility were then used to construct the efficient frontier.

Determining the appropriate strategic asset allocation on this efficient frontier is dependent on the appropriate level of risk the investor is willing to bear and the current asset allocation of the portfolio. The reason for taking the current allocation into account is to incorporate the impact of potential transaction costs associated with making changes to the current portfolio allocations. It also ensures feasibility of implementation because making significant allocation changes to illiquid asset classes is generally not feasible over the short-term.

4. Developing a Strategic Asset Allocation: Incorporating Current Allocation

The efficient frontier is most easily constructed using a simulation technique. The process involves calculating the risk and return for a very large number of simulated portfolios with varying asset allocations and then identifying portfolios with the largest returns for given levels of risk. It should not be surprising that there are perhaps several portfolios on the efficient frontier with risk and return levels that are negligibly different from one another but with very different asset allocations. Traditionally, the strategic asset allocation for a portfolio is determined by first choosing an acceptable level of risk and the determining the asset allocation on the efficient frontier with that level of risk. This traditional approach does not trade off small changes in risk with allocation changes needed to move the current allocation to the new one.

The appropriate approach is explicitly taking this trade-off into account when determining the final strategic asset allocation. It involves determining the return improvement arising from a new strategic asset allocation that has the similar risk (within pre-specified tolerance levels) as the current portfolio but for which the sum of allocation changes from the current portfolio is constrained. This, in turn, helps construct a plot between return benefits and permitted allocation changes.

This plot of is convex, with a higher slope for lower level of allocation changes. Consequently, significant benefits in return improvements may be expected with modest permissible changes in allocation. It may be worthwhile to forgo the remaining return improvements because the large allocation changes needed will result in higher transactions.

5. A Case Study: Developing a Strategic Asset Allocation

We applied this modified efficient frontier methodology to determine the strategic asset allocation for a large public pension plan. The pension plan currently invests in thirteen asset classes. These asset classes and the pension plan's current portfolio allocations are given in Table 1.

To forecast the future returns, volatility and correlations for these asset classes, we start with the quarterly historical returns of their respective benchmarks from July 2004 through September 2016. These returns were used to calculate the volatility of the benchmark returns as well as the correlations of the asset classes with each other.

Table 1 : Asset Allocation of a Case Study

Asset Class	Allocation
U.S. Equity	23.0%
Intl. Equity	14.0%
EM Equity	7.0%
Private Equity	7.0%
Fixed Income	14.0%
Long-term Treasury	4.0%
TIPS	4.0%
High Yield Bonds	5.0%
Opportunistic Debt	8.0%
EM Debt	2.0%
Real Estate	10.0%
Infrastructure	2.0%
Hedge Funds	0.0%

The historical volatilities are used as forecasts of future volatility for all liquid asset classes that include public equities, fixed income, long-term Treasuries, TIPS, high yield, and EM Debt. The volatilities for less liquid asset classes including private equity, opportunistic debt, real estate, infrastructure and hedge funds were calculated using the de-smoothening technique developed by Andrew Lo. The volatilities for all asset classes before and after de-smoothening are provided in Table 2.

Table 2 : Volatility for All Asset Classes Before and After De-smoothing

Asset Class	Volatility	De-smoothed Volatility
U.S. Equity	15.7%	15.7%
Intl. Equity	18.8%	18.8%
EM Equity	23.5%	23.5%
Private Equity	9.5%	14.5%
Fixed Income	3.2%	3.2%
Long-term Treasury	12.8%	12.8%
TIPS	5.2%	5.2%
High Yield Bonds	10.4%	10.4%
Opportunistic Debt	3.7%	5.1%
EM Debt	7.7%	7.7%
Real Estate	5.7%	14.2%

Infrastructure	16.6%	16.6%
Hedge Funds	6.7%	6.7%

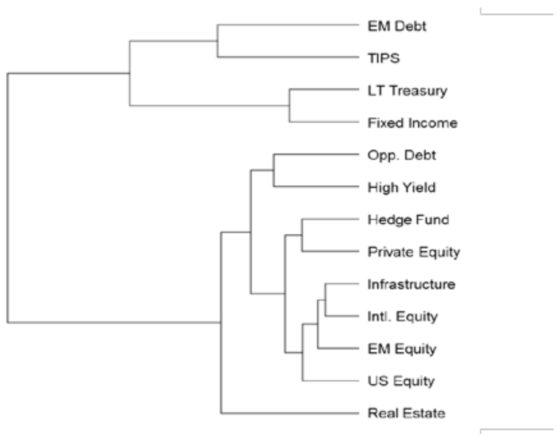

Figure 2: Correlation Cluster

The historical correlations of the individual asset classes with one another is used as a forecast of future correlations between asset classes. A cluster analysis in Figure 2 provides the structure of correlations across the individual asset classes. This cluster has an average correlation of 0.43 and a relatively high modularity of 0.87 suggesting that these set of asset classes provide sufficient diversification.

To forecast the future returns for the different asset classes, we assume that the return to risk ratio is constant across all of them. The level of this ratio is set at 0.51 by assuming future U.S. equity returns will be 8% (the annualized historical returns of U.S. equities over this period, and dividing these forecasted returns by forecasted U.S. equity volatility of 15.7%. The forecasted returns for all asset classes with this assumption are given in Table 3.

Table 3 : Expected Return and Volatility

Asset Class	Return	Volatility	Sharpe Ratio
U.S. Equity	8.0%	15.7%	0.51
Intl. Equity	9.6%	18.8%	0.51
EM Equity	12.0%	23.5%	0.51
Private Equity	7.4%	14.5%	0.51
Fixed Income	1.6%	3.2%	0.51
Long-term Treasury	6.5%	12.8%	0.51
TIPS	2.6%	5.2%	0.51
High Yield Bonds	5.3%	10.4%	0.51
Opportunistic Debt	2.6%	5.1%	0.51
EM Debt	3.9%	7.7%	0.51
Real Estate	7.2%	14.2%	0.51
Infrastructure	8.5%	16.6%	0.51
Hedge Funds	3.4%	6.7%	0.51

It is a mathematical truism that asset classes with identical Sharpe ratios must either be fully correlated or else be orthogonal to one another, i.e. have a correlation coefficient of 1 or 0 with each other. As the correlation coefficients for the asset classes with each other lie between 0 and 1, it follows that their Sharpe ratios cannot be equal.

One approach for ensuring consistency between Sharpe ratios and the correlation structure is by transforming the asset classes into orthogonal risk factors, i.e. the correlation between the risk factors is 1. We make this transformation by minimizing the sum of the angular distance between the asset classes and their corresponding risk factors using the Minimum Torsion methodology.

The risk factor vectors may be represented as a linear combination of the asset classes. Consequently, the returns and volatilities of these risk factors may be derived from the returns, volatilities and correlations of the asset classes. The Sharpe ratio of the risk factor most closely aligned to the dominant asset class, i.e. US equities is then determined. The Sharpe ratio of all other risk factors are then set at this same level; from which their respective returns can be determined, A reverse transformation may then be used to determine the returns of the individual asset classes. The asset classes Sharpe ratio calculated using these returns will be consistent with the forecasted correlation structure. Table 4 provides the forecasted returns, volatilities and Sharpe ratios of the asset classes that are consistent with the forecasted correlations structure.

A plot of the efficient frontier, as also the individual asset classes, in a return-volatility framework is given in Figure 3.

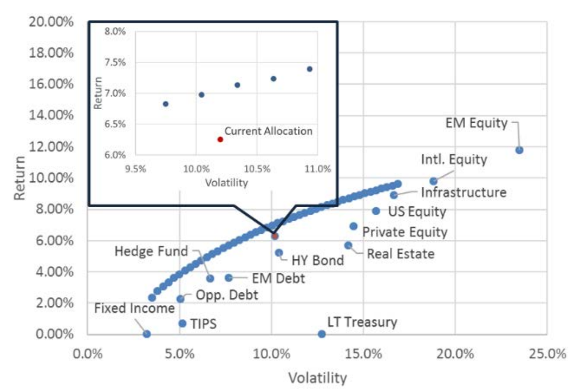

Figure 3: Efficient Frontier

The current portfolio of the public pension plan has a volatility of between 10% and 11% per annum, if we use the volatilities in Table 4, along with the forecasted correlations. The inset in Figure 3 plots a zoomed in version of the efficient frontier for portfolio volatilities between 10% and 12%. The inset also plots the return and volatility of the pension plan's current portfolio.

Table 4: Expected Return and Volatility

Asset Class	Return	Volatility	Sharpe Ratio
U.S. Equity	8.0%	15.7%	0.51
Intl. Equity	9.9%	18.8%	0.53
EM Equity	12.0%	23.5%	0.51
Private Equity	7.0%	14.5%	0.49
Fixed Income	0.0%	3.20%	0.00
Long-term Treasury	0.0%	12.8%	0.00
TIPS	0.7%	5.2%	0.14
High Yield Bonds	5.3%	10.4%	0.51
Opportunistic Debt	2.3%	5.1%	0.46
EM Debt	3.7%	7.7%	0.48
Real Estate	5.8%	14.2%	0.41
Infrastructure	9.0%	16.6%	0.54
Hedge Funds	3.6%	6.7%	0.54

The portfolios on the efficient frontier with similar volatility as the current portfolio have an expected return that are 50 bps higher. Our objective is to identify portfolios on the efficient frontier whose asset class allocations are like the pension plan's current allocations so as to minimize transition costs

We accomplish this by taking a narrow slice of the efficient frontier – between +/- 0.1% of the volatility of the current pension plan portfolio – and identify allocation differences between portfolios within this slice and that of the current portfolio. More specifically, we identify the most efficient portfolio if asset allocation changes from the current portfolio are constrained at 20%, 30% etc. A plot of the maximum excess return that can be generated for constrained level of asset allocation changes is given in Figure 4 below. To ensure that asset allocation changes are not heavily directed towards illiquid asset classes (private equity, opportunistic debt, real estate and infrastructure), we constrain the new allocations for these asset classes to be within +/- 2% of their current allocation

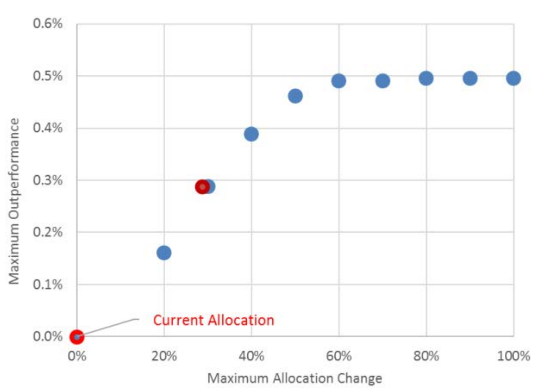

Figure 4: Outperformance vs Allocation Change.

Figure 4 is a convex function, in which the outperformance of the new portfolio increases as the constraint on the % asset allocation change is relaxed, but at a decreasing rate. The benefits for asset allocation changes above 20% are modest. Figure 4 also plots the risk and return of the current pension plan portfolio and the current portfolio modified to bring it closer to the efficient frontier, with similar risk and asset allocation changes constrained to 30%. The return benefit of the new allocation is about 25bps per annum. Table 5 provides the asset allocations for these portfolios.

Table 5: Allocation Recommendations

Asset Class	Current	New
U.S. Equity	23.0%	23.9%
Intl. Equity	14.0%	14.1%
EM Equity	7.0%	7.8%
Private Equity	7.0%	6.3%
Fixed Income	14.0%	5.7%
Long-term Treasury	4.0%	10.2%
TIPS	4.0%	2.8%
High Yield Bonds	5.0%	5.3%
Opportunistic Debt	8.0%	8.3%
EM Debt	2.0%	3.6%
Real Estate	10.0%	8.7%
Infrastructure	2.0%	2.8%
Hedge Funds	0.0%	0.6%

Some markets are less efficient than others and pension plans use active management in these asset classes to generate additional returns. The expected additional returns vary by asset classes and are generally uncorrelated to the returns of asset class benchmarks. The expected excess returns from active management have implications for the strategic asset allocation of the portfolio.

6. A Case Study: Developing a Strategic Asset Allocation (with Active Management)

The excess returns that may be generated through active management are generally forecasted subjectively using the historical performance of the underlying managers as a guide. For illustrative purposes, we subjectively set the level of excess returns (alpha) for each asset class. To help determine the volatility associated with these alphas, we assume that the Sharpe ratio of the alphas are the same as that of the underlying benchmarks. And finally, we assume that the alphas are uncorrelated with the benchmark returns. The total returns of the asset class (including alpha) and its volatility are also given in Table 6. The difference between the asset class returns in Table 6 and Table 4 measures the subjectively set alpha for each asset class.

Table 6: Expected Return and Volatility with Active Management

Asset Class	Return	Volatility	Sharpe Ratio
U.S. Equity	8.0%	15.7%	0.51
Intl. Equity	10.4%	18.8%	0.55
EM Equity	13.0%	23.5%	0.55
Private Equity	9.9%	15.5%	0.64
Fixed Income	0.0%	3.20%	0.00
Long-term Treasury	0.0%	12.8%	0.00
TIPS	0.7%	5.2%	0.14
High Yield Bonds	6.3%	10.6%	0.60
Opportunistic Debt	5.2%	8.1%	0.64
EM Debt	4.7%	7.9%	0.59
Real Estate	7.7%	14.8%	0.52
Infrastructure	9.0%	16.6%	0.54
Hedge Funds	4.6%	6.9%	0.67

Figure 5 is a plot of the efficient frontier (with active management) and the return and volatility of the individual asset classes. This chart is comparable to Figure 3 which plots the efficient frontier (without active management). The inset to Figure 6 is a zoomed in version of the efficient frontier for volatilities between 10% and 12%. It also includes the return and volatility of the public pension plan's current portfolio, with and without active management. Active management increases the forecasted return by 80 bps, even as it increases portfolio volatility by about 30 bps.

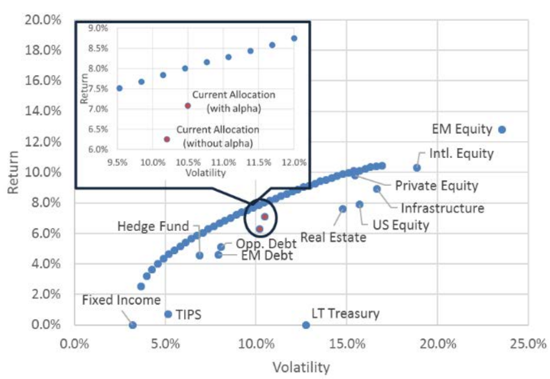

Figure 5: Efficient Frontier with Active Management

For reasons discussed earlier in this paper, the objective is to identify portfolios on the efficient frontier that have asset class allocations that are minimally different from the pension plan's current allocations. This will ensure that transition costs will be minimized. We plot the maximum excess return that can be generated for a constrained level of asset allocation changes in Figure 6 below, assuming active management. To ensure that asset allocation changes are not heavily directed towards illiquid asset classes (private equity, opportunistic debt, real estate and infrastructure), we ensure that their new asset allocation does not vary from their current allocation by more than +/- 2%. The inflection point for this graph occurs at allocation changes of about 30% that leads to about 30 bps of additional returns from allocation changes.

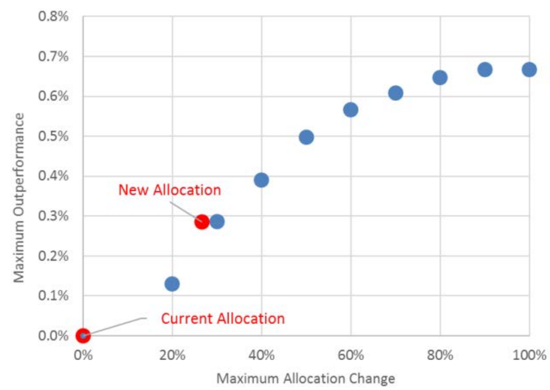

Figure 6: Recommended Allocation with Active Management

The portfolios marked "Current" and "New" relate to the return and volatility of the pension plan's current portfolio and the pension plan's current portfolio that has been suitably modified to bring it closer to the efficient frontier but with asset allocation changes constrained to 30%. The return benefit of the new allocation is about 30bps per annum. The asset allocations corresponding to these portfolios are given in Table 7.

Table 7: Recommended Allocations

Asset Class	Current	New
U.S. Equity	23.0%	22.7%
Intl. Equity	14.0%	14.5%
EM Equity	7.0%	8.4%
Private Equity	7.0%	7.6%
Fixed Income	14.0%	3.8%
Long-term Treasury	4.0%	10.1%
TIPS	4.0%	4.3%
High Yield Bonds	5.0%	4.3%
Opportunistic Debt	8.0%	8.2%
EM Debt	2.0%	3.7%
Real Estate	10.0%	8.5%
Infrastructure	2.0%	1.3%
Hedge Funds	0.0%	2.6%

7. Conclusions

This paper has presented an alternative approach to developing a strategic asset allocation for large institutional portfolios. The approach seeks to ensure consistency in capital market assumptions that are necessary for developing this allocation. It uses the efficient frontier methodology but avoids corner solutions that bedevil most practitioners. Most importantly, it explicitly considers the asset allocation of the current portfolio when recommending a new allocation to minimize transaction costs.

This paper presents the way this methodology was applied to determine the strategic asset allocation of a US public pension fund. It evaluates two cases: one in which all assets of the pension plan are managed passively, and a second in which some of the assets are actively managed and generate excess returns. In both cases a new asset allocation is developed that improves the portfolio's expected return by about 30 bps while keeping the portfolio's overall volatility the same. Table 8 provides the risk and return of the current and new portfolios. In both cases the two-way sum total of the allocation changes was constrained to 30%.

Table 8: Risk and Return

Allocations	Return	Volatility	Allocation Change
Current (passive)	6.25%	10.2%	0.00%
New (passive)	6.54%	10.2%	26.9%
Current (active)	7.08%	10.49%	0.00%
New (active)	7.36%	10.5%	26.6%

The modified approach presented in this paper overcomes many of the problems that arise when developing a strategic asset allocation for large institutional portfolios. First, it ensures that the capital market assumptions are reasonable and consistent. In other words, it avoids corner solutions, in which the allocation to specific asset classes like private equity or hedge funds will have to be artificially constrained. Absent such constraints, the model could end up allocating the entire portfolio to a single asset class. Second, and equally important, it allows for explicitly considering the asset allocation of the current portfolio when deciding on a new strategic asset allocation.

The paper develops a strategic asset allocation in an asset-only space. However, it could quite easily be adapted to develop this allocation in an asset-liability framework. The approach would be similar with the liabilities being modelled as negative assets.

Important Disclosures

Confidential – Not for public disclosure.

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