UBS
Asset Management

Quarterly Focus
Asset Allocation: The Alternatives Approach
by Brian Singer, Renato Staub and Kevin Terhaar[1]

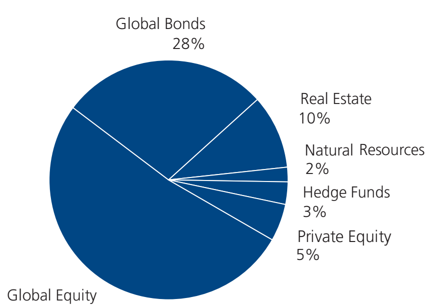
Pension plan sponsors, endowments, and other institutional investors have included non-traditional assets in their portfolios for many years. Larger, more aggressive funds—in particular those with longer investment horizons—have over time increased their allocations to venture capital, real estate, hedge funds, and other assets that fall outside the realm of regularly priced and traded securities.

One of the biggest problems institutional investors face in evaluating these alternative investments is determining the appropriate "normal" or policy allocation. Two important questions must be answered. What alternative investments should be included in the policy allocation, and in what proportions?

Our research concludes that a mid-risk pension plan should increase alternative investments to a 20% allocation within a broadly diversified policy. Of the 20%, we recommend allocations of 10% to real estate, 5% to private equity, 3% to hedge funds and 2% to natural resources, such as timber, farmland and oil and gas investments (Chart 1).

We arrive at these results using a systematic approach that is more flexible than typical one-period portfolio optimization programs, which often rely on historical data as key inputs. Instead of historical data, we use a factor approach to build a more appropriate set of return and risk characteristics for traditional and alternative asset classes. We then use these parameters in a multi-period simulation analysis that helps us arrive at the appropriate middle-risk policy. Using simulation techniques provides better insight into the characteristics of the portfolio over time as market swings and liquidity constraints force deviations from the desired policy mix.

Chart 1
Policy Mix for a Mid-Risk Pension Plan



Historical Data Revisited

Typically, analysis of policy mix alternatives is based on historical data. For alternative investments, it is tempting to use historical data for policy analysis purposes simply because such data are available. However, they have a number of unique characteristics that obviate their use for determining policy allocations.

Consider the policy implications of returns and risks derived from historical data. Historical returns, volatilities and correlations for U.S. and non-U.S. equities and bonds and alternative investments (private equity, real estate, natural resources and hedge funds) suggest that alternatives have a low or even negative correlation with the public markets. Between 1981 and 2000, for example, our estimate of the correlation between U.S. equity and venture capital is as low as -0.46. The measured volatility of venture capital, on the other hand, is a mere 10.4%, and real estate is 6.9%, compared to a U.S. equity figure of 12.8%. Meanwhile, returns for these asset classes over the same period were 20.7%, 7.8% and 14.8%. Given these historical volatilities and the expectation that investors should be properly compensated for holding higher-risk assets, there seems to be a free lunch for those who hold alternative investments.

> "...there seems to be a free lunch for those who hold alternative investments."

In fact, with such high returns, low risks and correlations to other investments, a traditional mean-variance portfolio optimization routine using historical data suggests a policy portfolio dominated by alternative investments. The observation that institutional investors do not hold the overwhelming share of their portfolios in alternatives reflects the doubts these investors have in the representativeness and consistency of the historical data.

It is imperative that the return and risk assumptions used for policy mix analysis across traditional and alternative investments be both forward-looking and consistent in the manner and extent to which

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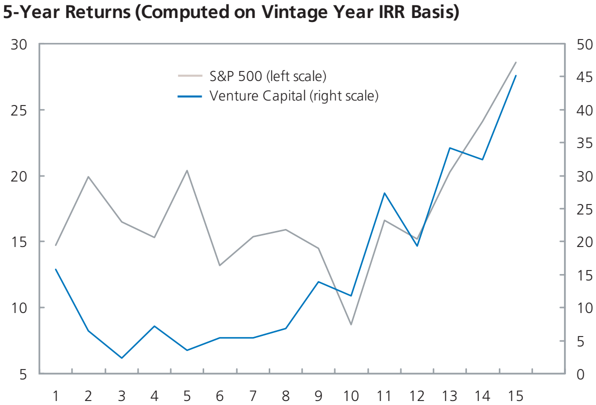
they reflect the true underlying economic exposures of the assets. Historical data is biased on both counts.

Determining the True Nature of Returns and Risks

To make our traditional and alternative risk estimates consistent, we undertake a series of experiments that model the risks of alternatives in a manner consistent with the public markets and vice versa.

One of our experiments is a comparison of U.S. equities and venture capital. The apparent volatility of venture capital is low because of the absence of price observations. To force the data to be an "apples-to-apples" comparison, we conduct the following experiment using historical data: to construct a venture capital analog from publicly-traded equity, the S&P 500 Index was "bought" in each vintage year and held for a 5-year period. We then use the terminal value and interim dividend flows to compute the public equity Internal Rate of Return (IRR). The resulting returns to this "private" S&P are comparable to the corresponding 5-year venture capital vintage year returns. A much more interesting picture of the correlation between the two asset classes comes into focus, as seen in Chart 2.

Chart 2
Venture Capital and Equity: A Simple Comparison
5-Year Returns (Computed on Vintage Year IRR Basis)



The left-hand scale, used for S&P 500 returns, has about one-half the range of the right-hand scale, used for venture capital. Integrating this analysis with other experiments, we conclude that the risk of venture capital is more likely to be twice that of the U.S. equity market than to be reflective of the much lower volatility captured in the historical data. This kind of analysis also suggests a much closer relationship between these two series than standard analysis of historical data would tend to suggest, so an assumption that the correlation between the S&P 500 and venture capital is zero or even negative now seems highly suspect. Clearly, the historical data are significantly misleading for policy allocation analysis.

> “...the historical data are significantly misleading for policy allocation analysis.”

Employing a Factor Approach

The next issue that arises is how one should go about constructing a consistent forward-looking correlation matrix that integrates the traditional and alternative asset classes. We have chosen a factor-based approach that is built on twelve primary factors or risk drivers that we formulate by aggregating traded asset markets. The twelve consist of 5 equity, 3 fixed income, 1 real estate and 3 currency factors. These combine to capture the systematic risk characteristics of all investments and provide the foundation for a correlation matrix of all asset classes. Individual markets can be modeled by setting their sensitivities to the factors as opposed to each other. The use of factors based on aggregates of traded asset markets in this way provides a consistent analysis of the entire investible universe, facilitating better understanding of risks and correlations across markets.

Our resulting forward-looking correlation matrix is consistent and based on both quantitative and qualitative analyses that include the input of asset class specialists around the world. The resulting equilibrium risk and correlation matrix allows us to tackle the first and most difficult dimension of alternative investments that renders most policy mix analysis useless: the misrepresentation of risk through the analysis of historical data.

We then build a consistent set of forward-looking risk premiums. A procedure developed for traditional asset classes by Singer and Terhaar (1997) enables us to extend an already consistent, forward-looking covariance matrix to a fully consistent set of risk premiums.[2] At one end of the spectrum we assume that assets are fully integrated and each risk premium can be determined relative to a world market portfolio—the Global Investment Market

(GIM)—that includes traditional and alternative asset classes.

In order to determine the fully integrated risk premiums, the betas of each asset with respect to the GIM are derived from the equilibrium covariance matrix. These betas convey the systematic risk that would be compensated in a fully integrated, equilibrium capital market environment.

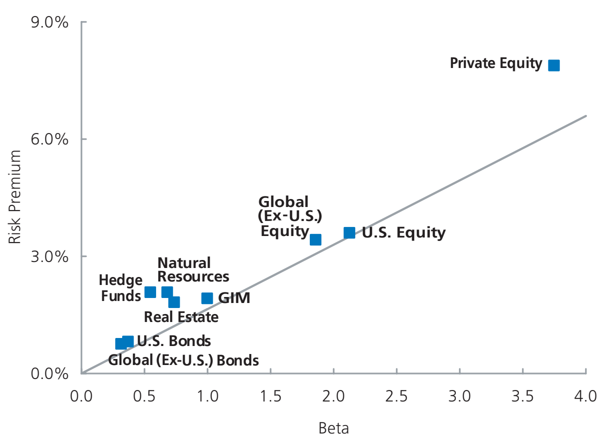
The assumption that assets are priced in a fully integrated, global context is too strong for traditional as well as alternative investments. Yet it would conversely be too restrictive to assume complete segmentation.

The equilibrium risk premium for each traditional and alternative investment is bounded at the low end by the fully integrated risk premium and at the high end by the segmented risk premium, reflecting the degree of integration. In general, the equilibrium risk premiums are set nearer to the home-biased risk premiums and reflect greater segmentation for alternative investments and lesser segmentation for traditional asset classes.[3]

Chart 3 displays the risk premiums of traditional and alternative asset classes relative to their betas. Fully integrated risk premiums plotted against the betas would result in the straight line shown on the chart. The extent to which an asset's pricing is segmented determines the additional segmentation premium, its vertical positioning above the line. The segmentation premium offers more return for a given level of systematic or beta risk. Based on our analysis, private equity provides the greatest segmentation premium and is the furthest above the line.

Chart 3

The Reward for Risk From Alternative Investments



Since risk premiums reflect compensation for more than just their systematic risks and traditional and alternative investments reflect differential segmentation, one would expect a simple mean-variance optimization to result in a disproportionately large allocation to alternative assets. Indeed, this is what occurs, with alternative investments still crowding out the traditional assets.

"...risk premiums reflect compensation for more than just their systematic risks..."

Using these risk premiums and covariances we are able to address the first two dimensions that distinguish alternative investments from traditional assets: misrepresentative historical data and segmentation. Nonetheless, the recommended policy mix remains unsatisfying.

The Liquidity Premium

Traditional and alternative investments should not be evaluated with a single-period model because of extremely divergent available liquidity. An assumption of a consistent single period forces the evaluation of illiquid assets into a shorter investment horizon, implicitly assuming the same degree of liquidity for both alternative and traditional assets. Conversely, the traditional assets could also be evaluated over longer horizons; however, this would effectively unfairly "penalize" them as if they were illiquid.

Investors in liquid assets have the option of rebalancing whenever they wish. By comparison, illiquid investments "lock in" the investor until exit. As a consequence, instantaneous rebalancing between the traded-asset market portfolio and the alternative investments is not possible. Using this intuition, Staub (2001) demonstrates that long-term investors are able to capture a liquidity premium from assets relative to their more liquid counterparts.[4]

The inclusion of a liquidity premium also means that alternative investments will carry a higher return than that implied by the Capital Asset Pricing Model (CAPM) and systematic risk alone. Lower required returns for traded assets can be viewed as the price paid for having the option to liquidate and rebalance at any time. Table 1 shows the excess returns offered by traditional and alternative investments, including consideration of equilibrium risks and correlations, differential segmentation and illiquidity.

Table 1

	Risk Premium	Excess Return (Risk Premium + Liquidity Premium)
GIM	1.84%	1.97%
U.S. Equity	3.59	3.59
Ex-U.S. Equity	3.42	3.42
U.S. Bonds	0.80	0.80
Ex-U.S. Bonds	0.75	0.75
Private Equity	7.88	9.92
Real Estate	1.82	3.06
Natural Resources	2.07	3.88
Hedge Funds	2.07	2.81

Simulation Instead of Optimization: the 80/20 Portfolio

To be effective, a good model must be able to deal with the problems of segmentation and illiquidity described above and mean-variance optimization falls short in this regard. Consequently, we propose a simulation approach.

The computing power needed to run complex simulations has become increasingly available in recent years. In essence, we are able to specify the sampling distributions of the returns, risks and correlations of a wide set of portfolio investments. We then run simulated case after case of hypothetical outcomes based on our forward-looking assumptions. We can also impose conditions that help to more realistically reflect the lags associated with entering and exiting alternative investments and parametric changes from period to period.

Applying this process, we run 1,000 iterations of a 20-year simulation. The first ten years are used to build up to the target policy mix, and the next ten years are used to evaluate the policy mix. In our experiments, we also create high and low states of volatility to address the issue of fat-tailed return distributions that have been both observed and intuitively justified by several historical and forward-looking studies.

We began the simulation with a relatively low alternative allocation. This allocation was modified and increased with each iteration until we arrived at a policy mix with the same risk as a typical global policy mix (65% equity and 35% fixed income) and with a maximum alternative allocation of 30%. The resulting policy mix includes a 20% allocation to alternative investments, with the remaining 80% of the portfolio held in a diversified global securities portfolio. The 20% alternative investment portion of the policy mix has 10% allocated to real estate, 5% to private equity, 3% to hedge funds and 2% to natural resources.[5]

If we run 1,000 10-year simulations of the no-alternatives 65/35 global balanced policy mix, the mean volatility is 10.3%, consistent with the covariance matrix estimate. Since the policy comprises only traded securities, we can safely assume that the asset class weights can be rebalanced annually to the target weights. Therefore, at the end of any given period the forecasted risk remains at 10.3% after rebalancing.

It might seem that adding alternative investments to the policy mix would not materially change the risk picture. However, rebalancing certain types of alternative investments is not always possible. At any given time, therefore, the weights of each of the alternative investments and their aggregate weight can differ considerably from target. This can produce forecasted risk characteristics that deviate from the target risk level of 10.3%. The alternative investments allocation and the portfolio's expected risk can fluctuate considerably.

In examining the results of 1,000 10-year periods, as we did in the "traded securities only" case, these effects are patently obvious. The average portfolio risk is 10.1%, but 5% of the time the expected risk is above 11.6%. This periodic increase in expected risk occurs because the allocation to riskier alternative investments varies over time, due to the constrained ability to rebalance.

"...the allocation to riskier alternative investments varies over time..."

Because the risk of some alternative investment classes is large and liquidity is low, the overall "swings" in their policy allocations can be pronounced. This increases the uncertainty of risk for the total portfolio. Investors must, as a result, have a tolerance for risk that is high enough to encompass these periodically elevated risk levels, as well as a sufficiently long investment horizon to allow for the benefits to offset the costs of illiquid investments.

The results of our simulation represent the recommended allocation for a typical, moderate-risk institutional investor. Other investors with different risk tolerances, investment horizons and liquidity needs would hold different allocations to the portfolio of alternative investments and have different allocations within the portfolio of alternatives. The longer the investor's horizon and the lower the need for liquidity, the greater will be the allocation to the illiquid alternative investments. Since the liquidity premium is essentially a compensation for accepting greater illiquidity, there is no free lunch, compensation being commensurate with the increased risk.

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Taking a well-constructed forward-looking covariance matrix and assuming realistic rebalancing opportunities within a simulation approach provides a flexible and logically consistent way of modeling and analyzing alternative investment policy allocations and can be tailored to the specific risk and liquidity constraints of any investor.■

2 Singer, Brian D. and Kevin Terhaar, "Economic Foundations of Capital Market Returns," The Research Foundation of the Institute of Chartered Financial Analysts, 1997.

3 One need only observe the carried interest arrangements of most alternative investments for evidence of the segmented and concentrated risks that the alternative investment managers incur. Combining this with the largely "bucketed" nature of alternative portfolio analysis and holdings provides adequate justification of the segmentation premium.

4 Staub, Renato, "Illiquidity, Segmentation, Home Bias and Returns," UBS-AM Working Paper, 2001.

5 This portfolio is the recommended allocation for a typical, moderate-risk institutional investor. The simulation results of other alternative investment allocations are available from the authors, and are intuitively consistent with those described here.

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