Strategic Asset Allocation for Endowment Funds

Kathleen E. Jacobs and Adam Kobor

Kathleen E. Jacobs
is chief investment officer at New York University in New York, NY.
kathleen.e.jacobs@nyu.edu

Adam Kobor
is managing director of investments for New York University in New York, NY.
adam.kobor@nyu.edu

KEY FINDINGS

- In constructing a strategic asset allocation for an endowment, a traditional mean-variance optimization framework alone does not provide sufficient context to generate comprehensive forward-looking analysis. However, adding additional measures such as maximizing the probability of achieving investment goals or minimizing relevant downside distress measures over the long term can improve the analysis.
- A typical endowment's asset allocation, with an equity orientation and tilt toward alternative asset classes, nearly maximizes the probability of achieving the dual long-term investment goals of meeting a spending rate target while preserving real capital, as well as minimizes endowment-specific downside risk measures.
- Optimal portfolio choices are dependent on underlying return expectations across asset classes. Although expected returns are typically the highest for private investments, there are limits to investing in private asset classes, including an endowment's liquidity requirements and ability to access the best-performing managers.

ABSTRACT

An endowment fund serves as a permanent source of capital to support a specific mission. It has, in the case of a university, dual goals of providing current financial support to the university and preserving long-term purchasing power to ensure that support continues in perpetuity. This article explores a methodology for constructing strategic asset allocation for endowment funds in the context of these competing long-term investment goals.

TOPICS

Long-term/retirement investing, foundations & endowments, portfolio construction*

An endowment is a pool of capital generally funded through donations for specific purposes, designed to support the present and future goals of a nonprofit organization. Typically, the original contributions to the endowment, or corpus, are meant to be maintained in perpetuity, and the income derived from investing the corpus as determined by a spending policy is used to support the financial needs of an institution. These two goals create an investment challenge whereby returns must be sufficient to meet spending needs while erosion of the corpus through overspending must be avoided.

Spending use differs by institution. In the case of a university, it funds scholarships, professorships, and research, for example. The 2019 National Association of College and University Business Officers (NACUBO)-TIAA Study of Endowments (NACUBO-TIAA 2019), which surveyed 774 US and Canadian private and public university endowments,

*All articles are now categorized by topics and subtopics. **View at PM-Research.com**.

determined that approximately 49% of endowment income was spent on financial aid, 17% on specific academic programs, 11% on faculty positions, and 7% on operation and maintenance of campus facilities, with the remaining 16% spent for other purposes.

ENDOWMENT INVESTMENT OBJECTIVES AND SPENDING REQUIREMENTS

An endowment should be structured to achieve a long-term return equal to inflation plus the spending policy rate, consistent with the risk level appropriate for the institution. This ensures that the dual goals of consistent spending and preservation of capital are achieved over time. For most endowments, the long-term return objective is in the 6.5% to 7.0% range, assuming long-term inflation of 2.0% plus an average spending rate of 4.5% to 5.0%, as discussed in the following.

The spending policy is a critical component in determining an asset allocation. A distribution rate that is too high compared to achievable long-term returns may negatively affect real capital preservation. Alternatively, a very high distribution rate may require risk-taking beyond the risk tolerance of the institution. Ultimately, the spending policy should mitigate the competing objectives of a higher current distribution that may be desired by a beneficiary versus sufficient support of the beneficiary in the future by facilitating sustainable and smooth distributions over time.

The most common spending calculation is the moving average of the prior several years' quarterly endowment values. For example, the spending appropriation may be calculated as 4.5% of the 12-quarter average market value after excluding the value of new gifts, or it may scale weights according to a timeframe. Use of a smoothing mechanism reduces the impact of year-to-year volatility, enabling an institution to maintain a prudent and relatively stable annual payout over time. According to the 2019 NACUBO-TIAA Study of Endowments, the average annual effective spending rate in fiscal year 2019 across surveyed institutions was 4.5%, calculated as the total distribution for spending divided by the endowment value at the beginning of the fiscal year.

STRATEGIC ASSET ALLOCATION FOR ENDOWMENTS

Strategic asset allocation, which defines how an endowment is invested, is a key determinant of long-term portfolio return and risk. A thoughtful and consistent asset allocation improves the probability that an institution will achieve target returns with appropriate risk over the long term. In addition, it incorporates rebalancing parameters that serve to protect against portfolio shifts based on behavioral biases and reallocate capital from overvalued asset classes into undervalued asset classes.

An endowment is a long-term investment vehicle with a relatively high return requirement, typically 4.5% to 5% real, or approximately 6.5% to 7% nominal. Key risks for an endowment are the erosion of the real value of capital and the reduction in the real value of spending over the long term, rather than short-term volatility. Given the investment horizon and return requirements, most endowments are equity oriented, and many maintain sizable exposure to illiquid investments. According to the 2019 NACUBO-TIAA Study of Endowments, the average endowment over $1 billion allocated 54% to public and private equity and 21% to hedge funds as of June 2019 and achieved annualized performance of 9.0% from June 2009 to June 2019. Further detail on endowments' asset allocations is provided later in this article.

A number of endowment-related research papers have recently been published. Chambers, Dimson, and Kaffe (2020) provided a 75-year historical review of endowment allocations, illustrating endowments' successful asset mix shifts from bonds to

stocks during the 1930s and 1940s and to alternative assets beginning in the 1980s. Ennis (2021) discussed the performance of typical endowment portfolios compared to traditional passive portfolios, which he asserted achieved better results since the Great Financial Crisis. Clearly, traditional stocks and bonds posted extraordinary returns over the past decade owing to strong equity markets and declining interest rates.

As noted, endowments tend to be equity oriented given their relatively high return requirements. A sound strategic asset allocation targets the amount of equity needed to achieve return objectives, but it incorporates other asset classes to reduce volatility and facilitate capital preservation. Although many endowments focus on allocation to asset classes, some focus on allocation to factors or allocations based on risk parameters. This article primarily addresses the strategic allocation to asset classes.

Asset Class Roles

Although many asset classes may be included in a strategic asset allocation, it is important to consider the underlying reason(s) for inclusion, such as growth, income, diversification, and/or liquidity. Defining a specific purpose for each asset class and investing accordingly increases the probability that an endowment will meet its long-term return objectives with the desired level of risk. Basic examples include

- Growth: Equity assets provide direct participation in economic growth, which can increase the real value of capital.
- Income: Traditional fixed income, equity, and certain real estate asset investments provide coupon or dividend payments.
- Diversification: Long-duration Treasury bonds, negatively correlated to equities, once provided sound diversification. However, although correlation remains negative, 10-year Treasury rates near 1% have limited room for further decline, so endowments may consider strategies such as absolute return or real estate for diversification.
- Liquidity: Cash and short-term government bonds provide daily liquidity.

When adding asset classes to a strategic asset allocation, it is also important to consider asset class performance during various macroeconomic periods and under specific economic scenarios. For example, risk assets such as equities respond most positively in healthy economic environments, whereas government bonds typically perform better during periods characterized by interest rate cuts and accommodative monetary policy. Inflation has been limited over the past decade, but should inflation exceed expectations in the future, assets including real estate, natural resources, and inflation-linked bonds may provide protection.

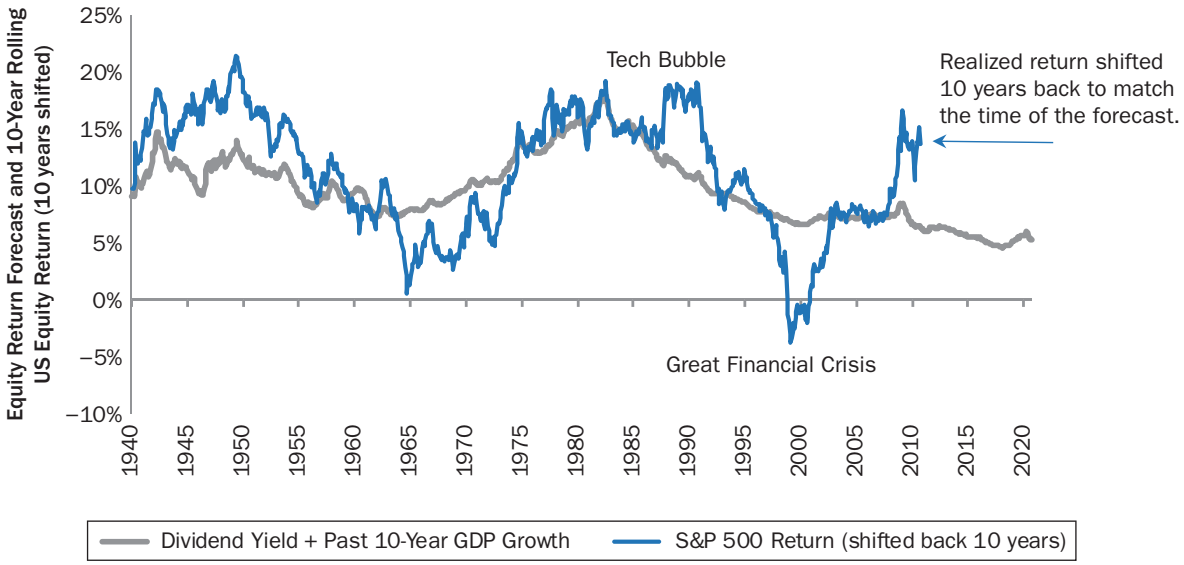
Capital Market Assumptions

Capital market assumptions (CMAs) are forward-looking estimates of return and risk and are important inputs to the process of setting a strategic asset allocation. CMAs include long-term (typically 10+ years) expected returns, volatilities, and correlations of various asset classes. CMAs are the main inputs into portfolio simulation and optimization analysis; therefore, they significantly affect the weight of each asset class in the strategic asset mix and the estimated expected long-term portfolio performance. CMAs are obviously not exact forecasts of the future returns but should reasonably incorporate the currently available market information and provide reasonable guidance for asset allocation.

Although long-term asset class volatility and correlation assumptions are usually fairly close to historical observations, expected returns can deviate significantly from

EXHIBIT 1

History of Simplified US Equity Building Block Return Forecast Compared to the 10-Year Total Return of the S&P 500 Index



SOURCE: Prepared by the authors using data provided by Bloomberg.

history based on prevailing market conditions. For example, long-maturity US Treasury bonds generated an annualized return of 7.2% over the past decade. In the current environment, with 10-year US Treasury yields below 1%, a 7% or higher annualized return for 10 years would be nearly impossible to generate going forward.

Long-term expected returns may be estimated in different ways. A mainstream approach is based on building blocks of the components of total return, such as the expected income and market value changes based on the assumed long-term value of yields, spreads, valuation ratios, and other metrics. An alternative approach sets expected returns based on a risk premium framework, in which asset-class-specific returns are determined relative to a base asset such as cash, government bonds, or the market portfolio of the capital asset pricing model. Ilmanen (2011) and Page (2020) have provided a broad and comprehensive overview of various approaches to setting expected returns for asset classes and investment strategies. Asset managers and investment consultants regularly publish their own long-term asset class return expectations; see, for example, AON (2020) or J.P. Morgan (2020).

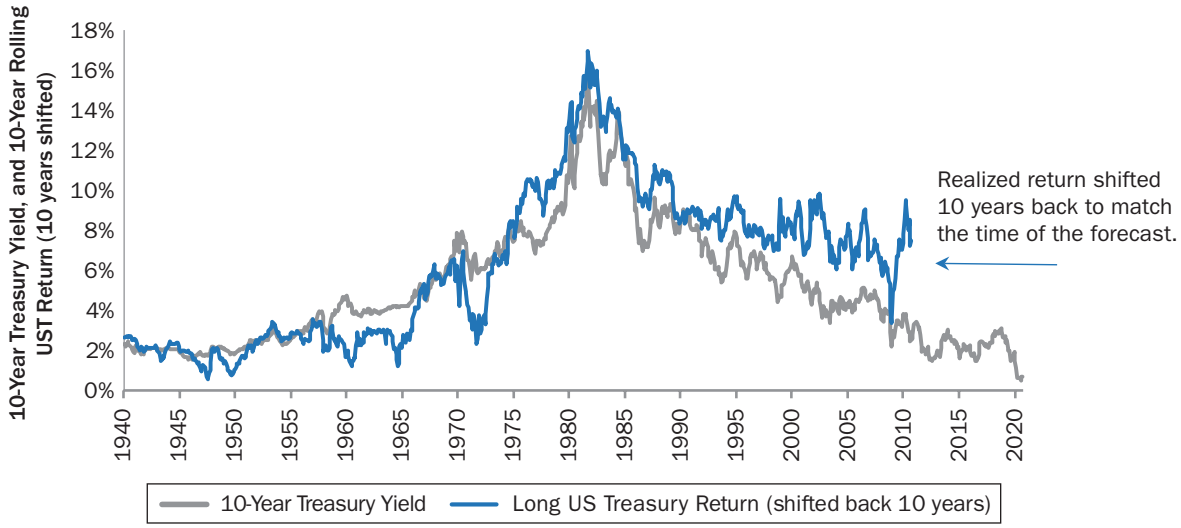
To illustrate the building block approach, methodology for calculating broad asset class categories is described in the following.

Public equity. Public equity return expectations may be composed of (1) inflation, (2) real earnings growth, (3) dividend income (earnings yield times payout ratio), (4) expected change in price-to-earnings valuations, and, for non-US equity, (5) expected currency impact. Exhibit 1 illustrates simplified results of the building block approach compared to the actual 10-year rolling returns of the S&P 500. Inflation and real earnings growth expectations are set using the historical trailing 10-year nominal gross domestic product (GDP) growth as a proxy for nominal earnings growth expectations, and Robert Shiller's cyclically adjusted price-to-earnings (CAPE) ratio data[1] are converted to a dividend yield by assuming a constant 50% dividend payout ratio. Exhibit 1 shows that, although the building block approach may identify secular trends, it is

[1] http://www.econ.yale.edu/~shiller/data.htm.

EXHIBIT 2

History of 10-Year US Treasury Yield Compared to Consecutive 10-Year Long-Duration Treasury Bond Total Return



SOURCE: Prepared by the authors using data provided by Bloomberg.

unlikely to predict bubbles or crises; nonetheless, it serves as a reasonable anchor for predicting long-term returns.

There are other ways to project future equity returns based on current valuations. For example, Philips and Kobor (2020) discussed a regression-based approach based on an adjusted price-to-earnings ratio and price-to-sales ratio. In this article, however, we illustrate the building block approach with simplified assumptions.

Using such a simplified approach to estimate public equity return expectations, we sampled inflation and economic growth forecasts from the 2020 October World Economic Outlook from the International Monetary Fund (IMF 2020) and collected dividend yields from Bloomberg, resulting in the following estimates:

- US equity: 5.5% expected return reflective of 2.2% inflation, 1.8% growth, and 1.5% dividend yield. This estimate is well below the realized return over the past decade but is reflective of equities' full valuation and consistent with equity return expectations published by asset managers and consultants.
- Non-US developed market and emerging market equity: 6.4% and 8.1% expected return, respectively, following a similar approach as noted earlier.

Fixed income. Fixed-income assets such as US Treasury bonds incorporate (1) current yield, (2) capital gains/losses due to yield curve change, (3) increase/decrease in income due to yield curve change, and (4) roll return. Long-duration bond prices may lead to sizable return volatility over the short term; however, the initial yield is generally a reliable estimator for the consecutive 10-year total return because accumulated income becomes a more dominant part of the longer-term return, and price changes (suffer if yield rises) are compensated by reinvestment rates (benefit if yield rises) and vice versa (Exhibit 2).

Note the realized return (blue line) does not overlap with the forecast (gray line) for two main reasons: Over the period of the 1940s to the 1980s, bond returns suffered from negative price changes owing to the secular rising rate environment. In contrast, bond prices benefited from the secular declining yield cycle since the mid-1980s. In addition, actual returns on a rebalanced bond portfolio benefited from the positive slope of the yield curve (roll-down effect). However, this analysis suggests

that realistic long-term Treasury return expectations can be set by considering the current yield level only.

Corporate bond return expectations are built from government bond expected returns and adjusted for corporate spreads and expected losses from defaults and downgrades. With Treasury yields between 0% and 1% up to the 10-year maturity at the time of setting our CMAs, and investment-grade credit spreads around 1%, we assume 1.0% expected returns for cash, 1.5% for core fixed income, and 1.7% for inflation-linked bonds. Again, forward-looking expectations are significantly lower than returns observed over the past decade, reflecting compressed current yields.

Alternatives. Return expectations for alternative asset classes including hedge funds or private equity are typically anchored to public asset class expected returns, and further adjustments are based on a risk-factor approach.

Hedge funds. Hedge fund expected returns typically combine systematic public market returns (a beta component) with an alpha assumption. For illustrative purposes, we assume an aggregate beta of 0.3 to global equity (a combination of US, non-US developed, and emerging market equities) with a 6.2% expected return and a net-of-fees alpha component of 2.5%, resulting in a 5.4% aggregate return expectation.

Private equity. Private equity expected returns can be built as a leveraged basket of public market subcomponents reflecting categories of the asset class, including buyout, growth equity, and venture capital, plus an illiquidity premium. A risk-factor approach may be used for volatility and correlation estimates to unsmooth private asset class returns.

For this case study, we assume a 9.9% expected return from private equity, reflecting a 1.25× levered return on global public equity plus a 2.5% illiquidity premium. Similarly, we expect a 7.0% return from private credit anchored to high-yield returns and a 7.5% return from private real estate anchored to rental yield and inflation expectations, both including an illiquidity premium of 2.5%. The private natural resources return of 8.5% is estimated as a 75%/25% blend of private equity and commodity return expectations (made equal to nominal GDP growth).

Long-term CMAs are not meant to be tactical asset allocation tools or trading signals; however, they provide reasonable directional guidance as to the relative attractiveness of various asset classes over the long term. It is important to note that from the portfolio optimization perspective, the absolute level of a particular return assumption is far less important than the relationship between assumptions; rather, what is most important is the spread between private equity and public equity and between public equity and bonds. Methodological consistency is critical in maintaining robust relationships across asset classes.

Mean–Variance Frontier versus Endowment Goals

In setting the strategic asset allocation, it is critical to examine whether the proposed allocation can realistically achieve the required long-term investment goal determined by the target spending rate and real capital preservation objectives.

Although the classic Markowitz expected return or mean–variance optimization framework is commonly used in asset allocation analytics, without a clearly defined abstract utility function, it is a limited tool to guide endowment investors' choices. Rather, the strategic asset allocation should be determined in the context of endowment investment objectives, such as maximizing the probability of achieving a 5% real return over a 10-year time horizon, or minimizing endowment-specific risk measures such as those proposed by Swensen (2009). These downside risk measures include the probability of a disruptive spending drop (DSD); for illustration, we show the probability of a greater than 20% decline in spending in real terms over a 10-year horizon. Another endowment-specific risk measure quantifies the probability

EXHIBIT 3

Sample Portfolios and Capital Market Assumptions

Allocations and Assumptions	NACUBO Average over $1Bn	Top Endowments as of June 30, 2019	100% US Core Bonds	100% US Equity	60/40 Allocation	70/30 Allocation	Expected Return	Volatility	Beta vs. US Equity	Beta vs. Global Equity
US Equity	14.7%	9.2%	0.0%	100.0%	34.8%	40.6%	5.5%	16.6%	1.0	0.9
Non-US Developed Market Equity	12.3%	8.0%	0.0%	0.0%	17.4%	20.3%	6.4%	18.4%	0.9	1.0
Emerging Market Equity	4.3%	7.1%	0.0%	0.0%	7.8%	9.1%	8.1%	25.4%	1.1	1.1
Hedge Funds	20.5%	22.9%	0.0%	0.0%	0.0%	0.0%	5.4%	8.5%	0.4	0.4
Core Fixed Income	6.3%	5.2%	100.0%	0.0%	40.0%	30.0%	1.5%	3.9%	0.0	0.0
TIPS	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	1.7%	4.7%	0.0	0.0
Cash	4.4%	4.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.2%	0.0	0.0
Private Equity	22.6%	29.3%	0.0%	0.0%	0.0%	0.0%	9.9%	21.3%	1.3	1.2
Private Credit	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	7.0%	12.4%	0.5	0.5
Private Natural Resources	6.6%	5.3%	0.0%	0.0%	0.0%	0.0%	8.4%	18.4%	1.0	1.0
Private Real Estate	6.7%	8.8%	0.0%	0.0%	0.0%	0.0%	7.5%	19.4%	0.7	0.7
Equity-Oriented Assets	*67.2%*	*67.7%*	*0.0%*	*100.0%*	*60.0%*	*70.0%*				
Alternative Assets	*57.6%*	*66.3%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*				

NOTES: Volatilities and correlations for each asset class are estimated based on historical returns from December 31, 1989–June 30, 2020 of representative market indexes as follows: US equity—Russell 3000; non-US developed market equity—MSCI EAFE Net USD index; emerging markets equity—MSCI Emerging Market Net USD index; hedge funds—HFRI Fund Weighted Index; core fixed income—Bloomberg Barclays US Aggregate Index; TIPS—Barclays US Treasury Inflation Notes Index (since 1997); cash—ICE BofA US Three-Month T-Bill Index; private equity—levered basket of Russell 3000, Russell 2000, and Bloomberg Barclays High-Yield indexes; private credit—Bloomberg Barclays High-Yield Index with 1.3× leverage; private natural resources—75% private equity and 25% commodities (S&P GSCI Total Return Index); private real estate—Dow Jones Equity REIT Total Return index. Equity-oriented assets include public and private equities, natural resources, and real estate.

SOURCE: Prepared by the authors using data provided by the 2019 NACUBO-TIAA Study of Endowments, fiscal year 2019 reports from select universities, Bloomberg, and authors' assumptions.

of purchasing power impairment (PPI), such as a greater than 40% decline in the real value of the corpus after spending over a 10-year time horizon as a result of adverse market conditions.

In this section, we illustrate how efficient and discretely defined portfolios compare in the mean–variance space versus across endowment-oriented risk and performance metrics. Exhibit 3 summarizes the asset allocations of six example portfolios together with illustrative CMAs described in the previous section. The first portfolio is based on the average asset allocation of endowments over $1 billion as per the 2019 NACUBO-TIAA Study of Endowments (NACUBO Average over $1Bn). The second is based on our survey of publicly available asset allocation information for the Harvard, Yale, Stanford, Princeton, MIT, Notre Dame, and Columbia endowments as of June 30, 2019 (Top Endowments as of June 30, 2019). Both portfolios required asset class mapping assumptions. The remaining four portfolios are simple combinations of stocks and bonds.

To evaluate the risk and return profile of these six portfolios we ran 10,000 10-year horizon simulated paths in quarterly steps. The Monte Carlo framework includes simulated quarterly returns for the 11 asset classes in Exhibit 4 together with inflation in a vector-autoregressive (1) framework. Note that expected returns throughout this article are geometrically compounded, consistent with the industry practice. Volatilities and correlations for private asset classes are based on levered

EXHIBIT 4

Standard Return and Risk Measures and Return Distribution

Selected Risk Measures	NACUBO Average Over $1Bn	Top Endowments as of June 30, 2019	100% US Core Bonds	100% US Equity	60/40 Allocation	70/30 Allocation
Expected Return	7.1%	7.5%	1.1%	5.6%	4.8%	5.3%
Total Return Volatility	13.3%	13.9%	3.7%	15.9%	9.4%	11.1%
Sharpe Ratio	0.45	0.47	0.04	0.29	0.40	0.38
Beta vs. US Equity	0.80	0.83	–0.03	1.00	0.58	0.69
Beta vs. Global Equity	0.77	0.79	–0.02	0.92	0.58	0.68
95% VaR Y/Y	–12.7%	–13.0%	–5.2%	–17.6%	–9.6%	–11.4%
95% CVaR Y/Y	–17.5%	–18.0%	–6.6%	–23.1%	–13.3%	–15.6%
99% VaR Y/Y	–20.5%	–20.9%	–7.5%	–26.2%	–15.4%	–17.9%
99% CVaR Y/Y	–24.4%	–25.1%	–8.7%	–30.4%	–18.6%	–21.6%
99% Worst Drawdown over 10 year	–48.7%	–49.5%	–23.8%	–61.9%	–38.8%	–44.3%

10-Year Horizon Return Distribution	NACUBO Average Over $1Bn	Top Endowments as of June 30, 2019	100% US Core Bonds	100% US Equity	60/40 Allocation	70/30 Allocation
5th Percentile	–0.3%	–0.1%	–1.1%	–2.9%	–0.4%	–0.7%
25th Percentile	4.0%	4.3%	0.2%	2.0%	2.6%	2.8%
50th Percentile	7.0%	7.5%	1.2%	5.6%	4.7%	5.2%
75th Percentile	10.1%	10.6%	2.1%	9.1%	6.9%	7.7%
95th Percentile	14.6%	15.3%	3.5%	14.4%	10.0%	11.3%

SOURCE: Authors' calculation.

market index returns rather than appraisal-based private asset class internal rates of return that would artificially smooth returns and lower volatilities. Exhibit 4 summarizes the standard return and risk measures based on the simulation, together with distribution ranges for the 10-year horizon returns, and highlights expected return ranges and downside risk profiles of these portfolios.

Exhibit 5 puts these portfolios into the context of an endowment's ultimate investment goals. The exhibit shows estimated probabilities of achieving a 5% and a 6% spending rate target, as well as ensuring capital preservation.

Unsurprisingly, top endowments, which have the highest allocation to the highest returning asset class (private equity), appear most likely to meet the illustrative spending rate. Of course, these forward-looking estimates are dependent on the underlying CMAs. This exercise results in several questions:

1. How efficient are the endowment strategic asset allocations? Could the probability of achieving investment objectives be improved? To address this question, we generated 20 mean–variance-efficient portfolios based on the simulated returns, with a few optimization constraints: a minimum of 2% cash and maximums of 30% private equity, 20% private real estate, 15% private credit, and 15% real assets.

Exhibit 6 shows the mean–variance-efficient frontier together with the six discrete portfolios in the expected return-volatility space, as well as the allocations behind these 20 efficient portfolios. We note that (1) the NACUBO average allocation and the top endowments portfolios are very close to the efficient frontier, near Portfolios 15 and 16, and (2) Portfolios 17 to 20 have even higher expected return than the top endowments.

EXHIBIT 5

Probability of Achieving Return Target

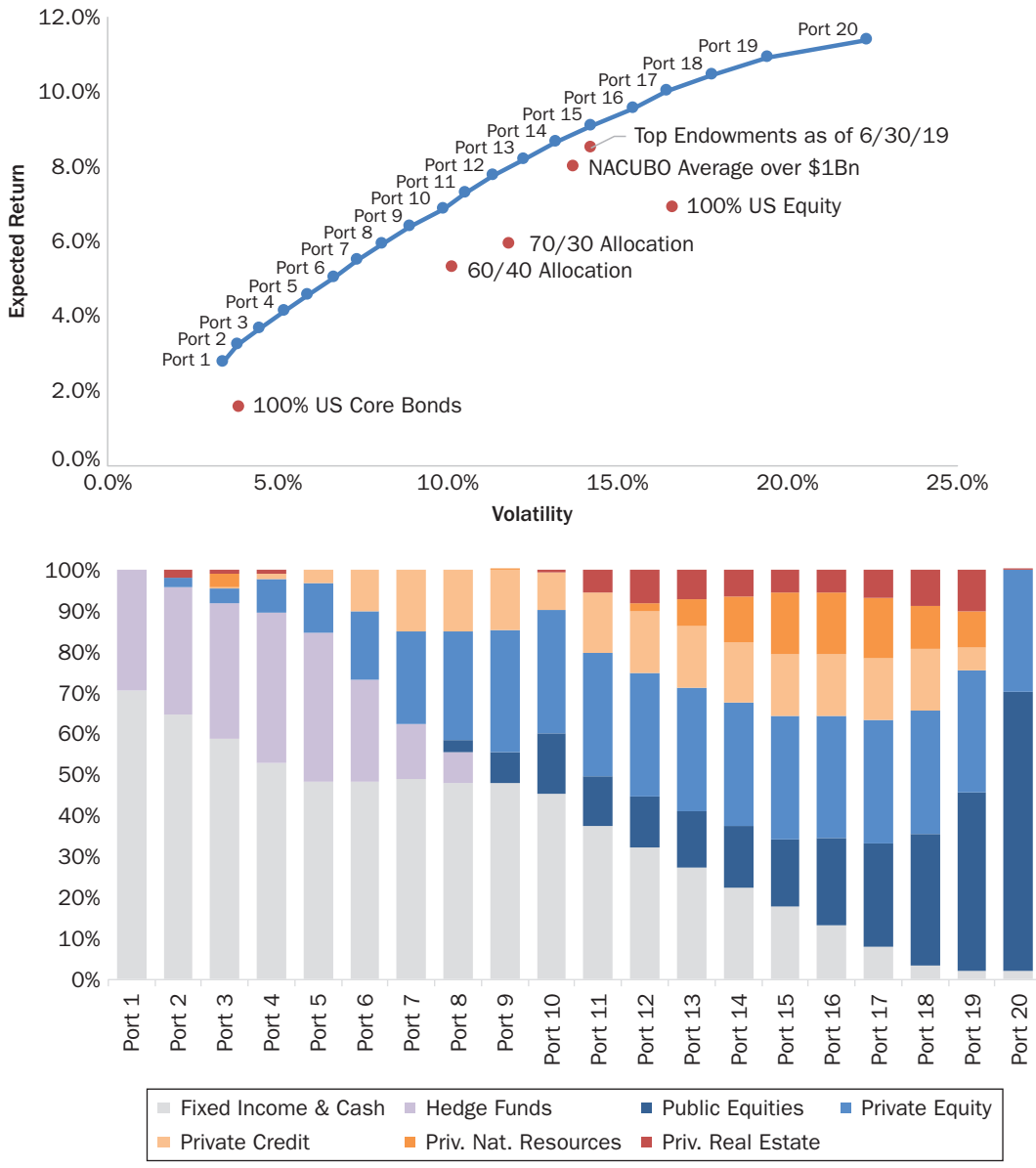
10-Year Horizon Probabilities	NACUBO Average Over $1Bn	Top Endowments as of June 30, 2019	100% US Core Bonds	100% US Equity	60/40 Allocation	70/30 Allocation
Meeting 5.0% Spending Rate	66.6%	69.4%	0.2%	53.3%	45.7%	51.8%
Meeting Spending Rate + CPI	48.4%	52.3%	0.0%	37.5%	20.4%	28.7%
Meeting 6.0% Spending Rate	58.3%	61.4%	0.0%	46.5%	33.7%	41.0%
Meeting Spending Rate + CPI	39.6%	43.7%	0.0%	30.6%	12.8%	20.3%

ABBREVIATION: CPI = Consumer Price Index.

SOURCE: Authors' calculation.

EXHIBIT 6

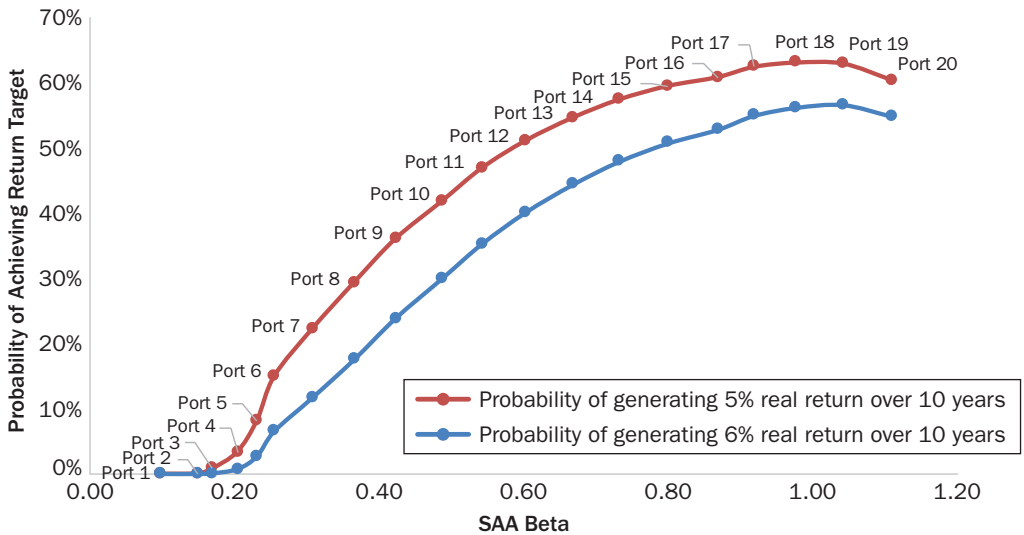
Mean–Variance-Efficient Frontier and Efficient Asset Allocations



SOURCE: Authors' calculation.

EXHIBIT 7

Probability of Maximizing the Investment Objective



SOURCE: Authors' calculation.

Exhibit 7 converts the efficient portfolios to probability estimates of generating 5% and 6% real returns over the forthcoming 10 years. Although Portfolios 19 and 20 would generate incremental returns, their higher expected returns do not translate to higher probabilities of meeting return targets. As the efficient frontier flattens toward these tail portfolios, the incremental returns become smaller, whereas the incremental volatility becomes higher compared to the lower-returning portfolios. The significantly higher volatility erodes the probability of success, illustrating a limit beyond which additional risk-taking hurts the chance of meeting investment goals.

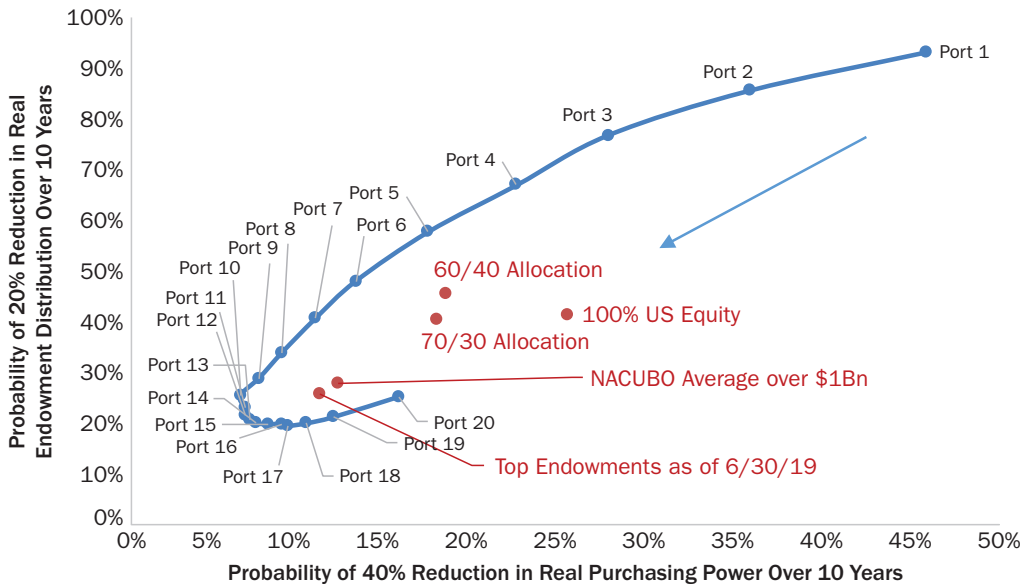
2. What is the downside risk? Although the probability measure tells us about the likelihood of success, how far might we fall below target? Referencing downside risk measures similar to those proposed by Swensen (2009), Exhibit 8 shows the efficient and discrete portfolios in the context of a 20% or worse reduction in spending (DSD) and the probability of a worse than 40% drop in real capital (PPI). Note that all these measures are calculated after spending, so real capital erosion is a combined result of spending and insufficient investment returns. We assume a 5% annual spending rate based on the three-year moving average of endowment balances calculated quarterly.

Portfolios 14 and 15 minimize both of these distress probabilities. The NACUBO average and top endowments allocations reside not far from the preferred range, whereas the other discrete portfolios show greater risk. Note that the 100% bond alternative is not displayed because it resides at 99.6% on the horizontal axis. Given sensitivity to variables, we consider optimizations and quantitative assessments as one input in the asset allocation process.

3. How sensitive are the results to the CMA assumptions? Differences in CMA assumptions and methodologies from different providers result in variations in long-term asset class return expectations. Results of portfolio analysis, including optimal portfolio choices, are highly dependent on the selected CMAs. Therefore, when modeling and assessing portfolios, it is prudent to compare multiple sources of CMAs. In practice, the ranking order across cash, bonds, hedge funds, public equity, and private investments remains reasonably consistent. For example, although the private equity return expectations across various sources may differ by several percentage points,

EXHIBIT 8

Mean–Variance-Efficient Portfolios in DSD-PPI Space



SOURCE: Authors' calculation.

this is typically the asset class with the highest expected return. If the optimization exercise is repeated by lowering every asset class's expected return uniformly by 100 bps such that the relative returns across asset classes remain the same, the same efficient allocations as shown in the lower chart of Exhibit 6 are generated. Thus, although the efficient frontier shifts down by 100 bps, the probability of meeting investment objectives declines, and the endowment-specific distress measures look worse; the preference order toward various asset classes does not change with such a moderate shift in absolute return expectations.

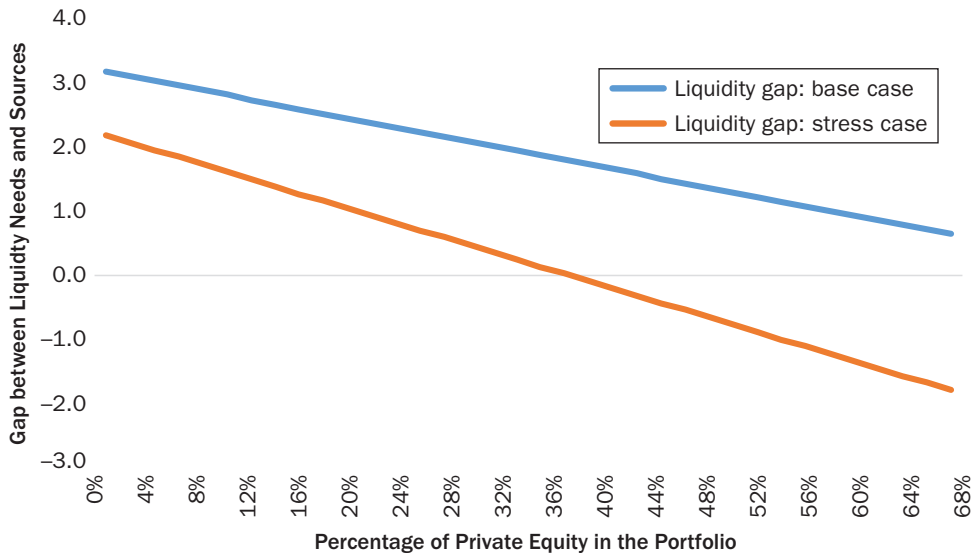
Liquidity Constraints

Liquidity requirements are an important constraint to a strategic asset allocation. An endowment requires liquidity based on spending goals and underlying investments including marketable versus private investments, including unfunded private commitments subject to capital calls. It should be noted that private asset class expected returns usually exceed marketable asset class expected returns because of the illiquidity premium. Therefore, quantitative analytics will usually favor them, as long as their premium is sufficient to compensate against the additional risk they introduce to the portfolio. It is important to manage this allocation in the context of available liquidity.

Exhibit 9 provides a simplified liquidity analysis illustrating the need for constraints on private investments. In this example, investments are grouped into fixed income and cash (8%), hedge funds (22%), and public and private equity (70%), with the total portfolio managed to a 0.77 beta target. Note that total return increases but liquidity falls as the allocation to private equity increases. The stress testing exercise assumes a one-year market sell-off: Public equity falls by –30%, private equity is marked down by –15%, hedge funds return –10%, and cash and fixed income earn 5%. At the same time, the endowment must pay 5% spending, fund private investment capital calls, and rebalance to target beta after equities decline. The endowment

EXHIBIT 9

Liquidity Stress Testing under a Market Sell-Off Scenario



SOURCE: Authors' calculation.

will receive inflows from gifts and private investment distributions described in the following. The exhibit illustrates the gap between liquidity needs and the sources of liquidity under the market sell-off scenario as a function of the portion of private investments in the portfolio. With respect to gift inflows and capital calls, we consider the following two cases:

- The base case assumes 4% inflow from gifts and net 7% outflows for private equity capital calls.
- The stress case assumes 3% inflow from gifts and net 9% outflows for private equity capital calls.

The exhibit highlights the significantly shrinking liquidity buffer as the weight of private equity increases and suggests a limit beyond which private equity imposes a liquidity challenge on an endowment. The limit depends on the unique characteristics of the beneficiary.

ADDITIONAL CONSIDERATIONS

Additional topics to be considered when constructing an endowment's strategic asset allocation include risk-factor analysis and portfolio implementation. These topics are highlighted, but not addressed in detail, in the following.

Analysis of risk factors enhances the asset allocation framework in several ways. First, risk-factor analysis provides more granular insight into diversification and sources of overall portfolio risk and return (e.g., addressing exposure to economic growth or decline across public and private equity). Second, a risk-factor framework is not limited to market factors such as equity or interest rate risk but can be extended to macroeconomic factors such as inflation risk as well. Finally, a risk-factor framework facilitates construction of a portfolio to a target beta, providing a framework and mechanism by which to compensate for over- or underweights to asset classes

relative to the strategic asset allocation (e.g., appropriately constructing a public equity overweight to compensate for a private equity underweight).

Implementation is possible through active or passive managers. Considerations include active managers' net-of-fees performance relative to the passive alternative and an endowment's ability to select and access the best managers. Low-fee passive investments may be best in highly efficient markets, whereas active management may generate value in less efficient and niche markets. In the alternatives space, passive investments are not available; an endowment's ability to select and access the best funds is critical to success.

CONCLUSIONS

We reviewed a quantitative framework that supports determining the optimal strategic asset allocation for an endowment in the context of long-term investment goals of meeting a spending rate target while preserving real capital. A traditional expected return-volatility optimization framework for endowment funds' strategic asset allocation is not sufficient owing to lack of context. However, maximizing the probability of achieving investment goals or minimizing relevant downside distress measures over the long term can be incorporated to improve the analysis.

We also showed that a typical endowment's asset allocation, with an equity orientation and tilt toward asset alternative asset classes, resides close to the optimized portfolios. That said, there is a ceiling on optimal risk taking: The probability of achieving investment goals grows with risk to a point, beyond which volatility begins to erode the marginal benefits of further increasing expected return. Optimal portfolio choices are heavily dependent on underlying CMAs and relative return expectations across asset classes. Although expected returns are typically the highest for private investments, there are limits to investing in private asset classes, including liquidity and an endowment's ability to access the best-performing managers.

REFERENCES

AON. "Capital Market Assumptions—As of 30 September 2020." 2020, https://insights-northamerica.aon.com/market-outlook/aon-capital-market-assumptions-quarterlyupdate-article.

Chambers, D., E. Dimson, and C. Kaffe. 2020. "Seventy-Five Years of Investing for Future Generations." *Financial Analyst Journal* 76 (4): 5–21.

Ennis, R. 2021. "Failure of the Endowment Model." *The Journal of Portfolio Management* 47 (5).

Ilmanen, A. *Expected Returns. An Investor's Guide to Harvesting Market Rewards*. Hoboken, NJ: John Wiley & Sons, 2011.

International Monetary Fund. "World Economic Outlook, October 2020: A Long and Difficult Ascent." 2020, https://www.imf.org/en/Publications/WEO/Issues/2020/09/30/world-economic-outlook-october-2020.

J.P. Morgan. "2021 Long-Term Capital Market Assumptions." 2020, https://am.jpmorgan.com/us/en/asset-management/institutional/insights/portfolio-insights/ltcma/.

National Association of College and University Business Officers (NACUBO) and TIAA. "2019 NACUBO-TIAA Study of Endowments: Annual Report of the National Association of College and University Business Officers and TIAA on Endowment Performance and Management Practices in Higher Education." 2019, https://www.nacubo.org/Research/2020/Public-NTSE-Tables.

Page, S. *Beyond Diversification—What Every Investor Needs to Know about Asset Allocation*. New York, NY: McGraw Hill, 2020.

Philips, T. K., and A. Kobor. 2020. "Ultra-Simple Shiller's CAPE: How One Year's Data Can Predict Equity Market Returns Better Than Ten." *The Journal of Portfolio Management* 46 (4): 140–155.

Swensen, D. *Pioneering Portfolio Management—An Unconventional Approach to Institutional Investment*. New York: The Free Press, 2009.