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# Is 5% the right return target for institutional investors?

Vanguard Research

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*Daniel W. Wallick, Kelly N. McShane, and Christos Tasopoulos*


- For many institutional investors, a 5% return has been the standard investment objective.[1] Yet since the 1930s, the rolling average of a traditional 60% stock/40% bond portfolio has achieved a 5% real return 56% of the time, or a little more than a coin flip.
- Moreover, many expectations for future returns for stocks and bonds are lower than their historical long-term averages.
- In this paper, we consider whether 5% is a viable return target, and examine three key levers that institutions can use to maximize the probability of achieving success. We find that while a consistent 5% real return is an ambitious target, using an integrated approach that considers asset allocation, spending levels and methods, as well as revenue-raising strategies, provides investors with the greatest prospect for success.


1 Indeed, since 1976, private foundations in the United States have been required under Section 4942 of the federal tax code to spend 5% each year in order to maintain their tax-exempt status.

*Notes on risk*

All investments are subject to risk. Investments in bonds are subject to interest rate, credit, and inflation risk. Foreign investing involves additional risks, including currency fluctuations and political uncertainty. Investments that concentrate on a relatively narrow market sector face the risk of higher share-price volatility. Diversification does not ensure a profit or protect against a loss in a declining market. Past performance is not a guarantee of future results. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.

IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model (VCMM) regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Distribution of return outcomes from the VCMM are derived from 10,000 simulations for each modeled asset class. Simulations are as of September 30, 2017. Results from the model may vary with each use and over time. For more information, see the appendix section "About the Vanguard Capital Markets Model."

## Historical and forecasted return analysis

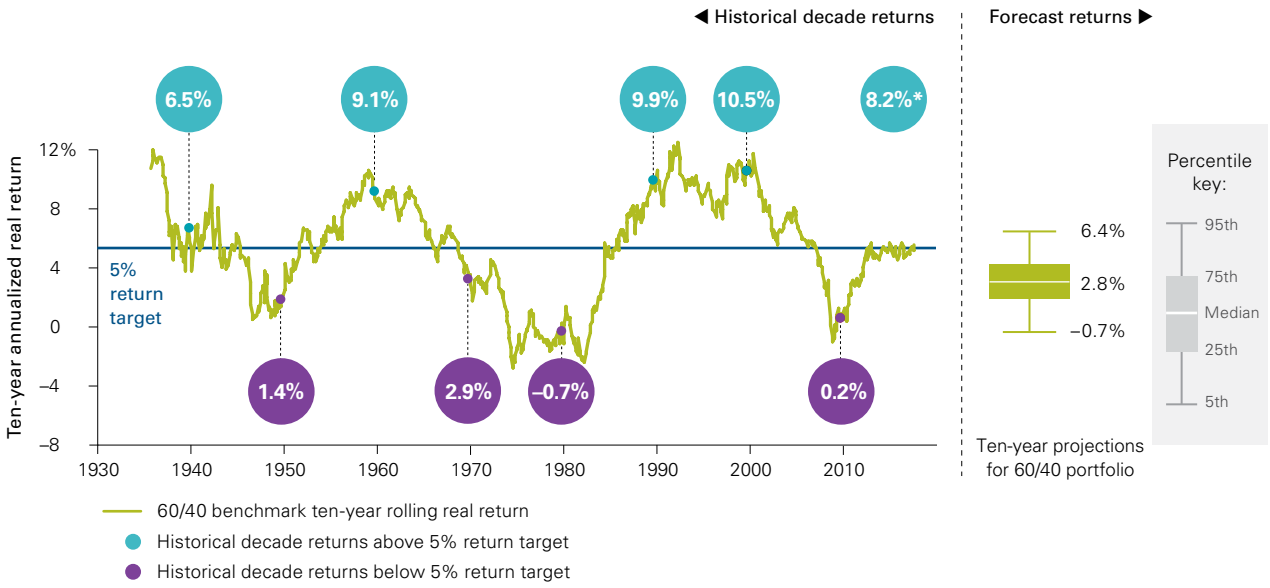
On the surface, it would seem that holding either stocks or bonds over the long term would provide investors with more than a 5% return. Indeed, the long-term nominal average annual return has been 10.1% for stocks and 5.4% for bonds. Over the 92 years from 1926 to 2017, a traditional 60% stock/40% bond portfolio would have provided an average annual return of 8.7%. But what often matters most to institutions that want to perpetuate their mission are not nominal returns but real (net of inflation) returns, for without considering the impact of inflation, investors are susceptible to losing actual purchasing power.

When we look at the ten-year annualized real returns for the decades between 1930 and 2010 and the annualized real return for the subsequent eight years, the average return on a 60/40 portfolio was 5.3%. But in four of the nine periods evaluated, returns were below this long-term average. Similarly, using a rolling 12-month measure, the odds of an investor meeting or exceeding the 5% real return target were no better than 56%.

Recent experience is particularly discouraging. While a 60/40 portfolio produced average annual real returns well in excess of 5% during the 1980s and 1990s, this same portfolio delivered barely positive real returns in the subsequent two decades. The future looks equally challenging: The median projected ten-year real return for a 60/40 portfolio, based on the Vanguard Capital Markets Model® (VCMM), is 2.8% (see **Figure 1**). As a result, nonprofit institutions face the difficult question of how to meet objectives in the face of historically inconsistent returns and projected low returns.

**Figure 1. A 5% real return: Elusive in the past, challenging in the future**

Ten-year annualized real return for a 60/40 balanced portfolio




**Notes:** The historical decade return represents the ten-year annualized return at the end of each decade as of December 31. *This represents the annualized real return for a modified period, January 2010 to December 2017. The Vanguard Capital Markets Model's ten-year projections are from September 30, 2017, to September 30, 2027. The traditional 60/40 portfolio comprises 60% U.S. stocks and 40% U.S. bonds over the 985 rolling ten-year periods ranging from December 1935 to December 2017. The 60/40 portfolio used in the ten-year projections comprises 36% U.S. stocks, 24% non-U.S. stocks, 28% U.S. bonds, and 12% non-U.S. bonds. The analysis is gross of costs. See the appendix for details on indexes.

**Source:** Vanguard.

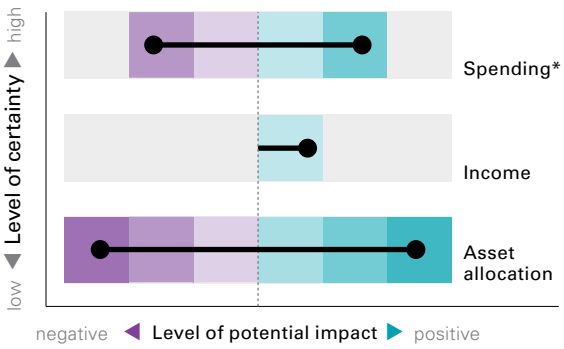
## The dilemma and the solution

If asset returns for a traditional 60% stock/40% bond portfolio have not consistently achieved a 5% real return in the past, and forward-looking expectations are lower, where does this leave institutional investors? Let us step back for a moment and consider that the impact of any asset pool is the combination of two things—the amount of its current principal (a proxy for future impact) and the amount it spends (a measure of past and current impact). It then becomes clear that potential solutions lie in some combination of the three key levers available to institutions: asset allocation decisions, income-raising strategies, and spending policies.

This three-pronged approach to asset pools—assets, income, and spending—applies to any investor using a total return investment approach.[2] At the conceptual level, it can be useful to consider the potential trade-off between the certainty of the strategy and the potential magnitude of the impact. **Figure 2** illustrates the general relationship among the three major levers available to investors. The proper combination of these three levers will vary by organization and depend on individual missions. An institution whose aim is intergenerational may well use a different mix of these strategies than an institution that is seeking a more immediate impact.

Nevertheless, it can be useful for all nonprofit institutions, indeed, all investors, to keep their primary mission in mind as they consider all the levers at their disposal.

Figure 2. The magnitude and certainty of each lever's impact




**Spending*:** Potential to have either a positive or a negative impact, depending on the rate and policy used. Of the three levers, spending has the highest level of certainty.

**Income:** Potential to have a positive impact with some level of certainty depending on the ability to consistently raise and maintain various sources of income over time.

**Asset allocation:** Potential to have a high level of either positive or negative impact with a low level of certainty.

*For those institutions that have discretion over the spending rate.

**Note:** This figure is for illustrative purposes only.
**Source:** Vanguard.

## The asset allocation lever

The decidedly mixed results shown in Figure 1 have prompted many investors to consider changing the asset allocation of their portfolio to improve results. Is it important for investors to expand beyond simply stocks and bonds to improve the expected returns?

To assess this issue we began with a base portfolio of 60% stocks and 40% investment-grade bonds. We then evaluated the impact of substituting a variety of asset and sub-asset classes and strategies in different increments depending on the asset class being replaced.

The substitutions replaced one of three possible portfolio components: only stocks, only bonds, or a combination of stocks and bonds. We measured the results as the probability of the portfolio meeting a 5% average annual real return over the period between 1991 and 2017. We then compared this to the base portfolio, which achieved a 5% real return 66% of the time over this period.

We found that while further diversifying a portfolio did help dampen volatility, it did not significantly improve the returns achieved by a traditional 60/40 portfolio.



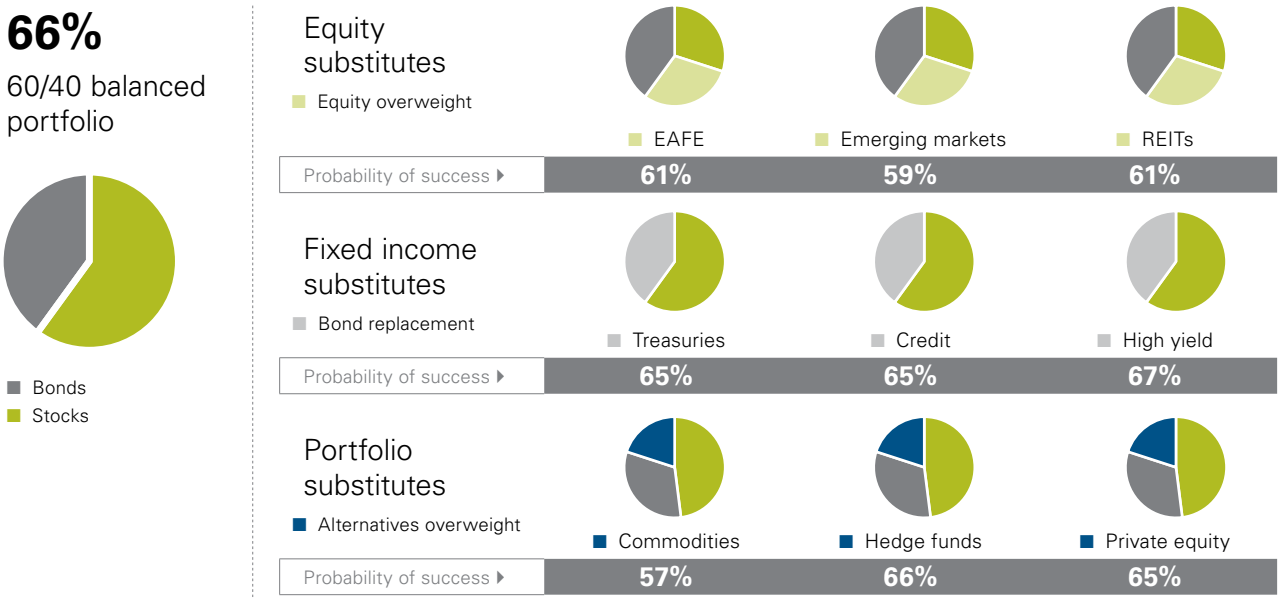
2 Alternatively, for investors using a liability-driven investment strategy, a slightly different analysis would apply. See Stockton (2014) for such an approach.

Figure 3 demonstrates these findings, calculating the probability of successfully achieving a 5% real return on a rolling 12-month basis. The first three portfolios substitute a portion of the stock portfolio, the next three portfolios replace the bond portfolio, and the final three portfolios substitute a combination of stocks and bonds. In each instance, we found no discernible difference in returns. Although the overall probability of success was higher for this truncated period (1991–2017) than for the longer history (1926–2017), none of the options achieved consistent success, producing a 5% real return or better, again, only about 66% of the time.

Indeed, even the addition of alternative investments did little to alter the level of success; a 20% allocation to hedge funds did not improve the results. This may come as a surprise, given the publicity that hedge funds and other alternative investments have received. However, when private investments are evaluated in the same way as public investments, using an average of all possible investments as a proxy for investing in a specific area, our analysis indicates that they provided no additional benefit.

The wide dispersion of returns among private equity funds highlights the fact that performance results are highly dependent on access to and selection of managers, among other things. Although the most successful private equity fund manager's results are outstanding, the median results have been mixed, depending on the specific type of private equity. For a fuller discussion of all types of alternative investments, including private equity, see Wallick et al. (2015).

Figure 3. The probability of achieving a consistent 5% real return (1991–2017)




**Notes:** The baseline 60/40 balanced portfolio comprises 60% stocks and 40% bonds. Stocks are represented by 60% U.S. stocks and 40% non-U.S. stocks, and bonds comprise 70% U.S. bonds and 30% non-U.S. bonds. In the category of equity substitutes, there's a 50% replacement of stocks by the respective sub-asset class. REITs are real estate investment trusts. For fixed income substitutes, there's a 100% replacement of bonds, and for portfolio substitutes, there's a 20% portfolio allocation to alternatives. Refer to the appendix for benchmark details. The hedge funds series spans January 1994 to December 2017 and the private equity series spans January 2001 to June 2017. All other series range from January 1991 to December 2017. The analysis is gross of costs.

**Source:** Vanguard calculations, based on data from Barclays, Datastream, and Prequin.

In addition to changing the sub-asset classes and strategies used in a portfolio, investors may also choose to raise the portfolio's risk profile by, for example, increasing the strategic equity allocation. An increase in risk can have a significant impact on a portfolio's ability to meet its return target, but the certainty of success is low, as detailed by Wallick et al. (2017).

## The spending lever

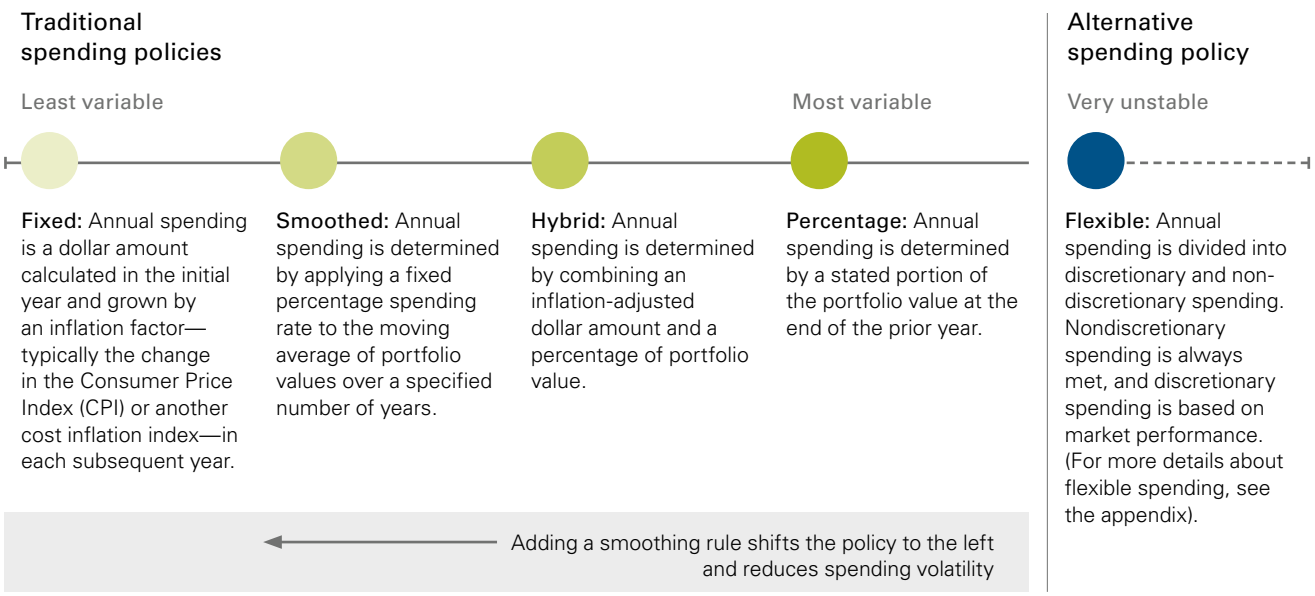
The spending policies typically take into account two key elements—level and variability. The level of spending is often referred to as the spending rate, and the variability refers to the year-over-year change in spending that the investor is willing to accept. Some institutions are required to spend a certain amount each year, such as a minimum 5% for private foundations, while others might have greater discretion. For institutions that have more discretion, spending policies are often a trade-off between level and variability, with a nearly infinite number of choices.

For the purposes of this paper, we compare five possible spending rules—four traditional and one alternative. The four traditional rules can be thought of as *fixed dollar, smoothed percentage, hybrid,* and *percentage of market value;* the alternative rule is *flexible.* See **Figure 4** for a more detailed description of each of these rules.

Our analysis examines each spending rule at three different spending rates—4.0%, 4.5%, and 5.0%—to see the impact on a $100 million endowment over the next 30 years using a forward-looking simulation

**Figure 4. Spectrum of spending policies**

The various spending rules and their characteristics




**Source:** Vanguard.

for a 60% stock/40% bond portfolio (see **Figure 5**). For each spending rule we calculated four elements—the median projection for the ending principal, the aggregate dollars spent, spending volatility, and the total investment power. Investment power is represented by a single figure that measures the cumulative impact of a spending rule by combining both the dollars spent (current impact) and the ending principal value (future impact). In the end, considering the relationship between a scenario's investment power and spending volatility enables investors to effectively compare the characteristics of different spending policies and levels relative to one another.

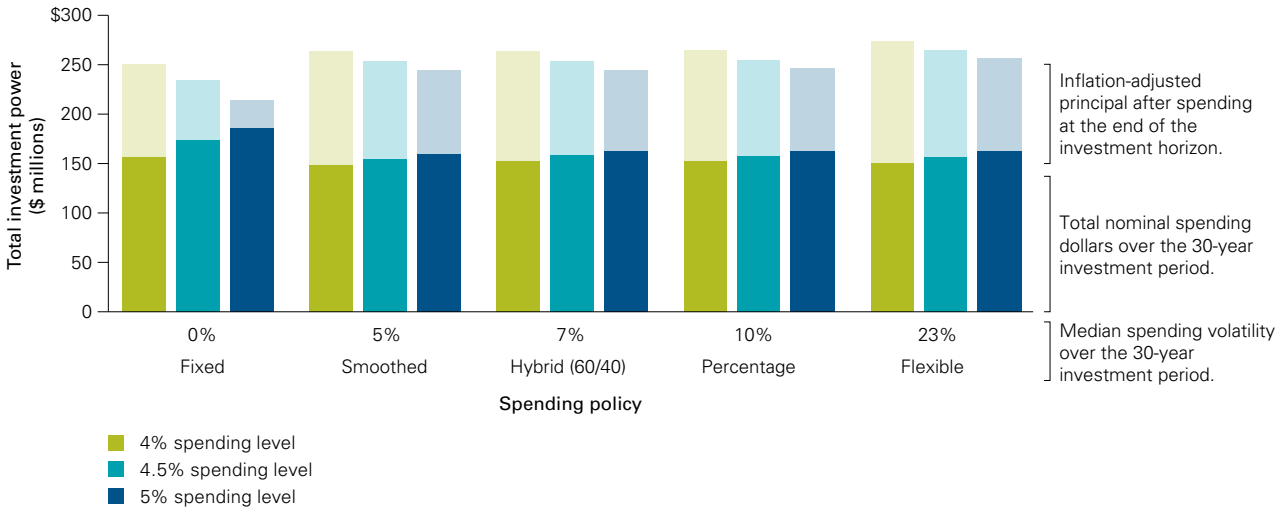
For example, projecting the results for a 5% spending rate reveals that over 30 years, a fixed-dollar rule, a five-year smoothed percentage rule, a hybrid (60/40) rule, and a fixed percentage without any smoothing rule resulted in less investment power (–$30 million, –$11 million, –$11 million, and –$10 million) relative to a flexible spending rule, which amounted to $258 million median investment power.

This notable difference in outcomes is due to the market sensitivity inherent in a flexible spending rule, which allows institutional investors to adjust discretionary spending depending on recent investment performance. It is worth noting that while flexible spending produced the greatest median investment power, it also came with the greatest spending variability. As a result, for those institutions not able to operate effectively with potentially large swings in spending, a more conventional spending rule may be more suitable.

Regardless of which spending rule an investor might select, our analysis also showed that simply reducing overall spending had a significant positive impact on investment power. Adjusting the spending rate by one-half percentage point, from 5.0% to 4.5%, made a noticeable difference, improving each median investment power across each spending rule by between 3.1% and 5.8%. Reducing spending even further, to 4.0%, increased results by approximately 7% or more when compared with a 5.0% spending rate. Depending on the total amount paid out each year, and how much an institution relies on having this amount available to fund various operations, the institution may

Figure 5. More spending flexibility means more investment power

The 30-year forward-looking impact of various spending rules and spending rates on an endowment's investment power and spending volatility




**Notes:** Three spending levels—4.0%, 4.5%, and 5.0%—were used in the analysis across five spending policies. Investment power is calculated by the sum of total nominal spending over the 30-year investment horizon plus the inflation-adjusted principal at the end the 30-year period. The VCMM was used to calculate the distribution of spending and ending principal over 10,000 simulations; the figure reflects the median values. Spending volatility is defined by the year-over-year change of real dollar spending. The smoothed percentage spending policy is defined by the five-year moving average of portfolio values. The hybrid spending policy is the sum of two parts—60% includes the three-year moving average of portfolio values and the remaining 40% is the prior-year spending adjusted for inflation. The flexible spending policy is calculated using the methodology detailed in the appendix. The analysis is gross of costs. See appendix **Figure A-2** for median values.

**Source:** Vanguard.

use an incremental approach to slowly reduce the total rate over time. Stepping down the spending rate can prevent drastic swings in spending amounts in the short term while improving the chances of achieving long-term goals.

It's interesting to note that lower spending rates in the short term can actually produce higher overall spending in the long term. Lower spending rates lead to higher saving rates, which, in turn, compound into stronger corpus growth over time. The effects of this chain reaction projected over the 30 years were remarkable: A reduction of 1 percentage point in spending (from 5.0% to 4.0%) over time produced approximately $30 million to $65 million larger corpus balances, depending on the type of spending rule employed (see Figure 5).

In the end, we find that even a modest reduction in the spending rate on a continued basis can have a tremendous impact over time and significantly improve an institution's chance of success in supporting its mission. Our analysis highlights that there are two notable ways that institutions can implement reduced spending patterns: imposing a lower constant spending rate, with 4% as a potentially reasonable starting point, or building in a flexible spending pattern. The key to both approaches is that they structure spending rates to be consistently lower than investment returns, thereby creating a surplus that compounds over time and has the potential to lead to higher future spending amounts.

## The income lever

A third element that can have an impact on an institution's mission is additional inflows of capital. Depending on the organization, this capital can take several forms, including fees, tuitions, or fund-raising. Annual income can supplement operating costs, while less-frequent sources of income are more likely to support an asset pool. While some organizations consider asset returns the linchpin of spending success, it can be valuable to consider non-portfolio income, in whatever form it takes.

For institutions for which fund-raising may be appropriate, it can be valuable to consider where organizational leaders' time is best spent. (For more information, see the "Fund-raising considerations" box on the next page.) Indeed, asset allocation and portfolio construction decisions, while crucial, are typically strategic, requiring substantial upfront time and resources. However, to the extent that the initial work has been done well, continuing asset allocation oversight should take much less time. In addition, organizational leaders involved in portfolio management may or may not be the ones who have the largest impact on fund-raising efforts.

As a result, it can be prudent to consider maximizing all potential forms of inflows to an organization, both current assets in the form of capital appreciation and income, and new sources of revenue.

### Fund-raising considerations

When using fund-raising as an alternative income source, there are several important considerations:

1. Attraction

   Attracting donors is a two-stage process: initial attraction and recurring commitment. Initial attraction is grounded in the ability to differentiate the organization in order to attract donors that already have many options in where to donate. Having a strong understanding of the organization's purpose and knowledge of how the donation will support the mission are crucial.

   Advances in technology have led to new, creative, and potentially less-expensive ways to evaluate the donor base, communicate with specific donor types, and attract income from various sources (i.e., donor analytics tools, social media, donation platforms for mobile devices, etc.). As advertising, social media, and other forms of technology evolve, institutions should continue to explore these options.

2. Stability of donor source

   There are various types of donors, including individual donors and institutional donors. The factors that affect the stability of a source will depend on the donor type. When considering alternative donation sources, it is important to evaluate how the donor's priorities align with the nonprofit's mission, as well as the reliability and consistency of donations from a specific source. Determining the stability allows a nonprofit to better incorporate these outside contributions into long-term planning. The number and size of donors should also be considered in order to avoid potential risks associated with a concentrated donor base.

3. Regulatory and legislative environment

   Organizations must stay abreast of potential policy changes that could affect their ability to perform various operations, as well as policies that may influence a donor's willingness or ability to contribute. For example, tax policy can play an important role in fund-raising decisions. Tax policy changes that reduce benefits for charitable giving can remove incentives for some donors and potentially reduce the total contributions received by nonprofits. A clear understanding of these policies and their direct effect on operations can help organizations more easily navigate changes that may arise.

## Conclusion

We began this paper by posing the question: Is a 5% real return the right target for institutional investors? We found, by analyzing historical asset returns, that a 5% real return has been a very difficult target to achieve. Forward-looking projections of market conditions do not provide grounds for optimism.

Given these results, we examined three levers that institutions have within their control. Based on historical returns, we found no specific asset allocation that would have continually enabled investors to meet the 5% target. Our forward-looking return expectations tell a similar tale. Indeed, diversifying a portfolio beyond just stocks and bonds does not, by itself, materially improve results. Adding more risk to a portfolio can, over time, increase returns, but typically with greater volatility. An organization can exert greater control over spending, but only to the extent that it does not hurt the chance of achieving the mission. Indeed, for some organizations, the greatest control can be exerted over sources of inflows. To the extent that sources of income are available independent of investment assets, they can be an invaluable supplementary source of benefit, particularly when returns are expected to be low.

As a result, it can behoove investors to take a comprehensive approach to solving the challenge of funding their mission. Such an approach could include holding a diversified portfolio, establishing multiple revenue streams if possible, and finding the most appropriate spending policy.

## References


Ameriks, John, and Colleen Jaconetti, 2006. *Endowment and Foundation Spending Guidelines.* Valley Forge, Pa.: The Vanguard Group.

Davis, Joseph H., Roger Aliaga-Díaz, Harshdeep Ahluwalia, Frank Polanco, and Christos Tasopoulos, 2014. *Vanguard Global Capital Markets Model.* Valley Forge, Pa.: The Vanguard Group.

Hammer, Sarah, and Anatoly Shtekhman, 2012. *A Mixed Bag: Performance of Hedge Fund Categories Before and After the Financial Crisis.* Valley Forge, Pa.: The Vanguard Group.

Kaplan, Steven N., and Antoinette Schoar, 2005. Private Equity Performance: Returns, Persistence, and Capital Flows. *Journal of Finance* 60(4): 1791–23.

Kinniry Jr., Francis M., 2007. Chasing the Efficient Frontier: The Opportunity, Challenges, and Risks. *Vanguard Investment Perspectives* (2): 7–12. Valley Forge, Pa.: The Vanguard Group.

Shanahan, Julieann, Jill Marshall, and Anatoly Shtekhman, 2010. *Evaluating Private Equity*. Valley Forge, Pa.: The Vanguard Group.

Stockton, Kimberly A., 2014. *Fundamentals of Liability-Driven Investing.* Valley Forge, Pa.: The Vanguard Group.

Wallick, Daniel W., Anatoly Shtekhman, Todd Schlanger, 2011. *Is 5% the Right Return Target for Institutional Investors?* Valley Forge, Pa.: The Vanguard Group.

Wallick, Daniel W., Daniel B. Berkowitz, Andrew S. Clarke, Kevin J. DiCiurcio, and Kimberly A. Stockton, 2017. *Getting More from Less in Defined Benefit Plans: Three Levers for a Low-Return World.* Pension Research Council. Philadelphia, Pa.: The Wharton School, University of Pennsylvania.

Wallick, Daniel W., Douglas M. Grim, Christos Tasopoulos, and James Balsamo, 2015. *The Allure of the Outlier: A Framework for Considering Alternative Investments.* Valley Forge, Pa.: The Vanguard Group.

## Appendix

### More about flexible spending

The flexible spending rule has two categories, nondiscretionary and discretionary spending. Such a rule provides investors with some control over the discretionary portion of their expenditures each year. With a flexible spending policy, an institution would cut or increase spending significantly depending on the most recent trailing asset returns.

The discretionary portion of the spending rule is calculated as the product of a baseline spending rate and the variable spending factor. The discretionary spending rate is simply the portion of an organization's annual spending subject to change—for the purposes of this paper, 50% of the overall 5% spending rate, or 2.5%. The discretionary spending factor is the rate at which the baseline is adjusted, based on the previous year's asset growth. The product of the two functions (baseline x factor) equals the discretionary spending amount (see **Figure A-1** for a hypothetical example).

A flexible spending rule requires that an institution make an adjustment once a year when it calculates the trailing 12-month asset change and augments discretionary spending. The effect of this action is to limit spending when returns have been most significantly reduced and to increase spending when returns have been most favorable. The rule acts as a mechanism to reduce losses in down markets by reducing expenditures and increasing expenditures in up markets. When losses are significant, the variable spending factor is reduced to zero. Conversely, when asset gains are repeated year over year, discretionary spending would be compounded and could grow significantly.

**Figure A-1. Flexible spending in action (hypothetical case)**

With a highly flexible spending policy, an institution cuts or increases spending significantly depending on the most recent trailing asset levels. For this analysis, we used a 50/50 split of 5% spending, creating a fixed spending amount of 2.5% and a baseline discretionary spending amount of 2.5%. The discretionary spending is adjusted in relation to market conditions.

Spending Formula

Fixed spending + Discretionary spending = Total spending

Fixed spending + (Baseline variable spending x Variable spending factor) = Total spending

An example:

2.5% + (2.5% x 0.5) = 3.8%

The variable spending factor is determined by the year-over-year change in assets.

| Year-over-year change in assets | Baseline variable spending | Variable spending factor | Discretionary spending | Total spending |
|---|---|---|---|---|
| 20% or more | 2.5% | 1.20 | 3.0% | 5.5% |
| 0% to 20% | 2.5% | 1.00 | 2.5% | 5.0% |
| –5% to 0% | 2.5% | 0.50 | 1.3% | 3.8% |
| –10% to –5% | 2.5% | 0.25 | 0.6% | 3.1% |
| –10% or less | 2.5% | 0.00 | 0.0% | 2.5% |

**Source:** Vanguard.

Figure A-2. Median values for each spending policy (table corresponds to Figure 5)

The 30-year forward-looking impact of various spending rules and spending rates on an endowment's median investment power. Dollar figures are in millions.

**4% spending level**

| | Total nominal spending | Ending inflation-adjusted principal | Investment power |
|---|---|---|---|
| Fixed | $157 | $92 | $254 |
| Smoothed | $148 | $116 | $267 |
| Hybrid | $153 | $111 | $266 |
| Percentage | $153 | $112 | $267 |
| Flexible | $151 | $123 | $275 |

**4.5% spending level**

| | Total nominal spending | Ending inflation-adjusted principal | Investment power |
|---|---|---|---|
| Fixed | $175 | $60 | $241 |
| Smoothed | $154 | $100 | $257 |
| Hybrid | $159 | $95 | $257 |
| Percentage | $159 | $96 | $258 |
| Flexible | $157 | $107 | $266 |

**5% spending level**

| | Total nominal spending | Ending inflation-adjusted principal | Investment power |
|---|---|---|---|
| Fixed | $187 | $28 | $228 |
| Smoothed | $159 | $85 | $247 |
| Hybrid | $163 | $82 | $247 |
| Percentage | $163 | $83 | $248 |
| Flexible | $162 | $93 | $258 |

**Notes:** Three spending levels—4%, 4.5%, and 5%—were utilized in the analysis across five spending policies. Investment power is calculated by the sum of total nominal spending over the 30-year investment horizon plus the inflation-adjusted principal at the end of the 30-year period. The VCMM was used to calculate the distribution of spending and ending principal over 10,000 simulations; the table reflects the median values. The smoothed percentage spending policy is defined by the five-year moving average of portfolio values. The hybrid spending policy is the sum of two parts—60% includes the three-year moving average of portfolio values and the remaining 40% is the prior-year spending adjusted for inflation. The analysis is gross of costs.

**Source:** Vanguard.

Figure A-3. Benchmarks

| | |
|---|---|
| U.S. stocks | Standard & Poor's 90 Index from January 1926 to March 1957, Standard & Poor's 500 Index from April 1957 to December 1974, Wilshire 5000 Index from January 1975 to April 2005, and MSCI US Broad Market Index through December 2017. |
| U.S. bonds | Standard & Poor's High Grade Corporate Index from January 1926 through December 1968, Citigroup High Grade Index from January 1969 through December 1972, Lehman Brothers U.S. Long Credit AA Index from January 1973 through December 1975, and Bloomberg Barclays U.S. Aggregate Bond Index through December 2017. |
| Non-U.S. stocks | MSCI All Country World ex-USA Index from January 1991 through December 2017. |
| Non-U.S. bonds | Bloomberg Barclays Global Aggregate ex-USD Index Hedged from January 1991 through December 2017. |
| High-yield bonds | Bloomberg Barclays U.S. High Yield Bond Index from January 1991 through December 2017. |
| Commodities | S&P GSCI Commodity Index from January 1991 through December 2017. |
| Credit bonds | Bloomberg Barclays U.S. Total Credit Index from January 1991 through December 2017. |
| REITs | FTSE EPRA/NAREIT Equity REITs Index from January 1991 through December 2017. |
| Treasury bonds | Bloomberg Barclays U.S. Total Treasury Index from January 1991 through December 2017. |
| Emerging-market stocks | MSCI Emerging Markets Index from January 1991 through December 2017. |
| International developed stocks | MSCI EAFE Index from January 1991 through December 2017. (EAFE stands for Europe, Australasia, and Far East.) |
| Hedge funds | Dow Jones Credit Suisse BlueChip Aggregate Hedge Fund Index from January 1993 through December 2017. |
| Private equity | Preqin All Private Equity Quarterly Market Index from January 2001 through June 2017. |

Source: Vanguard.

## About the Vanguard Capital Markets Model

**IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time.**

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The VCMM is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include U.S. and international equity markets, several maturities of the U.S. Treasury and corporate fixed income markets, international fixed income markets, U.S. money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the VCMM is that the returns of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta). At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

The primary value of the VCMM is in its application to analyzing potential client portfolios. VCMM asset-class forecasts—comprising distributions of expected returns, volatilities, and correlations—are key to the evaluation of potential downside risks, various risk–return trade-offs, and the diversification benefits of various asset classes. Although central tendencies are generated in any return distribution, Vanguard stresses that focusing on the full range of potential outcomes for the assets considered, such as the data presented in this paper, is the most effective way to use VCMM output. We encourage readers interested in more details of the VCMM to read Vanguard's white paper titled *Vanguard Global Capital Markets Model* (Davis et al., 2014).

The VCMM seeks to represent the uncertainty in the forecast by generating a wide range of potential outcomes. It is important to recognize that the VCMM does not impose "normality" on the return distributions, but rather is influenced by the so-called fat tails and skewness in the empirical distribution of modeled asset-class returns. Within the range of outcomes, individual experiences can be quite different, underscoring the varied nature of potential future paths. Indeed, this is a key reason why we approach asset-return outlooks in a distributional framework.

Vanguard Research

P.O. Box 2600
Valley Forge, PA 19482-2600



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