From assets to income: A goals-based approach to retirement spending

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- While the population and life expectancies of retirees in the United States increase, portfolio yields remain at historically low levels. And, as defined benefit income becomes less commonly available, the need for retirees to implement informed portfolio spending strategies is more critical, and yet more complex, than ever.
- For retirees, the stakes are high, and the impact of subpar decisions can be severe. While every retiree's financial situation is unique enough that there is no one-size-fits-all strategy, developing and implementing a spending strategy can reduce the anxiety and stress regarding one's ability to meet his or her retirement income goals.
- For retirees who hold the majority of their assets in tax-deferred accounts, assets can be turned into income by setting up an automatic withdrawal plan from their current holdings or purchasing an investment that is specifically designed to provide regular distributions. For other retirees, where taxable assets are a meaningful portion of their portfolio, working with an advisor to develop a unique goals-based strategy can add significant value.
- Regardless of the means—a product offering an automated distribution feature or a goals-based spending strategy developed with an advisor—the combination of complexity and consequences underscores the need for, and the value of, skillful guidance.

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Developing and overseeing a retirement-spending strategy can be a complex undertaking. As life expectancies increase, as well as the number of retirees who will need to rely more on their investment portfolios than on guaranteed sources of income such as defined benefit pension plans, the challenges will increase. Further complicating matters is the fact that yields on balanced and fixed income portfolios remain at historically low levels, leaving many retirees searching for ways to increase the income generated from their portfolios. This paper provides a framework to help investors and advisors turn an investment portfolio into a sustainable and relatively consistent level of income while at the same time planning for other financial goals.

Our goals-based retirement spending strategy has three components: a prudent spending rule tailored to each retiree's unique goals; a soundly constructed portfolio; and tax-efficient investment and withdrawal strategies. Each component involves complexities and trade-offs. The rewards of careful decision-making and the consequences of any missteps put a premium on skillful analysis and, for many investors, the insight of a knowledgeable advisor.

I. Develop a prudent spending rule tailored to each retiree's unique goals

It sounds simple, but choosing an appropriate portfolio spending rule that balances a retiree's competing goals—including differentiating wants from needs[1]—is especially challenging because many critical factors affecting the outcome are beyond a retiree's control and often unpredictable. For example, retirees have no control over the returns of the markets, the rate of inflation, or the length of their planning horizon (their life expectancy). Yet, each of these variables significantly affects how much a retiree can "safely" withdraw from his or her portfolio to provide for current consumption while preserving the potential to generate future income for the rest of the retiree's life, however long.

Notes on risk

IMPORTANT: The projections or 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 December 31, 2015. Results from the model may vary with each use and over time. For more information, see the appendix.

Investments are subject to market risk, including the possible loss of the money you invest. Past performance is no guarantee of future returns. Bond funds are subject to the risk that an issuer will fail to make payments on time, and that bond prices will decline because of rising interest rates or negative perceptions of an issuer's ability to make payments. Investments in stocks issued by non-U.S. companies are subject to risks including country/regional risk, which is the chance that political upheaval, financial troubles, or natural disasters will adversely affect the value of securities issued by companies in foreign countries or regions; and currency risk, which is the chance that the value of a foreign investment, measured in U.S. dollars, will decrease because of unfavorable changes in currency exchange rates. Stocks of companies based in emerging markets are subject to national and regional political and economic risks and to the risk of currency fluctuations. These risks are especially high in emerging markets.

Funds that concentrate on a relatively narrow market sector face the risk of higher share-price volatility. Prices of mid- and small-cap stocks often fluctuate more than those of large-company stocks. U.S. government backing of Treasury or agency securities applies only to the underlying securities and does not prevent share-price fluctuations. Because high-yield bonds are considered speculative, investors should be prepared to assume a substantially greater level of credit risk than with other types of bonds. Diversification does not ensure a profit or protect against a loss in a declining market. Performance data shown represent past performance, which is not a guarantee of future results. Note that hypothetical illustrations are not exact representations of any particular investment, as you cannot invest directly in an index or fund-group average.

1 As part of the planning process, it is important to differentiate between desired versus required spending, which has an impact on this discussion and other portfolio construction decisions (Bennyhoff, Jaconetti 2016).

First things first

An important step in developing a durable spending strategy involves carefully mapping out sources of both income and expenses. When accounting for income, retirees need to examine both the stability and the sustainability of each source. For example, sources such as Social Security and pensions may be more stable and can reasonably be expected to persist throughout retirement, while others, such as income from trusts or part-time employment, may be less stable. In terms of expenses, the most important consideration is to separate discretionary spending (e.g., for travel and leisure) from nondiscretionary spending (e.g., for housing and food).

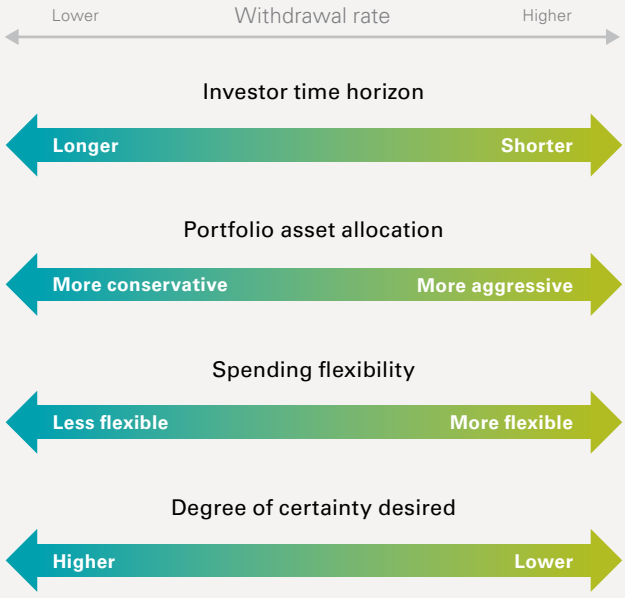
The gap between a retiree's income sources and expenses is the amount he or she needs to supplement from the investment portfolio, generally consisting of both taxable and tax-advantaged accounts. Obviously, if the amount needed from the portfolio is too high, the portfolio will be depleted regardless of the spending rule selected. That said, four primary levers affect how much a retiree can spend from his or her portfolio: the retiree's time horizon or life expectancy; the portfolio's asset allocation; the retiree's annual spending flexibility; and the retiree's degree of certainty that the portfolio won't be depleted before the end of his or her time horizon. **Figure 1** highlights these variables and their effect on portfolio withdrawal rates.

As expected, the longer the retiree's anticipated time horizon, the lower the initial spending rate. Conversely, the shorter the time horizon, the more spending the portfolio is likely to be able to sustain. For example, a 60-year-old investor with a 30-year time horizon can spend less than an 85-year-old investor with a 10-year horizon (as a percentage of the overall portfolio). Similarly, the more conservative the asset allocation, the lower the expected return over the time horizon and, therefore, the lower the spending rate. On the other hand, the more aggressive the asset allocation, the higher the initial spending rate—with one caveat: As the equity percentage approaches 100%, the return volatility will likely increase, and over shorter time horizons may actually increase the chance of prematurely running out of money.

The third lever, spending flexibility, can be defined as the proportion of total expenses that can be attributed to discretionary versus nondiscretionary spending. Simply put, what is the minimum you need "to keep the lights on" after accounting for ongoing income sources such as Social Security or other forms of "guaranteed" income? In general, the greater the proportion of expenses one can eliminate or minimize in any given year, the greater the level of spending flexibility. For example, if leisure and entertainment take up a large portion of each year's expenses, a retiree may be better able to endure a reduction in his or her portfolio-based income. Finally, the fourth lever—the degree of certainty a retiree desires regarding the chance for premature portfolio depletion—can be defined as the "success rate," or the likelihood that the portfolio will last for the investor's entire time horizon or life expectancy. The higher the preferred degree of certainty, the lower the spending rate.

As a general guideline, a prudent initial withdrawal rate for retirees *entering* retirement (that is, with a time horizon of approximately 30 years) is 3.5% to 5.5% of their portfolio balance. Typically, the 3.5% would apply to more conservative portfolios, and the 4.5% to 5.5% to more moderate or aggressive portfolios. Clearly, these rules can be broadly applied, and each investor's circumstances are unique, potentially allowing for more or less spending than this general guideline, as discussed later.

Figure 1. Four levers affecting portfolio withdrawal rates



Source: Vanguard.

Goals-based spending-rule options

A number of spending rules—each emphasizing different goals—have been developed to help retirees deal with changes in their individual circumstances and in the markets. Each rule places different emphasis on the competing priorities that many retirees are trying to balance: maintaining a relatively consistent level of current spending; and increasing—or preserving—the value of a portfolio to support future spending, bequests, and other goals. Two of the most popular rules are the "dollar plus inflation" rule (one example of which is the "4% spending" rule [Bengen, 1994]) and the "percentage of portfolio" rule. While these "rules of thumb" are used by many, they may not be flexible enough to provide a tailored solution for each retiree's unique circumstances.

Vanguard's dynamic spending strategy: a tailored solution for every retiree

To provide a customized solution for each retiree, we suggest a hybrid of these two rules, which we call the "dynamic spending" rule. With this rule, annual spending is allowed to fluctuate based on the performance of the markets while at the same time being sensitive to significant fluctuations in spending from year to year. This is accomplished by overlaying an annual ceiling and floor to each year's spending amount. As discussed in more detail below, the outcomes are significantly affected by the selection of the ceiling and floor percentages; this is where retirees, and their advisors, can tailor the strategy to provide the flexibility each retiree needs to meet his or her unique goals.

Spectrum of spending rules

We prefer to see these spending rules as a spectrum of choices based on the relative importance a retiree places on each goal, as shown in **Figure 2**. Thus, at one end of the spectrum is the dollar plus inflation rule, which is essentially the dynamic spending rule with a 0% ceiling and a 0% floor. At the other end of the spectrum is the percentage of portfolio rule, which is essentially the dynamic spending rule with an unlimited ceiling and unlimited floor. The dynamic spending rule is positioned in the middle of these two rules in terms of potential outcomes. **Figure 3**, on page 6, highlights the trade-offs of each rule more specifically.

For a retiree whose primary goal is spending stability, the "dollar plus inflation" rule (dynamic spending rule with a 0% ceiling and 0% floor) would likely be preferred. With this rule, upon retirement, a retiree selects the initial dollar amount he or she wants to spend from the portfolio and then increases that sum by the amount of inflation each year thereafter. Although this rule allows for more stable spending from year to year than the other spending rules we discuss, it comes with the risk of either premature portfolio depletion or lifetime underconsumption; this is because the strategy is exposed to "sequence of returns risk"—that is, it is indifferent to the capital markets, given that the annual spending amount is automatically increased by inflation regardless of whether the portfolio's market returns are positive or negative. A significant period of underperformance without an adjustment in spending could result in the retiree running out of money before the end of the investing time horizon. Conversely, a significant period of market outperformance could provide a retiree the opportunity to increase spending if desired. Failure to appropriately tailor spending to market performance could thus mean a retiree either misses out on enjoying retirement to the fullest extent possible or, at the other extreme, overspends and depletes the portfolio too soon.

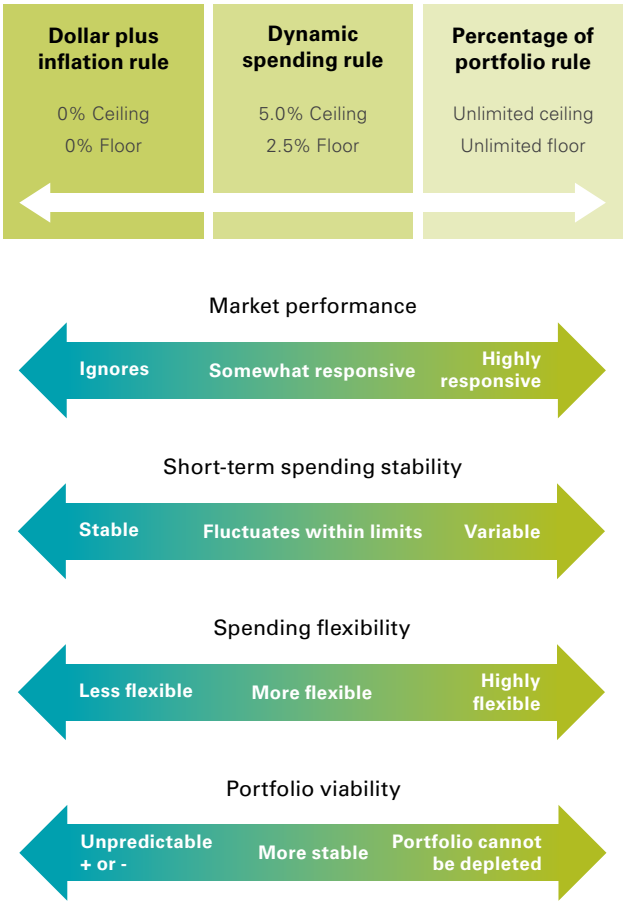
At the other end of the spectrum, for a retiree whose primary goal is not depleting the portfolio, the "percentage of portfolio" rule[2] (dynamic spending rule with an unlimited ceiling and unlimited floor) would likely be preferred. With this rule, a retiree annually spends a fixed percentage of his or her portfolio balance so that the annual spending amount is automatically increased or decreased based on the markets' performance; this rule is thus highly responsive to the capital markets. Although the retiree's portfolio will not be depleted (even though the spending amount may be substantially reduced through time), the annual spending amount can fluctuate significantly, which may not be an option for retirees whose nondiscretionary or fixed expenses (such as housing or food) are a relatively high proportion of their total expenses. However, for those with very high, if not unlimited, levels of flexibility, this option may be preferred.

2 For simplicity, we included percent of portfolio based on annual ending balances. In practice, it is common to apply three-year smoothing to the percent of portfolio strategy, which would generate similar results (directionally) to those presented in this paper; however, the variance would be truncated.

As previously mentioned, our dynamic spending rule is a hybrid of these two rules. With this rule, withdrawals are kept within a maximum percentage increase and minimum percentage decrease in real (inflation-adjusted) spending. The rule allows retirees to benefit from good markets by spending a portion of their gains, while weathering bad markets without a significant reduction in spending. Retirees accomplish this by saving some of their upside returns for use on a rainy day when the portfolio otherwise would have required a more significant reduction in spending[3] (see Appendix I and **Figure A-1** for an in-depth example of this spending rule).

To implement the dynamic spending rule, a retiree calculates each year's spending by taking a stated percentage of the prior year-end's *real* portfolio balance. The retiree then calculates a ceiling and a floor by applying chosen percentages to the previous year's *real* spending amount, such as a 5% ceiling (increase) and a –2.5% floor (decrease). The results are then compared. If the newly calculated spending amount exceeds the ceiling, the spending amount will be limited to the ceiling amount; if the calculated spending falls below the floor, the spending amount is increased to the floor amount. With this rule, depending on the ceiling and floor selected, spending can therefore be made relatively consistent while remaining responsive to the financial markets' performance—thereby helping to sustain the portfolio to meet future goals.

Figure 2. Spectrum of spending rules based on retirees' unique goals

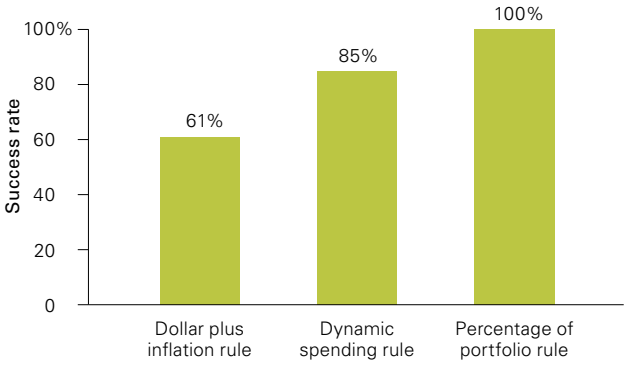


Source: Vanguard.

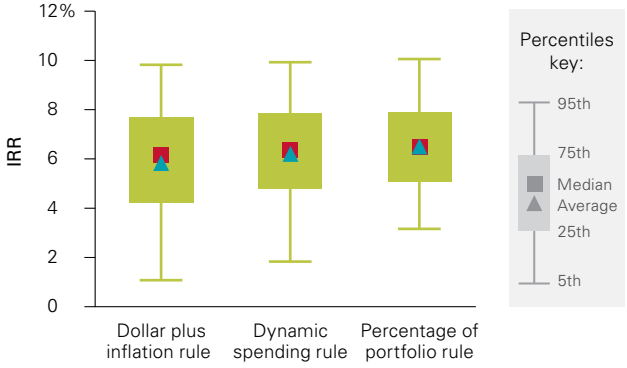
3 Note that this method clearly is a bit more involved than either the dollar plus inflation rule or the percentage of portfolio rule, and may warrant seeking the assistance of a financial advisor.

Figure 3. Comparison of various spending rules

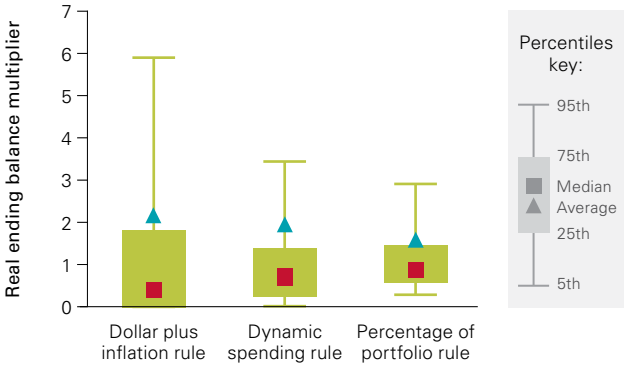
a. Portfolio success rates across spending rules



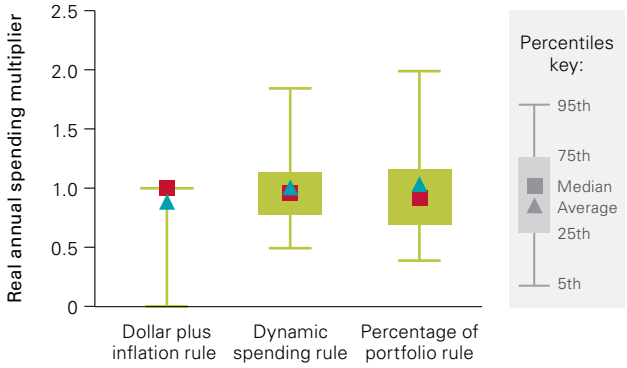
b. Portfolio IRRs across spending rules



c. Real ending balance multipliers across spending rules



d. Real annual spending multipliers across spending rules



Notes: This hypothetical illustration does not represent the investment results of any particular portfolio. All results based on 10,000 VCMM simulations using each specified spending rule. This analysis assumes portfolios with a starting balance at retirement of $1 million, with a moderate allocation of 50% stocks (60% U.S. equity, 40% non-U.S. equity) and 50% bonds (70% U.S. bonds, 30% non-U.S. bonds), a time horizon of 35 years, and an "initial portfolio withdrawal rate" of 5%. See Appendix II for further description of the VCMM. In part 3a, "success rate" is defined as the likelihood that the portfolio will last for the investor's entire time horizon or life expectancy. IRR = internal rate of return.

Source: Vanguard.

As Figure 3 illustrates, although the percentage of portfolio rule may have the highest rate of portfolio success and the highest internal rate of return (Figure 3a and 3b), those come with a cost—namely, higher volatility in annual real spending (see Figure 3d). However, by implementing Vanguard's hybrid approach, a retiree can capture many of the benefits of this approach while still significantly reducing the variation in annual spending that could occur as a result of market movements. We examined the trade-offs mentioned previously in a multiplier framework (that is, a multiple of initial balance or spending amounts over 35 years for each spending rule [Figure 3c and 3d]). For example, the dollar plus inflation rule produced real ending balances ranging from 0 times the initial amount at the 5th percentile to 5.9 times the initial amount at the 95th percentile (see Figure 3c). In practical terms, this would correspond to an investor with a starting portfolio balance of $1 million and a 5% withdrawal rate ending with an account balance somewhere between $0 and $5.9 million 90% of the time. As Figure 3c shows, the two other approaches produced results in a much narrower range.

The most important trade-off when discussing a spending method, however, is spending volatility. Our analysis shows that, on average, the dollar plus inflation rule produces a real annual spending multiplier of 1.0, unless the portfolio depletes, in which case it falls to zero (see Figure 3d). Continuing the example from the previous paragraph, in theory, this simply means real annual spending of $50,000 or $0. In reality, an investor would not let his or her portfolio drop to $0, but potentially would have to make uncomfortable adjustments along the way. The dollar plus inflation rule is thus strikingly insensitive to market conditions. On the other hand, the percentage of portfolio rule produces real annual spending multipliers ranging from 0.4 to 2.0 at the 5th and 95th percentiles and 1.0 on average, while the dynamic spending rule's multiples range from 0.5 to 1.8 at the 5th and 95th percentiles and also average 1.0. It bears repeating that, in this latter example using the dynamic spending approach, one's real spending would never decrease by more than 2.5% or increase by more than 5% in any given year; use of the percentage of portfolio approach, however, could result in real spending decreasing or increasing by a theoretically unlimited amount (although, in reality, bounded by the portfolio's performance and, hence, that of the financial markets). Ultimately, an investor with endless flexibility would likely choose the percentage of portfolio approach; however, for most retirees, this is simply not practical. In that case, dynamic spending can provide many of the benefits of the percentage of portfolio rule without giving up the relatively consistent level of real annual spending.

Tailoring the ceiling and floor percentages to meet each retiree's unique goals

An important point in this discussion is that the outcomes are significantly affected by the selection of the ceiling and floor percentages; this is where retirees, and their advisors, can tailor the ceiling and floor percentages along the spectrum (from a 0% ceiling and 0% floor to an unlimited ceiling and an unlimited floor) to provide the flexibility each retiree needs to meet his or her unique goals. For illustrative purposes, we used the 5% ceiling and the 2.5% floor as an initial starting point because it provided a portfolio survival rate of 85% over a 35-year time horizon; however, we tested hundreds of ceiling and floor scenarios to determine the impact on portfolios' success rates.

Figure 4 highlights two scenarios. The first scenario (Figure 4a) held the ceiling constant at 0%—meaning any excess returns were reinvested in the portfolio (as opposed to increasing the spending amount)—and

Figure 4. Dynamic spending floor and ceiling sensitivity

a. Effect of an increase in floor; ceiling constant at 0%

b. Effect of an increase in ceiling; floor constant at 0%

Notes: This hypothetical illustration does not represent the investment results of any particular portfolio. All results based on 10,000 VCMM simulations using the dynamic spending rule. Analysis assumes a moderate portfolio allocation of 50% stocks (60% U.S. equity, 40% non-U.S. equity) and 50% bonds (70% U.S. bonds, 30% non-U.S. bonds), a time horizon of 35 years, and an "initial portfolio withdrawal rate" of 5%. See Appendix II for further description of the VCMM.

Source: Vanguard.

tested the impact on portfolio success rates of different floor percentages in –0.5% increments between 0.0% and –12.0% (0.0%, –0.5%, –1.0%, –1.5% . . . –11.5%, –12.0%). The second scenario, Figure 4b, held the floor constant at 0%—meaning spending could not decrease—and tested different ceiling percentages between 0.0% and 12.0% in 0.5% increments.

Our analysis found that the more flexibility retirees have in their floor—meaning, the more they are able to reduce spending when the markets are performing poorly—the higher their success rate—meaning, the lower the chance that they will deplete their portfolio or be required to significantly reduce their spending before the end of their planning horizon. In fact, retirees' ability to accept changes in their floor helps their portfolio more than increasing their ceiling hurts it. For example, a ceiling/floor combination of 0% and –1% is about 12 percentage points more successful, as measured by success rate, than a ceiling/floor combination of 0% and 0% (i.e., dollars plus inflation). On the other hand, a ceiling/floor combination of 1% and 0% is about 4 percentage points less successful than a ceiling/floor combination of 0% and 0%. This is shown in Figure 4a, where the absolute slope of the line when keeping the ceiling constant is much steeper than that of the line when keeping the floor constant (Figure 4b).

This concept has implications for retiree withdrawal rates, as shown in **Figure 5**. The figure charts portfolio withdrawal rates for both a 0%/0% ceiling/floor rule and a 5.0%/–2.5% ceiling/floor rule using different time horizons and asset allocations[4] assuming an 85% success rate. As the figure shows, retirees who can incorporate flexibility into their annual spending needs are able to set higher initial portfolio withdrawal rates, which can help them be in a better position to meet their near-term financial goals.

For example, a moderate investor who wants stable inflation-adjusted spending (that is, a 0% ceiling and a 0% floor) with a 35-year time horizon can set an initial portfolio withdrawal rate of 3.9%, assuming an 85% chance that he or she will not run out of money. If that same retiree can cut spending back by 2.5% in years when the market is performing poorly, and if he or she can limit increases in annual spending to 5.0% if the markets are performing well, the retiree could set the initial portfolio withdrawal rate at 5.0%, which is 1.1 percentage points higher than the previous example.

In short, when choosing a floor and ceiling combination, there are trade-offs between maintaining the desired level of current spending (spending percentage) and preserving the portfolio to support future spending/goals (success rate). In selecting a floor and ceiling, retirees and their advisors must have a solid understanding of their income and expenses; the more they can tolerate some short-term fluctuations in spending, the more likely they are to achieve their longer-term goals (see the *First things first*

Figure 5. Portfolio initial withdrawal rates (%) for various asset allocations and time horizons

	0% ceiling/0% floor					5.0% ceiling/2.5% floor				
	Time horizon (years)					Time horizon (years)				
Asset allocation	10.0	20.0	30.0	35.0	40.0	10.0	20.0	30.0	35.0	40.0
Conservative	10.1	5.4	4.0	3.6	3.3	11.2	6.7	5.3	5.0	4.7
Moderate	10.0	5.6	4.3	3.9	3.7	11.1	6.7	5.3	5.0	4.7
Aggressive	9.7	5.5	4.3	3.9	3.7	10.7	6.3	5.0	4.7	4.4

Notes: Rates are gross of taxes. Any tax is assumed to be paid from the withdrawn amount. Portfolio allocations are: conservative—20% stocks/80% bonds; moderate—50% stocks/50% bonds; aggressive—80% stocks/20% bonds. Withdrawal rates were determined using data from the VCMM. See Appendix II for further description of the VCMM.

Source: Vanguard.

4 We assume a conservative asset allocation corresponds to a 20% stock/80% bond portfolio; a moderate asset allocation corresponds to a 50% stock/50% bond portfolio; and an aggressive asset allocation corresponds to an 80% stock/20% bond portfolio.

box on page 3 for more information). Finally, once a spending strategy and amount have been selected, possible implementation strategies include:

1. Setting up an automatic withdrawal plan from current holdings.
2. Purchasing an investment that is specifically designed to provide regular distributions.
3. Working with an advisor to develop a spending strategy tailored to meet your unique goals.

II. Construct a broadly diversified retirement portfolio

The second prong of our retirement-income strategy is a well-constructed portfolio. Four core investment principles underlie Vanguard's investment philosophy and form the basis on which we construct investment portfolios (Vanguard, 2014). These principles are: First, create clear, appropriate investment goals. Second, develop a suitable asset allocation using broadly diversified funds. Third, minimize investment costs. And fourth, maintain perspective and long-term discipline. The principles apply both to investors accumulating assets and to those in the drawdown phase of their investing life-cycle.

When it comes to building an investment portfolio for retirees, there are generally two approaches: the income-focused approach and the total-return approach. With an income-focused approach, the goal is to construct a portfolio with a natural yield (representing dividends plus interest) consistent with retirees' spending objectives; thus, with this approach, their asset allocation and diversification decisions are driven primarily by the natural yield of the investments they select, rather than by the retirees' time horizon, risk tolerance, and financial goals. The diversification, costs, and asset allocation of this portfolio may vary over time, depending on market conditions. With a total-return approach, on the other hand, the goal is to construct a portfolio based on a holistic view of the portfolio, matching the asset allocation to the retiree's risk–return profile, using diversified investments, minimizing costs, and remaining disciplined with the strategy's implementation over time.

Many investors spend much of their careers trying to achieve a "savings target," that is, an approximate target portfolio balance that they believe will support their goals in retirement. As a result, once retired, investors are often psychologically averse to spending from the portfolio in an amount that would make their balance drop below the target—in other words, causing them to spend from their principal. Understandably, the result is that many retirees gravitate toward an income-focused approach without realizing the possible negative implications. Ironically, as we discuss next, it's possible that the income-focused approach may put their portfolio at greater risk than a total-return approach.

We want to first point out that the income-focused and total-return approaches are identical, to a point—that is, with each method, retirees spend some or all of the income or natural yield generated by their portfolios. But when a retiree needs to spend in excess of the portfolio's yield, these two approaches diverge. This additional spending can be achieved either by reallocating the portfolio toward higher-income-producing assets or by spending from the other piece of the investor's total return, that is, from the portfolio's capital appreciation.

Advantages of a total-return approach

By focusing on the total return earned by the portfolio rather than its individual components, a total-return approach offers several advantages over an income-focused method, including:

- Maintaining a portfolio's diversification.
- Allowing more control over the size and timing of portfolio withdrawals.
- Allowing the portfolio to be more tax-efficient.
- Increasing the portfolio's longevity.

We consider each of these benefits next in more detail.

Maintaining portfolio diversification. Diversification can be a powerful strategy for managing volatility, allowing investors to establish portfolios with risk profiles that are consistent with their goals and preferences. Although every portfolio is subject to market risk, idiosyncratic risks are largely avoidable. Since a portfolio's yield is the primary driver of investment selection with the income-focused approach, the portfolio is likely to overweight higher-yielding stock or bond sectors, resulting in a less diversified portfolio than one constructed following a total-return approach.

Allowing more control over the size and timing of portfolio withdrawals. With an income-focused approach, a retiree's annual spending is limited to the portfolio's natural yield, so the retiree has less control over his or her annual spending amounts. On the other hand, investors who follow a total-return approach have more control over the size and timing of portfolio withdrawals (versus the income-focused approach) because these investors are willing to spend from capital appreciation in the years when their portfolio's yield falls below their required spending amount. Likewise, any excess income generated by the portfolio can be reinvested.

As a result, total-return investing also affords the investors a greater ability to implement flexible spending rules, by adjusting spending in proportion to the growth of the overall portfolio, rather than by focusing on the income that it is yielding. As previously discussed, the more retirees can tolerate some short-term fluctuations in their spending, the more likely they are to achieve their longer-term investing goals.

Allowing the portfolio to be more tax-efficient. Following a total-return approach allows the investment-purchase decisions (often referred to as asset location[5]) to be driven by tax efficiency, rather than by access to the natural yield of assets held in taxable accounts. As discussed in the following section, retirees whose primary goal is maximizing lifetime spending should spend from their taxable accounts before their tax-advantaged accounts. For income-focused investors, this requires purchasing higher-yielding equities and fixed income securities in their taxable accounts, and these investors are thus subject to:

1. Paying a federal marginal income tax rate on taxable bond income. This rate could be as high as 39.6% or 43.4%, accounting for the Medicare surtax. One could, of course, purchase municipal bonds, but the result would be to forgo the taxable–municipal spread.
2. Paying a long-term capital gains tax rate as high as 15% or 20% (depending on income) on long-term capital gains/distributions and, on short-term gains, the retiree's marginal income tax rate. (To the extent the portfolio includes actively managed equity funds, capital gains distributions are more likely.)
3. Paying a tax rate on qualified dividend income from equities also as high as 15% or 20%, depending on income.

By contrast, purchases of tax-efficient broad-market equity funds or exchange-traded funds (ETFs) in taxable accounts would still be subject to points 2 and 3; however, the amount of income or capital gains distributions would likely be significantly lower.[6]
The value of proper asset location can be significant indeed, in terms of both portfolio sustainability and real annual spending, as shown in **Figure 6**. Our analysis found that a portfolio whose assets were properly located had a 30 percentage-point-higher likelihood of outlasting one that did not (Figure 6a) and would likely afford higher levels of real annual spending (Figure 6b). For example, a hypothetical investor in our analysis would have seen a multiplier of real annual spending at the median of 0.94, maximizing the benefits of asset location, versus 0.82 for one who did not.

It is important to note that tax-advantaged savings are likely to result in higher success rates than taxable savings.

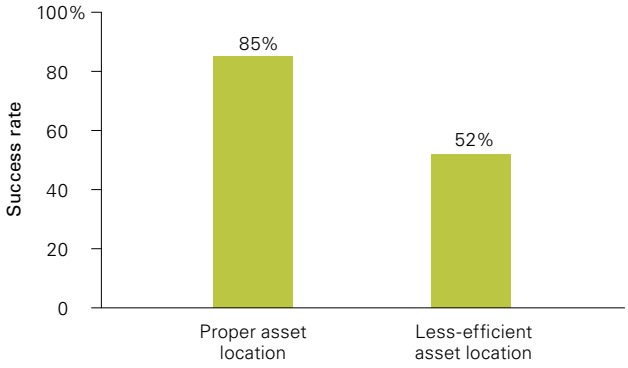
Increasing the portfolio's longevity. As a direct result of minimizing the impact of taxes and maintaining more control over how much is withdrawn from the portfolio and when it is withdrawn, retirees can potentially increase the length of time that their portfolios are able to meet their spending needs while also decreasing their risk of running out of money.

5 *Asset location* is the allocation of assets between taxable and tax-advantaged accounts. From a tax perspective, optimal portfolio construction minimizes the impact of taxes by holding tax-efficient broad-market equity investments in taxable accounts and by holding taxable bonds within tax-advantaged accounts. This arrangement takes maximum advantage of the yield spread between taxable and municipal bonds, which can generate a higher and more certain return premium. And those incremental differences have a powerful compounding effect over the long run.

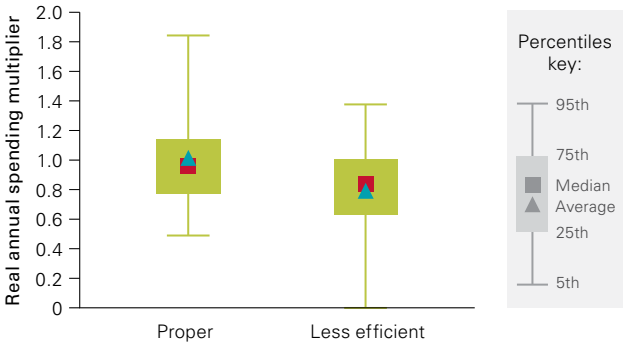
6 In addition, estate-planning benefits may result from placing broad-market equity index funds or ETFs in taxable accounts. Since broad-market equity investments usually provide more deferred capital appreciation over the long term than do bonds, the taxable assets have the added advantage of a potentially larger step-up in cost basis for heirs.

Figure 6. Effects of proper asset location

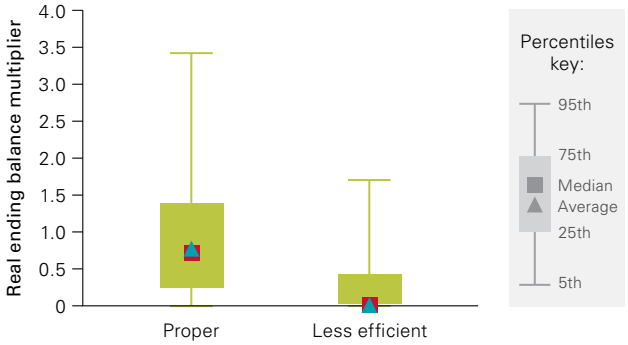
a. Comparison of portfolio success rates



b. Comparison of real annual spending multipliers



c. Comparison of real ending balance multipliers



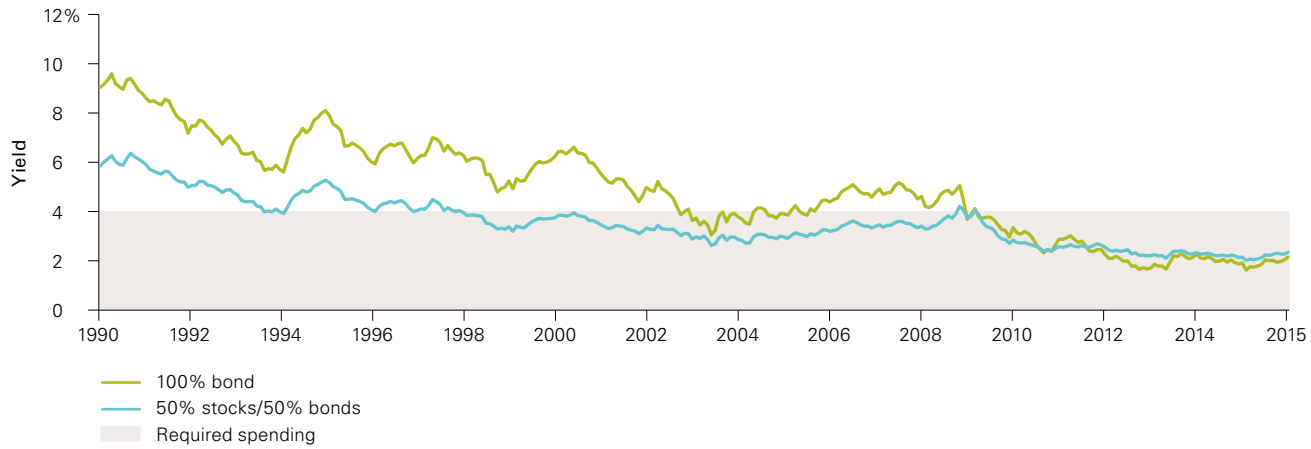
Notes: This figure's analysis is based on findings from Vanguard's recently revised research paper titled *Putting a Value on Your Value: Quantifying Vanguard Advisor's Alpha* (Kinniry et al., 2016), which determines that proper asset location is worth up to 75 basis points per year in net portfolio returns (1 bps = 1/100 of 1%). The charts' data are the result of 10,000 VCMM simulations demonstrating the hypothetical value to a portfolio (spent in retirement) from gaining the 75 bps advantage versus one that did not. This analysis assumed a moderate portfolio allocation of 50% stocks (60% U.S. equity/40% non-U.S. equity) and 50% bonds (70% U.S. bonds/30% non-U.S. bonds), a time horizon of 30 years, and an "initial portfolio withdrawal rate" of 5%, following the dynamic spending rule with an equal split between taxable and tax-deferred accounts. See Appendix II for further description of the VCMM.

Source: Vanguard.

Appeal and challenges of income-focused investing

Traditionally, many retirees were able to follow an income-focused approach to meet their retirement-income needs because their portfolios' natural yield exceeded a prudent portfolio withdrawal rate. Not only did this income source meet the spending needs of many retirees, but many retirees also remained accumulators. The challenge for an income-focused investor today is that yields on traditional bond and balanced portfolios have fallen over the past 25 years, as shown in **Figure 7**, to the point that yields of both a globally diversified 50% equity/50% bond portfolio *and* even a 100% bond portfolio hovered around 2% as of May 1, 2016. For an income-focused investor, using the portfolio's natural yield as a guide for how much to spend would lead to a shortfall of about 50% relative to a hypothetical 4% spending goal. This spending gap can be resolved either by overweighting income-producing assets, which often changes a portfolio's fundamental risk profile, or by embracing a total-return approach, as described earlier. This section focuses on three of the most common methods that investors use to try to increase their portfolios' income return or natural yield (**Figure 8** summarizes these methods and the likely impact on a portfolio).

Figure 7. Yields on traditional investments have fallen over the last 25 years



Notes: Past performance is not a guarantee of future results. Bonds represented by 70% Barclays U.S. Aggregate Bond Index and 30% Barclays Global Aggregate ex-USD Index. Equities represented by 60% Standard & Poor's 500 Index and 40% MSCI All World ex-USA Index. Data through December 31, 2015.

Sources: Vanguard calculations, based on data from Thomson Reuters Datastream.

Figure 8. Summary of portfolio impacts as a result of income-focused strategies

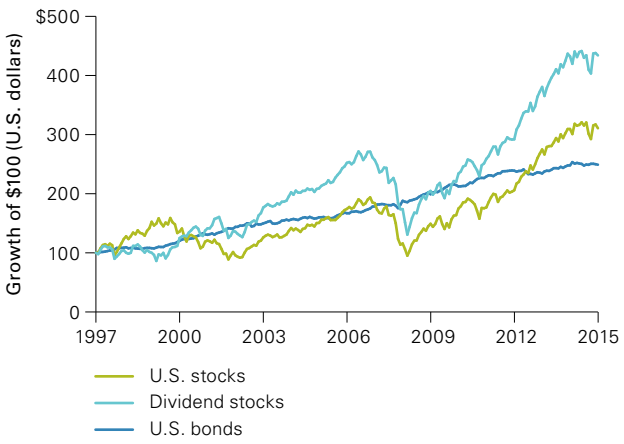
Income-only strategy	Portfolio impact (versus a market-cap-weighted portfolio at sub-asset-class level)
1. Increasing the portfolio's exposure to dividend-centric equity.	Decreases diversification of equity portfolio by overweighting certain sectors, and increases portfolio's overall volatility and risk of loss if the strategy reduces the bond allocation.
2. Overweighting high-yield bonds and underweighting U.S. Treasury bonds.	Increases portfolio's credit risk and raises portfolio's overall volatility.
3. Overweighting longer-term bonds (extending duration).	Increases portfolio's exposure to changes in interest rates.

Note: The term "sub-asset-class level" here refers to the breakdown within stocks and bonds.

Source: Vanguard.

Risk of reaching for higher yield: Increasing portfolio's exposure to dividend-centric equity. An often-advocated equity approach to increase income is to shift some or all of a fixed income allocation into higher-yielding dividend-paying stocks. But stocks are not bonds—that is, they have higher volatility and the potential for greater losses. Moreover, as seen in **Figure 9**, dividend stocks are highly correlated with the broad equity market and tend to perform in tandem with it, whereas bonds show little or no correlation to either. Figure 9 also shows the cumulative performance for dividend-paying stocks versus that of broadly diversified stocks and fixed income. For those investors who view fixed income as providing not just yield but also diversification, dividend-paying stocks fall well short as a substitute.

Figure 9. Dividend-paying stocks are not bonds: Growth of $100, December 31, 1997–December 31, 2015

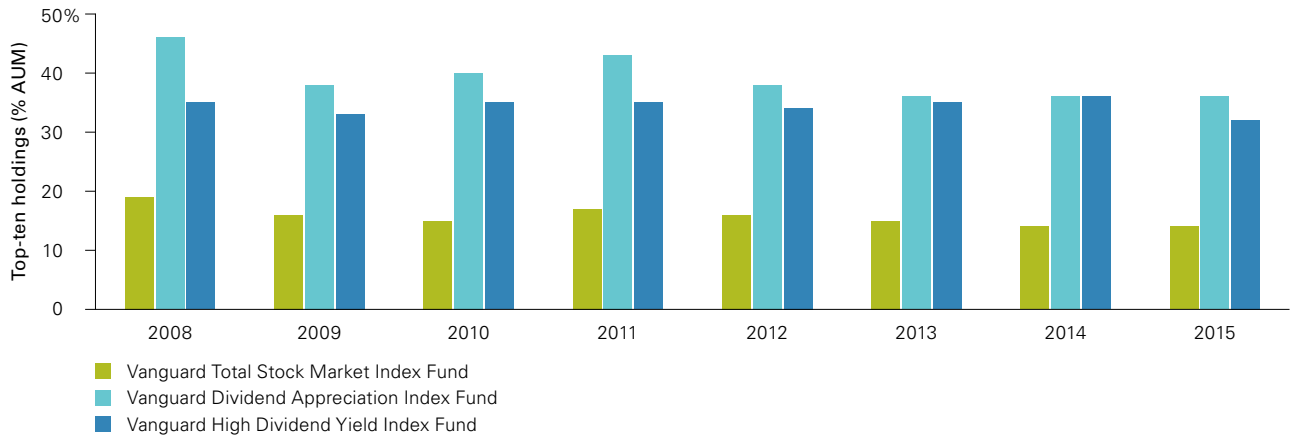


Notes: U.S. stocks represented by Dow Jones Wilshire 5000 Index from January 1, 1998, through April 22, 2005; MSCI US Broad Market Index through June 2, 2013; CRSP US Total Market Index thereafter. Dividend stocks represented by S&P 500 Dividend Aristocrats Index through December 31, 2003; FTSE High Dividend Yield Index thereafter. U.S. bonds represented by Barclays U.S. Aggregate Bond Index. Data through December 31, 2015.

Sources: Vanguard calculations, based on data from Thomson Reuters Datastream and Barclays.

A second approach investors may take is to shift from broad-market equity to dividend- or income-focused equity. However, these investors may thus inadvertently change the risk profile of their portfolio, because dividend-focused equities tend to display a significant bias toward "value stocks."[7] Although some may consider value stocks to be a less risky subset of the broader equity market,[8] the risks can nevertheless be substantial, owing to the fact that portfolios focused on dividend-paying stocks tend to be overly concentrated in certain individual stocks and sectors. **Figure 10**, for example, shows the percentage of assets under management that were concentrated in the top-ten holdings in a portfolio of three dividend-paying Vanguard funds for the years 2008–2015. The more broadly diversified Vanguard Total Stock Market Index Fund has a much lower percentage of assets under management in its top-ten holdings than do the dividend-centric Vanguard Dividend Appreciation Index Fund or Vanguard High Dividend Yield Index Fund.

Figure 10. Percentage of assets under management concentrated in top-ten holdings of three dividend-paying Vanguard funds: 2008–2015



Notes: This illustration does not represent the holdings of any particular portfolio. AUM = assets under management.

Source: Vanguard.

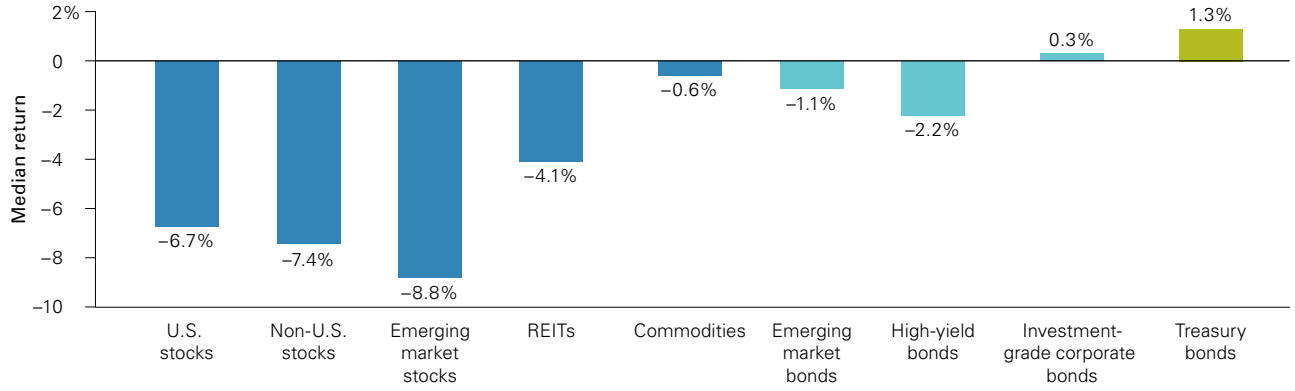
7 See the Vanguard research paper titled *An Evaluation of Smart Beta and Other Rules-Based Active Strategies* (Philips et al., 2015) for further information.

8 "Less risky" should not be taken to mean "better." Going forward, we believe value stocks should have a risk-adjusted return similar to that of the broad equity market, unless there are risks that are not recognized in traditional volatility metrics.

Risk of reaching for higher yield: Overweighting of higher-yielding bonds. Another common strategy investors use for increasing yield is to increase the portfolio's allocation to higher-yielding bonds[9] that are exposed to marginal or even significant credit risk. The risk here is that credit risk tends to be correlated with equity risk, as is demonstrated during periods of equity market distress (see **Figure 11**). This risk tends to be heightened when investors move into riskier bonds at the expense of U.S. Treasury or investment-grade corporate bonds, which are a proven diversifier during periods in which diversification is needed most.

In addition, our research has shown that replacing existing fixed income holdings with high-yield bonds has historically increased the volatility of a balanced portfolio by an average of 78 basis points annually (Philips, 2012). Investors who use this strategy are sacrificing diversification benefits in hopes of receiving higher current income from their portfolio.

Figure 11. Median return of various asset classes during worst decile of monthly equity returns: 1988–2015



Notes: U.S. stocks represented by Dow Jones Wilshire 5000 Index from January 1, 1988, through April 22, 2005; MSCI US Broad Market Index through June 2, 2013; CRSP US Total Market Index thereafter. Non-U.S. stocks represented by MSCI EAFE Index. Emerging market stocks represented by FTSE Emerging Index. REITs represented by FTSE NAREIT Equity REIT Index. Commodities represented by S&P GSCI Commodity Index. Emerging market bonds represented by Barclays Emerging Markets Tradable USD Sovereign Bond Index. High-yield bonds represented by Barclays U.S. Corporate High Yield Bond Index. Corporate bonds represented by Barclays U.S. Corporate Investment Grade Index. U.S. Treasury bonds represented by Barclays U.S. Treasury Bond Index. Data as of December 31, 2015.

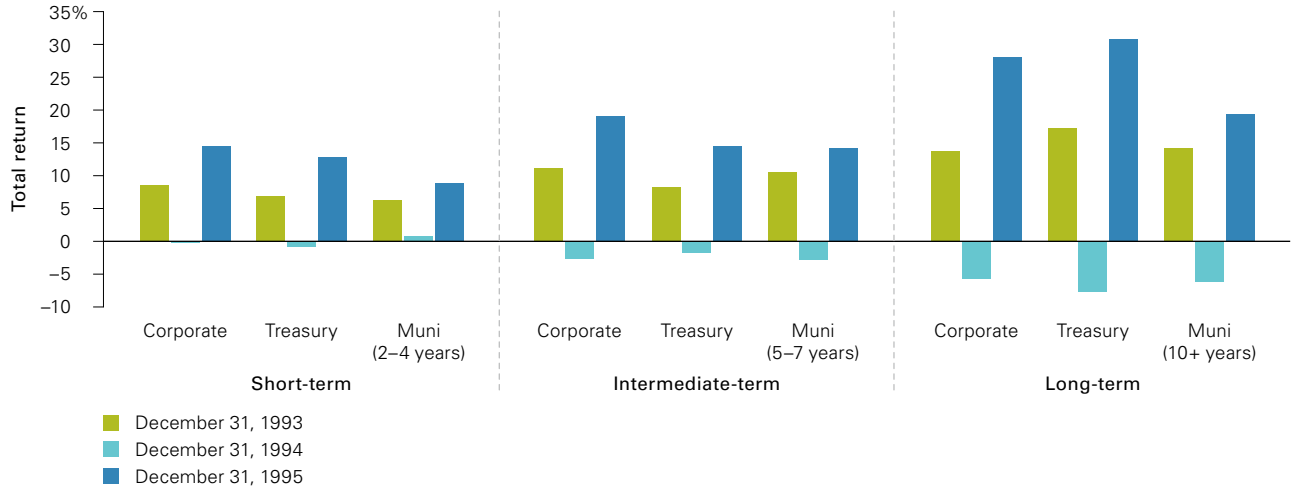
Sources: Vanguard calculations, based on data from S&P, Citigroup, Barclays, Dow Jones, MSCI, CRSP, and FTSE.

9 The term *high-yield bonds* refers to fixed income securities rated as below-investment-grade by the primary ratings agencies (Ba1 or lower by Moody's Investors Service; BB+ or lower by Standard & Poor's).

Risk of reaching for higher yield: Overweighting longer-term bonds (extending the duration). Extending a bond portfolio's duration likely increases the portfolio's current yield, but it also increases the portfolio's sensitivity to interest rate changes. Generally speaking, the longer the bond portfolio's duration, the greater the decline in prices when interest rates rise (and the greater the price gain when interest rates fall). For example, **Figure 12** illustrates the impact on total returns of increased durations in the early to mid-1990s. Notably, in 1994 the Federal Reserve surprised the bond markets with an increase in interest rates. As a result, long-term bonds returned an average of –6.5% in 1994, more than the losses incurred by short- or intermediate-term bonds that year. This example also supports the case for diversification both across and within asset classes. A bond portfolio diversified across the yield curve—meaning, it holds bonds across all maturities—can offset the negative effects as shown in 1994 (see Figure 12) while also allowing participation in higher yields as rates rise.

In summary, retirees who pursue the preceding income strategies may believe they will be rewarded with a more certain level of income and therefore less risk. Unfortunately, a number of unintended consequences can result from moving away from a broadly diversified portfolio for the sole purpose of increasing the portfolio's cash flow. Concentrating on higher-yielding sectors results in a less diversified portfolio, potentially higher levels of risk, decreased tax efficiency (for taxable investors), and an increased chance of falling short of long-term financial goals. A total-return approach, on the other hand, potentially offers a number of portfolio benefits, including maintaining diversification, enhancing the portfolio's tax efficiency, and increasing the portfolio's longevity.

Figure 12. Extending duration can introduce significant volatility: Selected bonds, 1993–1995



Notes: We selected the 1993–1995 period because it illustrates the impact of an unanticipated increase in interest rates. Treasury = U.S. Treasury bonds; Muni = municipal bonds.
Sources: Vanguard, based on data from Barclays.

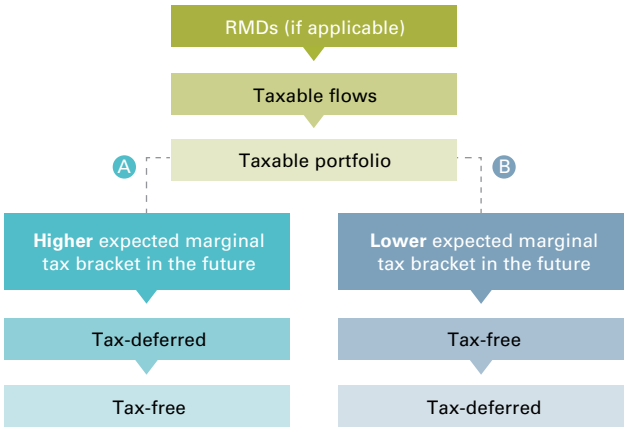
III. Implement tax-efficient withdrawal strategies

The third prong of our portfolio-based retirement-income strategy is implementing a tax-efficient withdrawal plan. Once a retiree establishes a comfortable spending target, the obvious question becomes "How?" In other words, which accounts should he or she withdraw that amount from? Many retirees today hold various account types—taxable, tax-deferred, and tax-free (Roth IRAs). Implementing an informed withdrawal-order strategy can minimize the total taxes paid over the course of one's retirement, thereby potentially increasing both the amount of spending the portfolio can support and the portfolio's longevity.

Framework for retirees whose primary goal is to maximize lifetime spending

The primary determinant of whether a retiree should spend from taxable assets or tax-advantaged assets is taxes. Absent taxes, any account withdrawal order would yield identical results (assuming accounts earned the same rates of return). Retirees with a goal of maximizing lifetime spending can minimize the impact of taxes on their portfolios by spending in the following order: required minimum distributions (RMDs), if applicable, followed by cash flows from assets held in taxable accounts, taxable assets, and finally tax-advantaged assets (see **Figure 13**).

Figure 13. Withdrawal order for retirees whose goal is to maximize lifetime spending



Source: Vanguard.

At the account-type level:

- RMDs are the first assets to be used for spending, because federal law requires that they be taken by retired investors more than 70½ years old who own assets in tax-deferred accounts. For investors not subject to RMDs or who need monies in excess of their RMDs, the next source of spending should be cash flows from assets held in taxable accounts, including interest, dividends, and capital gains distributions, followed by assets held in taxable accounts (this is explained in more detail below).
- Investors should deplete their taxable assets before spending from their tax-deferred accounts, because swapping the order would accelerate the payment of income taxes. Taxes on tax-deferred accounts will likely be higher than taxes on withdrawals from taxable accounts, for two reasons. First, the investor will pay ordinary income taxes on the entire withdrawal (assuming the contributions were made with pre-tax dollars), rather than just paying capital gains taxes on the capital appreciation. Second, ordinary income tax rates are currently higher than the respective capital gains tax rates, so the investor would have to pay a higher tax rate on a larger withdrawal amount if he or she spends from the tax-deferred accounts first. Over time, the acceleration of income taxes and the resulting loss of tax-deferred growth can negatively affect the portfolio, resulting in lower terminal wealth values and success rates.
- Investors should likewise consider spending from their taxable accounts before spending from their tax-free accounts, to maximize the long-term growth of their overall portfolio. Reducing the amount of assets that have tax-free growth potential can result in lower terminal wealth values and success rates.

Within the accounts:

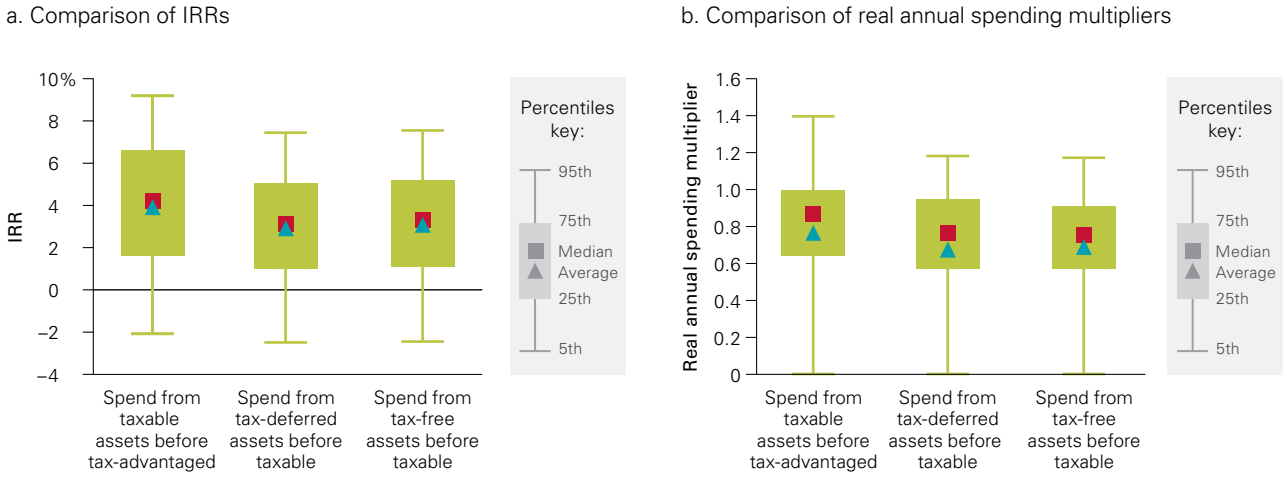
- Once the order of withdrawals between taxable and tax-advantaged accounts has been determined, the next step is to specifically identify which asset or assets to sell to meet spending needs. Within the taxable portfolio, a retiree should first spend his or her portfolio cash flows. This is because these monies are taxed regardless of whether they are spent or reinvested in the portfolio. Reinvesting these monies and then selling the assets later to meet spending needs could result in capital gains, which could be taxed at ordinary income tax rates for short-term capital gains or capital gains tax rates for long-term capital gains. Next the retiree should consider selling the asset or assets that would produce the lowest taxable gain or would even realize a loss. This should continue until the spending need has been met or the taxable portfolio has been exhausted.
- Once a retiree's taxable accounts have been depleted, he or she must decide whether to spend first from tax-deferred or tax-free (Roth) accounts. The primary driver of this decision is the investor's expectations for future tax rates relative to his or her current tax rate. If a retiree anticipates that his or her future tax rate will be higher than the current tax rate, then spending from tax-deferred accounts should take priority over spending from tax-free accounts. This allows the investor to lock in taxes on the tax-deferred withdrawals today at the lower rate. Conversely, if a retiree anticipates his or her future tax rate will be lower than the current tax rate, spending from the tax-free assets should take priority over spending from the tax-deferred assets. Taking distributions from the tax-deferred account at the future lower tax rate will result in lower taxes over the entire investment horizon.

Once the retiree's spending need has been met, the final step in the process should be a review of the retiree's asset allocation. If the process of selling assets to generate cash flow from the portfolio results in an asset allocation that deviates from the target asset allocation by more than 5 percent, the retiree should consider rebalancing within tax-advantaged accounts within the constraints of the wash-sale rules.[10]

Our research has shown that spending from the portfolio in this manner can add up to 110 basis points of average annualized value without any additional risk (Kinniry et al., 2016). To calculate this value, we compared the internal rate of return (IRR) of this spending order with that of two alternative spending orders in which tax-advantaged assets were tapped before taxable assets. The two withdrawal orders are as follows: spending from tax-deferred assets before taxable assets and spending from tax-free assets before taxable assets. The IRR of Vanguard's recommended spending order was 4.0% on average, as shown in **Figure 14a**, whereas accelerating spending from tax-deferred or tax-free accounts resulted in IRRs of 3.0% and 2.9%, on average, respectively. Following this, the investor could expect to be able to sustain higher levels of real annual spending as well. As shown in **Figure 14b**, our hypothetical investor experienced a median real annual spending multiplier of 0.87, versus 0.77 and 0.76, respectively, for the alternative withdrawal orders and, at the 95th percentile, was able to sustain spending at a level of 1.40 times initial spending versus 1.18 and 1.17, respectively.

10 A wash sale occurs when an investor sells a security at a loss and purchases a substantially identical security within 30 days before or after the sale. Therefore, the wash-sale period for any sale at a loss lasts for 61 days (day of sale plus 30 days before and after). To deduct the loss for tax purposes, an investor would need to avoid purchasing a substantially identical security during the wash-sale period. Consult a tax advisor or see IRS Code 1091 for more information.

Figure 14. Withdrawal-order comparison



Notes: All results based on 10,000 VCMM simulations using each spending rule cited in the figure. Analysis assumes a moderate portfolio allocation of 50% stocks (60% U.S. equity/40% non-U.S. equity) and 50% bonds (70% U.S. bonds/30% non-U.S. bonds), a time horizon of 35 years, and an "initial portfolio withdrawal rate" of 5%. See Appendix II for further description of the VCMM.

Source: Vanguard.

Framework for retirees with legacy planning goals

For retirees with both a strong desire to leave assets for their heirs and the financial resources to do so, implementation plans should consider not only the retirees' own current and future tax situations but also those of their beneficiaries. In situations where the beneficiaries are, or will be, in a similar or higher marginal income tax bracket, then accelerating spending from tax-deferred balances is usually preferred.

A general estate-planning best practice is to transfer assets that do not have an embedded income tax liability. Beneficiaries of tax-deferred retirement accounts such as 401(k) plans and IRAs are required to pay federal income taxes when they make withdrawals. On the other hand, Roth withdrawals are free from federal income taxes. Taxable assets that pass to heirs will benefit from a stepped-up cost basis. This means that when inherited, the cost basis of the taxable assets will reset based on the assets' fair market value on the date of death of the account owner. Therefore, retirees who prioritize legacy planning should consider making withdrawals from tax-deferred accounts *before* spending taxable assets and Roth assets, to allow for the potential for a greater transfer of assets.

Furthermore, tax-deferred retirement accounts may also potentially be subject to "double taxation" upon transfer. First, the account is part of the taxable estate and may be subject to estate tax.[11] Second, as stated previously, the beneficiaries must pay income tax on any withdrawals.[12] In addition to the points already noted, spending from tax-deferred accounts and paying income tax from those accounts has the benefit of removing dollars (and any growth of the dollars) from the estate. Although the estate tax savings may not be large, this method of estate reduction can be applied without using either the federal gift/estate tax exemption or the annual exclusion amount.

11 In 2016, the uniform federal gift/estate tax exemption is $5,450,000 per person; the annual gift exclusion per gift recipient is $14,000 for 2016.

12 Beneficiaries are generally able to take an income-tax deduction for the prorated amount of an estate tax on the traditional IRA in proportion to the withdrawal amount.

Annual tax-planning opportunities may afford flexibility

Just as retirees should monitor spending amounts annually, it is equally important for retirees to consider their tax situation yearly, to take advantage of tax-planning opportunities. The following are several implementation strategies that may suggest an alternate implementation plan.

- ***Charitable giving.*** Some retirees have earmarked charitable organizations to receive assets upon their death. From a tax standpoint, attractive accounts to pass to charities are tax-deferred assets.[13] The reason is that charities do not have to pay income taxes on tax-deferred retirement assets they receive, so they can receive the full benefit of the gift. Alternatively, retirees who have highly appreciated securities in their taxable accounts may consider lifetime gifting to charities, since the appreciation will not be subject to income taxation.
- ***Low taxable income.*** Much like spending from a portfolio, it is not uncommon for a retiree's tax situation to change. Examples include years when there may be a high amount of tax deductions (for instance, a year with high deductions for medical expenses), which may result in a lower marginal tax bracket. In these years, accelerating withdrawals from tax-deferred accounts and therefore taxable income may be a viable strategy to help manage the overall tax picture. This approach, which maximizes the use of low marginal tax brackets, means that despite incurring taxable income, retirees will be doing so with the full dollar threshold of income "maxed out" at the lower tax rate.
- ***Managing RMDs before age 70½.*** Retirees with a large part of their portfolio in tax-deferred accounts may face a very different, higher tax situation once they start taking RMDs at age 70½. At that point, the tax-planning options are very limited, since the RMDs must be satisfied. In addition, Vanguard research suggests that up to 20% of IRA owners may not need their RMD for spending (Weber and Bruno, 2014). The time to plan for RMDs is *before* age 70, to take advantage of any potential tax-planning strategies. For example, some retirees' income is relatively lower for a time after they retire, but before they start receiving Social Security benefits and taking RMDs. In that case, spending from tax-deferred IRAs *before* taxable accounts may be prudent. The rationale is that, although the retiree is accelerating income taxes, he or she is nevertheless paying taxes at a relatively lower rate. Not only are the withdrawals taxed at a relatively lower rate, but this also reduces the tax-deferred account balances, which in turn reduces future RMDs.
- ***Roth conversions.*** As just discussed, although the overall intent is to accelerate income taxes in years in which a retiree may be in a low marginal tax rate (instead of accelerating distributions from tax-deferred accounts and transferring the proceeds to taxable accounts), Roth conversions help build tax diversification because the proceeds are instead invested in a Roth IRA. Tax diversification, simply put, means holding different account types—taxable, tax-deferred, Roth—to provide the most flexibility in hedging the direction of future tax rates (for the account owner and beneficiaries). Even though Roth conversions overall may be an underutilized option, Vanguard has observed a conversions pickup when investors are in their 60s, peaking at age 70½ (we have called this the "Roth conversion zone") (Weber and Bruno, 2014). This may provide some evidence that retirees are becoming more proactive in managing the tax impact of RMDs.

Implementing a flexible withdrawal order from a portfolio should be embraced much like a dynamic spending strategy; as such, retirees can benefit from proactively monitoring their tax situation annually. Many retirees will find it prudent to work with a financial-planning professional/advisor throughout the implementation.

13 Qualified charitable organizations can be named beneficiaries. Note that in 2015, as part of the federal Protecting Americans from Tax Hikes (PATH) Act, the U.S. Congress permanently extended qualified charitable distributions from IRAs.

Conclusion

Vanguard's retirement spending strategy is a framework to help investors maximize their chances of achieving their financial goals over an unknowable number of years in retirement. The three key steps to our goals-based approach are to develop a prudent spending rule; construct a portfolio consistent with time-tested investment principles; and take advantage of tax-efficient investment and withdrawal strategies.

Each step involves complexities and trade-offs. The stakes are high, and the impact of subpar decisions can be severe. This combination of complexity and consequence underscores the need for skillful guidance, giving advisors an opportunity to have a profound impact on the financial well-being of their clients.

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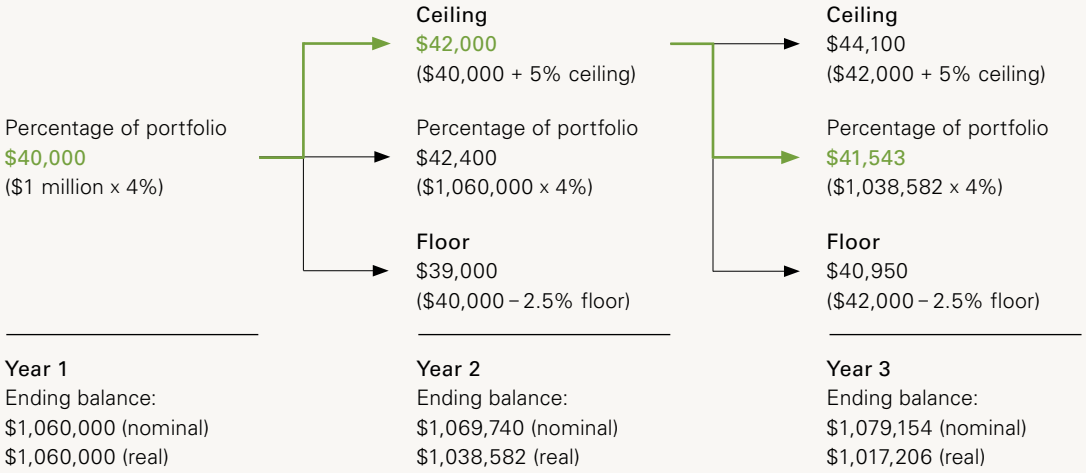
Appendix I. Dynamic spending rule illustration

The process is as follows:

1. Calculate each year's spending by taking a stated percentage of the prior year-end's portfolio balance. For example, a retiree with a $1 million portfolio and an income need of $40,000 per year would start by taking 4% of the portfolio in year one.
2. Calculate a ceiling and a floor by applying chosen percentages to the prior year's inflation-adjusted spending amount, such as a 5% ceiling and a 2.5% floor. In the example in **Figure A-1**, given a 3% rate of inflation, the ceiling and floor would be calculated as $42,000 and $39,000, respectively. The percentage of portfolio amount, after accounting for investment gains and the prior year's spending, would be $42,400.
3. Compare the results. If the newly calculated spending amount exceeds the ceiling, you limit spending to the ceiling amount; if the calculated spending is below the floor, you increase spending to the floor amount. In the example, since the $42,400 percentage of portfolio amount exceeds the ceiling of $42,000, spending would be constrained to the ceiling.

In short, this rule helps retirees maintain income for basic expenses while allowing for more discretionary income if market returns are favorable.

Figure A-1. Dynamic spending strategy example: Percentage of portfolio with ceiling and floor



Starting balance	$1 million
Spending rate	4%
Floor	2.5%
Ceiling	5%

Annual returns	
Year 1	10%
Year 2	5%
Year 3	5%

Annual inflation	3%
Cumulative inflation factor	
Year 1	1.0000
Year 2	1.0300
Year 3	1.0609

Notes: This hypothetical illustration does not represent the investment results of any particular portfolio. The figure shows a hypothetical three-year example of a spending strategy using the *percentage of portfolio with ceiling and floor* method. Here the Year 2 spending amount is constrained by the ceiling rule, while Year 3's spending amount is constrained by neither the ceiling nor the floor. Green lines emphasize which of the three calculated amounts should be used as each year's spending withdrawal.

Source: Vanguard.

Appendix II. About the Vanguard Capital Markets Model

IMPORTANT: The projections or 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 Vanguard Capital Markets Model 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 is the most effective way to use VCMM output.

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