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

Vanguard Research

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*Colleen M. Jaconetti, CPA, CFP®, Michael A. DiJoseph, CFA, Francis M. Kinniry Jr., CFA, David Pakula, CFA, Hank Lobel, CFA, CFP®*

- Although the population and life expectancies of U.S. retirees are increasing, portfolio yields remain at historically low levels. As defined benefit income becomes less commonly available, the need for informed retirement portfolio spending strategies is more critical, and yet more complex, than ever.
- The stakes are high, and the impact of subpar decisions can be severe. Because every investor's financial situation is unique, there is no one-size-fits-all solution. But developing and implementing a personal spending strategy can reduce anxiety and stress about the ability to meet retirement income goals.
- Retirees who hold the majority of their assets in tax-deferred accounts can turn those assets into income by setting up an automatic withdrawal plan. They can also purchase an investment specifically designed to provide regular distributions. Those whose portfolios contain a significant portion of taxable assets can add value by working with an advisor to develop a goals-based strategy.
- Whatever spending strategy you choose, the complexity and consequences of the process underscore the need for and value of skillful guidance.

Developing and overseeing a retirement spending strategy is a complex process. As life expectancies increase, so do the challenges. Greater numbers of retirees need to rely more on their investment portfolios than on guaranteed sources of income such as defined benefit pension plans. And yields on balanced and fixed income portfolios are at historically low levels.

These circumstances leave many searching for ways to increase the income generated from their portfolios. This paper provides a framework to help turn an investment portfolio into a sustainable and relatively constant level of income and plan 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 piece 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, the insight of a knowledgeable advisor.

### I. Develop a prudent spending rule tailored to your unique goals

It sounds simple, but choosing an appropriate portfolio spending rule to balance competing goals—including differentiating wants from needs—is challenging.<sup>1</sup> Many critical factors are unpredictable and beyond an individual's control. For example, investors have no control over the returns of the markets, the rate of inflation, or the length of their retirement planning horizon (life expectancy). Yet each of these variables significantly affects how much can be safely withdrawn from a portfolio while preserving the potential to generate income for life.

#### Notes on risk

**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, 2019. Results from the model may vary with each use and over time. For more information, see **Appendix 2**.

*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.*

<sup>1</sup> 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 and Jaconetti, 2016).

### First things first

An important step in developing a durable spending strategy is to carefully map out sources of both income and expenses. When accounting for income, retirees need to examine the stability and sustainability of each source.

For example, Social Security and pensions may be relatively stable and can reasonably be expected to persist throughout retirement. Other sources, 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 (such as travel and leisure) from nondiscretionary (such as housing and food) spending.

The gap between income sources and expenses is the amount the investment portfolio must provide. This generally consists of both taxable and tax-advantaged accounts. If the amount needed is too high, the portfolio will be depleted regardless of the spending rule selected.

Four primary levers affect how much can be spent from the portfolio: the retiree's time horizon or life expectancy, asset allocation, annual spending flexibility, and degree of certainty that the portfolio won't be depleted before the end of the time horizon. **Figure 1** highlights these variables and their effect on portfolio withdrawal rates.

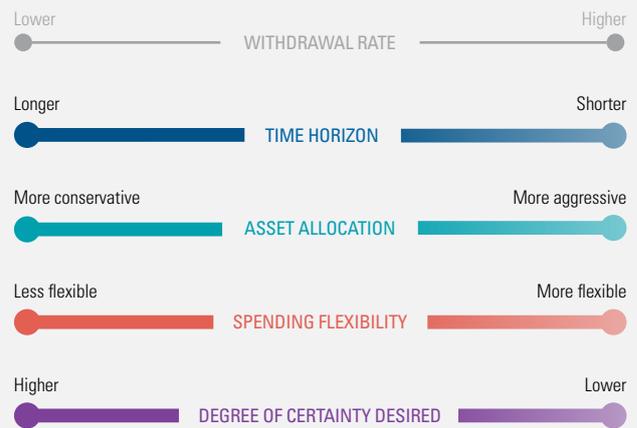
As expected, the longer the anticipated time horizon, the lower the initial spending rate should be. The shorter the horizon, the more spending the portfolio is likely able to sustain. For example, a 60-year-old investor with a 30-year horizon should probably spend less (as a percentage of the overall portfolio) than an 85-year-old investor with a 10-year horizon.

Similarly, the more conservative the asset allocation, the lower the expected return over the time horizon and the lower the spending rate. The more aggressive the asset allocation, the higher the initial spending rate, with one caveat. As the equity percentage approaches 100%, return volatility will likely increase. Over shorter horizons, this may increase the chance of running out of money.

The third lever, spending flexibility, is the proportion of total expenses attributable to discretionary versus nondiscretionary spending. What is the minimum needed "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 that can be eliminated or minimized in any given year, the greater the level of spending flexibility. For example, a retiree whose leisure and entertainment take up a large portion of each year's expenses may be better able to endure a reduction in portfolio-based income.

**Figure 1. Four levers affecting portfolio withdrawal rates**



Source: Vanguard.

The fourth lever—the desired degree of certainty regarding the chance for premature portfolio depletion—can be defined as the "success rate." This is 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.

Generally, a prudent initial withdrawal rate when entering retirement (with a time horizon of approximately 30 years) is 3.5% to 5.5% of the portfolio balance. Typically, the 3.5% would apply to more conservative portfolios and the 4.5% to 5.5% to more moderate or aggressive ones. Clearly, these rules are broad, and each investor's circumstances are unique. More or less spending may be appropriate.

### Goals-based spending

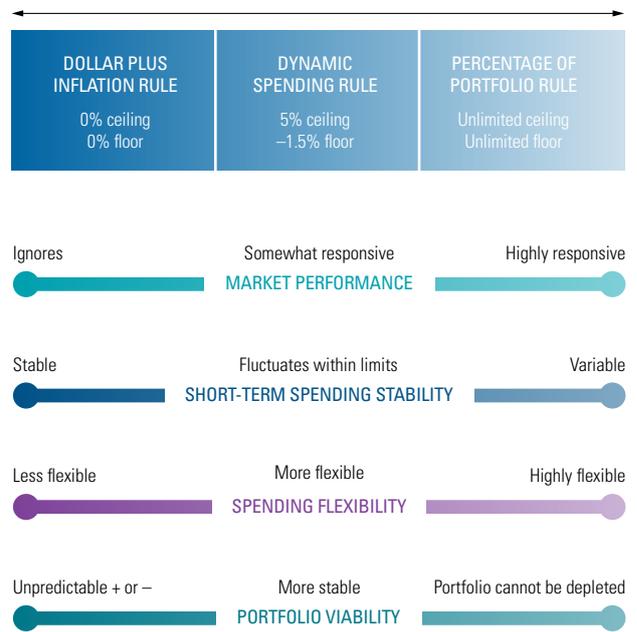
Numerous spending rules have been developed to help retirees deal with changes in their circumstances and the markets. Each places different emphasis on the competing priorities many are trying to balance: to maintain a relatively consistent level of current spending while increasing—or preserving—a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

To provide a customized solution, we suggest a hybrid of these two rules, which we call “dynamic spending.” It allows spending to fluctuate based on market performance while remaining sensitive to significant changes by setting a ceiling and floor for each year’s spending amount. Because outcomes are significantly affected by the selection of the ceiling and floor percentages, the strategy can be tailored to each retiree’s unique goals.

### Spectrum of spending rules

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

Figure 2. Spectrum of spending rules



Source: Vanguard.

A retiree whose primary goal is spending stability would probably prefer the dollar plus inflation rule. Upon retirement, he or she would select the initial dollar amount to spend from the portfolio and then increase that sum by the amount of inflation each year.

Although this rule allows for more stable annual spending, it comes with the risk of either premature portfolio depletion or lifetime under-consumption due to “sequence of returns risk”: annual spending is automatically increased by inflation regardless of whether market returns are positive or negative.

A significant period of underperformance without an adjustment in spending could result in running out of money. A significant period of market outperformance could provide the opportunity to increase spending if desired. Failure to appropriately tailor spending to market performance could mean either missing out on fully enjoying retirement or overspending and depleting the portfolio too soon.

A retiree whose primary goal is not depleting the portfolio might opt for the percentage of portfolio rule.<sup>2</sup> He or she would annually spend a fixed percentage of the balance so that the annual spending amount automatically increases or decreases based on market performance.

Although the portfolio will not be depleted (though the spending amount may be substantially reduced through time), the annual spending amount can fluctuate significantly. This may not be an option for those whose nondiscretionary or fixed expenses (such as housing or food) are a relatively large proportion of total expenses. But those with very high, if not unlimited, levels of flexibility may prefer it.

Under our dynamic spending rule, withdrawals are kept within a maximum percentage increase and minimum percentage decrease in real (inflation-adjusted) spending. Retirees can benefit from good markets by spending a portion of their gains and weather bad markets without a significant spending reduction. They can thus experience more stability than under the percentage of portfolio approach while maintaining more flexibility than allowed by the dollar plus inflation approach (see **Appendix 1** and **Figure A-1** for an in-depth example).<sup>3</sup>

To implement the dynamic spending rule, a retiree would calculate each year’s spending by taking a stated percentage of the prior year-end’s real portfolio balance. He or she would then determine a ceiling and floor by applying chosen percentages to the previous year’s real spending amount, such as a 5% ceiling (increase) and a –1.5% floor (decrease), and compare the results.<sup>4</sup>

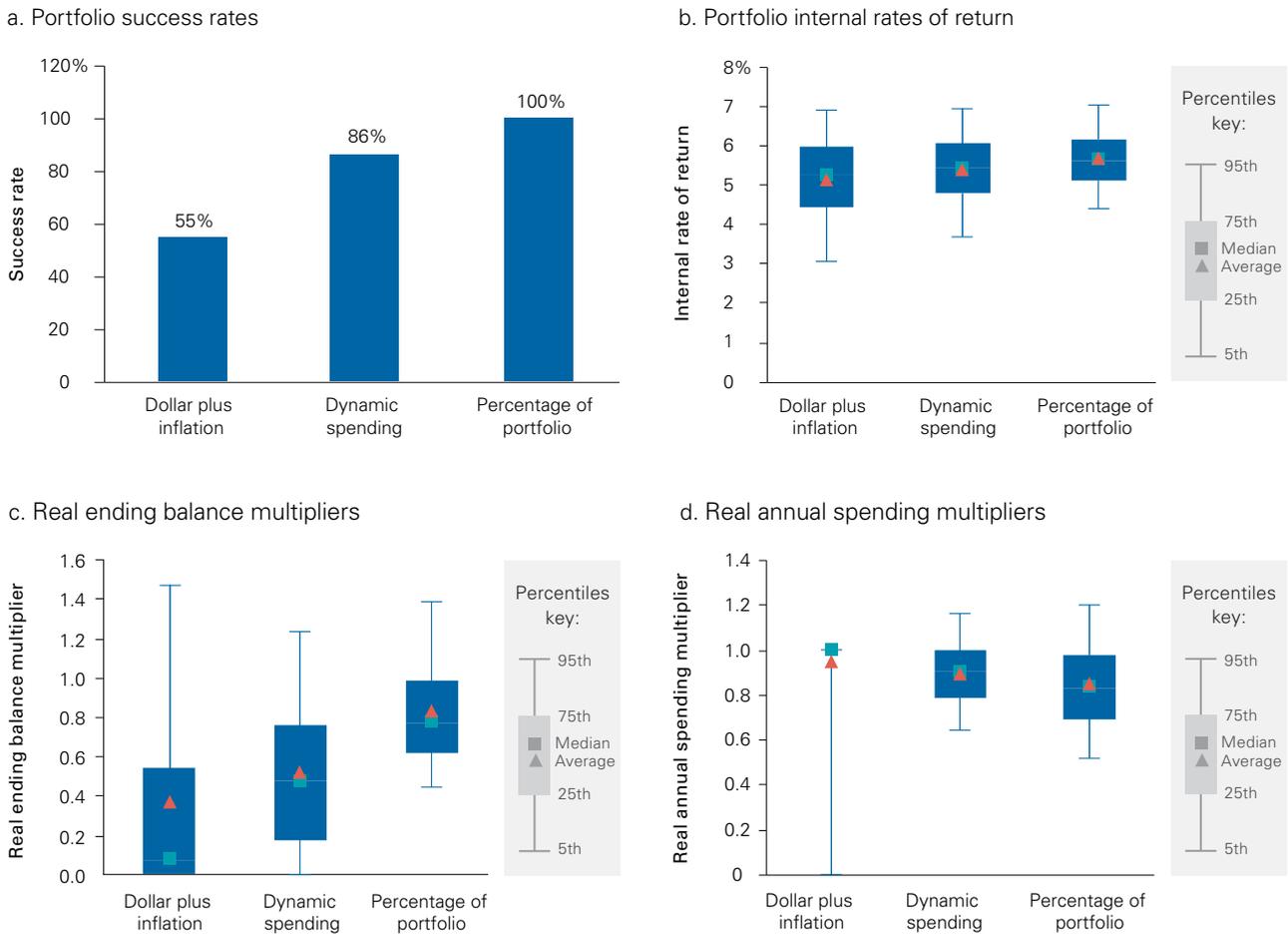
If the new spending amount exceeds the ceiling, it will be limited to the ceiling amount. If it falls below the floor, it will be increased to the floor amount. Spending can therefore be made relatively consistent while remaining responsive to the financial markets’ performance, helping to sustain the portfolio.

<sup>2</sup> For simplicity, we base the percentage of portfolio on annual ending balance. In practice, three-year smoothing is commonly applied. This would generate results directionally similar to those in this paper but with truncated variance.

<sup>3</sup> This method clearly is a bit more involved than either the dollar plus inflation or percentage of portfolio rule. It may warrant seeking the assistance of a financial advisor.

<sup>4</sup> While many successful ceiling/floor combinations exist, a best practice could be to set the ceiling at a higher rate than the floor. This can help mitigate the impact of loss aversion, in which “losses loom larger than gains” (Kahneman and Tversky, 1979). For example, an investor might be more resistant to reducing spending during down markets if he or she could only increase it by the same amount during periods of outperformance. This investor might be more accepting of the sacrifice if he or she could partake in the upside to a greater degree.

**Figure 3. Comparison of various spending rules**



**Notes:** This hypothetical illustration does not represent the investment results of any particular portfolio. All results are based on 10,000 VCMM simulations using each spending rule. The analysis assumes portfolios with a starting balance of \$1 million, a moderate allocation of 50% stocks (60% U.S. equity and 40% non-U.S. equity) and 50% bonds (70% U.S. bonds and 30% non-U.S. bonds), a time horizon of 35 years, and an initial withdrawal rate of 5%. See **Appendix 2** for further description of the VCMM. In Figure 3a, “success rate” is the likelihood the portfolio will last for the investor’s entire time horizon or life expectancy.

**Source:** Vanguard.

As Figure 3 illustrates, the percentage of portfolio rule may have the highest rate of portfolio success and the highest internal rate of return in suboptimal scenarios (Figures 3a and 3b). However, those come with a cost—higher volatility in annual real spending (Figure 3d). Using Vanguard’s hybrid approach, a retiree can capture many of the benefits of this method while still significantly reducing variation in annual spending.

We examined the trade-offs mentioned above in a multiplier framework, using the ending real balance as a multiple of the initial portfolio (Figure 3c) or real annual spending as a multiple of the initial spending amount (Figure 3d) over 35 years for each rule. The dollar plus inflation rule produced real ending balances ranging from 0 times the initial amount at the 5th percentile to 1.47 times at the 95th percentile (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 \$1.47 million 90% of the time. As Figure 3c shows, the two other approaches produced a narrower range of results.

The most important trade-off in methods, 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 (Figure 3d). For the investor in the previous paragraph, in theory, this would mean real annual spending of \$50,000 or \$0. In reality, a

retiree 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. The percentage of portfolio rule produces real annual spending multipliers ranging from 0.52 to 1.21 at the 5th and 95th percentiles and 0.85 on average. The dynamic spending rule's multiples range from 0.65 to 1.17 at the 5th and 95th percentiles, with an average of 0.89.

Using the dynamic spending approach in the example above, real spending would never decrease by more than 1.5% or increase by more than 5% from the prior year. The percentage of portfolio approach, however, could result in real spending decreasing or increasing by a theoretically unlimited amount (although in reality it would be bound 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 not practical. Dynamic spending can provide many of the benefits of the rule without surrendering a relatively consistent level of real annual spending.

### Tailoring an approach to meet unique goals

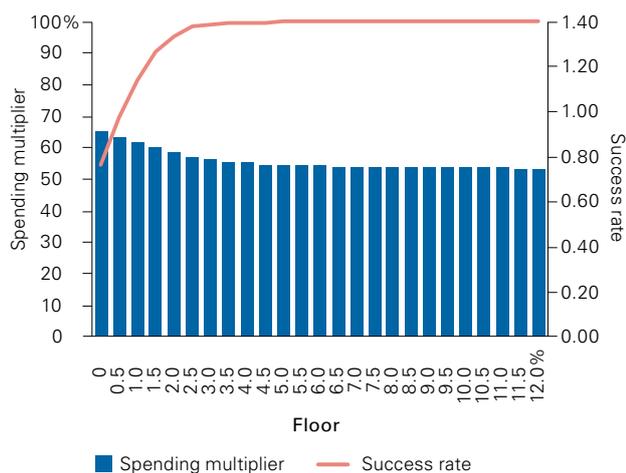
Retirees and their advisors can tailor the selection of ceiling and floor percentages along the spectrum from 0% to unlimited to provide the flexibility needed to meet their unique goals. We used the 5% ceiling and -1.5% floor as a starting point for illustrative purposes because it provided a portfolio survival rate greater than 85% over 35 years.

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

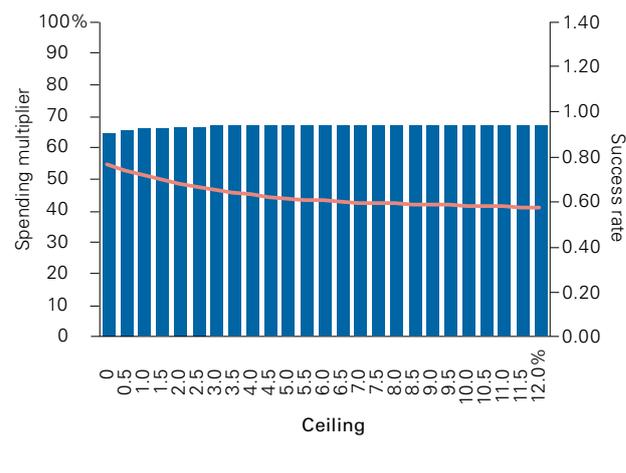
Our analysis found that the more flexibility retirees have in their floor—the more they are able to reduce spending when the markets are performing poorly—the higher their success rate—meaning the lower the chance that they will deplete their portfolio or have to significantly

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 are based on 10,000 VCMM simulations using each spending rule. The analysis assumes portfolios with a starting balance of \$1 million, a moderate allocation of 50% stocks (60% U.S. equity and 40% non-U.S. equity) and 50% bonds (70% U.S. bonds and 30% non-U.S. bonds), a time horizon of 35 years, and an initial withdrawal rate of 5%. See Appendix 2 for further description of the VCMM. "Success rate" is the likelihood the portfolio will last for the investor's entire time horizon or life expectancy.

Source: Vanguard.

reduce their spending. 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 27 percentage points more successful, as measured by success rate, than a ceiling/floor combination of 0% and 0% (or dollar plus inflation). On the other hand, a ceiling/floor combination of 1% and 0% is about 3 percentage points less successful. As shown in Figure 4, the line's absolute slope when keeping the ceiling constant is much steeper than it is when keeping the floor constant.

This concept has implications for retiree withdrawal rates, as shown in Figure 5. The table charts portfolio withdrawal rates for both a 0%/0% ceiling/floor rule and a 5.0%/-1.5% ceiling/floor rule using different time horizons and asset allocations and assuming an 85% success rate.<sup>5</sup> It reveals that retirees who can incorporate flexibility into their annual spending needs are able to set higher initial portfolio withdrawal rates. This 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 (a 0% ceiling and a 0% floor) with a 35-year horizon can set an initial portfolio withdrawal rate of 4.3%. This assumes an 85% chance that he or she will not run out of money. If that same retiree can cut spending by 1.5% in years when the markets are performing poorly and limit increases in annual spending to 5.0% if they are performing well, he or she can set the initial portfolio withdrawal rate 0.7 percentage points higher, at 5.0%.

In short, when choosing a floor and ceiling combination, trade-offs must be made between maintaining the desired level of current spending (spending percentage) and preserving the portfolio to support future spending goals (success rate). Retirees and their advisors must have a solid understanding of their income and expenses. The more they can tolerate some short-term spending fluctuations, the more likely they are to achieve their longer-term goals.

Figure 5. Portfolio withdrawal rates for various asset allocations and time horizons

Asset allocation	Ceiling/floor: 0%/0%					Ceiling/floor: 5.0%/-1.5%				
	Time horizon (years)					Time horizon (years)				
	10	20	30	35	40	10	20	30	35	40
Conservative	10.2	5.5	4.0	3.7	3.4	10.9	6.2	4.8	4.4	4.2
Moderate	10.3	5.9	4.6	4.3	4.1	10.9	6.6	5.3	5.0	4.8
Aggressive	10.0	6.1	5.0	4.7	4.5	10.6	6.6	5.5	5.2	5.0

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, and aggressive—80% stocks/20% bonds. Withdrawal rates were determined using data from the VCMM. See Appendix 2 for further description of the VCMM.

Source: Vanguard.

<sup>5</sup> We assume that a conservative asset allocation corresponds to a 20% stock/80% bond portfolio, a moderate allocation to a 50% stock/50% bond portfolio, and an aggressive allocation to an 80% stock/20% bond portfolio.

Once a spending strategy and amount have been selected, possible implementation strategies include:

- Setting up an automatic withdrawal plan from current holdings
- Purchasing an investment specifically designed to provide regular distributions
- Working with an advisor to develop a strategy tailored to your unique goals.

## II. Construct a broadly diversified retirement portfolio

The second prong of our retirement income strategy is a well-constructed portfolio. Four principles underlie Vanguard's philosophy and form the basis on which we construct investment portfolios (Vanguard, 2017). First, create clear, appropriate goals. Second, develop a suitable asset allocation using broadly diversified funds. Third, minimize costs. And fourth, maintain perspective and long-term discipline. The principles apply both to investors accumulating assets and to those in the drawdown phase.

The two general approaches to building an investment portfolio for retirees are "income focused" and "total return." The goal of the income-focused strategy is to construct a portfolio with a natural yield (dividends plus interest) consistent with spending objectives. Asset allocation and diversification decisions are driven primarily by the natural yield of the investments selected, rather than by the retirees' time horizon, risk tolerance, or financial goals. The diversification, costs, and asset allocation of the portfolio may vary over time, depending on market conditions.

The goal of the total-return approach is to construct a portfolio based on a holistic view. Asset allocation is matched to the retiree's risk-return profile by diversifying investments, minimizing costs, and remaining disciplined over time.

Many investors spend much of their careers trying to achieve a "savings target," or portfolio balance that they believe will support their goals in retirement. Once retired, they are often psychologically averse to spending that would drop their balance below that target, causing them to spend from their principal.

Understandably, many retirees gravitate toward an income-focused approach without realizing the possible negative implications. This focus on income may put their portfolio at greater risk than a total-return approach would.

The income-focused and total-return approaches are identical to a point. With each method, retirees spend some or all of the income or natural yield generated by their portfolios. But when they need to spend in excess of a portfolio's yield, the approaches diverge. The additional spending can be achieved either by reallocating toward higher-income-producing assets or by spending from the other piece of total return—the portfolio's capital appreciation.

### Advantages of a total return approach

The advantages of a total return approach include:

- Maintenance of portfolio diversification
- More control over the size and timing of withdrawals
- Greater tax-efficiency
- Increased portfolio longevity.

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

**More control over the size and timing of withdrawals.**

Investors who follow a total-return approach have more control over the size and timing of withdrawals because they are willing to spend from capital appreciation when their portfolio's yield falls below their required spending amount. Any excess income can be reinvested.

Total-return investing also increases the ability to implement flexible spending rules by adjusting spending in proportion to the portfolio's growth rather than focusing on the income it is yielding. The more retirees can tolerate some short-term spending fluctuations, the more likely they are to achieve their longer-term goals.

**Greater tax-efficiency.** A total-return approach allows investment purchase decisions (asset location) to be driven by tax efficiency rather than by access to the natural yield of assets held in taxable accounts.<sup>6</sup> 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. They are thus subject to:

- Paying a federal marginal income tax rate on taxable bond income that can be as high as 37% (40.8% if subjected to the 3.8% Medicare surtax on net investment income). They could, of course, purchase municipal bonds but would then forgo the taxable-municipal spread.
- Paying a long-term capital gains tax rate that can range from 0% to 20% on long-term gains/distributions (based on taxable income) and, on short-term gains, the retiree's marginal income tax rate.<sup>7</sup> (Capital gains distributions are more likely the more actively managed equity funds a portfolio holds.)

- Paying a tax rate on qualified dividend income from equities that also ranges from 0% to 20%, depending on the level of taxable income.

Purchases of tax-efficient broad-market equity funds or exchange-traded funds (ETFs) in taxable accounts would still be subject to the first two payments; however, the amount of income or capital gains distributions would probably be much lower.<sup>8</sup> The value of proper asset location can be significant in terms of both portfolio sustainability and real annual spending, as shown in **Figure 6**.

*Tax-advantaged savings are likely to result in higher success rates than taxable savings.*

Our analysis found that a portfolio with properly located assets had a 20-percentage-point-higher likelihood of outlasting one that did not (Figure 6a) and would likely afford higher levels of real annual spending (Figure 6b). A hypothetical investor in our analysis who maximized the benefits of asset location would see a multiplier of real annual spending at the median of 0.92, versus 0.85 for one who did not.

**Increased portfolio longevity.** By minimizing the impact of taxes and maintaining more control over how much is withdrawn (and when), retirees can possibly increase the length of time their portfolios are able to meet their spending needs while also decreasing their risk of running out of money.

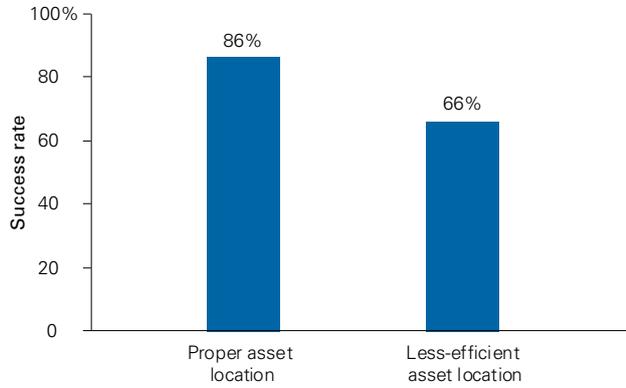
<sup>6</sup> Asset location is the allocation of assets between taxable and tax-advantaged accounts. From a tax perspective, optimal portfolio construction holds tax-efficient broad-market equity investments in taxable accounts and taxable bonds in tax-advantaged accounts. This arrangement takes maximum advantage of the yield spread between taxable and municipal bonds, which can generate a higher and more certain return premium. Those incremental differences have a powerful compounding effect over the long run.

<sup>7</sup> For both long-term capital gains and qualified dividends, the following rates apply: 0% for investors in the lowest two marginal tax brackets, 15% for investors in the next four brackets, and 20% for investors in the highest bracket. Depending on his or her taxable income and amount of realized capital gains, an investor could have capital gains taxed at two different rates (for example, a portion at 0% and a portion at 15%). In addition to long-term capital gains taxes, some investors could also be subject to the 3.8% Medicare surtax.

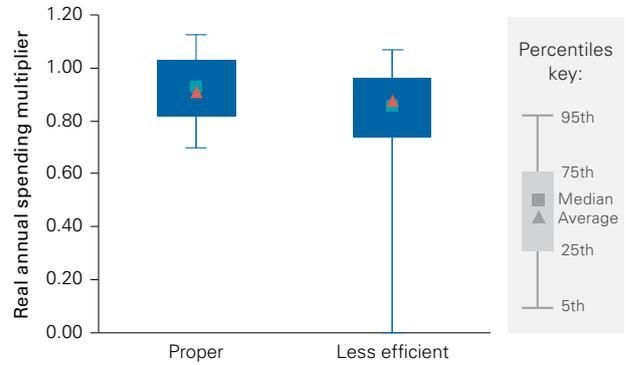
<sup>8</sup> In addition, estate planning benefits may result from placing broad-market equity index funds or ETFs in taxable accounts. Since broad-market investments usually provide more deferred capital appreciation over the long-term than bonds, the taxable assets have the added advantage of a potentially larger step-up in cost basis for heirs.

**Figure 6. Effects of proper asset location**

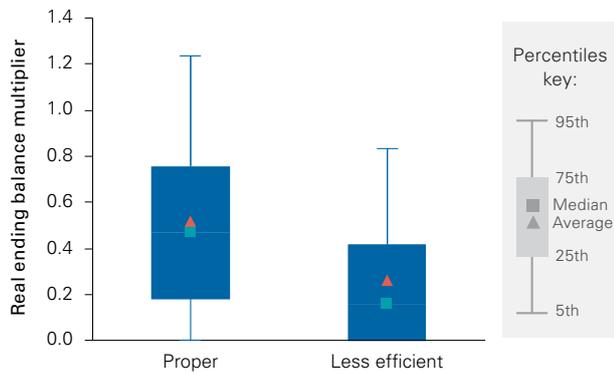
a. Portfolio success rates



b. Real annual spending multipliers



c. Ending balance multipliers



**Notes:** This analysis is based on findings from Vanguard’s recently revised research paper *Putting a Value on Your Value: Quantifying Vanguard Advisor’s Alpha* (Kinniry et al., 2019). It determined that proper asset location is worth up to 75 basis points per year in net portfolio returns (1 basis point = 1/100 of 1%). The charts’ data are the results of 10,000 VCMM simulations demonstrating the hypothetical value to a portfolio (spent in retirement) of gaining the 75 basis-point advantage versus one that did not. The 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 35 years, and an initial withdrawal rate of 5% following the dynamic spending rule, with an equal split between taxable and tax-deferred accounts. See Appendix 2 for further description of the VCMM.

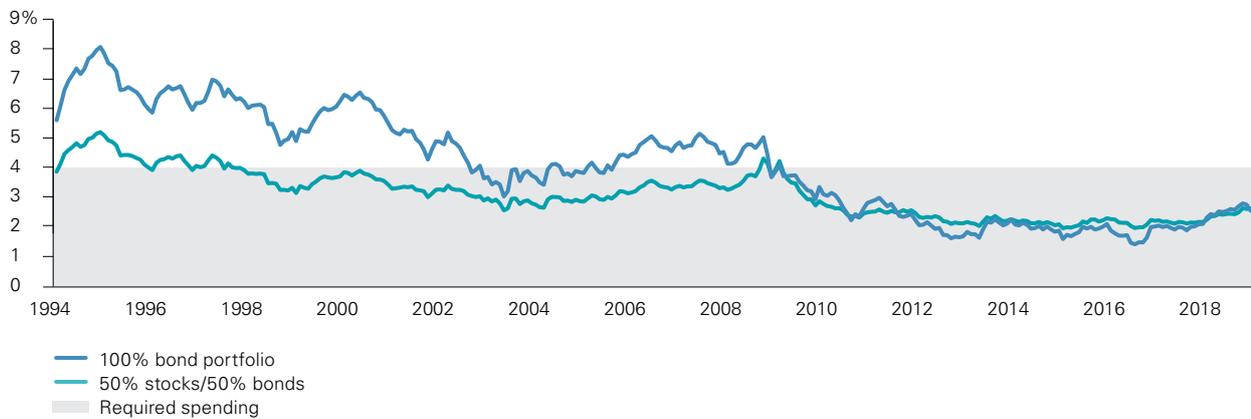
**Source:** Vanguard.

### Appeal and challenges of income-focused investing

Traditionally, many investors were able to take an income-focused approach to their retirement income because their portfolios' natural yield exceeded a prudent withdrawal rate. Not only did they meet their spending needs, many 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**. Yields of a globally diversified 50% equity/50% bond portfolio and even a 100% bond portfolio hovered at or below 2% as of September 2019.

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 gap can be resolved either by overweighting income-producing assets, which often changes a portfolio's fundamental risk profile, or through a total-return approach, as described earlier. This section focuses on three of the methods most commonly used to try to increase a portfolio's income return or natural yield (**Figure 8** summarizes the methods and their potential impacts).

**Figure 7. Low yields on traditional investments present a challenge for income-focused investors**



**Notes:** Past performance is not a guarantee of future results. Bonds are represented 70% by the Bloomberg Barclays U.S. Aggregate Bond Index and 30% by the Bloomberg Barclays Global Aggregate ex-USD Index. Equities are represented 60% by the Standard & Poor's 500 Index and 40% by the MSCI World ex USA Index. Data are based on the last 300 months from October 1, 1994, to September 30, 2019.

**Sources:** Vanguard calculations, based on data from FactSet.

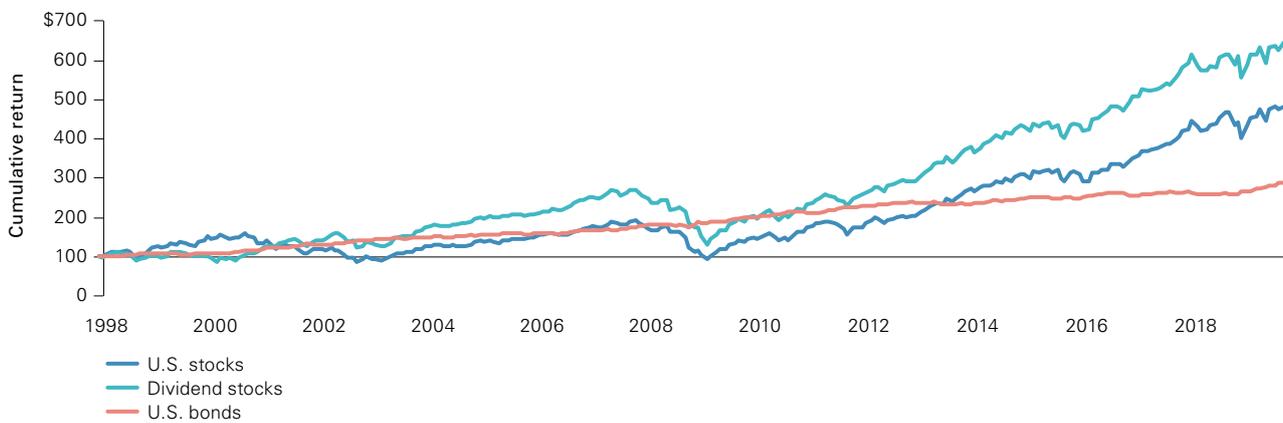
**Figure 8: Portfolio impacts of income-focused strategies**

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

**Note:** "Sub-asset-class level" refers to holdings within the stock and bond portions of a portfolio.

**Source:** Vanguard.

**Figure 9. Dividend-paying stocks are not bonds: Growth of \$100 from January 1, 1998, through September 30, 2019**



**Notes:** U.S. stocks are represented by the Dow Jones Wilshire 5000 Index from January 1, 1998, through April 22, 2005; the MSCI US Broad Market Index through June 2, 2013; and the CRSP US Total Market Index thereafter. Dividend stocks are represented by the S&P 500 Dividend Aristocrats Index through December 31, 2003, and the FTSE High Dividend Yield Index thereafter. U.S. bonds are represented by the Bloomberg Barclays U.S. Aggregate Float Adjusted Index. Data are through September 30, 2019.

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

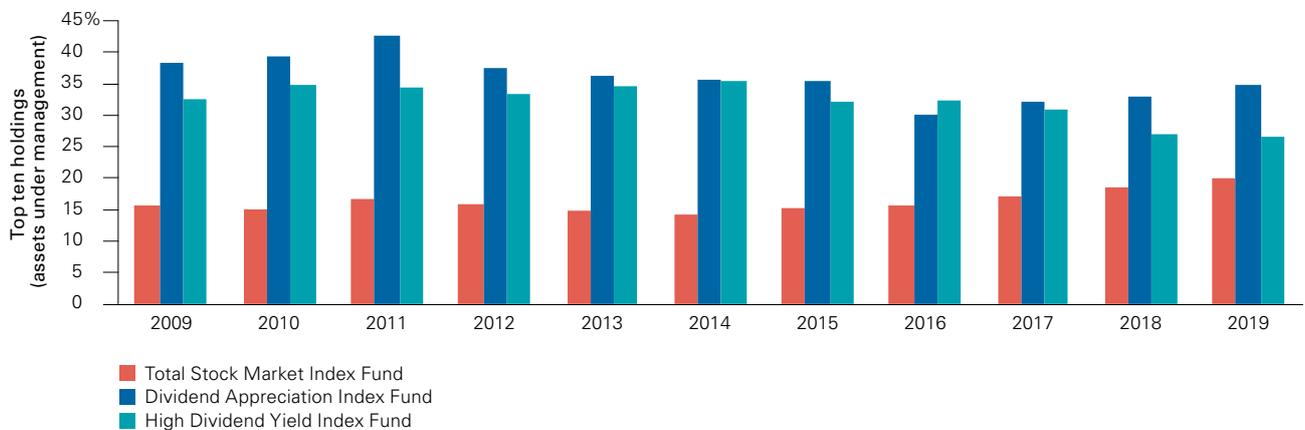
**Risk of reaching for higher yield: Increasing portfolio exposure to dividend-centric equity.** An often-advocated equity approach to increasing income is to shift some or all of a fixed income allocation into higher-yielding, dividend-paying stocks. But stocks are not bonds—they have higher volatility 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 of dividend-paying stocks versus broadly diversified stocks and fixed income. For investors who view fixed income as providing both yield and diversification, dividend-paying stocks fall well short as a substitute.

A second possible approach is to shift from broad-market to dividend- or income-focused equity. However, this may inadvertently change the risk profile of a portfolio, because dividend-focused equity strategies tend to display a significant bias toward value stocks.<sup>9</sup> Some may consider value stocks to be a less risky subset of the broader equity market. But the risks can be substantial, because portfolios focused on dividend-paying stocks tend to be overly concentrated in certain individual stocks and sectors.

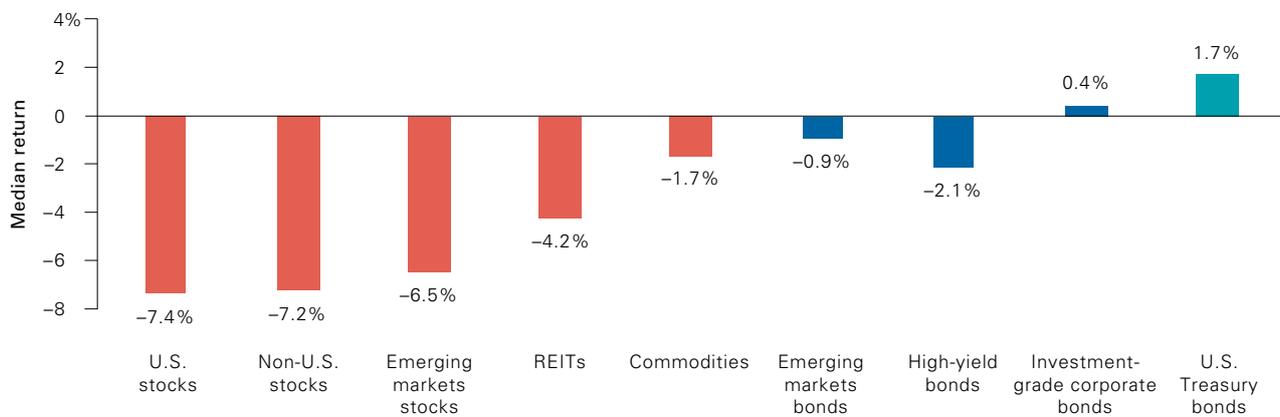
**Figure 10**, for example, shows the percentage of assets under management that were concentrated in the top ten holdings in a hypothetical portfolio of three dividend-paying Vanguard funds over the past ten years. The more broadly diversified Vanguard Total Stock Market Index Fund has a much lower percentage of assets under management in its top ten holdings than do the dividend-centric Vanguard Dividend Appreciation Index Fund and Vanguard High Dividend Yield Index Fund.

**Figure 10. Percentage of assets under management concentrated in the top ten holdings of three dividend-paying Vanguard funds (2009–2019)**



**Notes:** This illustration does not represent the holdings of any particular portfolio.  
**Source:** Vanguard.

Figure 11. Median return of various asset classes during worst decile of monthly equity returns: 1994–2019



**Notes:** U.S. stocks are represented by the Wilshire 5000 Total Market Index from January 1994 through March 2005, the MSCI US Broad Market Index from April 2005 through May 2013, and the CRSP US Total Market Index thereafter. Non-U.S. stocks are represented by the MSCI EAFE Index. Emerging-market stocks are represented by the MSCI Emerging Markets Index. REITs are represented by the Wilshire US REIT Index. Commodities are represented by the Bloomberg Commodity Index. Emerging-market bonds are represented by the JPMorgan EMBI Global Diversified Index. High-yield bonds are represented by the Bloomberg Barclays U.S. Corporate High Yield Bond Index. Corporate bonds are represented by the Bloomberg Barclays U.S. Corporate Bond Index. U.S. Treasury bonds are represented by the Bloomberg Barclays U.S. Treasury Bond Index. Data are as of December 31, 2018.

**Sources:** Vanguard calculations, based on data from MSCI, CRSP, Bloomberg, Wilshire, JPMorgan, and FTSE.

**Risk of reaching for higher yield: Overweighting higher-yielding bonds.** Another common strategy is to increase a portfolio’s allocation to higher-yielding bonds that are exposed to marginal or even significant credit risk.<sup>10</sup> Credit risk tends to be correlated with equity risk, as is demonstrated during periods of equity market distress (see Figure 11). This is often heightened when investors move into riskier bonds at the expense of U.S. Treasury or investment-grade corporate bonds—proven diversifiers when diversification is needed most.

Our research suggests that for an investor in a 60/40 portfolio who allocates a portion of its fixed income holdings to high-yield bonds, the risk-adjusted return difference is negligible (Stockton, 2019). While high-yield bonds do tend to offer a yield premium, investors are not always compensated for the higher risks in the form of higher total returns. Those who make such an allocation are likely sacrificing diversification benefits in hopes of receiving higher current income.<sup>11</sup>

<sup>10</sup> “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).

<sup>11</sup> In their paper, Stockton et al. (2015) found that allocating a portion of equity exposure to high-yield bonds could provide benefits from a risk-adjusted standpoint.

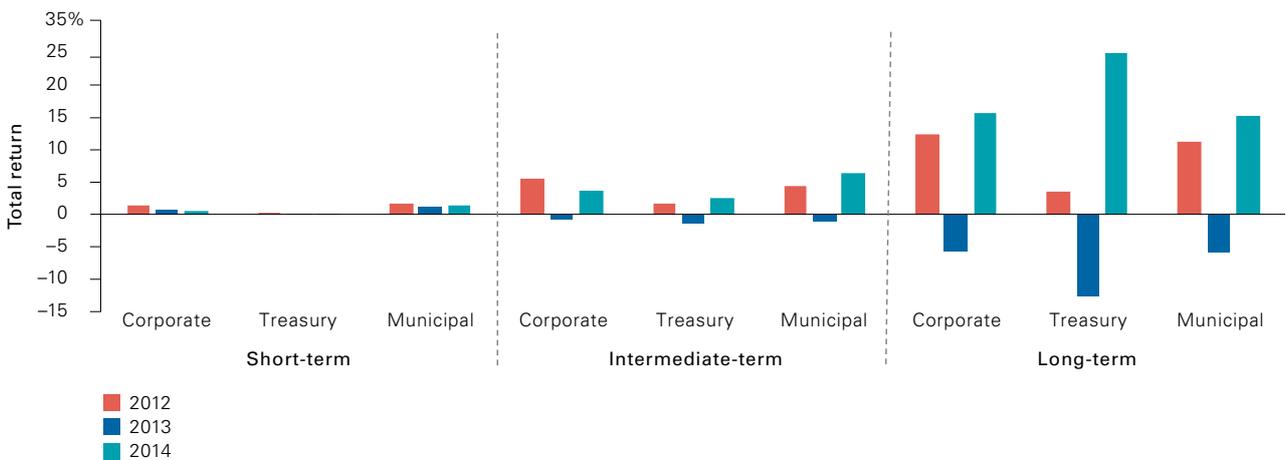
**The risk of overweighting longer-term bonds (extending duration).** Extending a bond portfolio's duration will probably increase its current yield, but it will also increase its sensitivity to interest rate changes. Generally speaking, the longer the duration, the greater the decline in prices when interest rates rise (and the greater the gain when they fall).

Figure 12 illustrates the impact on total returns of increased durations earlier this decade during the 2013 "taper tantrum." In May 2013, Chairman Ben Bernanke stated that the Federal Reserve was considering slowing the rate of its bond purchases through quantitative easing later in the year as the U.S. economy recovered from the 2008 financial crisis (Neely, 2014). This positive yet unexpected announcement caused Treasury yields to spike almost immediately after the news broke. As a result, long-term bonds of various issuances lost value while those of short and intermediate maturities were less affected.

This example supports the case for diversification both among and within asset classes. A bond portfolio diversified across the yield curve—holding bonds of all maturities—can offset the negative effects seen in 2013 while allowing for participation in higher yields as rates rise.

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 its cash flow. Concentrating on higher-yielding sectors results in 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, offers a number of potential benefits, including maintaining diversification, enhancing tax efficiency, and increasing portfolio longevity.

Figure 12. Extending duration can introduce significant volatility: Selected bonds, 2012–2014



**Notes:** We selected the 2012–2014 period because it illustrates the impact of an unanticipated increase in bond yields. Corporate benchmark performance is represented by the Bloomberg Barclays 1-5 Year Corporate Bond Index, the Bloomberg Barclays U.S. Intermediate Corporate AA Bond Index, and the Bloomberg Barclays U.S. Long-Term Corporate Bond Index. Treasury benchmark performance is represented by the Bloomberg Barclays U.S. Short-Term Treasury Index, the Bloomberg Barclays U.S. Aggregate Intermediate Treasury Index, and the Bloomberg Barclays U.S. Aggregate Long-Term Treasury Index. Municipal benchmark performance is represented by the Bloomberg Barclays Short-Term Municipal Bond Index, Bloomberg Barclays Intermediate Municipal Bond Index, and the Bloomberg Barclays Long-Term Municipal Bond Index.

**Sources:** Vanguard, based on data from FactSet.

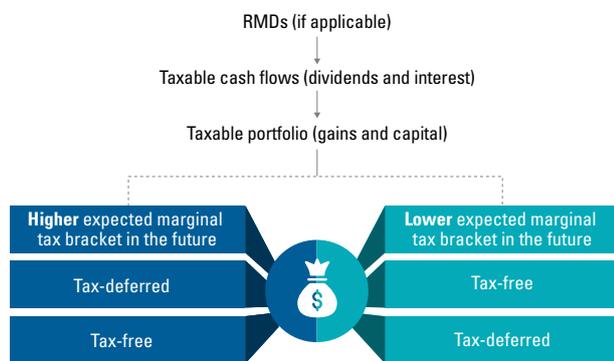
### III. Implement tax-efficient withdrawal strategies

The third prong of our portfolio-based retirement-income strategy is implementing a tax-efficient withdrawal plan. Once an investor establishes a comfortable spending target, the obvious question is how to achieve it. Which accounts should withdrawals come from? Many retirees today have various account types—taxable, tax-deferred, and tax-free (Roth IRAs). An informed withdrawal-order strategy can minimize the total taxes paid over the course of retirement, potentially increasing the amount of spending a portfolio can support as well as its longevity.

#### Framework to maximize lifetime spending

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 to help maximize lifetime spending



Source: Vanguard.

#### At the account-type level

- Federal law requires that RMDs be taken by retirees over age 72 who own assets in tax-deferred accounts. For those not subject to RMDs or who need additional funding, the next source, cash flows from assets held in taxable accounts, includes interest, dividends, and capital gains distributions.
- Investors should consider depleting their taxable assets before spending from their tax-deferred accounts to help maximize the long-term growth of the portfolio and avoid accelerating the payment of income taxes. Taxes on tax-deferred accounts will likely be higher because the investor will pay ordinary income taxes on the entire withdrawal (assuming the contributions were made with pre-tax dollars) rather than a capital gains tax on just the capital appreciation.

Ordinary income tax rates are currently higher than the correlating capital gains tax rates. Over time, the acceleration of income taxes and resulting loss of tax-deferred growth can hurt the portfolio, resulting in lower terminal wealth values and success rates.

While the approach laid out in Figure 13 can help determine the order of distributions, some investors might benefit from a blended strategy. A retiree experiencing a short-term change in spending or income or nearing a threshold determined by that year's income might opt to change the order of distributions to minimize the tax cost (or maximize the benefit).<sup>12</sup>

<sup>12</sup> Various bases are used to determine thresholds. For example, capital gains rates are based on taxable income, Medicare premiums on modified adjusted gross income from two years prior, and income taxes on Social Security benefits on a "combined income" formula.

Taking distributions in a nonstandard manner can help to:

- Avoid an increase in Medicare premiums or loss of subsidies for health insurance premiums from a health insurance exchange
- Avoid the trigger of a higher marginal tax rate on the final distributions for a tax year
- Avoid subjecting a greater portion of Social Security benefits to income taxation
- Maximize the use of the standard deduction<sup>13</sup>
- Maximize the use of certain carry-forward deductions before expiration (such as charitable contributions or net operating losses).

#### *Within accounts*

- After determining the order of withdrawals among taxable and tax-advantaged accounts, the next step is to identify which asset or assets to sell to meet spending needs. Within the taxable portfolio, cash flows should be spent first because they are taxed regardless of whether they are spent or reinvested.

Reinvesting and then selling them later to meet spending needs could result in capital gains. Short-term gains could be taxed at ordinary income tax rates, and long-term gains at capital gains tax rates.

- The retiree should then consider selling the asset or assets that would produce the lowest taxable gain or even realize a loss. This should continue until the spending need has been met or the taxable portfolio has been exhausted.
- Next, the investor must decide whether to spend from tax-deferred or tax-free (Roth) accounts. This decision is primarily based on expectations for future versus current tax rates. If the retiree anticipates a higher future tax rate, then spending from tax-deferred accounts should take priority in order to lock in taxes at the lower rate.

- If the retiree anticipates a lower future tax rate, spending from the tax-free assets should take priority because later distributions from the tax-deferred account will result in lower taxes over the investment horizon.

Once the spending need has been met, the final step should be a review of asset allocation. If selling assets to generate cash flow from the portfolio causes the allocation to deviate from the target by more than 5 percent, the investor should consider rebalancing in tax-advantaged accounts within the constraints of the wash-sale rules.<sup>14</sup>

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., 2019). To calculate this value, we compared the internal rate of return (IRR) of this spending order with that of two alternatives: 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 3.2% on average, as shown in **Figure 14a**, whereas accelerating spending from tax-deferred or tax-free accounts resulted in average IRRs of 2.1% and 2.2%.

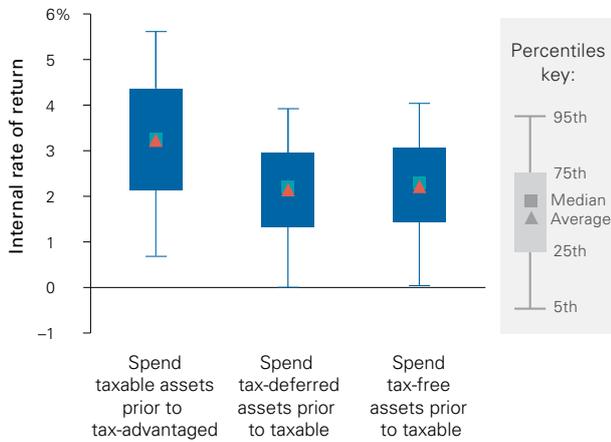
The retiree using the recommended order could expect to be able to sustain higher levels of real annual spending as well. As shown in **Figure 14b**, our hypothetical investor experienced a median real annual spending multiplier of 0.97, versus 0.91 and 0.89 for the alternative withdrawal orders. At the 95th percentile, the investor was able to sustain spending at a level of 1.26 times initial spending versus 1.16 and 1.13.

<sup>13</sup> Retirees who can fund their desired retirement while staying under the standard deduction limit should not increase spending simply to use the entire deduction. However, they could consider converting traditional IRAs to a Roth IRA with the projected shortfall.

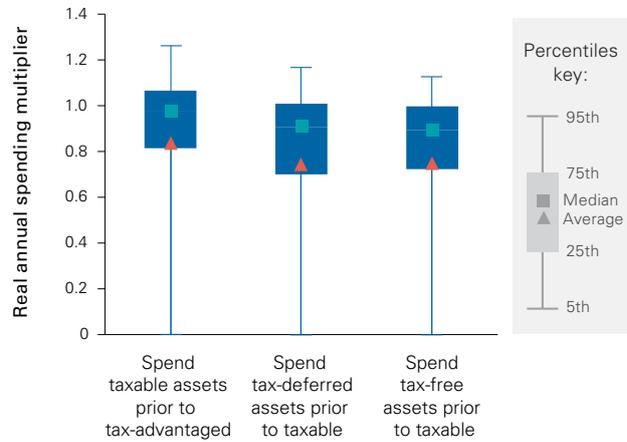
<sup>14</sup> A wash sale occurs when an investor sells a security at a loss and purchases a substantially identical security within 30 days before or after the sale. To deduct a loss for tax purposes, an investor would need to avoid a wash sale. Consult a tax advisor or see *IRS Publication 550* for more information.

Figure 14. Withdrawal order comparison

a. Internal rates of return



b. Real annual spending multipliers



**Notes:** Results are based on 10,000 VCMM simulations using each spending rule cited in the figure. The analysis assumes a moderate portfolio 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 withdrawal rate of 5%. See Appendix 2 for a further description of the VCMM.

**Source:** Vanguard.

### Framework for legacy planning goals

Retirees desiring to leave assets to their heirs should consider their beneficiaries' current and future tax situations as well as their own. If the beneficiaries are or will be in a similar or higher marginal income tax bracket, accelerating spending from tax-deferred balances is usually preferable.

A general 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.

Roth withdrawals are free from federal income taxes. Taxable assets that pass to heirs will benefit from a stepped-up cost basis. The cost basis will reset based on the assets' fair market value on the date of the account owner's death.

### Annual tax-planning opportunities

Retirees should consider their tax situation yearly to take advantage of planning opportunities. One of the following strategies may be appropriate.

- **Charitable giving.** From a tax standpoint, tax-deferred assets are attractive options for retirees who have earmarked charitable organizations to receive donations upon their death.<sup>15</sup> Because they do not have to pay income taxes on these received assets, charities can receive the full benefit of the gift.

<sup>15</sup> Qualified charitable organizations can be named beneficiaries. Note that in 2015, as part of the Protecting Americans from Tax Hikes (PATH) Act, the U.S. Congress permanently extended qualified charitable donations from IRAs.

This can also apply to certain IRAs. Through qualified charitable donations (QCDs), a retiree can directly donate to a charity up to \$100,000 per year without incurring any taxable income.<sup>16</sup> This can also count toward the tax year's required minimum distribution. Retirees with highly appreciated securities in their taxable accounts can also consider lifetime gifting to charities, since the appreciation will not be subject to income taxation.

- **Low taxable income.** 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, 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. Despite incurring taxable income, retirees will do so with the full dollar threshold of income "maxed out" at the lower tax rate.
- **Managing RMDs before age 72.** 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 72. At that point, the tax-planning options are very limited. Vanguard research finds 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 72. Some investors' 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. Although this will

accelerate income taxes, they will be at a relatively lower rate. This will also reduce the tax-deferred account balances, which in turn will reduce future RMDs.

- **Roth conversions.** Although the overall intent is to accelerate income taxes in years that 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. Holding different account types—taxable, tax-deferred, and Roth—provides the most flexibility in hedging the direction of future tax rates for the account owner and beneficiaries.

Roth conversions overall may be an underutilized option, but Vanguard has observed a conversion pickup when investors are in their 60s, peaking at age 70½ (we call 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.

A flexible portfolio withdrawal order should be embraced much like a dynamic spending strategy. Many retirees will find it prudent to work with a financial-planning professional/advisor throughout the process.

## 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.

## References

- Bengen, William P., 1994. Determining Withdrawal Rates Using Historical Data. *Journal of Financial Planning* (Oct.): 14–24.
- Bengen, William P., 2012. How Much Is Enough? *Financial Advisor*, available at <http://www.fa-mag.com/news/how-much-is-enough-10496.html>.
- Bennyhoff, Donald G., and Colleen M. Jaconetti, 2016. *Required or Desired Returns? That Is the Question*. Valley Forge, Pa.: The Vanguard Group.
- Blanchett, David, Maciej Kowara, and Peng Chen, 2012. Optimal Withdrawal Strategy for Retirement Income Portfolios. *Retirement Management Journal* 2(3, Fall): 7–18.
- Blanchett, David, and Paul Kaplan, 2013. Alpha, Beta, and Now Gamma. *Journal of Retirement* 1(2, Fall): 29–45.
- Cooley, Philip L., Carl M. Hubbard, and Daniel T. Walz, 1998. Retirement Savings: Choosing a Withdrawal Rate That Is Sustainable. *AAll Journal* 20(2): 16–21.
- Davis, Joseph, Roger Aliaga-Díaz, Harshdeep Ahluwalia, Frank Polanco, and Christos Tasopoulos, 2014. *Vanguard Global Capital Markets Model*. Valley Forge, Pa.: The Vanguard Group.
- Donaldson, Scott J., Francis M. Kinniry Jr., David J. Walker, and Justin C. Wagner, 2015. *Tax-Efficient Equity Investing: Solutions for Maximizing After-Tax Returns*. Valley Forge, Pa.: The Vanguard Group.
- Kahneman, Daniel, and Amos Tversky, 1979. Prospect Theory: An Analysis of Decision Under Risk. *Econometrica* 47(2): 263–292.
- Kinniry, Francis M., Jr., Colleen M. Jaconetti, Michael A. DiJoseph, Yan Zilbering, and Donald Bennyhoff, 2019. *Putting a Value on Your Value: Quantifying Vanguard Advisor's Alpha*. Valley Forge, Pa.: The Vanguard Group.
- Neely, Christopher J., 2014. Lessons from the Taper Tantrum. *Economic Synopses* 2. Available at: <https://doi.org/10.20955/es.2014.2>
- Philips, Christopher B., Donald G. Bennyhoff, Francis M. Kinniry Jr., Todd Schlanger, and Paul Chin, 2015. *An Evaluation of Smart Beta and Other Rules-Based Active Strategies*. Valley Forge, Pa.: The Vanguard Group.
- Scott, Jason S., and William F. Sharpe, and John G. Watson, 2008. The 4% Rule—At What Price? *Journal of Investment Management* 7(3): 31–48.
- Scott, Jason S., and John G. Watson, 2011. *The Floor-Leverage Rule for Retirement*, available at [http://siepr.stanford.edu/sites/default/files/publications/FLRR\\_Rev2\\_j\\_2.pdf](http://siepr.stanford.edu/sites/default/files/publications/FLRR_Rev2_j_2.pdf).
- Stockton, Kimberly, Scott Donaldson, and Simone Chen, 2019. *Junk or Jewel? Assessing the Role of High-Yield Bonds in a Diversified Portfolio*. Valley Forge, Pa.: The Vanguard Group.
- The Vanguard Group, 2017. *Vanguard's Principles for Investing Success*. Valley Forge, Pa.: The Vanguard Group.
- Weber, Stephen M., and Maria A. Bruno, 2014. *IRA Insights: But What if I Don't Want My RMD?* Valley Forge, Pa.: The Vanguard Group.

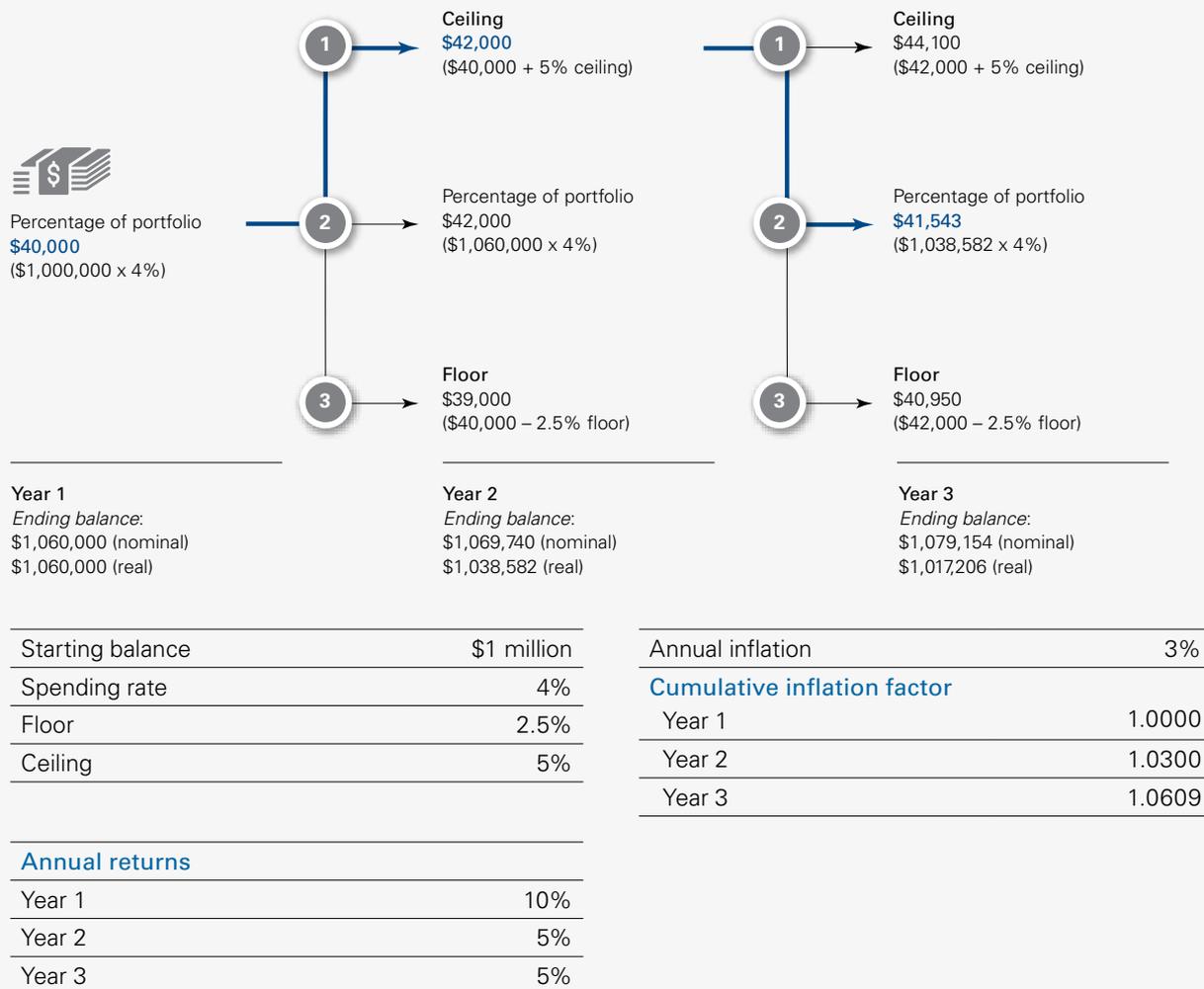
## Appendix 1. Dynamic spending rule

1. Determine 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**, with a 3% rate of inflation, the ceiling and floor would be calculated as \$42,000 and \$39,000. 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, limit spending to the ceiling amount. If the calculated amount is below the floor, 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.

This rule helps 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



**Notes:** This 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. The blue lines emphasize which of the three calculated amounts should be used as each year's spending withdrawal.

**Source:** Vanguard.

## Appendix 2. 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 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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P.O. Box 2600  
Valley Forge, PA 19482-2600

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