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A more dynamic approach to spending for investors in retirement

Vanguard research

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Executive summary. Investors face many challenges when deciding how to spend from their retirement savings. One of the most important is choosing a spending strategy that will best balance their two competing goals: maintaining their desired level of current spending, and increasing or preserving their portfolios to support future spending.

In this paper we focus on two of the most common spending strategies and introduce a third—a hybrid of the others that we view as a more dynamic approach. Through a simulation analysis of these strategies, we highlight the trade-offs they entail. We conclude that, while adopting an appropriate strategy is important, the key ingredient in a long-term spending plan is flexibility: The more investors can tolerate some short-term fluctuations in spending, the more likely they are to achieve their longer-term goals.

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As investors plan for retirement, one of their most difficult decisions is to select a spending strategy that will provide an ample income stream for their lifetime. What makes this so challenging is that many of the critical factors that affect the decision are completely out of the investor's control and are entirely unpredictable. Investors have no control over the returns of the investment markets, the rate of inflation, or even the length of their planning horizon (life expectancy). Each of these variables has a significant impact on how much an investor can "safely" withdraw from a portfolio so as to maximize current consumption while preserving the potential to generate future income for an unknown period.¹

Many strategies have been devised to help investors deal with these uncertainties, each placing a different emphasis on the competing goals. An investor's decision will depend on his or her assessment of the trade-offs. In this paper we focus on two of the most common strategies, *dollar amount grown by inflation* and *percentage of portfolio*, and we introduce a third—a hybrid of the others that we view as a more dynamic approach. This third method, *percentage of portfolio with ceiling and floor*, incorporates balance: Spending is relatively consistent while remaining responsive to the financial markets' performance, thereby helping to sustain the portfolio.

An important note: We examine each strategy in its purest form—as if an investor were to adhere to the strategy blindly, without making any changes over the investment horizon. In the real world, of course, such a situation neither could nor should exist. Because circumstances constantly change, investors and their financial counselors need to review portfolio performance and strategy regularly to assess the status of spending plans. Nonetheless, we believe that examining the strategies in this pure form can help investors evaluate the trade-offs involved.

All of the analyses in this paper assume that retirement assets are invested in a diversified portfolio of equities and fixed income holdings, and that a systematic withdrawal strategy is employed to generate income. It's important to note that there are other ways to obtain income from a portfolio. Purchasing an income annuity is one example, and the marketplace continues to introduce other products aiming to provide lifetime income benefits.

Notes on risk:

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.

All investments are subject to risk. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income. Diversification does not ensure a profit or protect against a loss in a declining market.

¹ For more information on withdrawal rates, including hypothetical examples, see Appendix A.

Figure 1. The spectrum of spending strategies

| Dollar amount grown by inflation | Percentage of portfolio with ceiling and floor | Percentage of portfolio |
|---|--|--|
| Method | | |
| Calculate a dollar amount in the first year; adjust it for inflation as time goes by. | Withdraw a specific percentage of the portfolio each year subject to upper and lower limits based on the prior year's spending. | Withdraw a specific percentage of the portfolio each year. |
| Key characteristics | | |
| Ignores market performance. | Somewhat responsive to market performance. | Highly responsive to market performance. |
| Provides short-term spending stability. | Spending may fluctuate in the short term but is held within limits. | Spending may fluctuate significantly in the short term. |
| Long-term effect on the portfolio can be unpredictable. | If the markets decline significantly, the portfolio's principal could fall far enough to require reductions in future spending beyond the "floor." | The portfolio is never depleted; however, long-term spending levels depend on both market performance and investment strategy. |

Source: Vanguard.

The three strategies: A look at 10,000 outcomes for each

Figure 1 provides a high-level synopsis of the three spending strategies. To illustrate the trade-offs among these three strategies, we simulated 10,000 potential scenarios for each of them, employing a computer model that estimates future returns for broad asset classes.² Each scenario generated a cash-flow path based on the following assumptions:

- Time horizon: 35 years.
- Portfolio asset allocation: 35% U.S. stocks/ 15% international stocks/50% U.S. bonds, rebalanced annually.

- Starting balance: \$1 million.
- First-year spending: 4.75% of the portfolio (or \$47,500).
- Taxes are paid from the withdrawn amounts.

Figure 2, on page 4, summarizes the resulting statistics for each spending strategy. Investors can use statistics such as these to help evaluate the trade-offs between strategies. The following discussion looks at those trade-offs in more detail.

² See Appendix B for details about the model and the analysis, including return assumptions.

Figure 2. Summary statistics for the three spending strategies

| | Spending strategy | | |
|---|----------------------------------|---|-------------------------|
| | Dollar amount grown by inflation | Percentage of portfolio with ceiling and floor (assuming 5% ceiling and 2.5% floor) | Percentage of portfolio |
| Portfolio survival rate (assets not depleted over 35 years) | 71% | 89% | 100% |
| Real (inflation-adjusted) ending asset balances: | | | |
| Maximum | \$48,950,000 | \$36,174,700 | \$16,756,600 |
| Median | \$752,200 | \$798,500 | \$1,017,800 |
| Minimum | \$0 | \$0 | \$54,300 |
| Real annual spending as a percentage of initial spending: | | | |
| Maximum | 100% | 525% | 1,421% |
| Median | 100% | 100% | 97% |
| Minimum | 0% | 0% | 6% |
| Percentage of time real spending drops below initial spending | 8% | 48% | 53% |

Source: Vanguard.

Dollar amount grown by inflation

Under the *dollar amount grown by inflation* strategy, the investor decides on a dollar amount of spending in the initial year of retirement. To determine the spending amount in each subsequent year, the investor multiplies the prior year's spending by an inflation factor—typically the change in the Consumer Price Index.

This strategy is indifferent to the performance of the capital markets, with the result that investors may accumulate unspent surpluses when markets perform well and face spending shortfalls when markets provide poor returns.³ In either case, the strategy provides short-term spending stability;

however, the long-term consequences (positive or negative) can be significant if an investor does not make as-needed adjustments along the way.

For example, in our simulation, the portfolio following this approach would have survived only 71% of the time, meaning that in 2,900 of the 10,000 scenarios the investor would have run out of money within 35 years. Among the three methods, this represented the highest likelihood of prematurely depleting assets. However, this method resulted in a decrease in real spending only 8% of the time, meaning that 92% of the time the real spending from the portfolio met the initial spending target. It is important to note, though, that when real spending did drop, it most likely went to zero.

³ See Scott, Sharpe, and Watson (2009).

Percentage of portfolio

As the name implies, the *percentage of portfolio* strategy bases annual spending on a stated portion of the portfolio's value at the end of the prior year. As a result, this strategy is strongly linked to the performance of the capital markets. Because spending levels vary based on investment returns, short-term planning can be problematic, especially if the majority of an investor's spending is nondiscretionary.

On the other hand, this strategy builds in regular adjustments: Spending is automatically cut back when the markets have been doing poorly, and automatically increased after periods when the markets have done well. Thus, poor investment returns are at least partially offset by reductions in current spending. Such cutbacks help to preserve the portfolio value and thereby sustain future spending. As a result, over the longer term, the *percentage of portfolio* strategy provides for at least some level of annual spending. Although the dollar amount may decrease over time (if market conditions are poor), spending will never drop to zero because the portfolio is never depleted.

For example, in our simulation, following this approach, the portfolio survival rate was 100%, meaning that in all 10,000 paths the investor had a positive inflation-adjusted ending asset balance after 35 years (as compared with 71% for the *dollar amount grown by inflation* strategy). The trade-off is that the investor's annual income stream fluctuated; 53% of the time the investor's annual income (on a real basis) fell below the initial target (compared with 8% for the *dollar amount grown by inflation* strategy). In addition, although the portfolio balance is never depleted, it can drop substantially, causing a significant reduction in annual spending. In the worst case among our scenarios, real annual spending dropped to 6% of the initial spending amount (i.e., 6% of \$47,500, or \$2,850).

Percentage of portfolio with ceiling and floor

To address the pitfalls of these commonly used spending strategies, investors can employ a more dynamic method: applying a ceiling and a floor to percentage-based withdrawals. In essence, this strategy is a hybrid of the two others.

As in the *percentage of portfolio* strategy, the investor calculates each year's spending by taking a stated percentage of the prior year-end portfolio balance. The investor also calculates a "ceiling" and "floor" by applying chosen percentages to the prior year's spending amount. The investor then compares the three results. If the newly calculated spending amount exceeds the ceiling, the investor limits spending to the ceiling amount; if the calculated spending is below the floor, the investor increases spending to the floor amount.

Although spending will vary from year to year based on what the markets do, it is not allowed to go beyond a set range as long as assets remain—a factor that can assist with short-term planning. The strategy allows investors to benefit from good markets by increasing their spending, while in less favorable periods it prompts them to adjust spending downward, thereby supporting the portfolio's longevity. By periodically monitoring the portfolio and allowing for some flexibility in annual spending based on recent market performance, investors can improve their likelihood of meeting long-term financial goals.

Keep in mind, however, that although this strategy does provide for some reduction in spending in poor markets, it does not preclude the possibility of a substantial decline in the portfolio's principal, which could require spending to drop below the "floor" and could even result in premature portfolio depletion. In our simulation—which assumes a ceiling of 5% and a floor of 2.5%—89% of the paths resulted in a positive ending portfolio balance after 35 years. As expected, this value lies between the survival rates for the other two approaches (71% and 100%).

When it comes to real annual spending amounts, applying the ceiling and floor constrains the upside as well as the downside. In our simulation, the highest annual spending level reached with this strategy was 525% of the original target; by contrast, the *percentage of portfolio* strategy reached a maximum of 1,421%. On the other hand, the ceiling/floor limits produced fewer scenarios in which annual spending fell below the target level: 48%, compared with 53% for the *percentage of portfolio* strategy. These differences reflect the moderation imposed by the ceiling and floor.

When compared with the *dollar amount grown by inflation* strategy, the ceiling/floor method had a higher maximum-spending scenario (525% of the original target versus 100%), but it also had many more cases in which spending dropped below that target (48% versus 8%). This is because, under the *dollar amount grown by inflation* strategy, inflation-adjusted spending is kept at a constant level, instead of being allowed to rise to a ceiling or held up above a floor.

The primary consideration for the *percentage of portfolio with ceiling and floor* strategy is the selection of the upper and lower percentages that will be applied to the prior year's spending. The narrower the spread between them, the more similar this strategy is to the *dollar amount grown by inflation* strategy, and the more likely that the portfolio could reach a crisis point at some time in the future. The wider the difference between the ceiling and floor percentages, the more similar this strategy is to the *percentage of portfolio* strategy. That is because calculated spending reaches the ceiling or floor infrequently, leaving the withdrawal percentage as the primary factor in annual spending fluctuations.

To demonstrate this point, we repeated the ceiling/floor simulation analysis with two variations: a 0% ceiling and floor, and a 10% ceiling and floor. As

shown in **Figure 3**, the results for those variations are quite similar to the results for the two other strategies, which are shown in Figure 2. This is because the 0% variation—in which inflation-adjusted spending has no room to fluctuate—is essentially the same as the *dollar amount grown by inflation* strategy, and the 10% variation, with its hard-to-reach limits, is quite similar to the *percentage of portfolio* strategy. The outcomes for other ceiling/floor combinations between 0% and 10% would likely fall between these values.

Conclusion

While believing it's useful to analyze these conceptual spending frameworks, we recognize that most investors determine their annual spending in a less rigid way. Certainly no strategy should be followed blindly; indeed, it is essential for investors to periodically evaluate their income strategies, assess their portfolios, and consider whether alterations are needed. Still, working through calculations such as these on an annual basis can assist investors with their long-term planning and help them move toward the realization of their financial goals.

In our view, *flexibility* is the word that best describes a prudent spending strategy. Rigid spending rules cannot eliminate investment volatility; they simply push its consequences into the future. Spending strategies insensitive to returns are risky, inasmuch as they rely on the assumption that the portfolio will recover before a crisis point is reached, at which time much more dramatic reductions in spending would be necessary. If the portfolio is to rely on the capital markets for growth, then investors must either accept continuous, relatively smaller changes in spending or else run the risk of having to make abrupt and significantly larger adjustments later. The more investors can tolerate some short-term fluctuations in spending, the more likely they are to achieve their longer-term goals.

Figure 3. Percentage of portfolio with ceiling and floor: Summary statistics for the three strategies

| | 0% ceiling, 0% floor | 5% ceiling, 2.5% floor | 10% ceiling, 10% floor |
|--|-------------------------|---------------------------|---------------------------|
| Portfolio survival rate | 71% | 89% | 100% |
| Real (inflation-adjusted) ending asset balances: | | | |
| Maximum | \$48,950,000 | \$36,174,700 | \$20,416,000 |
| Median | \$752,200 | \$798,500 | \$970,500 |
| Minimum | \$0 | \$0 | \$11,000 |
| Real annual spending as percentage of initial spending: | | | |
| Maximum | 100% | 525% | 1,690% |
| Median | 100% | 100% | 99% |
| Minimum | 0% | 0% | 5% |
| Percentage of time real income drops below initial spending | 8% | 48% | 52% |

Source: Vanguard.

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Appendix A

General guidelines for setting initial withdrawal rates

The desired amount of annual spending is unique to each investor, but several factors are generally worth considering when determining the target level. Investors should try to envision the lifestyle they would like to have during retirement (if there are any bequest goals, these should be included in planning from the start). From there, investors should determine how much annual spending they would need to support the desired lifestyle, recognizing that over the course of retirement their needs are likely to evolve. For example, early in retirement travel and entertainment may be the priority, whereas in later years health and long-term care costs may be more important. Finally, investors should estimate what percentage of their annual spending is nondiscretionary; i.e., payments that must be made irrespective of yearly income. This information will help them weigh the trade-offs involved in choosing a spending level appropriate for their circumstances.

For general reference, we calculated initial withdrawal rates that would give a hypothetical portfolio an *85% chance of survival* under various circumstances. The tables in **Figure A-1** show these rates for two strategies—*dollar amount grown by inflation* and *percentage of portfolio with ceiling and floor*—based on various asset allocations and time horizons. It's important to note that income taxes were not part of the calculation; an investor would need to pay any taxes from the withdrawn amounts.

The tables do not reflect any investor's circumstances and must not be taken as advice, but they do illustrate the potential benefit of a flexible approach. The ability to tolerate annual fluctuations in income within a specified range is accompanied by higher initial withdrawal rates. The ceiling/floor strategy, assuming a 5% ceiling and a 2.5% floor, allows for initial withdrawal rates that are from 0.50 to 1.25 percentage points above those for the inflation-based strategy.

Figure A-1. Initial withdrawal rates providing an 85% chance of survival for hypothetical portfolios

Important notes:

- The 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.
- The computer model we used and its assumptions are described in Appendix B.

a. Dollar amount grown by inflation

| Portfolio | Initial withdrawal rate | | | |
|--------------|-------------------------|-----------------|-----------------|-----------------|
| | 10-year horizon | 20-year horizon | 30-year horizon | 40-year horizon |
| Conservative | 10.00% | 5.50% | 4.00% | 3.25% |
| Moderate | 10.25 | 5.75 | 4.50 | 3.75 |
| Aggressive | 10.25 | 5.75 | 4.50 | 3.75 |

b. Percentage of portfolio with ceiling and floor (assuming a 5% ceiling and 2.5% floor)

| Portfolio | Initial withdrawal rate | | | |
|--------------|-------------------------|-----------------|-----------------|-----------------|
| | 10-year horizon | 20-year horizon | 30-year horizon | 40-year horizon |
| Conservative | 11.25% | 6.75% | 5.25% | 4.50% |
| Moderate | 11.25 | 6.75 | 5.25 | 4.50 |
| Aggressive | 11.00 | 6.50 | 5.00 | 4.25 |

Appendix B

This paper attempts to help investors assess the trade-offs in withdrawal strategies by looking at a range of potential outcomes assuming different asset-class returns, inflation rates, and spending strategies. To generate the outcomes, we employed the Vanguard Capital Markets Model (VCMM), a proprietary, state-of-the-art financial simulation tool developed and maintained by Vanguard's Investment Counseling & Research and Investment Strategy Groups.

The VCMM forecasts distributions of future returns for a wide array of broad asset classes. These 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 markets, and certain alternative investment strategies. The asset return distributions shown in this paper are drawn from 10,000 VCMM simulations based on market data and other information available as of March 31, 2010.

The VCMM is grounded on the empirical view that the returns of various asset classes reflect the compensation investors receive for bearing

different types of systematic risk (or beta). Using a long span of historical monthly data, the VCMM estimates a dynamic statistical relationship among global risk factors and asset returns. Based on these calculations, the model uses regression-based Monte Carlo simulation methods to project relationships in the future. By explicitly accounting for important initial market conditions when generating its return distributions, the VCMM framework departs fundamentally from more basic Monte Carlo simulation techniques found in certain financial software. The reader is directed to the research paper *Vanguard Capital Markets Model* (Wallick et al., 2009) for further details.

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 diversification benefits of various asset classes. Although central tendencies are generated in any return distribution, Vanguard stresses that focusing on the full range of potential outcomes for the assets considered, such as the data presented in this paper, is the most effective way to use VCMM output.



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