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Revisiting the '4% spending rule'

Vanguard research

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Executive summary. Today's low-yield environment, combined with a prevailing market and economic outlook that low yields and low growth may persist in the United States for years to come (Davis, Aliaga-Díaz, and Patterson, 2011), has brought the "4% spending rule" for investment portfolios to the forefront of retirement-planning topics. This paper examines the current yield environment for a balanced portfolio, revisits the assumptions of the 4% spending rule of thumb, and discusses cost and risk considerations for today's retirees.

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The current low-yield environment that retirees are facing is much different than the investment climate of 30 years ago. This has important implications for the amount that a retiree can safely expect to spend annually from a portfolio without jeopardizing its durability. This paper updates Vanguard's perspectives on the so-called 4% spending rule—a well-known guideline for portfolio spending at retirement—and also examines important cost and risk factors for retirees. First, a word about today's yields, followed by a note on inflation.

How low are yields today?

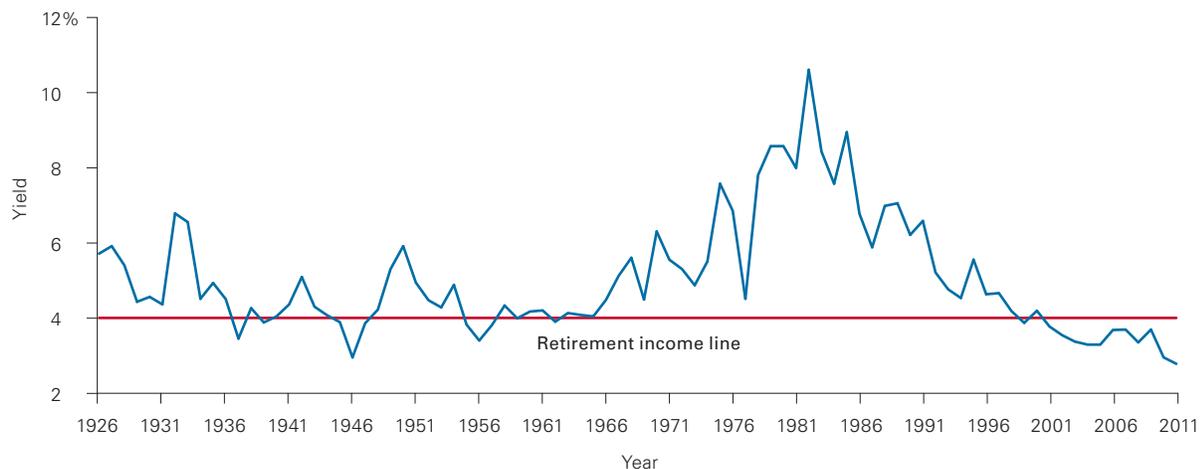
For the majority of years from 1926 through 2011, the yield or income return on a 50% stock/50% bond portfolio exceeded 4% (see Figure 1). Over the last several decades, however, the yield for such a balanced portfolio has been steadily decreasing. At its peak, in 1982, the portfolio's average yield was 10.6%; by year-end 2011, the yield had dropped to 2.8%.

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. VCMM results will vary with each use and over time. Please see page 9 for more information on the VCMM.

A conservative asset allocation in this paper is considered to be 20% stocks/80% bonds; a moderate asset allocation is 50% stocks/50% bonds; and an aggressive asset allocation is 80% stocks/20% bonds. For stock allocations, we assumed a 70% allocation to U.S. stocks and a 30% allocation to international stocks.

Notes on risk: All investments, including a portfolio's current and future holdings, are subject to risk. Past performance is no guarantee of future returns. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index. Investments in bond funds are subject to interest rate, credit, and inflation risk. Investors in any bond fund should anticipate fluctuations in price, especially for longer-term issues and in environments of rising interest rates. U.S. government backing of Treasury or agency securities applies only to the underlying securities and does not prevent share-price fluctuations. Foreign investing involves additional risks, including currency fluctuations and political uncertainty. Diversification does not ensure a profit or protect against a loss in a declining market.

Figure 1. Yields for U.S. balanced portfolios (50% stock/50% bond): 1926 through 2011



Notes: U.S. equity returns are represented by the Standard & Poor's 90 Index from 1926 through March 3, 1957; the S&P 500 Index from March 4, 1957, through 1974; the Wilshire 5000 Index from 1975 through April 22, 2005; and the MSCI US Broad Market Index from April 23, 2005, through December 31, 2011. U.S. bond market returns are represented by the S&P High Grade Corporate Index from 1926 through 1968; the Citigroup High Grade Index from 1969 through 1972; the Lehman Brothers U.S. Long Credit AA Index from 1973 through 1975; the Barclays U.S. Aggregate Bond Index from 1976 through 2009; and the Barclays U.S. Aggregate Float Adjusted Index from 2010 through December 31, 2011.

Source: Vanguard.

Thus, for the majority of 20th-century retirees, spending 4% from a balanced stock/bond portfolio could have been a realistic spending target, funded primarily with cash flows (dividends and interest income) from their portfolios. But with today's yields at historic lows and retirees often reluctant to spend from the principal, many are questioning whether 4% is an appropriate and/or feasible goal. Vanguard believes that 4% is still a reasonable starting point for investors who follow a total-return spending approach—that is, an approach in which they remain properly balanced between stocks and bonds, and diversified within asset classes, so that their portfolios can potentially benefit from both dividends and capital appreciation. For example, instead of attempting to alter their portfolios by overweighting bonds, increasing bond duration, or overweighting income-yielding stocks, investors using the total-return approach allow for spending both from portfolio cash flows and from the potential increase in their portfolios' value (see Jaconetti, 2007).

Note also that the 4% spending rule is a *dollar amount grown by inflation* withdrawal program; thus, inflation can have long-term implications on an investor's retirement portfolio. Vanguard believes it's important for investors to consider real-return expectations when constructing portfolios, since today's low stock dividend yields and U.S. Treasury bond yields are, in part, associated with lower expected inflation today than 20 or 30 years ago. Specifically, Vanguard's market and economic outlook indicates that the average annualized returns on a balanced 50% equity/50% bond portfolio for the decade ending 2021 are expected to center in the 3.0%–4.5% real-return range (Davis and Aliaga-Díaz, 2012). Although this level is moderately below the actual average real return of 5.0% for the same portfolio since 1926, it potentially offers support for the continued feasibility of a 4% inflation-adjusted withdrawal program as a starting point for balanced investors.

Figure 2. Withdrawal rates for hypothetical portfolios based on various allocations

a. Portfolio withdrawal rates assuming 85% success rate

Portfolio	Planning horizon (years)						
	10	15	20	25	30	35	40
Conservative	9.3%	6.3%	4.8%	4.0%	3.5%	3.1%	2.9%
Moderate	9.6	6.6	5.2	4.4	3.9	3.5	3.3
Aggressive	9.6	6.7	5.3	4.5	4.0	3.7	3.4

b. Portfolio withdrawal rates assuming 75% success rate

Portfolio	Planning horizon (years)						
	10	15	20	25	30	35	40
Conservative	9.7%	6.7%	5.2%	4.4%	3.8%	3.4%	3.2%
Moderate	10.4	7.3	5.9	5.0	4.5	4.1	3.8
Aggressive	10.7	7.7	6.2	5.4	4.9	4.5	4.3

Notes: Results are based on projections from the Vanguard Capital Markets Model as of December 31, 2011. See page 2 and this paper’s appendix for more information on VCMM-generated projections and asset-allocation assumptions. In this figure, respective portfolio success rates of 85% and 75% refer to the overall probability that a portfolio will not be depleted before the end of the planning horizon.

Source: Vanguard.

4% spending rule explained

The 4% spending rule states that retirees with a diversified portfolio split between stocks and bonds can safely withdraw 4% of their *initial* balance at retirement, adjusting the dollar amount for inflation each year thereafter.¹ This level of spending is intended to provide a stable, inflation-adjusted income stream that can potentially be sustained for 30 years, based on historical returns for stocks and bonds. There have been numerous studies on sustainable withdrawal rates, including the early research of William P. Bengen (1994) and what is commonly called the “Trinity study” of Cooley, Hubbard, and Walz (1998). Vanguard’s analysis supports a general initial withdrawal rate of roughly 4% for an investor with a “moderate” allocation (see Figure 2a and 2b).

Investors seeking to determine how much they can safely spend from their portfolio must balance their current spending needs with their need to grow or preserve their portfolios to support future spending. Although selecting a conservative withdrawal rate at the onset of retirement may be prudent, it’s unlikely, as Jaconetti and Kinniry (2010) have discussed, that a retiree will adhere to an inflation-adjusted withdrawal schedule. More realistically, retirees continue to monitor their portfolios and spending, adopting some level of flexibility to account for changes in market returns and unplanned spending needs.² Thus, the spending rule of thumb is meant to provide a simple framework, based on asset-class return data, to help an investor balance the need for current income with the need for portfolio longevity.

1 A *dollar amount grown by inflation strategy* is intended to provide a predictable stream of withdrawals that keep up with inflation. Conversely, using a *percentage-of-portfolio* withdrawal method, the retiree withdraws the same percentage annually from the prior year-end portfolio balance. The dollar amount will fluctuate with market performance, and although the portfolio balance and withdrawals may shrink, the portfolio is unlikely to ever be fully depleted. In practice, retirees are likely to incorporate a hybrid spending method—spending moderately in years when the market is up and spending less when the market experiences prolonged downturns.

2 Jaconetti and Kinniry (2010) examined percentage of portfolio and dollar amount grown by inflation withdrawal strategies, while modeling a hybrid of both methods. They concluded that although 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.

Figure 3. Levers that influence spending rates

	Lower spending rate	Higher spending rate
Time horizon	Longer	Shorter
Asset allocation	More conservative	More aggressive
Portfolio success rate	Higher	Lower

Source: Vanguard.

We next revisit some assumptions of the 4% spending rule and review the key variables that affect spending levels—namely, the retirement time horizon, the portfolio asset allocation (and accompanying return assumptions), and the desired level of “certainty” regarding portfolio success rates (that is, the likelihood of not running out of money prematurely). **Figure 3** summarizes how these variables affect spending rates.

Retirement time horizon

The factor that has the biggest impact on withdrawal rates is the retirement-planning horizon. For most people, an estimate of how long the retirement portfolio will be needed can be based on the investor’s current health and anticipated longevity, as determined by statistics and family history. An estimate of age 95 is a reasonable default, given today’s longer life expectancies. For a 65-year-old married couple today, for example, there is an 80% chance that at least one spouse will live to age 85, a 55% chance that one will live to age 90, and a 25% chance that one will reach age 95.³

For our analysis, we ran simulations using the Vanguard Capital Markets Model (VCMM), a proprietary financial simulation tool (see page 2 and the appendix, for additional details on the VCMM).⁴ Figure 2’s tables illustrate various spending rates over different time horizons. The tables represent the initial percentage of spending from the portfolio that, adjusted annually for inflation, would have resulted in a reasonable probability of not depleting the portfolio. If a retiree is planning a long retirement

horizon, such as more than 30 years, then, not unexpectedly, our analysis shows that portfolio spending levels should be lowered. By the same token, if a retiree begins spending from the portfolio later in retirement (and thus has a shorter time horizon), the portfolio may be able to sustain a greater initial spending level, above 6%.

Portfolio asset allocation

Over the long term, a portfolio’s asset allocation and return assumptions can have a substantial impact on the portfolio’s sustainability. A more aggressive portfolio with a greater allocation to stocks may be able to support higher spending levels but will also result in a higher variability of returns. A more conservative allocation may support more modest spending over the long term.

For example, Figure 2a shows that, for an investor with a 30-year time horizon and assuming an 85% success rate (that is, an 85% probability that a portfolio will not be depleted before the end of the time horizon), an aggressive portfolio allocated 80% stocks/20% bonds would likely have supported a 4% initial spending rate, but a conservative portfolio of 20% stocks/80% bonds would likely have supported a rate of 3.5%. Investors must balance market risk (or short-term portfolio volatility) with shortfall risk (the risk of not being able to fund a future goal).

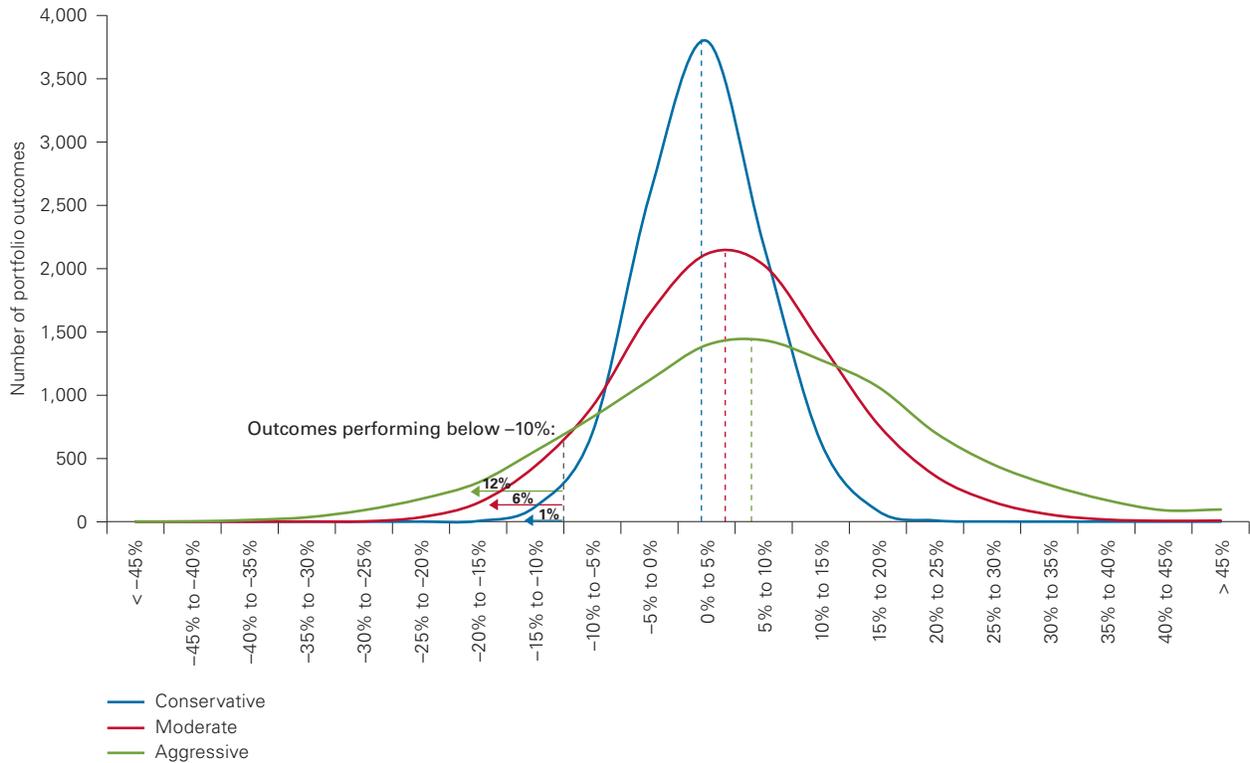
Portfolio success rates

Simulating a portfolio’s success rate is a common way to assess whether a portfolio is at risk of being depleted before the end of the planning horizon. Different investors require varying levels of “certainty” that they will not run out of money. To illustrate this point, Figure 2b repeats the preceding asset allocation analysis, this time assuming a 75% success rate. In this case, a likely successful withdrawal rate for a moderate investor with a 30-year time horizon was 4.5%, compared with 3.9% given an 85% success rate.

³ Calculations are based on mortality data from the Society of Actuaries Retirement Participant 2000 Table (RP-2000), projected generationally.

⁴ Readers should view the outcomes in this paper’s figures as estimates only, since they can vary from actual outcomes.

Figure 4. Distribution of hypothetical portfolio returns in first year of simulations



Notes: This figure's projections, generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes, are based on U.S. dollars as of December 31, 2011. See page 2 and this paper's appendix for more information on VCMM projections and asset-allocation assumptions.

Source: Vanguard.

It's important to emphasize with these portfolio simulations that there is still a real risk of running out of money before the end of the planning horizon. With simulations that assumed an 85% success rate, there was yet a 15% risk that the portfolio would fall short. Also, lowering the success rate to 75% might be attractive—because it potentially allowed for increased flexibility in spending—but the trade-off was a 25% chance of running out of money.

We acknowledge with this analysis that there was not a significant difference in spending rates between the moderate and aggressive allocations overall. Nevertheless, substantial risks are involved when considering a more aggressive portfolio.

Figure 4 examines the distribution of returns for our portfolios in the first year of our simulations.

The figure makes apparent that the return distribution was much wider for more aggressive portfolios, meaning that although there were greater opportunities for higher returns, there were also greater possibilities for lower returns. This, combined with high inflationary periods, is commonly considered the *downside* risk of a dollar amount grown by inflation spending strategy. For example, when we looked at outcomes performing below -10%, the percentage rose drastically with increased risk, from 1% for the conservative portfolios, to 6% for the moderate portfolios, and to 12% for the aggressive portfolios. This downside risk should not be overlooked when considering the appropriate asset allocation and spending strategy. This is especially important for investors who are spending from their portfolios. Typically, such investors have a more limited ability to withstand significantly negative

returns, which are more likely to occur over one- and three-year periods with higher allocations to equities. Although equities are expected to outperform bonds over longer time periods, one of the trade-offs for the outperformance is that investors should expect an increase in negative outcomes over short-term periods. Furthermore, investors need to stay invested to achieve the longer-term returns associated with higher equity allocations. If a significant drop in a portfolio's value over a one- or three-year period would cause an investor to abandon his or her asset allocation, it may be that the investor's portfolio is invested too aggressively.

The hidden impact of costs

Although investors can't control certain factors such as portfolio returns and inflation, they can control their investment costs, which reduce the amount they can spend from their portfolio dollar for dollar. To illustrate how retirees can better understand the impact of costs on spending levels, we repeated the previous analysis, except this time we factored in annual investment costs. Specifically, **Figure 5** models low- and high-cost investments (at varying asset allocations) with annual expense ratios of 0%, 0.25% and 1.25%, respectively, assuming a 30-year time horizon and an 85% portfolio success rate for each asset allocation category.

According to Figure 5, assuming the moderate investor retired with a \$300,000 portfolio and invested it in low-cost investments, he or she could potentially withdraw \$11,400 (3.8%) initially and adjust that amount for inflation thereafter. In a portfolio comprising high-cost funds, however, the amount potentially drops to \$9,900 (3.3%). Owing to the power of compounding, the impact of the higher-cost investment over 30 years could mean the retiree loses \$45,000 in spending power in today's dollars. Although a 1% difference in annual portfolio costs may not sound that significant, the impact on a retiree's spending could be substantial.

Figure 5. Hypothetical portfolio withdrawal rates assuming 30-year planning horizon

Portfolio	Planning horizon (30 years)		
	0-cost	Low-cost	High-cost
Conservative	3.5%	3.4%	2.9%
Moderate	3.9	3.8	3.3
Aggressive	4.0	3.9	3.4

Notes: This figure models expense ratios of 0% (for 0-cost investments), 0.25% (for low-cost), and 1.25% (for high-cost). The figure's projections, generated by the Vanguard Capital Markets Model, are based on U.S. dollars as of December 31, 2011, and assume an 85% overall portfolio success rate (see Notes to Figure 2, for definition of "success rate"). See page 2 and this paper's appendix for more information on VCMM projections and asset-allocation assumptions.

Source: Vanguard

Conclusion

Given an understanding of the relationships among key variables (time horizon, asset allocation, and portfolio success rates), an investor can develop a customized spending rate that provides the highest probability of meeting his or her long-term goals. As the analyses in this paper illustrate, sustainable withdrawal rates can range from 3% of a portfolio (for conservative investors with long time horizons) to more than 9% (for more aggressive investors with shorter time horizons)—all with a high probability of not depleting assets during the specified time horizons. Although these spending guidelines can be broadly applied, each investor's situation includes unique circumstances that can affect portfolio spending and sustainability.

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Appendix. Description of VCMM and asset allocation and return assumptions

Vanguard Capital Markets Model. The Vanguard Capital Markets Model (VCMM) is a proprietary financial simulation tool developed and maintained by Vanguard Investment Counseling & Research and the Investment Strategy Group. The VCMM uses a statistical analysis of historical data for interest rates, inflation, and other risk factors for global equities, fixed income, and commodity markets to generate forward-looking distributions of expected long-term returns. 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 December 31, 2011.

The VCMM is grounded in 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, Aliaga-Díaz, and Davis, 2009) for further details.

The projections or other information generated by the 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. VCMM results will vary with each use and over time.

Asset allocation and return assumptions. The asset-return distributions in this paper are based on 10,000 simulations from the VCMM, reflecting 30 years of forward-looking simulations through December 2011. The VCMM uses a statistical analysis of historical data to create forward-looking expectations for the U.S. and international capital markets. The model uses index returns, without any fees or expenses, to represent asset classes. Taxes are not factored into the analysis. Inflation is modeled based on historical data from 1962 through 2011 and simulated going forward.

Unless otherwise noted, for all the figures in this paper, U.S. stocks are represented by the Wilshire 5000 Composite Index; U.S. bonds are represented by the Barclays U.S. Aggregate Bond Index; international stocks are represented by the Morgan Stanley Capital International Europe, Australasia, and Far East (MSCI EAFE) plus Emerging Markets Index; inflation is calculated from the Consumer Price Index; and intermediate Treasury Inflation Protected Securities (TIPS) and cash positions are derived from underlying U.S. Treasury yield data from the Federal Reserve Board.



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