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April 2022

What can new retirees withdraw from a portfolio? A scenario analysis

- The past few decades have been a good time to spend from a retirement portfolio. Returns have been strong, inflation low. Secondary capital market dynamics have also helped. Inflation volatility and asset class volatility have both declined, and stock/bond correlations have plumbed historical depths, supporting high portfolio withdrawals.
- At the start of 2022, these dynamics seemed to be changing. Return expectations were subdued. Inflation and inflation volatility spiked. And stock/bond correlations were on the rise.
- We look at historical return environments to estimate how changes in volatility and correlation might interact with lower expected returns to affect a portfolio's sustainable withdrawal rate. We develop three scenarios—downside, baseline, and upside—which produce sustainable inflation-adjusted withdrawal rates of 2.8%, 3.0%, and 3.3%.

From 1997 through 2020, U.S. stocks, as measured by the S&P 500 Index, returned an annualized 8.9%. U.S. 10-year Treasury bonds returned 5.4%. Inflation hit historical lows, and the correlation between stock and bond returns turned deeply negative, enshrining a golden age for diversification. Despite brutal stock market declines in the dot-com crash and the 2008 global financial crisis, it was a good time to spend from a retirement portfolio.

As a starting point for our investigations, we used the returns, volatilities, and asset class correlations from 1997 through 2020 to estimate what retirees could withdraw from a portfolio divided evenly between U.S. stocks and U.S. Treasury bonds if the conditions in this 24-year period prevailed for a full 30 years. In 85% of our simulations, a retiree could withdraw at least 5.4% of the portfolio's initial value the first year and then increase this amount by the inflation rate over the next three decades.[1]

At the start of 2022, however, the 1997–2020 capital market conditions seemed to be changing. High stock market valuations and low interest rates fueled consensus forecasts for lower expected returns. Inflation spiked, proving more stubborn than transitory. And stock/bond correlations crept higher.

1 Our simulations use the 1997–2020 mean stock and bond returns and inflation rates, return and inflation volatilities, and average asset class correlations over the 24-year period. We run 10,000 simulations based on these inputs. The retiree follows a fixed real-dollar withdrawal rule in which the annual withdrawal amount is set at the beginning of retirement and then adjusted for inflation over the next 30 years. The 5.4% initial withdrawal rate is the amount that prevents portfolio depletion in 85% of all simulations.

What might a changing return environment mean for those reaching retirement today? Like other researchers (Finke, Pfau, and Blanchett, 2013; Benz, Ptak, and Rekenthaler, 2021), we expect that sustainable withdrawal rates will decline, most likely falling short of the "4% rule" popularized by William Bengen (1994). Bengen found that inflation-adjusted withdrawals equal to 4% of the portfolio's initial balance would ensure portfolio solvency over *any* 30-year period since 1926.

How far short? We answer this question in two steps. First, we uncover how asset class dynamics have changed in three distinct regimes over the past 60 years. As inflation and monetary policy in each period changed, asset class correlations and inflation and bond market volatility also changed. We then explore how these asset class dynamics might interact with today's return and inflation outlook to determine a portfolio's sustainable withdrawal rate.

This analysis draws on baseline, upside, and downside scenarios. In our downside scenario, a retiree would be able to withdraw an inflation-adjusted 2.8% from a portfolio split between U.S. stocks and U.S. Treasury bonds. In the upside scenario, a retiree would be able to withdraw 3.3%.

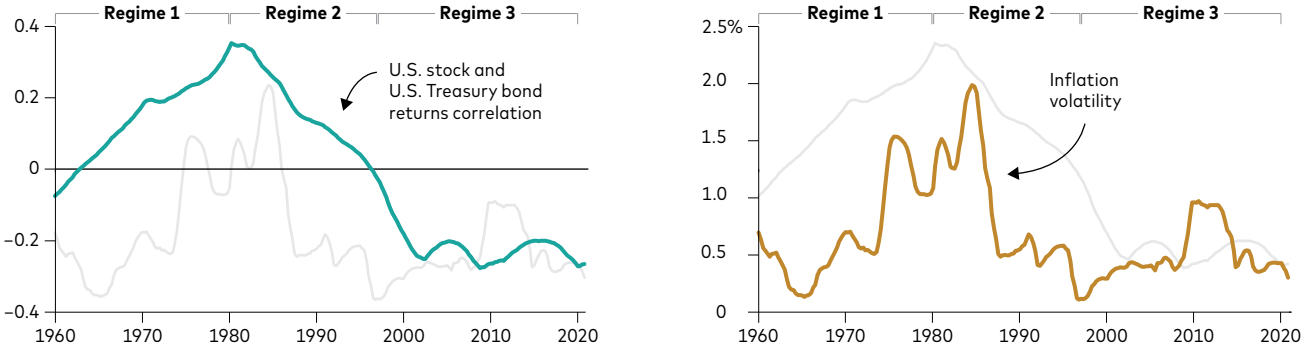
Uncertainty calls for scenario analysis

Scenario analysis is a powerful risk-management tool. It provides perspective on a range of potential outcomes to facilitate better decision-making. We anchor our three scenarios to the return and inflation forecasts from the Philadelphia Federal Reserve Bank's Survey of Professional Forecasters. As of March 31, 2021, this survey projected higher inflation (2.5% annually) and moderate-to-low stock (5%) and bond (2.5%) returns for the next decade.[2]

As illustrated in **Figure 1**, stock/bond correlations have varied with the inflation environment since 1960. We break these variations into three distinct regimes. We derive the correlations in each regime with a time-varying-parameter Bayesian vector autoregression framework, as detailed in Khang, Pakula, and Clarke (2022).[3] Our delineation is consistent with the three regimes found by Song (2017), who approached the analysis with a macroeconomic focus on inflation and monetary policy.

FIGURE 1.

As inflation has varied, stock/bond correlations have gone through three distinct regimes



Sources: Vanguard calculations, based on data from Morningstar, Inc. (intermediate-term U.S. government bond returns), Kenneth French's Data Library (U.S. total stock market return), and Robert Shiller's website (CPI) for the period from January 1, 1960, to December 31, 2020. Kenneth French's Data Library: mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html; Robert Shiller's website: http://www.econ.yale.edu/~shiller/data.htm.

2 We use these 10-year consensus forecasts, rather than Vanguard's 10-year projections (Davis et al., 2020), to emphasize the role of asset class dynamics and to minimize the role of variations among different forecasters' return projections. Note: Our analysis uses March 2021 consensus forecasts, before the post-2021 surge in inflation. The longer the current level of inflation persists, the more likely that we would need to update our scenario analysis to reflect the revision in consensus forecasts.

3 This Vanguard Portfolio Perspectives is based on "Sustainable Withdrawal Rates by Return Environment: A Time-Varying Bayesian Analysis," forthcoming in *The Journal of Retirement*. We direct readers to the *Journal* paper for a more comprehensive study of this topic.

We identify three regimes:

1. **1960–1980**. Stock/bond correlations are positive and rising, with an average correlation of 0.21. Inflation rises, with high volatility. Bond volatility is moderate.
2. **1981–1996**. Stock/bond correlations average 0.32 but decline from their early-1980s high. Inflation volatility declines, and bond market volatility soars, averaging 8.1%, a historical high.
3. **1997–2020**. Stock/bond correlations plummet, averaging –0.15 for the 24-year period. Inflation averages 1.4%, and average inflation volatility hits a historical low of 0.8%.

We use the correlations and volatilities from these regimes to model our upside, baseline, and downside scenarios. In all three scenarios, expected returns and inflation are the same: 2.5% for bonds, 5.0% for stocks, and 2.5% for inflation. Differences in sustainable withdrawal rates reflect differences in asset class correlations and volatilities.

1. **Upside scenario**. As inflation rises, the capital markets adjust instantly to the new long-term level. Bond and inflation volatility resembles that of the 1997–2020 period, and stock/bond correlation remains negative. Inflation volatility is low (0.8%), bond volatility reaches a historical low (2.6%), and stock/bond correlations track their 1997–2020 average (–0.15).
2. **Baseline scenario**. Bond market and inflation volatility rises. Stock/bond correlations turn positive but remain below historical highs. Inflation volatility is 2%, its 1960–1980 average. Bond volatility rises to 4.5% and the stock/bond correlation averages 0.22; these values are consistent with 1981–1996 averages.
3. **Downside scenario**. The transition to higher inflation triggers significant volatility in inflation and bonds. Stock/bond correlations match their post-1960 highs. Inflation volatility rises to 2.5%, slightly higher than its 1960–1980 peak. Bond volatility rises to 8.1%, and stock/bond correlations reach 0.32, matching their 1981–1996 average.

Simulating sustainable withdrawal rates

Our portfolio allocation and spending strategies build on the design from Bengen's research:

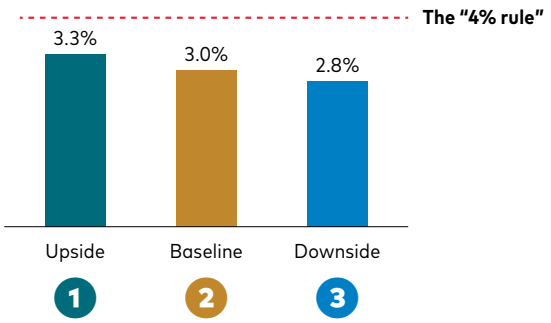
- The sustainable withdrawal rate is the fixed real dollar amount, expressed as a percentage of the initial portfolio balance, that prevents depletion in 85% of all simulations over 30 years.
- The retiree holds a portfolio split evenly between U.S. stocks and U.S. intermediate-term government bonds, rebalanced quarterly.

Figure 2 displays three scenarios for sustainable withdrawal rates over the next 30 years. We also include a 4% withdrawal rate to illustrate how our scenarios' rates compare with this ubiquitous rule of thumb.

FIGURE 2.

Sustainable portfolio withdrawal scenarios for 2022 retirees—three scenarios

Annual inflation-adjusted withdrawal rates (estimated for the 30 years ending 2052)



Notes: The sustainable withdrawal rate assumes a percentage withdrawal from the portfolio's initial balance that can be increased by the inflation rate over the 30 years starting in 2022. At this rate, the portfolio would avoid depletion in 85% of all simulations.

Sources: Vanguard calculations, based on data from the Survey of Professional Forecasters, Morningstar, Inc. (intermediate-term U.S. government bond returns), Kenneth French's Data Library (U.S. total stock market return), and Robert Shiller's website (CPI). Kenneth French's Data Library: mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html; Robert Shiller's website: http://www.econ.yale.edu/~shiller/data.htm.

Like other researchers, we project that sustainable inflation-adjusted withdrawal rates in the next few decades will fall below historical rates. We enhance this insight by demonstrating that sustainable spending depends not only on returns but also on volatility and correlation.

The value of a risk-management mindset

In the decades ahead, an investment portfolio's sustainable withdrawal rate is likely to fall short of its historical levels. By how much? The answer depends not only on prospective returns, but also on evolving relationships among returns, inflation, volatility, and their cross correlations. We analyze historical return regimes to capture these dynamics. We use these insights to develop scenarios that could drive sustainable withdrawal rates from 2.8% to 3.3%.

Compared with the 4% rule, these estimates are low, but hardly catastrophic. Even if the prospective return environment mirrors the worst regime in the past 60 years, analysis suggests that retirees can count on a 2.8% withdrawal rate. And for investors approaching retirement now, that rate would be applied to portfolio values that have benefited from strong stock and bond returns over the past few decades.

These scenarios can help investors and their advisors approach retirement spending with a risk-management mindset. Those who worry that rising inflation will produce significant volatility and rising asset class correlations may target spending at the lower end of the range. Those who expect that the favorable dynamics of the past two decades will continue may target the higher end. And those with a different return outlook may target a rate outside this range.[4]

Our scenarios can serve as a starting point for these discussions.

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4 Our analysis assumes that the subdued return forecasts for the next decade will persist for the full 30 years. This assumption is reasonable. As retirees spend from a portfolio, return levels and dynamics in the first decade have an outsized impact on a portfolio's long-term solvency. That said, some may be inclined to assume that stock and bond returns revert toward longer-term (higher) historical averages after 10 lean years in the beginning of their retirement. In unreported analysis, we consider this alternative and find that the sustainable withdrawal rates would be about 0.5% higher in all three scenarios.

Appendix

Prospective sustainable withdrawal rates in three different transitions to the consensus expectation of higher inflation.

APPENDIX 1.

Sustainable withdrawal rates for three scenarios with consensus forecast, including correlations

		Median	Volatility	Sustainable withdrawal rate
1 Upside scenario	Stock	5.0%	18.0%	
	Bond	2.5	2.6	3.32%
	Inflation	2.5	0.8	
2 Baseline scenario	Stock	5.0%	17.6%	
	Bond	2.5	4.5	3.02%
	Inflation	2.5	2.0	
3 Downside scenario	Stock	5.1%	17.9%	
	Bond	2.5	8.1	2.83%
	Inflation	2.5	2.5	

Correlations

		Stock	Bond	Inflation
1 Upside scenario	Stock	1.00	–0.15	–0.03
	Bond	–0.15	1.00	0.06
	Inflation	–0.03	0.06	1.00
2 Baseline scenario	Stock	1.00	0.22	–0.07
	Bond	0.22	1.00	0.07
	Inflation	–0.07	0.07	1.00
3 Downside scenario	Stock	1.00	0.32	–0.08
	Bond	0.32	1.00	0.05
	Inflation	–0.08	0.05	1.00

Notes: Calculations are based on TVP-BVAR estimation of data from 1960 to 2020. They use the three return environments described in Figure 1 on page 2.

Sources: Vanguard calculations, based on data from the Survey of Professional Forecasters, Morningstar, Inc. (intermediate-term U.S. government bond returns), Kenneth French's Data Library (U.S. total stock market return), and Robert Shiller's website (CPI). Kenneth French's Data Library: mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html; Robert Shiller's website: http://www.econ.yale.edu/~shiller/data.htm.

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ISGWNRP 042022