Rethinking Safe Withdrawal Rates: The Meaning of Failure

By Wade Pfau
April 17, 2012

Merely knowing the probability that an investor’s wealth will be depleted at some point is not enough to build a retirement strategy. That is the traditional measure of failure in safe withdrawal studies, and it’s time to move beyond it.

Instead, investors should consider additional factors such as how long a retiree might live after depleting his or her wealth. One must also consider other retiree goals, such as spending as much possible or leaving a bequest, other income sources that may still be available when portfolios run dry, which dampen the impact of wealth depletion, and how much flexibility retirees have to reduce their spending, should the need arise.

Let’s look at how recent research reported in the Journal of Financial Planning – including some of my own – pushes toward a more complete perspective on defining the viability of retirement income strategies.

Methodology

By a withdrawal rate, for the purposes of this article, I mean the percentage of the portfolio an investor withdraws in the first year of retirement. Subsequent annual withdrawals adjust this amount for inflation. Withdrawals take place at the start of the year and do not account for taxes or fees.

My analysis below used Monte Carlo simulation incorporating historical means, standard deviations, and correlations for annual total returns data since 1926 from Ibbotson Associates' Stocks, Bonds, Bills, and Inflation (SBBI). Stocks were represented by the U.S. S&P 500 index (large-capitalization stocks). Bonds were intermediate-term U.S. government bonds. Applying inflation data, I calculated real asset returns, real remaining wealth, and inflation-adjusted withdrawal amounts.

My assumptions are generous, so a few caveats are in order. To be consistent with most existing research, I based my analysis on historical averages, though it is advisable to also reconsider these results in light of current low bond yields. Retirees may tend to live longer than implied by the mortality data used herein. Moreover, retirees will of course start cutting back on spending before their wealth dissipates entirely, but the fixed spending until depletion assumption used here at least demonstrates the eventual need, in some simulated outcomes, to lower the standard of living late in retirement.
Shortfall probabilities approach to retirement planning

The 4% safe withdrawal rate for systematic withdrawals from a volatile portfolio provides a rule of thumb designed to make failure less likely over the course of a 30-year retirement. (Failure, in this case, is narrowly defined as portfolio depletion at any point before the end). Since Bill Bengen’s seminal 1994 article on safe withdrawal rates, related studies have commonly used either historical or Monte Carlo simulations over a fixed time horizon to determine the probability of failure for different withdrawal rate and asset allocation strategies.

Figure 1 presents the classic Monte Carlo simulation approach to safe withdrawal rates over a 30-year horizon. Failure rates for the 4% rule are under 10% for stock allocations between 20% and 70%. A 40% stock allocation yields the lowest failure rate, just 7%. Though Bengen found that 4% always worked in historical simulations, my Monte Carlo simulations based on the same data show that wealth exhaustion is a possibility. Retirees increase their withdrawal rate above 4% at their peril; the lowest failure rate for a 5% withdrawal is 23%, with a 70% stock allocation. Higher withdrawal rates increase both the failure rates and optimal stock allocations.
Bequests

If a retiree has a specific bequest goal, meeting it requires a lower withdrawal rate and/or a higher stock allocation. The next figure shows the median real wealth remaining 30 years into retirement, represented in inflation-adjusted future values. Initial starting wealth is 100, so a bequest value of 100 preserves the undiscounted real purchasing power of the retirement date portfolio.

In figure 2, we see an upward trajectory in median remaining wealth as the stock allocation increases. Retirees using a 4% withdrawal rate could have preserved the real value of their initial principal with at least 30% stocks, and a 100% stock allocation increases the median real bequest to nearly 300.

Remember from figure 1, though, that these strategies have different failure rates. For lower withdrawal rates, the stock allocation that minimizes failure may be much lower than that which maximizes expected bequests. Joe Tomlinson’s article in the February 2012 Journal of Financial Planning, A Utility-Based Approach to Evaluating Investment Strategies, explores a new framework to evaluate tradeoffs between the desire to leave a bequest and the desire to avoid running out of wealth.

![Figure 2](image_url)
Survival probabilities

An alternative approach to the safe withdrawal rate question, advocated by researchers such as Moshe Milevsky and David Blanchett, incorporates specific survival probabilities with random life spans calibrated to mortality data.

To understand what motivates this alternative to fixed-retirement durations, first consider the survival probabilities data. Figure 3 shows the survival probabilities to each subsequent age for males, females, and at least one member of a same-age, opposite-sex couple, conditional on the individuals under consideration already having lived to age 65. The underlying data comes from the 2007 Social Security Administration Period Life Tables. From age 65, men have a life expectancy of 17 years, to age 82, while women live on average for another 20 years. The longest-living member of a couple can expect to live another 24 years, to age 89. Considering a traditional 30-year retirement duration assumption, for 65-year olds the probability of surviving another 30 years to age 95 is 6 percent for males, 12 percent for females, and 18 percent for at least one member of a couple.

The argument for using survival probabilities is that for a typical person retiring at age 65, conservatively assuming a 30-year remaining lifespan will needlessly cause investors to apply too low a withdrawal rate. In this view, the probability of running out of wealth should
be defined as the probability of running out of financial wealth before death, rather than within an arbitrarily long period of time.

This is important because, as I showed in Table 3 of my article *Capital Market Expectations, Asset Allocation, and Safe Withdrawal Rates* from the January 2012 *Journal of Financial Planning*, sustainable withdrawal rates do decline as time horizon increases. For a retiree willing to accept a 10% failure rate, a 10.1% withdrawal rate is fine over a 10-year horizon, or 7.1% for 15 years, 5.7% for 20 years, 4.8% for 25 years, 4.3% for 30 years, and so on. Someone planning for the 30-year retirement may end up using an overly conservative withdrawal rate.

Figure 4 shows the decrease in failure rates for a couple, incorporating simulated ages of death for each member. In some simulations, individuals at age 65 may live well over 30 or 40 years, but this approach effectively shortens the average retirement duration and decreases the failure rates connected to different strategies. Failure for 4% withdrawals falls from 7% to 4% with the optimal 40% stock allocation, while failure for 5% withdrawals falls from 23% to 14% and the optimal stock allocation falls from 70% to 50%.
Magnitude of failure

While failure rates are the most common way to present outcomes for withdrawal strategies, just knowing whether failure takes place at some unspecified point within the couples’ lifetime is not the only consideration. A number of researchers have investigated the magnitude of failure, which is defined as how much planned lifetime spending exceeds available wealth. Here I will investigate the number of years retirees may live without any remaining portfolio wealth. The key idea is that retirees may be more willing to accept failure if it means living only a brief period having depleted their wealth, rather than spending 10 or more years in this predicament. This willingness is closely linked to the availability of other income sources, as I will discuss in the next section.

Figure 5 shows one perspective for a couple both aged 65: the probability that at least one of them will experience at least “x” years (the number of years on the x-axis) without any wealth when using a 5% withdrawal rate. This analysis extends the probability of failure, which here is spending at least 1 year of retirement with no wealth. What I find interesting is the jump from 100% bonds to 100% stocks at about 12 years. A 100%-bond allocation is the "riskiest strategy" if you are worried about spending 1-12 years of retirement without any wealth, but a 100% stock allocation is the "riskiest strategy" when it comes to spending more than 12 years without any wealth.
Another way to investigate this issue is to measure the percentage of their retirement years that a couple should expect to experience with depleted wealth. Figure 6 shows these percentages, weighted by whether one or two members remain alive. This is the percentage of time in the couple’s joint lives that they should expect to not have any wealth, as detailed in the March 2012 Journal of Financial Planning article Spending Flexibility and Safe Withdrawal Rates by Michael Finke, Duncan Williams, and me.

With a 5% withdrawal rate and 50% stock portfolio, the couple represented in the graph below faces a 14% chance of running out of wealth at some point while at least one of them is alive (as shown in figure 4). Now we see that this couple should expect to spend only about the final 3% of their collective lives with no remaining wealth. More often than not, a widowed female will be the one to endure this outcome. I believe this information is more useful for planning than just the failure probability. Note as well that the optimal stock allocations tend to be lower than seen in figure 1 or figure 4.

Figure 6
Percentage of Years with No Remaining Wealth for Inflation-Adjusted Withdrawal Strategies for Same-Age Couple, Retirement Age: 65

And what is the impact of failure?
The safe withdrawal rate question deals with the probability of running out of wealth. But the impact of such “failure” depends on the income sources available outside of a retiree’s portfolio of savings, such as Social Security, defined-benefit pensions, fixed-income annuities and family support. Though failure means that no further income is available from savings, it does not necessarily mean that retirement income falls to zero. Retirees will differ both in their outside income sources and in their flexibility to endure potential spending drops later in retirement. A more aggressive retiree may take the chance to spend at a higher rate with the understanding that he or she may need to cut back significantly at some point in the future.

This confounding factor makes defining an acceptable failure rate much more nebulous. How to incorporate the safe withdrawal rate question into this broader framework was the subject explored in the Finke, Pfau and Williams article mentioned above.

The bottom line

It is important to move beyond the idea that retirees have a straightforward acceptable failure probability criterion. We must also consider the magnitude of failure as well as a retiree’s aversion to spending reductions late in retirement. It may matter to some retirees how much of a bequest they leave. And decisions cannot be made without fully considering the other spending resources available to the retiree. Conflicting stock allocation advice will often result – more stocks maximize bequests, for example, but fewer minimize time spent without wealth. Advisors must help their clients to find the best balance among their goals.

Wade Pfau, Ph.D., CFA, is an associate professor of economics at the National Graduate Institute for Policy Studies (GRIPS) in Tokyo, Japan, and the curriculum director for the Retirement Management AnalystSM designation program. He maintains a blog about retirement planning research at wpfau.blogspot.com.

I want to thank Michael Finke, Robert Powell, Dick Purcell, Joseph Tomlinson, and Duncan Williams for their helpful discussions.

For a free subscription to the Advisor Perspectives newsletter, visit: http://www.advisorperspectives.com/subscribers/subscribe.php