Retirement Withdrawal Rates and Portfolio Success Rates: What Can the Historical Record Teach Us?

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Executive Summary

Countless current and prospective retirees now rely on portfolio success rates calculated from the historical data for different retirement withdrawal strategies when planning their own retirements. Past history-based studies ushered forth what has become known as the 4% rule for retirement withdrawals, as historically 4% with inflation adjustments has served as a relatively safe withdrawal rate in the United States. But this study investigates whether the safety of the 4% rule achieved with an aggressive asset allocation is an appropriate conclusion to draw from the historical record. Historical portfolio success rates calculated from U.S. data may present a misleadingly rosy picture. In the time period covered by key withdrawal rate studies, financial markets in the United States performed exceedingly well from an international perspective, and such continued successes should not simply be assumed. Second, rolling historical simulations have made high stock allocations look more attractive than may be justified by over-representing a portion of the historical record in which bonds performed exceedingly poorly. Third, and most importantly, historical portfolio success rates teach the wrong lesson from the historical data as they do not account for the changing circumstances facing recent retirees. High earnings multiples, low dividend yields and low nominal interest rates indicate that conservative retirees should adjust their forecasts for future asset returns downward, which further implies lower sustainable withdrawal rates. For prospective retirees, the real lesson provided by the historical data is not past portfolio success rates, but rather to see how maximum sustainable withdrawal rates have related to the underlying sources of asset returns.

Introduction

In the retirement planning literature, a landmark study is Cooley, Hubbard, and Walz (1998). It is more commonly known as "The Trinity Study" since the three authors are all affiliated with

Trinity University. The original study used annual data between 1926 and 1995, but more recently Cooley, Hubbard, and Walz (2011) updated their earlier findings with data through 2009. Using rolling periods from the U.S. historical data, the study investigates success rates for various fixed and inflation-adjusted withdrawal rates from one's retirement savings for different time horizons and asset allocations.

Along with Bengen (1994), the Trinity study was originally meant to dispel the notion that withdrawal rates like 6% or 7% (which match the historical inflation-adjusted returns for stocks) are safe. The studies have since taken on a life of their own, and countless current and prospective retirees now rely on these historical success rates for planning their own retirements. These studies ushered forth what has become known as the 4% rule for retirement withdrawals, as historically 4% with inflation adjustments has served as a relatively safe withdrawal rate.

Here I investigate whether the safety of the 4% rule is an appropriate conclusion to draw from the historical record. After summarizing the mechanics for how the Trinity study works, I explain several concerns about the fundamental appropriateness of using the portfolio success rates from the Trinity study tables to plan for future retirements. The underlying data represent a very favorable period for asset returns in world history, the historical simulation method makes bonds look less favorable for retirement portfolios than warranted, and portfolio success rates ignore whether underlying conditions facing new retirees have changed. While the Trinity authors encourage users to remain flexible with their retirement spending, my concern is that retirees who think of 4% as a worst-case withdrawal rate will be ill-prepared for the spending cuts that such flexibility may potentially entail.

Portfolio Success Rates from the Historical Data

Cooley, Hubbard, and Walz (2011) use historical data for the United States to determine the chances for success for different withdrawal rates (between 3% and 12%, and both on a fixed and inflation-adjusted basis) from one's retirement savings for different time horizons (15, 20, 25, and 30 years) and for different asset allocations (stock allocations of 100%, 75%, 50%, 25%, and 0% large-capitalization stocks, with the remainder in high-grade long-term corporate bonds). A classic finding from the study is the case of an inflation-adjusted 4% withdrawal rate over a 30-year retirement horizon with a fixed 50/50 strategic asset allocation of stocks and bonds. Cooley, Hubbard, and Walz (2011) find that from rolling periods of the historical data, this strategy enjoyed a 96% success rate. As this represents the 4% rule-of-thumb, a prospective retiree may decide that this is a reasonable success rate and settle on using 4% for her withdrawal rate (assuming, of course, that her desired retirement expenditures are not less than 4%).

To show more clearly how the study works, I shall further dissect the 96% success rate. Cooley, Hubbard, and Walz (2011) use data from 1926 to 2009. To consider retirements lasting 30 years, they are able to include retirement dates between 1926 and 1980. For anyone retiring after 1980, the 30-year maximum sustainable withdrawal rate (MWR) cannot yet be calculated. The years 1926 to 1980 represent 55 beginnings for retirement. Of those 55 possibilities, the 4% inflation-adjusted withdrawal rate failed 2 times, in 1965 and 1966. Thus, its success rate is 53/55 = 96.4%, or 96% when rounded down. Though Cooley, Hubbard, and Walz (2011) provide their results as tables of portfolio success rates, I find it helpful to see a visual representation of the underlying MWRs. Figure 1 provides a time series plot of the MWRs for this scenario. The figure shows that the MWR fell below 4% in 1965 and 1966. In another case, MWRs for

FIGURE 1: MAXIMUM SUSTAINABLE WITHDRAWAL RATES (MWR)

For 50/50 Asset Allocation, 30-Year Retirement, Inflation Adjustments, No Fees

United States, 1926-2009: An Upwardly Biased Sample Period?

Source: Own calculations from Stocks, Bonds, Bills, and Inflation data provided by Morningstar and Ibbotson Associates. The U.S. S&P 500 index represents the stock market and long-term corporate bonds represent the bond market.

17 of the 55 retirement dates fell below 5%, and the remaining 38 successes represent a 69% success rate.

From an international perspective, results from U.S. historical data tend to provide a rather optimistic outlook for retirement withdrawal rates, which depend on the returns to the underlying stocks and bonds that make up the retiree's portfolio. Pfau (2010) investigates asset returns and withdrawal rates for 17 developed market countries with data between 1900 and 2008. In Cooley, Hubbard, and Walz (2011), the average real geometric stock return was 6.6%, with a standard deviation of 20.5%. Among the other 16 developed market countries, only three enjoyed higher average real returns. At the same time, remarkably, only four enjoyed lower stock volatility. For the bond data, the geometric real return was 2.8%, with a standard deviation of 9.5%. Only one country (Denmark) enjoyed a higher average real bond return, and only two countries enjoyed lower bond volatility. Inflation averaged 3.1% in the data covered by the Trinity study, which was less than all but two of the other countries.

Maximum sustainable withdrawal rates are a function of the underlying asset returns and inflation. For the data in Pfau (2010), the historical worst-case withdrawal rate was above 4% in only 4 of the 17 countries: Canada, Sweden, Denmark, and the United States. For 30-year retirements, the 4% rule failed in 62.5% of the historical cases in Italy and in 42.5% of the historical cases in France. Five of these developed market countries experienced maximum sustainable withdrawal rates of 1.56% or lower.

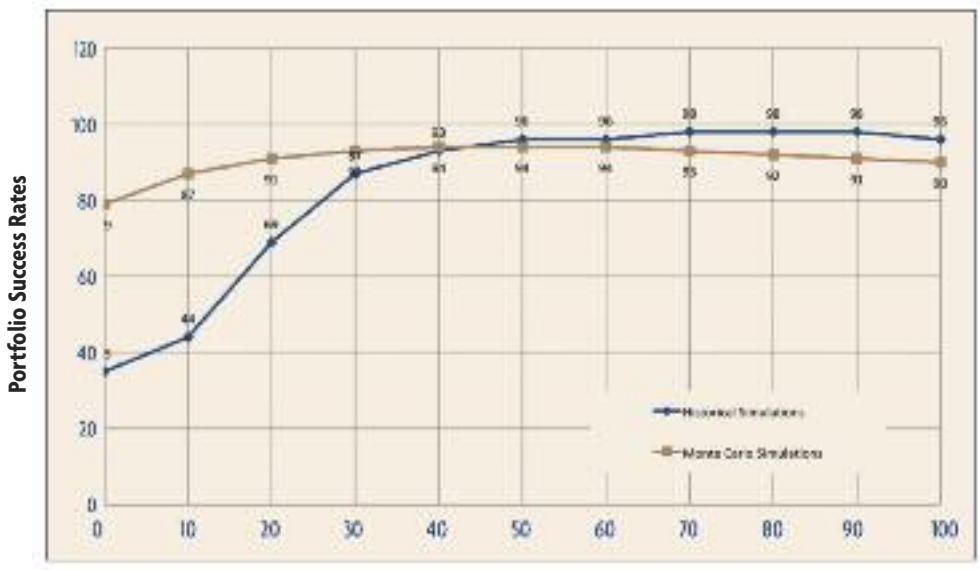
In terms of real returns for stocks and bonds, as well as for inflation, the United States enjoyed a rather remarkable run in comparison to other developed market countries in the period since 1900. This is important, because in planning for retirements in the future, it is not clear whether asset returns in the twenty-first century United States will continue to be as great as in the twentieth century, or whether savers and retirees should plan for something closer to the average international experience.

Bias against Bonds in Historical Simulations

As Dick Purcell helped to make clear in a discussion at the Bogleheads Forum, and a point which is also addressed in Cooley, Hubbard, and Walz (2003), rolling historical simulations lead to a unique bias against bonds that is not found when estimating portfolio success rates using Monte Carlo simulations based on the same underlying historical data. For 30-year retirement lengths, 1926 appears in one rolling historical simulation, while 1927 appears in two (for the 1926 and 1927 retirees). This pattern continues until 1955, which appears in 30 simulations (the last year for the 1926 retiree through the first year for the 1955 retiree). The years 1955 through 1980 all appear in 30 simulated retirements. Then a decline occurs as 1981 appears in 29 simulations, through 2009 which only appears in one simulation (as the final year of retirement for the 1980 retiree). As well, it is well known that retirement success depends more on what happens early in retirement than late in retirement. Pfau (2011b) quantifies this relationship, showing that the wealth remaining 10 years after retirement combined with the cumulative inflation during those 10 years can explain 80% of the variation in a retiree's 30-year MWR. Since data for recent years appear only late into retirements, asset

FIGURE 2: PORTFOLIO SUCCESS RATES FOR 4% WITHDRAWAL RATE: HISTORICAL VS. MONTE CARLO SIMULATIONS

For 30-Year Retirement, Inflation Adjustments, No Fees



Source: Own calculations from Stocks, Bonds, Bills, and Inflation data provided by Morningstar and Ibbotson Associates. The U.S. S&P 500 index represents the stock market and long-term corporate bonds represent the bond market.

returns since about 1990 actually contribute very little to the portfolio success rates in studies such as Cooley, Hubbard, and Walz (2011).

With Monte Carlo simulations (based on the average returns, standard deviations, and correlations among inflation and the real returns on stocks and bonds), each year in the dataset contributes equally to the parameters that define the random simulations. The years 1955 through 1980 do not play a disproportionate role, unlike the case with historical simulations. For the long-term corporate bond data used in the Trinity study, the arithmetic mean for real bond returns between 1955 and 1980 was -1.4%, compared to 5.2% for the years before 1955 combined with the years after 1980.

Figure 2 (at left) provides the implications for this, comparing portfolio success rates for varying asset allocations when using a 4% withdrawal rate. Historical simulations imply that higher stock allocations tend to provide a greater chance for success in retirement, with the Trinity study showing the best success rate for a 75% stock allocation. Cooley, Hubbard, and Walz (2011) urge stock holdings of at least 50% during retirement. Holding only bonds resulted in a 35% success rate with historical simulations. Such results may scare retirees into holding more stocks than justified by their risk tolerance or by reality. With Monte Carlo simulations based on the same historical data, retirees would be encouraged to hold some stocks, but success rates of over 90% are possible with stock allocations of only 20%. The highest success rates occur in the range between 40 and 60% stocks. Pfau (2010) also shows that for U.S. data, the choice of stock allocations between 30% and 80% had very little impact on the worst-case sustainable withdrawal rates since 1900. These finding may help provide psychological relief for retirees who are nervous about maintaining excessive stock allocations.

Historical Averages and Future Expectations

The discussion in the previous section adapts the methodological approach of Cooley, Hubbard, and Walz (2011), which puts the emphasis on determining the success of different withdrawal rate strategies from a historical perspective. However, the most important point of this paper is that such analysis may be of little use to someone seeking to determine a safe withdrawal rate in a forward-looking manner. What the historical record can teach us that is actually relevant for prospective retirees is not the historical portfolio success rates, but rather how sustainable withdrawal rates have related to the underlying sources of returns provided by the retiree's investment portfolio.

While many financial advisors do apply forward looking forecasts for stocks and bonds when estimating sustainable withdrawal rates, such practices are not universal. Countless retirees and financial planners do base their retirement decisions on the portfolio success rates found in research such as Cooley, Hubbard, and Walz (2011) and its predecessors. But it must be clear that this is not the information that current and prospective retirees need for making their withdrawal rate decisions. John Bogle emphasizes why. Though he was writing about stock returns, the same idea applies to sustainable withdrawal rates, since they are related to the returns from the underlying portfolio of stocks and bonds. Bogle (2009) wrote, "My concern is that too many of us make the implicit assumption that stock market history repeats itself when we know, deep down, that the only valid prism through which to view the market's future is the one that takes into account not history, but the sources of stock returns" (page 102, original emphasis).

Future stock returns (and, therefore, future sustainable withdrawal rates) depend on the sources of returns: dividend income, growth of the underlying earnings, and changes in the valuation

multiples placed on those earnings. If the current dividend yield is below its historical average, then future stock returns will also tend to be lower. When price-earnings multiples are high, markets tend to exhibit mean reversion and relatively lower future returns can be expected. Returns on bonds, meanwhile, depend on the initial bond yield and on subsequent yield changes. Low bond yields will tend to translate into lower returns due to less income and heightened interest rate risk. Sustainable withdrawal rates are intricately related to the returns provided by the underlying investment portfolio.

Pfau (2011a) develops a regression model with this idea in mind to predict the maximum sustainable withdrawal rates a person can use with their retirement savings to obtain inflation-adjusted income over a 30-year period. The regression model explains and predicts the withdrawal rate by including variables for the cyclically-adjusted earnings yield, a 10-year moving average of the dividend yield, and the nominal bond yield at the retirement date. The regression framework includes variables to predict long-term stock returns, bond returns, and inflation (the components driving a retiree's remaining portfolio balance). It produces estimates that fit the historical data well.

The study suggests that a 4% withdrawal rate cannot be considered as safe for U.S. retirees in the past 15 years when the cyclically-adjusted price-earnings ratio (PE10) has experienced unprecedented record highs and the dividend yield has experienced record lows. As described above, the events that have taken place since about 1990 have very little impact on the results of Cooley, Hubbard, and Walz (2011), as that study cannot consider 30-year retirements beginning after 1980. The regression model in Pfau (2011a) predicts sustainable withdrawal rates falling below 3% since 1999, and even below 2% in the years since 2003.

We can be hopeful that withdrawal rates will not fall to such extreme lows. In the past 15 years, financial markets have really been sailing in uncharted waters. We have never experienced such high valuation multiples and such low dividend yields. This makes it difficult for the model to make predictions for withdrawal rates, as it must make predictions outside the range of historical observation. But the real lesson is that even though Cooley, Hubbard, and Walz (2011) demonstrate that a 4% withdrawal rate enjoyed a 96% historical success rate for a 50/50 portfolio with inflation-adjustments over 30 years, this success rate does not really apply to the situation in more recent years.

Conclusions

The emphasis here has been to explain why the historical portfolio success rates calculated from U.S. data may present a misleadingly rosy picture about sustainable withdrawal rates in retirement. First, in the time period covered by key withdrawal rate studies, financial markets in the United States performed exceedingly well from an international perspective, and such successes should not simply be projected forward without further justifications. Second, rolling historical simulations have made high stock allocations look more attractive than may be justified. Third, historical portfolio success rates teach the wrong lesson from the historical data as they do not account for the changing circumstances facing recent retirees. High earnings multiples, low dividend yields and low nominal interest rates indicate that conservative retirees should adjust their forecasts for future asset returns downward, which further implies lower sustainable withdrawal rates. For prospective retirees, the real lesson provided by the historical data is not past portfolio success rates, but rather to see how maximum sustainable withdrawal rates have related to the underlying sources of asset returns. Using annuities or structuring a fixed income portfolio with TIPS provides two alternatives for those worried about low withdrawal rates. ■

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AN ADVISOR'S PERSPECTIVE

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In theory, this paper brings up an excellent point, and one occasionally used by advisors. If a client has a higher "coverage ratio" meaning a larger share of their retirement living expenses are covered by fixed sources of income such as pensions and Social Security, then this should mean they can sustain more risk in their investment portfolios. As Yogi Berra says, "In theory, practice and theory are the same. In practice they aren't."

In practice, I have found that clients who stayed with their company for a long enough period of time to acquire higher defined benefit payouts tend to be more risk adverse, which may be why they were able to stay in a position long enough to acquire those benefits. Those who were self-employed, or changed jobs more frequently, tend to be more comfortable with risk, which also mean they have not acquired the same level of guaranteed sources of income as their risk-adverse peers. It is often one's nature that has led them to a situation where they have more guaranteed income to begin with, and although they may technically be capable of sustaining more risk, they often will not do so. And, try as you might, it is difficult to get the risk-takers to buy into guaranteed products.

Perhaps what we really need is an entirely new way of assessing risk in retirement. The standard risk questionnaires are not suitable for the task. It may be time for a better suite of risk assessment tools that help an upcoming retiree visualize their need for fixed income sources. This work could perhaps be leveraged to begin creating such tools. ■