Determining Optimal Withdrawal Rates: An Economic Approach

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Abstract

We propose a utility maximizing model to determine portfolio allocations and withdrawal rates in retirement. We compare this model to the common practice of estimating safe withdrawal rates which focuses on portfolio allocations that minimize shortfall risk. We find that optimal withdrawal rates depend largely on the client's level of risk aversion and the level of other retirement income benefits, and that portfolio allocation in retirement is a function of minimizing consumption variance given the optimal withdrawal rate. This approach allows advisors to estimate optimal post-retirement strategies that are consistent with client risk tolerance and the impact of unintended bequests.

Executive Summary

This paper identifies portfolio withdrawal rates that are utility maximizing for retirees. Prior literature defines withdrawal rate success as the client dying with a positive portfolio value. The typical approach is to treat the portfolio as a synthetic annuity that can consistently spin off inflation-adjusted income without running out of money. It is the degree to which we recognize the tradeoff of failing to consider unspent retirement savings that makes our approach fundamentally different. The goal of maximizing lifetime utility requires that we balance shortfall minimization with the satisfaction that a client would receive from an increased level of consumption.

We use a bootstrap method with replacement to randomly select the age of death and annual stock and bond returns for 10,000 replicates. The baseline assumption is that the client retires at 65 with a $1 million portfolio and that consumption is indexed for inflation at 3.2%. We test many combinations of portfolio allocations, withdrawal rates, and levels of non-portfolio income (e.g. Social Security, pension, annuities, etc.) to determine the optimal strategy for each level of risk aversion. Our portfolio allocations are 20% equity/80% bonds, 40% equity/60% bonds, 60% equities/40% bonds, and 80% equities/20% bonds. The levels of risk aversion tested are 1, 2, 5, and 10 on the Arrow-Pratt scale, representing a wide range of risk tolerance. We test initial non-portfolio income levels of $20,000 and $65,000.

We find that optimal withdrawal rates are negatively related to the client's level of risk aversion, but are positively related to the level of non-portfolio relative to portfolio income. We also find that the appropriate portfolio allocation in retirement is the one that minimizes consumption variance given the chosen withdrawal rate. These findings could have major implications in the approach practitioners take to designing retirement income strategies for their clients.

Introduction

> *"Man... is so anxious about the future that he does not enjoy the present; the result being that he does not live in the present or the future; he lives as if he is never going to die, and then dies having never really lived."*
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> *-The Dalai Lama, when asked what surprised him most about humanity.*

Financial advisors, in general, seem to understand that there should be a balance between present and future. They know that their fundamental objective is to help their clients direct their resources in a way that maximizes their respective levels of satisfaction over time. It is evident in the way the advisor goes about conducting analysis for his client during his working years: plan for the unexpected, plan for next year's big vacation, set an achievable target amount for retirement, or design a suitable investment portfolio. Most skillful advisors balance these goals very well, and their approaches to them are supported by a theoretical foundation called utility maximization. The assumption that individuals seek to maximize their utility is one of the fundamental tenets of economics. In this context, it means that the advisor is using specialized knowledge to help the client achieve the most happiness possible from available resources.

Current Approach to Distribution Planning

When it comes to distribution planning, the goal of utility maximization seems not to rank as highly in the practitioner literature. Rather, the focus is on designing portfolios and distribution strategies that are "sustainable" or "safe." Models vary in their parameters and methodology, but there are some common threads. A new retiree begins with a certain amount in his portfolio and withdraws a percentage of the initial portfolio value the first year. Subsequent withdrawal amounts are based on the first year's withdrawal and are indexed for inflation, so that real consumption remains constant. Investigators typically test the survival rate of portfolios, with allocations ranging from conservative to aggressive, over periods of 20 to 40 years.

In his seminal article, Bengen (1994) tests historical portfolio performance from 1926 to 1993 assuming various stock / bond allocations and initial withdrawal rates that adjust with inflation. He finds that a safe withdrawal rate is 4% and that portfolios with equity allocations of 50% to 75% perform best. Subsequent studies include a broader range of market returns and return sequence assumptions and further divide the portfolio into more asset classes. They conclude that rates as high as 5% or 6% may be sustainable (Cooley, Hubbard,

& Walz, 1998). A more recent study finds the rate may be as low as 3% for those who retired between 1990 and 2005 (Chatterjee, Goetz, & Palmer, 2011). Ameriks, Veres, and Warshawsky (2001) conduct tests using both rolling historical periods and Monte Carlo simulations. They find that an aggressive portfolio with 85% equity and a withdrawal rate of 4.5% minimizes shortfall risk for periods of 25 to 40 years. They also test scenarios in which the retiree purchases an annuity with varying portions of his initial portfolio value, and find that shortfall risk of the same portfolio can be further reduced by purchasing an annuity with 50% of the initial portfolio value. Milevsky and Robison find the assumed length of the retirement period to be a major determinant of the sustainable withdrawal rate (2005).

Certainly, clients will not be happy if they run out of money, but managing longevity risk is not the only key to maximizing happiness in the retirement years. A singular purpose of increasing portfolio sustainability leads an advisor to design a distribution strategy that could last in perpetuity, as if the client is never going to die. This focus on minimizing shortfall risk is an attempt to address a client's aversion to variance in consumption over time. This is an important step when it comes to utility maximization, but it is only part of the equation. People gain utility from maximizing consumption. However, the more that is consumed from portfolio withdrawals in retirement, the higher the variance due to increased shortfall risk. A more holistic approach to distribution planning would attempt to design a distribution strategy that optimizes consumption given the strategy's shortfall risk and client's aversion to variance, much in the same way that Modern Portfolio Theory (Markowitz, 1952) attempts to optimize expected return given the portfolio's expected standard deviation and the client's risk tolerance. This requires consideration of the tradeoff between spending too much and being forced to cut back in retirement, and spending too little and dying with funds unspent on vacations, medical procedures, second homes, or any of the things that money provides access to in retirement.

A Different Approach

This paper proposes an approach to designing withdrawal strategies that attempts to maximize lifetime utility through mean-variance optimization of consumption. Arrow (1965) and Pratt (1964) developed a concept called Relative Risk Aversion (RRA). The goal is to determine the level of constant consumption a person would accept in exchange for a higher average level of consumption with greater variability. This is known as the certainty equivalent. As the coefficient of RRA increases, the certainty equivalent required decreases. This is the same concept as weighting a portfolio allocation's standard deviation more heavily for clients who are less risk tolerant. Greater portfolio volatility increases the range of wealth outcomes, which increases the variance of consumption in the distribution phase. Under this model, given in equation 1, utility (U) is a function of consumption (C) and RRA (γ).

$$\text{(1)}\quad U(C) = \frac{c^{(1-\gamma)}}{(1-\gamma)}$$

We consider two possible states of consumption in retirement. Consumption in the good state (C_G) represents consumption from Social Security and the portfolio, when the client has not outlived his portfolio. Consumption in the bad state (C_B) represents only consumption from non-portfolio income, after the portfolio has been exhausted. We can use equation 2 to solve for the certainty equivalent (CE) level of consumption, which not only depends on the coefficient of RRA, but also the probability (P) of the portfolio providing income to support consumption. This probability, coupled with the difference between C_G and C_B, captures variance.

$$\text{(2)}\quad CE = \{(1-\gamma)[\,P * \frac{C_G^{(1-\gamma)}}{(1-\gamma)} + (1-P) * \frac{C_B^{(1-\gamma)}}{(1-\gamma)}\,]\}^{(\frac{1}{1-\gamma})}$$

Solving for the certainty equivalent gives us a dollar value that allows us to compare utility from consumption across different coefficients of RRA and risk parameters of the consumption stream. Intuitively, the larger the consumption decline when portfolio runs out (the difference between C_G and C_B), the larger the utility loss when the portfolio is exhausted. Those with higher rates of RRA feel the consumption difference more acutely. The presence of more reliable non-portfolio income, such as Social Security, a defined benefit plan, or an annuity, mitigates the effect of shortfall risk and can affect how the retiree should manage his portfolio distribution strategy.

Our model accepts some of the parameters of the existing studies and modifies others. Traditional approaches are adequate to model the randomness of expected returns and variance for different portfolio allocations and different withdrawal rates. We employ a bootstrapping method that uses historical index return data to simulate portfolio performance. Our return data for stocks is S&P 500 returns obtained from Professor Robert Shiller's website, and the proxy for bonds is the Ibbotson long-term Treasury index return provided by Morningstar. Both data sets give annual return measures from 1926-2010.

Longevity assumptions commonly used in the literature err on the conservative side and fail to capture the randomness of the death, which is an important determinant of the variance of consumption, or shortfall risk. The longer a person lives, the more likely they are to exhaust their investment portfolio before death. However, assuming that retirement will last much longer than the mortality tables would suggest leads to large average portfolio balances at death. Using the Ameriks et al paper as an example, the average

TABLE 1: PANEL A – 20% EQUITY / 80% BOND PORTFOLIO

Initial W/D	C-GS C-BS	Years - GS Years - BS	Coefficient of Relative Risk Aversion 0	1	2	5	10	Forgone Cons.
3%	$ 50,000 $ 20,000	99.75% 0.25%	$ 49,925	$ 49,886	$ 49,814	**$ 48,880**	**$ 38,501**	**$ 1,280,019**
4%	$ 60,000 $ 20,000	97.77% 2.23%	$ 59,107	$ 58,547	$ 57,437	$ 46,445	$ 30,508	$ 897,962
5%	$ 70,000 $ 20,000	92.32% 7.68%	$ 66,160	$ 63,579	$ 58,725	$ 37,267	$ 26,599	$ 606,037
6%	$ 80,000 $ 20,000	84.03% 15.97%	$ 70,416	$ 64,109	$ 54,083	$ 31,475	$ 24,521	$ 414,732
7%	$ 90,000 $ 20,000	75.11% 24.89%	$ 72,574	$ 61,892	$ 48,096	$ 28,263	$ 23,342	$ 298,464
8%	$ 100,000 $ 20,000	66.59% 33.41%	$ 73,270	$ 58,406	$ 42,799	$ 26,285	$ 22,591	$ 229,453
9%	$ 110,000 $ 20,000	59.21% 40.79%	$ 73,285	$ 54,874	$ 38,791	$ 25,015	$ 22,095	$ 184,008

retiree who follows the allocation and withdrawal recommendations and dies 20 years into retirement would die with 160% of his initial portfolio balance. This value represents a large opportunity cost in terms of foregone consumption that could have been used to increase lifetime utility. We adopt an actuarial approach to determining the probability of living to the next year, based on data obtained from the Social Security Administration.

Given many factors with uncertain outcomes, the issue of deciding how much to spend each year is difficult. In a portfolio of risky assets, returns experienced since the last withdrawal continually differ from long-run expected returns. Theory suggests that the optimal approach is to adjust consumption each period to reflect updated portfolio values and age (Sharpe, Scott, & Watson, 2007). It seems intuitive that a client should reduce withdrawals in the future if the portfolio value is significantly less than expected and he is still in good health, or that he may feel comfortable taking higher distributions if the portfolio value is well ahead of projections. In practice, empirical research suggests that consumption levels are habit-forming and clients may adjust less frequently than theoretically optimal (Grossman & Laroque, 1990).

Uncertain longevity adds another layer of complexity. The typical approach of increasing the withdrawal amount by the rate of inflation holds real consumption constant until the portfolio is exhausted or until death, whichever comes first. This fails to consider that a utility maximizer will discount future consumption based on the probability of being alive for each year in the future. If the discount rate is 4% per year, the expected utility from consumption at age 82 will be only approximately half the utility from consumption at age 65. In order to

Table 1: Panel B – 40% Equity / 60% Bond Portfolio

Initial W/D	C-GS C-BS	Years - GS Years - BS	Coefficient of Relative Risk Aversion 0	1	2	5	10	Forgone Cons.
3%	$ 50,000 $ 20,000	99.67% 0.33%	$ 49,902	$ 49,850	$ 49,755	$ 48,550	$ 37,437	$ 1,955,341
4%	$ 60,000 $ 20,000	97.96% 2.04%	$ 59,185	$ 58,672	$ 57,651	$ 47,118	$ 30,818	$ 1,458,641
5%	$ 70,000 $ 20,000	93.59% 6.41%	$ 66,793	$ 64,595	$ 60,326	$ 38,830	$ 27,137	$ 1,037,578
6%	$ 80,000 $ 20,000	86.91% 13.09%	$ 72,145	$ 66,723	**$ 57,441**	$ 33,038	$ 25,069	**$ 718,447**
7%	$ 90,000 $ 20,000	79.16% 20.84%	$ 75,414	$ 65,786	$ 52,044	$ 29,534	$ 23,808	$ 482,809
8%	$ 100,000 $ 20,000	71.11% 28.89%	$ 76,890	$ 62,818	$ 46,393	$ 27,254	$ 22,959	$ 329,569
9%	$ 110,000 $ 20,000	63.21% 36.79%	$ 76,887	$ 58,749	$ 41,421	$ 25,668	$ 22,350	$ 240,617

Table 1: Panel C – 60% Equity / 40% Bond Portfolio

Initial W/D	C-GS C-BS	Years - GS Years - BS	Coefficient of Relative Risk Aversion 0	1	2	5	10	Forgone Cons.
3%	$ 50,000 $ 20,000	99.12% 0.88%	$ 49,735	$ 49,598	$ 49,347	$ 46,511	$ 33,723	$ 2,970,780
4%	$ 60,000 $ 20,000	96.74% 3.26%	$ 58,695	$ 57,887	$ 56,325	$ 43,528	$ 29,249	$ 2,336,442
5%	$ 70,000 $ 20,000	92.52% 7.48%	$ 66,259	$ 63,737	$ 58,970	$ 37,491	$ 26,677	$ 1,778,751
6%	$ 80,000 $ 20,000	86.64% 13.36%	$ 71,985	$ 66,477	$ 57,113	$ 32,876	$ 25,013	$ 1,317,347
7%	$ 90,000 $ 20,000	79.81% 20.19%	$ 75,869	$ 66,432	$ 52,738	$ 29,766	$ 23,892	$ 956,116
8%	$ 100,000 $ 20,000	72.49% 27.51%	$ 77,992	$ 64,226	$ 47,610	$ 27,587	$ 23,084	$ 667,218
9%	$ 110,000 $ 20,000	65.42% 34.58%	$ 78,876	$ 61,004	$ 43,033	$ 26,067	$ 22,504	$ 449,047

maximize expected lifetime utility then, a retiree would consume more in the early years of retirement and less in the later years when the probability of being alive is lower.

The discount rate is offset by the expected real rate of return in the portfolio (Campbell and Viceira, 2001). A person might be incented to defer some consumption until a later time if the expected return were high enough. Both the discount and expected return rates are inversely related to risk aversion. A person with a high RRA will have a relatively low expected rate of return due to conservative portfolio choice, but will also not discount future consumption much because he is not willing to accept much variability in consumption. If these rates are equal, then holding real consumption constant is utility maximizing. We maintain this assumption of rate equality as a baseline in our model so that we can compare our results to those of the existing literature. However, in the discussion section we provide an explanation of how a discount rate in excess of the expected real return might affect expected lifetime utility and choice of distribution strategy.

Results

The analysis presented in this section follows several steps from the research on shortfall risk. We test withdrawal rates from 3% to 12%, indexed for inflation at 3.2%. Though consumption with both portfolio income and non-portfolio income (C-GS), and consumption with only non-portfolio income (C-BS) are listed in real dollars, the inflation assumption is important because it is factored into the nominal withdrawal amount, which affects portfolio survival. Then we bootstrap 10,000 stock returns, bond returns, and ages of death and apply to each combination of portfolios and withdrawal rates.

Table 1: Panel D – 80% Equity / 20% Bond Portfolio

Initial W/D	C-GS C-BS	Years - GS Years - BS	Coefficient of Relative Risk Aversion 0	1	2	5	10	Forgone Cons.
3%	$ 50,000 $ 20,000	98.30% 1.70%	$ 49,489	$ 49,226	$ 48,755	$ 44,130	$ 31,394	$ 4,490,654
4%	$ 60,000 $ 20,000	95.44% 4.56%	$ 58,177	$ 57,070	$ 54,989	$ 40,869	$ 28,185	$ 3,677,496
5%	$ 70,000 $ 20,000	91.25% 8.75%	$ 65,627	$ 62,735	$ 57,440	$ 36,164	$ 26,218	$ 2,957,924
6%	$ 80,000 $ 20,000	86.37% 13.63%	$ 71,825	$ 66,230	$ 56,788	$ 32,718	$ 24,958	$ 2,326,724
7%	$ 90,000 $ 20,000	80.70% 19.30%	$ 76,489	**$ 67,323**	$ 53,713	$ 30,097	$ 24,011	**$ 1,805,452**
8%	$ 100,000 $ 20,000	74.97% 25.03%	$ 79,978	$ 66,845	$ 49,973	$ 28,243	$ 23,328	$ 1,377,547
9%	$ 110,000 $ 20,000	69.02% 30.98%	$ 82,116	$ 64,865	$ 45,944	$ 26,791	$ 22,781	$ 1,010,801

Rather than calculate the probability that the portfolio will reach zero before death, we calculate the percentage of years for each combination that the portfolio has enough assets to produce an income stream to support consumption (Years-GS) versus the number of years with only non-portfolio income (Years-BS). This represents the distribution of consumption variance, which is used to calculate the certainty equivalent, given the coefficient of RRA for each portfolio/withdrawal combination.

Coefficients of RRA of 1, 2, 5, and 10 are used with 0 as a reference with its certainty equivalent representing the expected annual consumption. We do not consider the 0 case because we assume that all rational people will demand a higher expected level of consumption for increased risk. A person with a coefficient of 1 is very risk tolerant; 2 is moderately risk tolerant; 5 is fairly risk averse, and 10 is extremely risk averse. The certainty equivalent that maximizes utility for each level of RRA is bolded. The corresponding average forgone lifetime consumption is also bolded. In order to get a better feel for what these numbers represent, the certainty equivalents can be used to compare what a person with a particular RRA score would be willing to give up, given the distribution of C-GS and C-BS, for a certain level of consumption. For example, a person with an RRA of 5 would only pay $40,869 for the opportunity to receive $60,000 in an expected 19 out of 20 years and receive $20,000 in the other (80/20 portfolio with 4% withdrawal). That is an average payout of over $58,000, and the $60,000 payouts are going to come first.

In the first scenario (presented in Tables 1A through 1D on the previous pages), we set real non-portfolio income equal to $20,000 per year. This is an amount similar to what a new retiree who earned

$75,000 in his last year of work can expect from Social Security. Note that for the two most risk-averse categories, the most conservative combination of withdrawal rates and portfolio allocations is utility maximizing, while the combination of a 7% withdrawal rate and the most aggressive allocation best suits the most risk tolerant. The moderate risk taker maximizes utility with the 40/60 allocation and a 5% withdrawal rate, in the case where he draws over 70% of his income from his portfolio.

In Table 2, the analysis is presented in the same way, except we increase the non-portfolio income to see what effect this may have on the choices of people at various levels of risk aversion.

By increasing non-portfolio income to $65,000, we are able to examine the effect of reducing the difference between consumption in the good state versus consumption in the bad state, or the proportion of C_G/C_B. Those in the two most risk-averse categories increase their portfolio distributions by 33% and 67% respectively, and double their equity allocations from 20% to 40%. The new utility maximizing level for those with an RRA of 2 doubles the equity position from 40% to 80% and increases the withdrawal rate from 5% to 7%, while the most risk tolerant maintain their aggressive allocation and increase the withdrawal rate to 8%. We notice that people in every risk profile are willing to become more aggressive in their portfolio distribution strategies due to the decrease in the difference between C_G and C_B. They can withstand the increase in variance of portfolio income associated with higher withdrawal rate because non-portfolio income is higher. The new allocations provide the least variance given the increased withdrawal rates.

Table 2: Panel A – 20% Equity / 80% Bond Portfolio

Initial W/D	C-GS C-BS	Years - GS Years - BS	Coefficient of Relative Risk Aversion 0	1	2	5	10	Forgone Cons.
3%	$ 95,000 $ 65,000	99.75% 0.25%	$ 94,925	$ 94,910	$ 94,891	$ 94,790	$ 94,256	$ 1,280,019
4%	$ 105,000 $ 65,000	97.96% 2.04%	$ 104,107	$ 103,882	$ 103,578	$ 101,848	$ 94,228	$ 897,962
5%	$ 115,000 $ 65,000	93.59% 6.41%	$ 111,160	$ 110,070	$ 108,585	$ 101,077	$ 85,795	$ 606,037
6%	$ 125,000 $ 65,000	86.91% 13.09%	$ 115,416	$ 112,602	$ 108,937	$ 94,783	$ 79,565	$ 414,732
7%	$ 135,000 $ 65,000	79.16% 20.84%	$ 117,574	$ 112,542	$ 106,460	$ 88,629	$ 75,825	$ 298,464
8%	$ 145,000 $ 65,000	71.11% 28.89%	$ 118,270	$ 110,902	$ 102,747	$ 83,856	$ 73,408	$ 229,453
9%	$ 155,000 $ 65,000	63.21% 36.79%	$ 118,285	$ 108,734	$ 99,052	$ 80,445	$ 71,805	$ 184,008

The relative size of the changes can be explained by differences in how they perceive the increase in non-portfolio income. Different coefficients of RRA imply different levels of compensation required to accept an increased variance associated with a higher withdrawal rate. The compensation is measured by the value a person at each level of RRA puts on the reduction of the proportion of C_G/C_B. The value can be disentangled from the effect of an increase in income by subtracting the dollar value of income increase ($45,000) from the change in certainty equivalents. The total effect on certainty equivalents for those with RRA of 1 is $51,298, meaning the effect of the C_G/C_B reduction is worth $6,298. The reduction is valued at $6,442 for an RRA of 2, $8,949 for an RRA of 5, and $11,313 for an RRA of 10. Those with higher levels of risk aversion assign a greater value to the reduction in the relative variance in consumption between the two states.

Forgone consumption is another potential measure of risk aversion. We might have expected to see that more risk-averse people would have greater forgone consumption because they choose to spend more conservatively. Yet we observe no such pattern because this effect seems to be offset by their more conservative portfolio choices. Even when non-portfolio income is increased, changes in withdrawal rates seem to move in lockstep with changes in allocations.

Notice that for each withdrawal rate chosen, the optimal portfolio allocation is the one that is expected to minimize the percentage of bad years (Years-BS), or variance of consumption for that withdrawal rate. The aggressiveness of the portfolio is positively related to the withdrawal rate. This finding of optimal co-movement is in contrast to the previous literature which calls for high equity allocations and low withdrawal rates. While

Table 2: Panel B – 40% Equity / 60% Bond Portfolio

Initial W/D	C-GS C-BS	Years - GS Years - BS	Coefficient of Relative Risk Aversion 0	1	2	5	10	Forgone Cons.
3%	$ 95,000 $ 65,000	99.67% 0.33%	$ 94,902	$ 94,882	$ 94,856	$ 94,724	$ 94,031	$ 1,955,341
4%	$ 105,000 $ 65,000	97.96% 2.04%	$ 104,185	$ 103,979	$ 103,700	$ 102,105	**$ 94,814**	**$1,458,641**
5%	$ 115,000 $ 65,000	93.59% 6.41%	$ 111,793	$ 110,867	$ 109,592	**$102,828**	$ 87,392	**$1,037,578**
6%	$ 125,000 $ 65,000	86.91% 13.09%	$ 117,145	$ 114,745	$ 111,524	$ 97,884	$ 81,310	$ 718,447
7%	$ 135,000 $ 65,000	79.16% 20.84%	$ 120,414	$ 115,929	$ 110,258	$ 91,840	$ 77,329	$ 482,809
8%	$ 145,000 $ 65,000	71.11% 28.89%	$ 121,890	$ 115,003	$ 106,969	$ 86,586	$ 74,602	$ 329,569
9%	$ 155,000 $ 65,000	63.21% 36.79%	$ 121,887	$ 112,583	$ 102,688	$ 82,386	$ 72,632	$ 240,617

Table 2: Panel C – 60% Equity / 40% Bond Portfolio

Initial W/D	C-GS C-BS	Years - GS Years - BS	Coefficient of Relative Risk Aversion 0	1	2	5	10	Forgone Cons.
3%	$ 95,000 $ 65,000	99.12% 0.88%	$ 94,735	$ 94,683	$ 94,615	$ 94,268	$ 92,596	$ 2,970,780
4%	$ 105,000 $ 65,000	96.74% 3.26%	$ 103,695	$ 103,370	$ 102,933	$ 100,541	$ 91,617	$ 2,336,442
5%	$ 115,000 $ 65,000	92.52% 7.48%	$ 111,259	$ 110,194	$ 108,742	$ 101,341	$ 86,027	$ 1,778,751
6%	$ 125,000 $ 65,000	86.64% 13.36%	$ 116,985	$ 114,545	$ 111,279	$ 97,575	$ 81,132	$ 1,317,347
7%	$ 135,000 $ 65,000	79.81% 20.19%	$ 120,869	$ 116,481	$ 110,892	$ 92,412	$ 77,600	$ 956,116
8%	$ 145,000 $ 65,000	72.49% 27.51%	$ 122,992	$ 116,281	$ 108,323	$ 87,511	$ 75,006	$ 667,218
9%	$ 155,000 $ 65,000	65.42% 34.58%	$ 123,876	$ 114,766	$ 104,813	$ 83,566	$ 73,133	$ 449,047

forgone consumption still exists in our model, co-movement significantly reduces it.

Discussion

The results suggest that when the focus is maximizing client utility, appropriate withdrawal rates vary significantly with the client's level of risk aversion. The optimal portfolio allocation in retirement is a function of minimizing the variance of consumption for the chosen withdrawal rate. The effect of risk aversion on withdrawal rate is moderated by the proportion of consumption that is supported by non-portfolio income. These findings are in contrast with the studies on shortfall risk that prescribe the same aggressive portfolio and low withdrawal rate for everyone, regardless of the client's level of risk aversion and other resources.

Although we did not present results for those whose discount rates exceed the portfolio's expected return, theory can guide us to the direction of the effect. In the case of the client outliving his investment portfolio, reduced consumption will be experienced later in life. If the client discounts future consumption based upon the probability of being alive, the effect of the expected utility loss will be reduced by the compounded discount rate. This means that clients will be less sensitive to consumption variance, which will increase the optimal withdrawal rate.

Implications

Advisors may want to consider a client's level of risk aversion and other retirement income sources as they are working to develop distribution strategies. Given the utility gains of reducing the gap between certain and uncertain consumption,

TABLE 2: PANEL D – 80% EQUITY / 20% BOND PORTFOLIO

Initial W/D	C-GS C-BS	Years - GS Years - BS	Coefficient of Relative Risk Aversion 0	1	2	5	10	Forgone Cons.
3%	$ 95,000 $ 65,000	98.30% 1.70%	$ 94,489	$ 94,388	$ 94,259	$ 93,612	$ 90,808	$ 4,490,654
4%	$ 105,000 $ 65,000	95.44% 4.56%	$ 103,177	$ 102,730	$ 102,136	$ 99,013	$ 89,136	$ 3,677,496
5%	$ 115,000 $ 65,000	91.25% 8.75%	$ 110,627	$ 109,402	$ 107,750	$ 99,709	$ 84,647	$ 2,957,924
6%	$ 125,000 $ 65,000	86.37% 13.63%	$ 116,825	$ 114,344	$ 111,035	$ 97,270	$ 80,957	$ 2,326,724
7%	$ 135,000 $ 65,000	80.70% 19.30%	$ 121,489	$ 117,237	**$111,767**	$ 93,220	$ 77,985	**$1,805,452**
8%	$ 145,000 $ 65,000	74.97% 25.03%	$ 124,978	**$118,621**	$ 110,854	$ 89,313	$ 75,797	**$1,377,547**
9%	$ 155,000 $ 65,000	69.02% 30.98%	$ 127,116	$ 118,412	$ 108,468	$ 85,684	$ 74,031	$ 1,010,801

advisors may also consider hedging strategies for their clients who rely on their portfolios to fund a large portion of their consumption. This could mean using a portion of the retirement portfolio to purchase a deferred annuity that would begin paying some years in the future when portfolio exhaustion is more likely. For example 65-year-old may be able to purchase $10,000 of inflation-adjusted income that starts at 75 for $50,000 to $60,000. Finally, for clients who understand the risk and still desire to increase their portfolio withdrawals a couple of percentage points beyond what it is traditionally considered safe, remember that the Dalai Lama would let them "live in the present." ■

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AN ADVISOR'S PERSPECTIVE

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This paper reinforces the need for flexibility as a key characteristic of the retirement income advisor. It is easy to get locked into a "right" way to practice, and far too easy to get locked into a product as a solution. A product could be defined as a variable annuity with a guaranteed income rider. A product could also be defined as a 60/40 portfolio of index funds, or a time-segmented strategy.

The questions an advisor might ask after reading the article are:

- In a world where future sustainable withdrawal rates are likely to be around 2 and 3%, how much more appealing does an immediate annuity solution become? Or a fixed annuity solution? Or a guaranteed income rider on a variable annuity?
- Over a 20- to 30-year time horizon, could we once again see a world where higher withdrawal rates are sustainable? Acknowledging that as a possibility, how do you avoid tying up too much of a client's money in an irrevocable solution, when a decade from now, other choices may produce better results?
- And more importantly, how do you build a process that provides you with a disciplined framework within which to make these decisions?

As a profession, retirement income advisors need a process that is quantifiable and devoid of compensation model conflicts of interest. They need guidelines to help them think strategically and long-term. They need tools to use to educate clients about the complexity and importance of the decisions made as they enter the draw-down phase. What tools allow an advisor to deliver reliable monthly paychecks without having to try to determine whether the upcoming two decades will be ones that will deliver 2% sustainable withdrawal rates, or 6% sustainable withdrawal rates? These are the questions we must answer. ■