Retirement Income Showdown: Risk Pooling vs. Risk Premium

by

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Abstract

The retirement income showdown regards finding the most efficient approach for meeting retirement spending goals: obtaining mortality credits through risk pooling with an income annuity, or investing for upside growth through the stock risk premium. Analyzing the question involves understanding how clients view a hierarchy of retirement goals related to spending, liquidity and legacy. Client attitudes toward longevity risk aversion also matter: how fearful is the client of outliving their investment portfolio? Risk pooling offers a unique source of returns not available from an investment portfolio: those in the risk pool who experience shorter lives subsidize the payments to those in the pool who experience longer lives (mortality credits). Risk pooling may provide a cheaper way to meet a spending goal, leaving more assets to cover contingencies and support legacy. The primary advantage of an investments-only strategy is that it can support greater legacy in the short-term compared to a partial-annuitization strategy that uses risk pooling to meet spending goals and investments to meet liquidity and legacy goals. Risk averse retirees, though, may feel obligated to earmark a larger portion of their portfolio to spending goals, which leaves less true liquidity, while also exposing the spending goal to the risk of portfolio depletion. The advantages of risk pooling include a contractual guarantee to support lifetime spending, the ability to meet spending goals with a smaller portion of assets that creates greater true liquidity for the retirement income plan, and the potential to support a larger legacy in the event of a long life.

Introduction

Different groups within the financial services profession continue to debate about the best approach to building a retirement income plan. Pfau (2014) identifies two general philosophies about retirement income as the probability-based and safety-first schools of thought. A key issue of disagreement between these sides is about where retirees are best served in placing their focus and trust: in the risk/reward tradeoffs and upside potential of a stock portfolio (probability-based), or on the contractual guarantee of income annuities (safety-first).

We aim to test these competing approaches to provide greater clarity about the role of risk pooling (income annuities) and risk premium (stocks) in a retirement income plan. The analysis is based on meeting a prioritized list of spending goals: funding retirement spending, supporting liquidity to cover contingencies or to support further lifestyle enhancements, and providing a legacy to the next generation. The "risk premium" strategy will use an investment portfolio to meet all three goals. The "risk pooling" strategy is actually an integrated strategy: an income annuity (risk pooling) is used to meet spending goals and an investment portfolio is used to support liquidity and legacy. For a generalizable case study, we find that risk pooling provides a number of attractive features relative to solely seeking the risk premium from stocks. For risk averse retirees, risk pooling funds retirement spending goals more cheaply and with contractual guaranties, which in turn allows for greater true liquidity for non-annuitized investment assets. The main advantage for the investments-only risk premium strategy is that it allows for a larger legacy should the retiree die early, but at the cost of not having a contractual guarantee for income, and having less true liquidity as more must be set aside to provide sufficient confidence that the spending goal can be funded. In the event of a long retirement, the legacy advantage of the risk premium strategy gradually declines as partial annuitization can ultimately support a larger legacy in the long-term. These tradeoffs suggest that greater care should be taken by advisors and retirees to consider how a client's risk aversion and desires for legacy impact the relative advantages of risk pooling and the risk premium as strategies to fund retirement spending goals. It is not obvious that an investments-only retirement income strategy will outperform a partial annuitization strategy when seeking to meet various client retirement goals and managing retirement risk.

Theory of Retirement Income Planning

The theory for retirement income planning used in this research is informed from multiple sources. First, Branning and Grubbs (2010) outlined a framework for thinking about retirement income in terms of household liabilities and asset-liability matching. Their analysis starts from the perspective of the household balance sheet. Liabilities represent the goals of a retiree, which Branning and Grubbs outline as a pyramid of funding priorities. In order of priority, retirees match assets to a base fund to cover essential spending, a contingency fund for spending shocks, a discretionary fund for additional lifestyle

improvements, and a legacy fund. We simplify their approach by assuming that a retiree first has a basic lifestyle spending goal for their retirement, then would like to preserve liquid assets to support contingency expenses (or possible lifestyle upgrades), and ultimately would be satisfied with building a legacy after being sure they can first meet their spending goals and support liquidity.

Next, we must clarify the meaning of risk from the perspective of retirement and personal finance. Risk is not only related to short-term market volatility, though the ability of a risk averse investor to stomach portfolio volatility is an important constraint for asset allocation decisions. Rather, the fundamental nature of risk for retirees is the threat that events take place (unexpectedly long life, poor market returns, spending shocks) that trigger a permanently lowered standard of living in subsequent years.

Retirees must decide how much risk to their lifestyle they are willing to accept. Major retirement risks relate to the unknown longevity and planning horizon of a retiree, the impacts of market volatility, and the risks of spending shocks that require additional unanticipated expenditures. Risk management tools include spending conservatively to stretch assets out and preserve liquidity for the unexpected, pooling risk through an insurance company, and investing for upside growth with a diversified portfolio.

In terms of longevity risk, the tradeoff relates to how one must spend less in order to spread assets over a long period of time, to the extent that one is worried about outliving their portfolio. Risk pooling provides another option. An insurance company can pool longevity risk across a large number of consumers, paying each member of the pool as though they will live to their life expectancy, with those who die earlier subsidizing those who live longer.

As for market risk, if one is willing to assume that risk premium on stocks will be earned, and therefore decides to spend more today than the bond yield curve can support, then this person is engaged in risky behavior. A natural mathematical formula that applies to retirement planning is that higher assumed future market returns imply a higher sustainable spending rate. Bonds provide a fixed rate of return when held to maturity, and stocks potentially offer a higher return than bonds as a reward for their additional volatility. But this “risk premium” is not guaranteed and it may not materialize; it is risky. Retirees who spend more today because they are planning for higher market returns than available for bonds are essentially “amortizing their upside.” They are spending more today than justified by bond investments, based on an assumption that higher returns in the future will make up the difference and justify the higher spending rate.

Maintaining liquidity is also an important tool for managing unanticipated spending shocks in retirement. But the nature of liquidity in a retirement income plan must be carefully considered. Cloke (2011) provides a key distinction about liquidity in a retirement income plan. In a sense, an investment portfolio is a liquid asset, but some of its liquidity may be

only an illusion. Assets must be matched to liabilities. Some, or even all, of the investment portfolio may be earmarked to meet future lifestyle spending goals. In Cloke's language, the portfolio is held "hostage to income needs." A retiree is free to reallocate her assets in any way she wishes, but the assets are not truly liquid because they must be preserved to meet the spending goal. While a retiree could decide to use these assets for another purpose, doing so would jeopardize the ability to fund future spending.

This is different from "true liquidity," in which assets could be spent in any desired way because they are not earmarked to cover other liabilities. True liquidity emerges when there are excess assets remaining after specifically accounting for ongoing lifestyle spending goals. This distinction is important because there could be cases when tying up part of one's assets in something illiquid, such as an income annuity, may allow for the spending goal to be covered more cheaply than could be done when all assets are positioned in an investment portfolio. In simple terms, an income annuity that pools longevity risk may allow lifetime spending to be met at a cost of 20 years of the spending objective, while self-funding for longevity may require setting aside enough from an investment portfolio to cover 30-40 years of expenses. Because risk pooling allows for less to be set aside to cover the spending goal, there is now greater true liquidity and therefore more to cover other unexpected contingencies, such as long-term care or health care shocks, without jeopardizing core-spending needs.

In order to calculate the "true liquidity" for an investment portfolio that is also supporting a spending goal, we must make assumptions about how much of the portfolio shall be earmarked for the spending goal. To accomplish this, we draw from Monte Carlo approaches for calculating retirement spending using an actuarial framework. In particular, Frank, Mitchell, and Blanchett (2012) developed a three-dimensional model in which sustainable spending is based on a time horizon, acceptable probability of failure, and asset allocation (linked to underlying capital market expectations). The asset base to support a spending goal is the spending goal divided by the estimated "safe" withdrawal rate based on the retiree's planning age, accepted probability of portfolio depletion, and asset allocation. If the current portfolio value is larger than this threshold, then the excess reflects true liquidity. True liquidity can be negative (the spending goal has a shortfall at the accepted level of risk) if current assets are less than what is needed to create sufficient comfort that the retirement spending goal will be met:

$$True\ Liquidity = Current\ Portfolio\ Value - \frac{Spending\ Goal}{\text{Safe } Withdrawal\ Rate}$$

If a retiree chooses to fully cover a spending goal through the partial annuitization of her portfolio, then remaining assets in the portfolio are not earmarked to cover spending. With this integrated strategy, risk pooling is used to earmark assets for spending, and the risk premium is used for remaining liquidity and legacy goals. They can be said to provide true liquidity. Since the retiree owns a contractual guarantee to cover her spending for life, she also has more risk capacity than with a pure investment strategy. After partial annuitization

to a bond-like income annuity, the retiree may decide to use a more aggressive asset allocation to seek more risk premium with her remaining portfolio assets.

Retirement Reality with Fixed Income Investments

For this analysis, we will simplify fixed income investments to assume a flat and unchanging yield curve. This eliminates interest rate risk from the analysis, as there is no possibility for fluctuating interest rates to create capital gains or losses for the underlying bond portfolio. In reality, if interest rates rise, the value of a fixed income portfolio declines, but the present-value cost of funding a future spending objective also decreases. If the duration of the bond portfolio matches the duration of the spending liability, then interest rate fluctuations have offsetting effects on the asset and liability sides of the household balance sheet and interest rate risk is hedged. Alternatively, we could think of our retiree as holding individual bonds to maturity, which means that any capital gains or losses from interest rate fluctuations would not be realized as the bonds reach maturity and provide their face value as a source of retirement spending for that year.

This simplification about fixed income does not meaningfully impact the decision between stocks and income annuities; it simply lets us focus more directly on the equity risk premium and risk pooling without also having to worry about fluctuating interest rates. In reality, bond holdings may be riskier for retired households than implied by our analysis, but this is not our focus.

Table 1: Sustainable Retirement Spending from Bonds for a 65-Year Old with $1 Million

		Interest rate					
		0%	**1%**	**2%**	**3%**	**4%**	**5%**
Planning Horizon (Age)	**70**	$200,000	$204,000	$207,998	$211,995	$215,988	$219,976
	75	$100,000	$104,537	$109,144	$113,816	$118,549	$123,338
	80	$66,667	$71,410	$76,299	$81,327	$86,482	$91,755
	85	$50,000	$54,867	$59,958	$65,258	$70,752	$76,422
	90	$40,000	$44,957	$50,216	$55,755	$61,550	$67,574
	95	$33,333	$38,364	$43,774	$49,533	$55,606	$61,954
	100	$28,571	$33,667	$39,218	$45,184	$51,517	$58,164
	105	$25,000	$30,154	$35,839	$42,002	$48,580	$55,503
	110	$22,222	$27,431	$33,245	$39,597	$46,406	$53,583

With a flat and unchanging yield curve, it is simple to determine the amount of sustainable spending that can be supported by a bond portfolio in retirement. The answer depends on the interest rate and the length of retirement. More specifically, the PMT function in Excel provides an answer for how much can be spent for a given interest rate, planning horizon, portfolio value, desired legacy value, and whether distributions are taken at the start or end of the year. Table 1 provides sustainable spending for a 65-year old with $1 million who seeks to spend down the portfolio by the specified planning age, and who takes

distributions at the start of each year. Longer planning horizons demand less annual spending in order to spread out assets for a longer period of time, and higher interest rates allow for higher spending through greater investment growth.

The baseline we use for subsequent analysis is a 2% interest rate. This is aligned with the Daily Treasury Long-Term Composite Rates at the time of writing.[1] In this case, a 65-year old wishing to plan for spending through age 80 could spend $76,299, whereas sustainable spending falls precipitously to $59,958 to make it through 85, to $43,774 to make it through 95, and to $39,218 to make it through 100.

Risk Pooling as a Retirement Income Solution

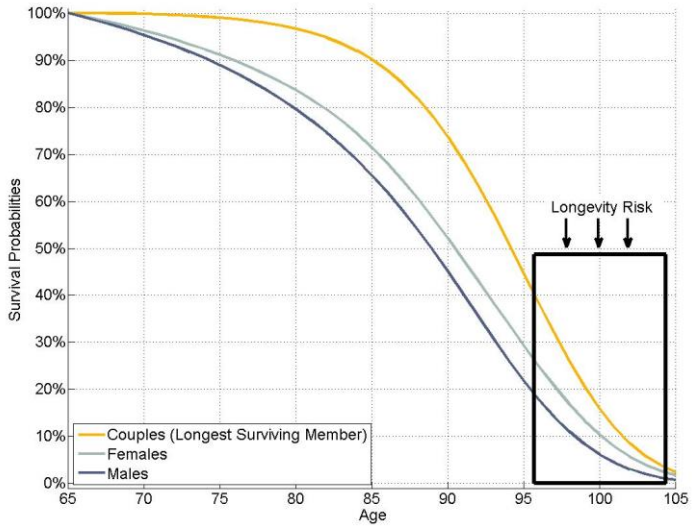
What planning age should a 65-year old retiree choose when building a retirement income plan? This is a personal decision to be based partly on objective characteristics: gender, smoking status, health status and history, family health history, and other socio-economic characteristics that correlate with mortality. It is also partly based on a client's answers to more subjective questions: how does she feel about outliving her investment portfolio, and what would be the impact on her standard of living if she outlives her portfolio? Milevsky and Huang (2011) define longevity risk aversion as the attitude one has regarding the possibility of living longer than expected and outliving one's financial resources. Beyond the objective available information about mortality, longevity risk aversion is what will drive the client's decision about an appropriate planning age.

Longevity risk, or the risk of running out of assets before running out of time, is the fundamental risk for retirement. We know about the distribution of longevity for the overall population, but an individual cannot know in advance precisely where he or she will fall in the distribution. The length of one's retirement could be much shorter or longer than their statistical life expectancy. Half of the population will outlive their median life expectancy; some will live much longer. Retirees do not know how long their retirements will last, and so they face a delicate tradeoff between wanting to spend as much as possible without overdoing it and risking old age poverty.

[1] The long-term composite rate was 1.98% on August 1, 2016, and 2.02% on August 2, 2016. Source: https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=longtermrate. Use of the long-term rate implicitly means that the analysis herein will be based on a nominal spending goal without inflation increases. This long-term composite rate does tend to closely match the internal rate of return supported by a 30-year retirement income bond ladder, which justifies assuming a flat yield curve at this rate as a simplification for the analysis. The market for Consumer Price Inflation adjusted income annuities is smaller and less competitive, so this analysis is based on the more competitive nominal annuities market. This distinction does not otherwise matter for the comparisons between risk premiums and risk pooling. Without loss of generality, fixed spending adjustments (such as 2% annual spending growth) could be incorporated into the analysis. As a point of reference, the long-term real interest rate on August 1, 2016, was 0.49%.

To add longevity risk to our retirement model, we will use the Society of Actuaries (SOA) 2012 Individual Annuity Mortality tables with built-in projections for mortality improvements through 2016. We treat this as the objective information available regarding longevity for a 65-year old retiree. This mortality data is for annuity purchasers, who do tend to live longer than the average American. This will reflect the more highly educated and higher earning clients working with financial planners. In terms of remaining life expectancy at 65 in 2016, the Society of Actuaries project an expected 22.6 more years for male annuitants to 87.6, while female annuitants can expect 24.3 more years to 89.3. For an opposite-sex couple, the longest living member of the couple can expect to live 27.6 more years to age 92.6. Figure 1 illustrates longevity risk for a 65-year old who builds a retirement plan using a 30-year planning horizon. The probability of outliving this time horizon is not insignificant. The probability for a 65-year old reaching age 95 is 22% for male annuitants, 29% for female annuitants, and 45% for at least one member of an opposite-gender annuitant couple.

Figure 1: Longevity Risk and the Probability of Survival from Age 65



Source: Own calculations for Society of Actuaries 2012 Individual Annuitant Tables with improvements through 2016.

Without risk pooling, the mechanism for an individual to manage longevity risk is to use a conservative planning horizon for which there is a sufficiently low probability to outlive. This requires spending less so that available assets can be drawn out for a longer period of time. The probability of surviving to advanced ages is low. Individuals must determine how low of spending they are willing to accept today in their effort to plan for a longer life and better ensure that they will not deplete their assets before death. An individual's longevity risk aversion determines how she will evaluate this tradeoff. As an example, let us consider a 65-year female client who decides that her appropriate planning horizon is the age for which there is only a 10% chance she might live even longer. Assuming our objective mortality data is correct for this individual, her planning age is roughly 100 (precisely, there

is a 10% chance she will live beyond age 100.1). She plans for 35 years of retirement spending from 65 through 99, with an assumption she will pass away on her 100th birthday. We assume this is the planning age that she is comfortable using with respect to her longevity risk aversion. With a 2% interest rate, if she invests $1 million in a bond portfolio and plans to live to 100, Table 1 revealed that she can sustain retirement spending of $39,218 throughout her retirement.

Next we introduce an income annuity as a tool to pool longevity risk. An insurance company prices income annuities using the bond yield curve, mortality data, and any overhead charges. The price for an income annuity is the survival-weighted sum of discounted cash flows provided by the annuity. With a 2% interest rate and the SOA mortality data, the lifetime annual income that could be supported by a $1 million premium for a 65-year old female is $51,943. If we add a realistic overhead charge of 2%, the lifetime annual income is $50,924.[2] With a 2% interest rate, Table 1 showed that this income is slightly more than what could be generated with a planning age of 90. More precisely, a bond ladder could support this amount of income for 24.55 years, which falls between ages 89 and 90.

The income annuity has effectively calibrated lifetime income to what an individual could support on her own if her planning age was roughly the same as her median life expectancy. The $50,924 from the annuity is 30% more than the $39,218 that could be supported (through age 100) from bonds. Figure 3 illustrates the sources of income for an income annuity. There are three sources of returns: repayment of the principal, interest earned on the principal, and mortality credits available through risk pooling. For principal and interest, Figure 3 shows the amortized payments from the bond portfolio as it is spent down through age 100, when it is depleted and bond income stops. The 30% additional income through age 100, and then any ongoing income beyond age 100 for those still alive is a unique source of additional returns from pooling risk (the short-lived subsidizing the long-lived) not available from a bond portfolio. These mortality credits are mortality-contingent in that the income is only received when an individual is still alive. Importantly, though, for those demonstrating longevity risk aversion (and who therefore use a planning age somewhere beyond their statistical life expectancy), higher income is supported no matter how long one actually lives. Annuitization reduces concern about outliving assets and provides a license to spend more.

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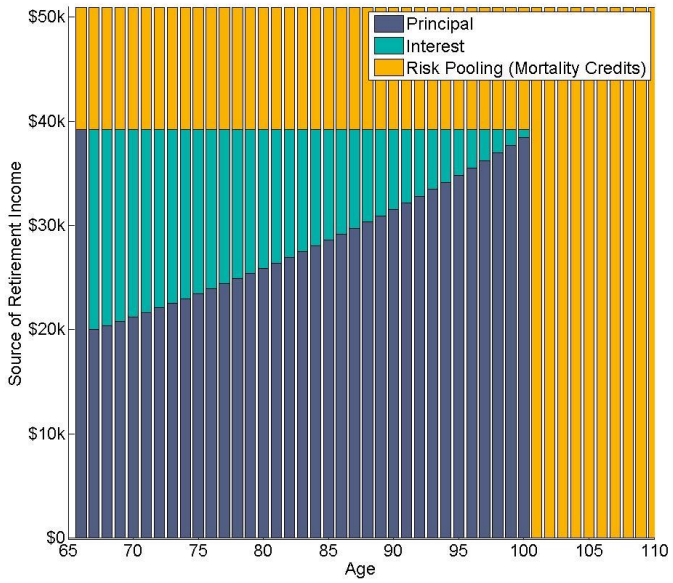
[2] Mathematically, the actuarial present value of a $1 of income for a 65-year old female is $APV = \sum_{t=65}^{119} \frac{SURV_t}{(1+r)^{t-(65-1)}}$, in which *SURV* represent survival probabilities from age 65, and *r* is the interest rate of 2%. With an additional 2% overhead charge, the payout of $50,904 from a $1 million premium is calculated as $\frac{\$1\ million}{APV*(1+0.02)}$.

Figure 3: Sources of Income for Income Annuity Purchased by 65-Year Old Female



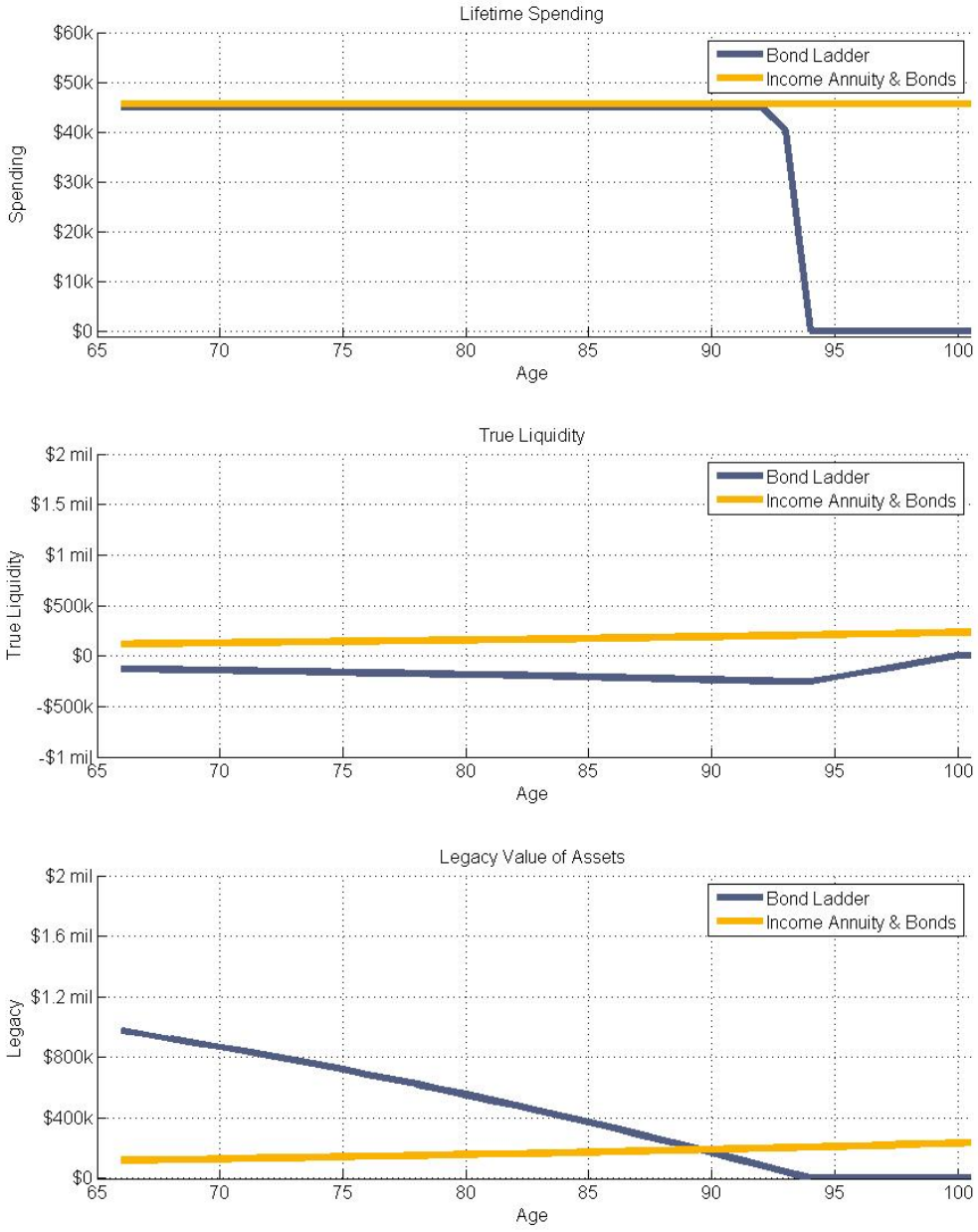
Notes: Based on a fixed 2% bond yield curve and a $1 million portfolio. Bond portfolio spending (principal, interest) is based on a planning age of 100. Annuity pricing is based on a life-only single female option using a 2% interest rate, Society of Actuaries 2012 Individual Annuitant Mortality Table (with improvements through 2016), and a 2% overhead charge.

To further investigate the case of a 65-year old female deciding between bonds and an income annuity, we add another assumption: her retirement spending goal is to take a $45,000 distribution at the start of each year. Our 65-year old has $1 million at retirement, faces a 2% bond yield curve, and wishes to build a financial plan that works through a planning age of 100. The life-only income annuity costs $883,669 at age 65 and provides income for life. Costs are fixed at the initial premium level. Meanwhile, the cost of funding retirement with bonds is dependent on the length of life. It is the present-discounted value of the $45,000 spending stream for an increasing number of years. With the age 90 distribution, the cost of funding retirement through bonds exceeds the cost with an income annuity. With the age 94 distribution, the cost of the bond ladder exceeds $1 million. For a planning age of 100 (35 years of payments), the bond ladder cost is $1,124,485, which is 27% more than the annuity cost. The bond ladder cost continues to rise with longevity. The tradeoff for the bond ladder: more legacy assets for a given level of wealth in the event of an early death, but the rising costs and risk of portfolio depletion in the event of a long life. For those with longevity risk aversion, the income annuity offers contractually guaranteed higher lifetime spending at the cost of potential legacy in the event of early death.

Figure 4 investigates each retirement goal ($45,000 spending goal, support true liquidity, support legacy) for the same 65-year old female with $1 million. As noted, the $1 million in the bond ladder can support the $45,000 goal until funds are depleted by age 94. Retirement spending then falls to $0. For the income annuity, a premium of $883,669

purchases $45,000 of spending for as long as the individual lives. This leaves $118,657 at age 65 that is not needed to cover spending.

Figure 4: Spending, Liquidity, and Legacy for Bonds and Income Annuities
65-Year Old Female with $1 million Seeking to Spend $45,000 Through Age 100



Next, true liquidity is measured as any remaining wealth not earmarked for meeting the retirement spending goal through the planning age. With the bond ladder, we already determined that assets are insufficient to meet the spending goal. The retiree needs to have wealth exceed $1,124,485, before there is any true liquidity for her retirement income strategy. Liquidity, measured as remaining portfolio assets less the present value of remaining desired spending through the planning age, is negative. Meanwhile, with the income annuity, the spending goal is fully covered with the $883,669 initial outlay, leaving the entire remainder of the $1 million as a resource of truly liquid assets. At 2% interest, this $118,657 grows to $232,649 at the planning age of 100.

Finally, in terms of legacy, the bond portfolio is spent down until it reaches $0 by age 94. Prior to 94, legacy assets are whatever remains in the bond portfolio. Meanwhile, the legacy supported by the income annuity is the remaining $118,657 at 65 that is not needed for income and that subsequently grows at 2% for the remainder of retirement. By age 90, legacy assets with the partial annuitization strategy ($190,853) exceeds legacy assets with the bonds-only strategy ($170,415). At the planning age of 100, legacy assets for the partial annuitization strategy are $232,649, compared to $0 for bonds.

Risk Premium as a Retirement Income Solution

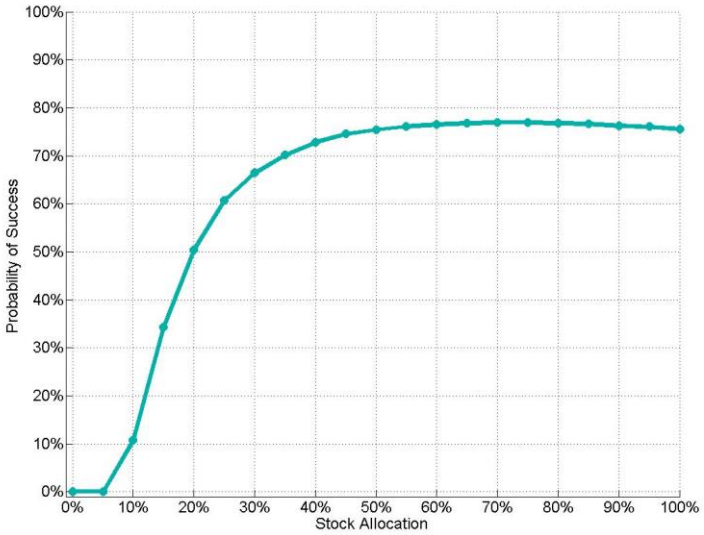
Thus far, the financial portfolio grew based on a fixed growth rate less any distributions. We now add stocks as a volatile asset class. Our 'risky' asset is based on large-capitalization stocks in the United States. The *Stocks, Bonds, Bills, and Inflation* yearbook from Morningstar provides historical data which shows that the arithmetic average return on large-capitalization stocks for the period 1926-2015 was 12%, with a standard deviation of 20%. During this time period, this was 6% larger than the 6% average return earned by long-term U.S. government bonds. The historical premium that large-capitalization stocks earned above long-term government bonds was 6%. We base our subsequent analysis using this historical 6% equity risk premium and 20% standard deviation. Stock returns are modeled using a lognormal distribution based on an 8% arithmetic average (6% more than our 2% long-term bond rate) and a 20% standard deviation.

The introduction of stock market risk requires two additional elements for the decision making of our risk averse retiree. What failure probability does she comfortably and willingly accept that her portfolio will continue supporting spending through the planning age? As well, how high of stock allocation is she willing to accept, in terms of her ability to stomach the daily volatility experienced by her investment portfolio? With the volatile investment and a fixed spending goal, some probability for portfolio depletion must be accepted by anyone seeking upside growth potential through the equity risk premium.

Our hypothetical retiree seeks to support a retirement spending goal of $45,000 annually for 35 years from a starting portfolio of $1 million. Figure 5 shows the probability of success for meeting this goal for different asset allocations using 10,000 Monte Carlo simulations.

This figure makes clear that for someone to consider the risk premium as a retirement solution, it is important not to be timid with one's stock allocation. Being able to support the full spending goal requires an internal rate of return on investments of 2.97%. With bonds yielding 2%, success is not possible with an all-bonds portfolio (confirming our earlier point that the bond portfolio depletes by age 94). Adding stocks to the portfolio creates the opportunity to achieve upside growth, improving the odds that the goal can be achieved. Success probabilities peak for portfolios that include at least 50% stocks. For stock allocations of at least 50%, the probabilities of success for the spending plan fall between 75% and 77%.

Figure 5: Probability of Success for a 65-Year Old Female Seeking 35-Years of $45,000 Spending from $1 Million



Notes: Based on 10,000 Monte Carlo simulations. Bonds returns are fixed at 2%. Stock returns are lognormally distributed with an arithmetic mean of 8% and a 20% standard deviation.

To continue our example, we assume that our 65-year old female seeking to fund $45,000 per year through age 100 is comfortable with holding a 50% stock allocation in retirement, and is willing to accept a 25% chance that her portfolio will be depleted by age 100 (which we need to know for the purposes of determining the true liquidity for her portfolio).

Figure 6 provides the key results for comparing three strategies: bond ladder, an investment portfolio with 50% stocks, and using an income annuity to cover the spending goal while investing remaining funds in 100% stocks. For strategies including stocks, the figure shows the median as a solid line, and the 5th, 10th, 90th, and 95th percentiles of the distribution as dashed lines. For lifetime spending, the bond portfolio supports income through age 94. The 50/50 portfolio experiences a 5% chance that the spending goal cannot be fully met by age 89, and a 10% chance by 92. The first case of wealth depletion happens at 79, and there is a 14.6% chance that the investment portfolio runs out of assets before the bonds-only

strategy. For the other percentiles of the distribution shown in the figure, income can be sustained indefinitely. As for the income annuity, partially annuitizing $883,669 of the $1 million provides a contractual guarantee to support the $45,000 spending goal for life.

Next, with regard to true liquidity, the bond ladder experiences the same shortfalls as described before. For the 50/50 portfolio, median liquidity remains positive throughout the planning horizon, but shortfalls relative to the goal are experienced at the 5th and 10th percentiles. For the 90th and 95th percentiles, liquidity grows dramatically throughout retirement as portfolio growth outpaces the distributions for spending. As for the income annuity strategy, the distribution for liquidity stays more narrow than with the stock/bond strategy. Median liquidity with partial annuitization remains higher throughout the retirement horizon. Since distributions are not taken from the liquid assets with the partial annuitization strategy, there are not cases where liquidity becomes negative.

Finally, regarding legacy assets, wealth is slowly spent down with the bond portfolio as the spending rate exceeds the 2% portfolio return, until the portfolio reaches $0 at age 94. With the investment portfolio and the equity risk premium, the distribution of outcomes is wide. As noted, at both the 5th and 10th percentiles the 50/50 portfolio depletes earlier than the bond portfolio. This is the risky aspect of investing for the risk premium. However, the potential for upside is great. Median wealth is $785,276 at age 100, and at the 90th percentile of the distribution wealth has already exceeded $2 million by age 84. There is a 43.6% chance that the initial $1 million can be preserved by the planning age. Meanwhile, for the partial annuitization strategy, legacy wealth declines dramatically as the life-only annuity is purchased, but it increases over time as a result of no further distributions being taken from this asset combined with the more aggressive 100% stock allocation supported by the retiree's increased risk capacity. Median wealth is $962,010 by the planning horizon, and there is a 48.6% chance that the initial $1 million is preserved by the planning age.

Figure 7 shows the probabilities for the risk pooling and risk premium strategies to support more with each of the three retirement goals: spending, liquidity, and legacy. Risk pooling provides a contractual guarantee to meet the spending goal, while beginning at age 79 the risk premium strategy begins to experience portfolio depletion. This accounts for the slowly increasing probability that risk pooling can support greater income at advanced ages. Regarding liquidity, risk pooling is able to meeting the spending goal with a smaller asset base, which allows for greater liquidity at the start of retirement. Throughout the retirement horizon, risk pooling supports a greater amount of true liquidity more than 65% of the time at the lowest levels and more than 70% of the time at the planning horizon. Greater liquidity can allow for greater peace of mind in retirement as well as potential lifestyle improvements because of a reduced fear about outliving assets. With risk pooling, the ability to support greater legacy is hampered until late in retirement. There is a greater than 50% chance that legacy is larger with risk pooling by age 96, and a more than 70% chance for a larger legacy by age 100. Preserving legacy for the early part of retirement is the primary advantage of the risk premium investment-only strategy.

Figure 6: Spending, Liquidity, and Legacy for Bonds, Annuities, and Stocks
65-Year Old Female with $1 million Seeking to Spend $45,000 Through Age 100

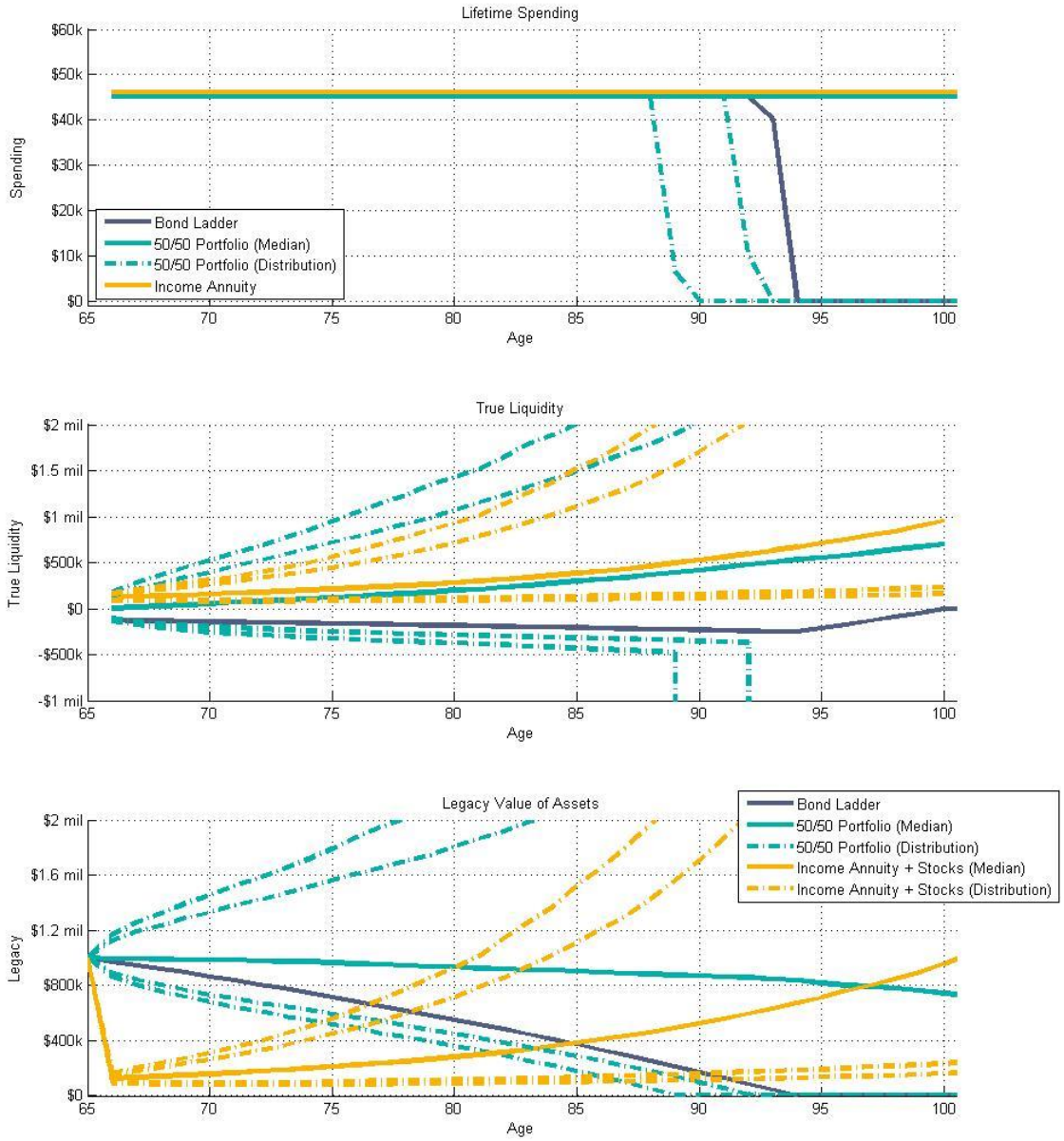
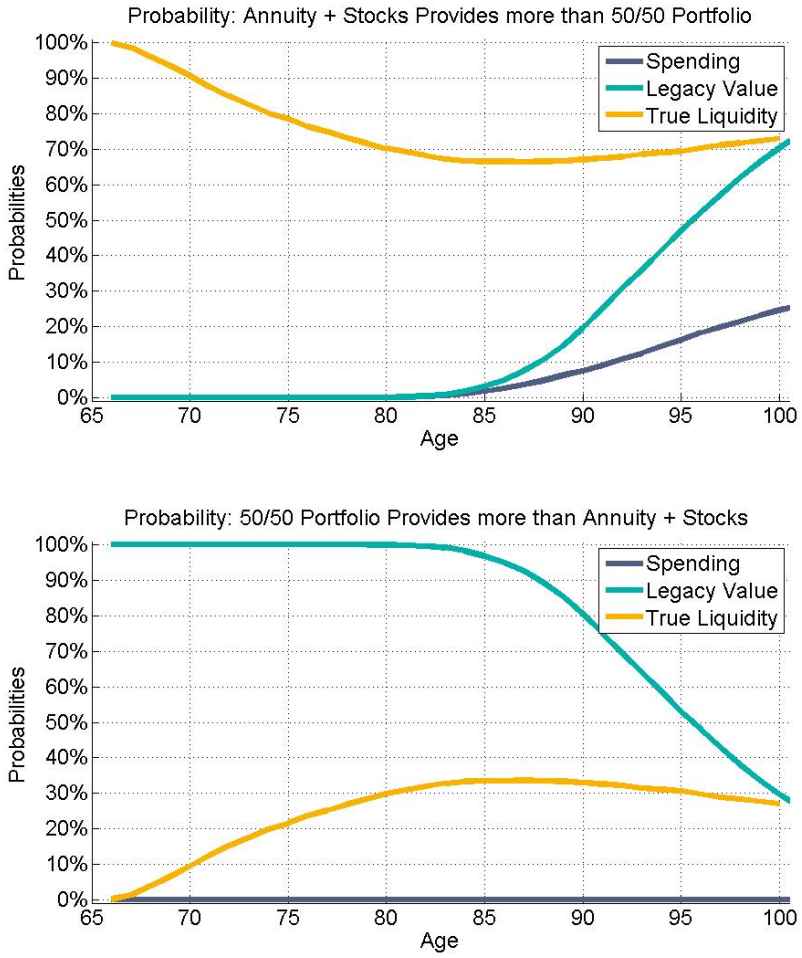


Figure 7: Probability for Outperformance, Risk Premium vs. Risk Pooling
Investments-Only (50/50 portfolio of stocks and bonds) vs.
Partial Annuitization (income annuity for spending goal, 100% stocks for remainder)
For 65-Year Old Female with $1 million Seeking to Spend $45,000 Through Age 100



Conclusion

For the retirement income showdown between risk pooling and risk premium, we have seen with this case study that risk pooling provides stronger support for meeting a retirement spending goal and for preserving true liquidity. The risk premium does support greater legacy at the beginning of retirement, but this advantage does diminish at more advanced ages. For clients choosing between these strategies, an important distinction will be on how much weight is given to the increased legacy in early retirement supported by the risk premium. Those favoring spending and true liquidity will find that it is much more difficult than commonly assumed for an investments-only strategy to outperform a strategy with partial annuitization.

Table 2: The Relative Impacts of Changing Assumptions for the Case Study

Assumption Used	Alternatives	Impact
Client Characteristics and Retirement Goals		
65-year old female	Different age or gender, or a couple	This assumption is fundamentally about the length of the planning horizon. If the planning horizon is longer (because younger or a couple), spending must be reduced for either strategy. A joint and survivor income annuity may be used. Income annuities will pay less, but portfolio distributions must also be reduced to account for the longer horizon.
Spending goal is fixed	Desire inflation adjustments for spending goal	Switching to an inflation-adjusted spending goal shifts the focus to real interest rates which lowers initial spending for both strategies. Note that a strategy with greater true liquidity has more potential to support spending increases later in retirement.
Initial spending percentage is 4.5% ($45,000 from a $1 million portfolio)	Spending percentage could be higher or lower	A higher spending percentage is less sustainable for both strategies. For investments only, more assets must be earmarked for spending and success rates will fall. For risk pooling, a greater percentage of assets will be required for the income annuity, leaving less for liquidity and legacy.
Client Risk Aversion		
Planning age of 100 based on allowing 10% chance of outliving the planning age	Planning age could be higher (greater longevity risk aversion) or lower (less longevity risk aversion).	A client with less longevity risk aversion could plan for a shorter time horizon, which would allow for relatively more spending from investments. Risk pooling becomes increasingly favorable as longevity risk aversion increases.
Accepts 75% probability that investment portfolio can sustain spending until planning age	Accepted success rate could be higher or lower	Seeking a higher probability of success means lower sustainable spending for investments, which increases the spending differential in favor of risk pooling.
Client risk tolerance allows for up to 50% stock allocation with investments only	Stock allocation could be higher or lower	Increasing the stock allocation does not have much impact on the probability of success (Figure 5), but it does widen the distribution of outcomes both on the downside and upside.
Financial Market Characteristics		
Bond yields are fixed at 2%.	Bond yields could be higher or lower	Lower bond yields support partial annuitization. Lower yields reduce sustainable spending for both investments and income annuities. This increases the relative importance of the mortality credits available through risk pooling. With higher bond yields, sustainable spending can be increased for both strategies.
Stocks are lognormally distributed with a 6% equity premium above bonds and a 20% volatility.	Stock returns and volatility could be different	Since both strategies include a role for stocks, high stock returns will lead to more favor outcomes for both.
Income annuity is life-only	Provisions could be added to refund a portion of the premium in the event of early death, which reduces the payout rate	Such annuity provisions will work to narrow the differences between investments only and partial annuitiziation. The legacy value of assets will not be impacted as negatively in the event of an early death with partial annuitization, but partial annuitization will require more assets to meet a spending goal, leaving less for true liquidity and long-term legacy.

To preserve space, this research has focused on one general case study. Variations in these results could be found by changing the assumptions, including the bond interest rate, the value of the equity premium and the volatility of the stock market, the gender and size of the retired household, and the ratio of the retirement spending goal to the amount of retirement date assets. Aspects of the retiree's longevity risk aversion and general risk aversion are also important, including the planning age, accepted probability of failure by the planning age, and acceptable asset allocations for both the investments-only and partial annuitization strategies. Additional options for the income annuity may also be considered, such as including a cash refund provision to provide unspent premiums back to the estate in the event of the annuitant's early death. Table 2 provides an overview about how changing these assumptions would impact the relative performance for the risk premium (investments only) and risk pooling (partial annuitization).

Ultimately, the message of this research is that risk premiums do not obviously outperform risk pooling as a way to meet retirement spending goals as well as providing support for contingencies and legacy. Advisors with aversion to income annuities think carefully about whether their advice is serving the best interest of their clients.

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