Hearn Wealth Management LLC

RESEARCH

Improving Outcomes for Retirement Income Solutions

Combining Managed Money and Annuities

ABSTRACT

Our study provides evidence that a combination of an annuity and a managed money solution may improve outcomes when used together in a retirement income solution. We conduct a simulation analysis to test this theory using a balanced allocation with equal stock exposures and a moderate annuity allocation under a variety of market conditions. Our results show that combining a single premium immediate annuity (SPIA) with a managed money allocation added value across planning horizons, across different spending rates, and across market types. While we do not address other types of annuities and riders in this paper, our approach presents conditions under which the most basic form of longevity insurance would add value, and is therefore applicable to a vast array of annuity products. With rising interest rates and fixed income markets facing headwinds, these results support the inclusion of annuity products as substitutes for portions of fixed income in a financial plan. By insuring future income and immunizing interest rate risk, adding annuities may also allow for higher stock allocations in a managed money solution, thereby increasing measures of success without sacrificing insurance against worst case scenarios.

1. INTRODUCTION

While investment professionals rarely agree on the risks and direction of markets, many would list planning for retirement as one of the most important financial objectives every investor faces. Over the last 30 years the trend has shifted to put the focus squarely on the individual, given the rise of the defined contribution plan and the demise of the defined benetfit plan. In choosing a retirement plan, financial advisors have two broad categories to choose from: managed money solutions offered by asset managers, and annuities offered by insurance companies. Within both categories, the number of available investment options and variations are virtually limitless, making the advisor's role in the retirement planning process absolutely critical to help simplify the investment management landscape for their clients. Additionally, while specified research in each of these respective categories is abundant, there exists less research on how to help advisors combine managed money and annuities into a single plan. In this research piece our goal is to strip down the complexity and examine some basic tradeoffs and synergies that are available by combining both managed money and annuities.

2. MANAGED MONEY AND ANNUITIES

2.1 SYSTEMATIC WITHDRAWAL PLANS

When using a managed money solution in a retirement plan, a systematic withdrawal plan is commonly used to generate income during retirement. Perhaps the best known rule of thumb in this category is the 4% rule, made famous in the 1994 paper by William Bengen (Bengen [1994]). In this study Bengen considered all rolling 30-year retirement horizons starting in 1926 and a 50/50 stock

(S&P 500 Total Return) and bond (Intermediate Term Government bonds) portfolio. In each starting year he computed the maximum initial portfolio withdrawal rate, that when adjusted for actual inflation each year thereafter, could have been withdrawn from the portfolio without depleting all the assets for the entire 30 years. The worst case result: a 4.15% withdrawal rate starting in 1966. Pfau [2010] followed a similar methodology in international markets and found the 4% rule to be problematic since historical returns in those markets have been weaker on average than the U.S. Another classic article in the withdrawal literature was a study referred to as the "Trinity Study" Cooley et al. [1998], which introduced the now ubiquitous statistic, the portfolio success rate. Two key conclusions are evident from this study: 1) on average a higher success rate occurs for all initial spending rates as stock allocations increase, and 2) a larger stock allocation becomes more important as the initial spending rate and spending horizon increases. A more recent article, Kitces and Pfau [2015], actually promoted a rising equity glidepath to reduce spending risk. A ubiquitous conclusion across the withdrawal rate literature is that more equity exposure typically allows for higher rates of success[2].

2.2 ANNUITIES

Turning our attention to insurance solutions, the many different options can be paralyzing. One of the most popular insurance options, a variable annuity (VA), combines both the growth or accumulation phase with the spending or funding phase of a retirement plan through the additions of riders. Other products such as the growing index-linked variable annuity (ILVA) product line and the deferred income annuity (DIA) product line (often referred to as longevity annuities) also combine accumulation and funding. In these products growth may be linked to an underlying index or credited at a conservative rate. In Milevsky et al. [2013] the authors tackle the most complex of these products, the variable annuity with an income rider and highlight all of the competing forces that must be considered when determining when to begin taking income from the rider. Here we only consider annuitization, the process by which funds are turned into a guaranteed income stream for life. While not immediately obvious, once annuity assets are annuitized, they are all basically a single premium immediate annuity (SPIA) struck on that particular date. This is a key concept when evaluating using annuities and managed money together, and in this research paper we are interested only in evaluating the funding insurance portion of an annuity. By not mixing these two concepts we can simplify the complexity of the problem so that the true value of the funding insurance can be identified. Therefore, this analysis can be insightful for any type of annuity that contains funding insurance through an annuitization feature.

2.3 FACTORS TO CONSIDER

The two main factors governing the payout rates for annuitization, specically the most basic type

of annuity, a SPIA, are actually quite simple: 1) the life expectancy of the contract and 2) the implied internal rate of return net of fees provided by the insurance carrier. All annuities are in essence, one large and complicated time value of money problem, with funds shifted around in time using mortality tables and different implied rates of return. One aspect of annuity quotes that can be misleading is the payout rate. Payout rates are not returns. In fact, most of the payout rate quotes include return of capital, i.e. the insurance company returning your own money to you, plus an implied internal rate of return. Therefore, the first step in evaluating the value of an annuity is understanding the implied rate of return. Once we understand the implied rate of return we can begin to compare annuities with other non-annuity investments. Below are key factors and tradeoffs to consider when evaluating how much of annuity and managed money solution to use in a portfolio allocation:

1. **Guarantee:** Of course one of the most attractive features of annuities is the guarantee, but as we'll show the guarantee is not free. While perhaps obvious, a guarantee is most appropriate for investors who are risk averse, expect to live a long time, or have poor expectations about future market returns. On the contrary, the guarantee is less appropriate for investors without those characteristics. It is also important to consider the guarantee and the annuity itself as part of the asset allocation. Therefore, a larger allocation to the annuity means investors can use a larger allocation to equities for the remainder of the portfolio without increasing overall portfolio risk. For example, we believe it is overly conservative to invest 50% into an annuity and then invest the other 50% of the portfolio into 100% fixed income.
2. **Legacy wealth:** A traditional SPIA is not designed for growth, and investors that value passing funds down to the next generation should be mindful of this. However, related to our last point, including a guarantee in a portfolio allocation should allow for a greater equity allocation for the remainder of the portfolio, making larger legacy wealth more likely. While variable annuities combine both growth and income, it is an important point to keep in mind that variable annuities provide exposure to returns that are available in the market. Investors should always consider the opportunity cost of what they are not investing in when considering annuities.
3. **Inflation protection:** While riders and SPIA payouts are usually available with inflation protection, these are not free. Any flexibility or payout protection that a buyer wants will lower his or her payout rates and the implied internal rate of return. We believe one of the best ways to use annuities for inflation protection is by using more equities in the remainder of the portfolio to fight inflation risk with investment growth.
4. **Liquidity:** Just as with inflation protection, any flexibility a buyer wants will lower payout rates and the implied internal rate of return. This applies to both period certain payouts and death benefits. Therefore, an investor who places value on having variable spending patterns may want to allocate less to an annuity.

3. LIFE EXPECTANCY AND INTERNAL RATES OF RETURN

While internal rates of return of insurance companies are not widely published, they can be inferred. In a paper by Vanguard, (Zahm and Ameriks [2012]), the authors do just that and compute internal rates of return that would accrue to holders of income annuities using market payout rates and mortality tables. In Figure 1 we do a similar analysis using the 2013 Actuarial Life Table (SSA [2013]) and current market payout rates. Using data from the Cannex Pay Index (Limited [2018]) we were able to gather payout rates for standard contracts for the top 10 carriers listed on Cannex based on income annuity sales. As expected, the internal rate of return increases as life expectancy increases. We also note that at the median life expectancy, the return is less than the current yield of a 30-year U.S. bond, which can be thought of as the risk-free rate for a 30-year time horizon. As noted in Zahm and Ameriks [2012], annuities are insurance products, and like other forms of insurance, should not be expected to provide value under average conditions, but instead provide payoffs under adverse conditions. This is intuitive: if there was no risk in the market or no risk of outliving one's savings, there would be no need for funding insurance via annuities. This can be seen from this chart as the "value" (IRR) to the holder increases with longevity.

Figure 1 Life Expectancy of a joint contract of a 70-year-old male and 65-year-old female along with the implied internal rate of return using current payout rates and the life expectancy percentiles. Examples of how to interpret the percentiles: the 50th percentile is the median life expectancy for at least one contract owner and the 75th percentile is the number of years for a 25% chance of survival.

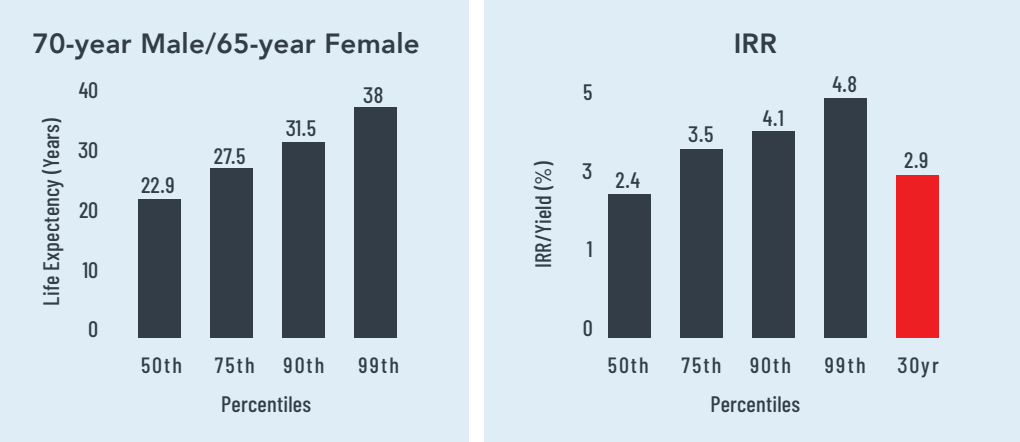
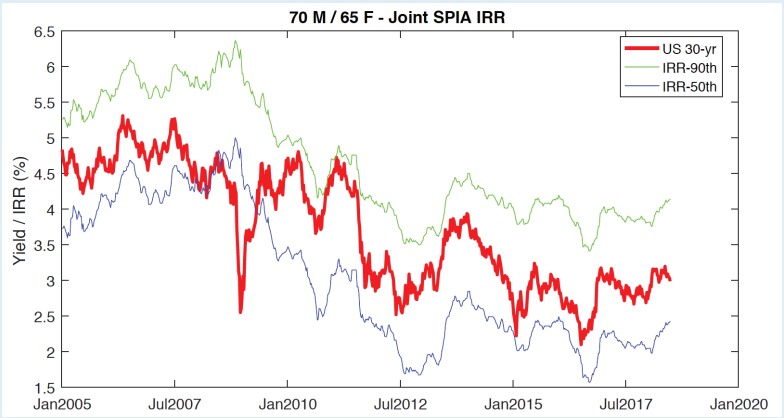


Figure 2 Implied internal rates (IRR) of return for a SPIA using payout rates for a 70-year-old male and 65-year-old female joint contract over time using data from the Cannex Pay Index. Calculations of the IRR are done using statistical data provided in the Actuarial Life Table found here SSA [2013]. The 50th percentile is median life expectancy for at least one contract owner and the 90th percentile is the number of years for a 10% chance of survival for at least one contract owner.



In Figure 2 we are able to do these same calculations over time and plot these returns alongside the 30-year U.S. treasury yield.[3] A few observations: 1) IRR for median life expectancy is below the risk free rate while for long life expectancy it is above, 2) rates are currently low, and 3) as rates go up and down, so does the return to the annuity purchaser. This evidence suggests that a SPIA may be an excellent substitute for bonds in an allocation framework since expected returns are similar. The annuity can be used to both guarantee future income and immunize the portfolio from interest rate risk during a period of rising rates.

4. SPENDING ANALYSIS

As noted by Pfau [2017], capital market assumptions in a spending analysis are absolutely critical. When evaluating an insurance product especially, simulating scenarios that are less than average are necessary to truly realize the value of the insurance. Evaluating an insurance product under only average conditions does not truly capture the payoff states that the insurance was designed to protect against. Table 1 shows the distribution of returns over various horizons for stocks (S&P 500 Total Return) and bonds (Intermediate Term Government Bonds) using SBBI Ibbotson data from 1926 - 2017. These returns will help guide our capital market assumptions. This is also an excellent example of the Law of Large Numbers, a statistical principle that states that an average value becomes more certain as the number of data points used to compute the average grows.

This can be seen by observing that as the number of years increases, the spread between the 90th and 10th percentile of returns shrinks. In fact, according to this historical data sample, stocks can be thought of as less risky than bonds at a 30-year horizon because the 90-10 spread is smaller.

Table 1 Annualized return distribution of stocks and bonds expressed as percentiles using quarterly SBBI Ibbotson data from 1926-2017 over 6 rolling time horizons.

	Percentile								
	100% Stocks					100% Bonds			
Years	10th	50th	90th	90-10	Years	10th	50th	90th	90-10
1	-12.9	12.5	37.3	50.2	1	-0.1	3.9	12.3	12.4
5	-1.6	10.8	20.2	21.9	5	1.7	4.7	10.0	8.3
10	3.1	9.9	17.4	14.4	10	1.7	4.7	10.4	8.6
15	4.8	10.7	16.6	11.8	15	2.0	5.2	9.9	7.8
20	7.1	11.4	15.2	8.1	20	2.2	5.2	9.5	7.3
30	9.7	11.0	13.0	3.3	30	2.6	6.3	8.6	6.0

4.1 SCENARIO SPENDING PARAMETERS

For our spending analysis we will conduct a basic case study considering several different allocations. We consider the following:

1. A 70-year-old male and 65-year-old female purchasing a joint contract SPIA using the payout rates as of June 27, 2018 from the Cannex Pay Index.
2. Their goal is to spend $50K per year of a $1 MM account (i.e. 5% unless otherwise noted), with distributions taken at the end of each quarter and adjusted upwards for inflation each year thereafter. We also include a 2% fee taken annually to reflect fund or advisory fees and other practical implementation costs.
3. To understand the efficacy of an annuity we will compare two different allocations. First we use a 50/50 stock and bond balanced allocation consistent with the original "4% rule" analysis conducted in Bengen [1994]. Next we consider a 30% allocation[4] to the SPIA, and the remainder allocated to a 70/30 stock and bond allocation. This amounts to a nearly equal equity allocation (49% to 50% in favor of the balanced portfolio). Given current SPIA rates, this amounts to a 4.7% spending rate from the 70/30 portfolio. We simulate paths with a Monte Carlo analysis where natural log returns follow a normal distribution and capital market assumptions for annualized returns are defined in each table caption. Covariance matrix estimates for the simulations assumes the annualized volatility for stocks (22%) and bonds(5%) and a correlation of 0.024 from the data used in Table 1.

4. We compare the performance of the annuity as we vary the following: 1) the planning horizon, 2) the spending rate, and 3) a good or poor market.

Table 2 tells us the exact spending rate which would be successful with an assumed fixed investment growth rate and also helps reinforce how much impact return assumptions can have on a spending analysis. These rates can also be related to annuity payout rates, with life expectancies replacing planning horizons. Below are a few key conclusions from this analysis.

1. As the planning horizon gets shorter, the sustainable spending rate increases. This is perfectly consistent with payout rates increasing as investors get older, i.e. their life expectancy decreases.
2. As the assumed return increases, the sustainable spending rate increases. In fact, at a 30-year horizon with inflation adjustments, a 6% return can sustain a 5% spending rate while a 0% return can only sustain a 2% spending rate.
3. Inflation adjustments cause sustainable spending rates to drop.

Table 2 Sustainable spending rates for different fixed returns and planning horizons.

Inflation Adjustment 3% each Year

r	10 yrs	20 yrs	30 yrs	40 yrs
0%	8.5%	3.6%	2.0%	1.3%
2%	9.5%	4.5%	2.9%	2.0%
4%	10.5%	5.5%	3.9%	3.0%
6%	11.7%	6.7%	5.0%	4.3%
8%	12.9%	7.9%	6.4%	5.7%

No Inflation Adjustment

r	10 yrs	20 yrs	30 yrs	40 yrs
0%	10.0%	5.0%	3.3%	2.5%
2%	11.1%	6.1%	4.5%	3.7%
4%	12.3%	7.4%	5.8%	5.1%
6%	13.6%	8.7%	7.3%	6.6%
8%	14.9%	10.2%	8.9%	8.4%

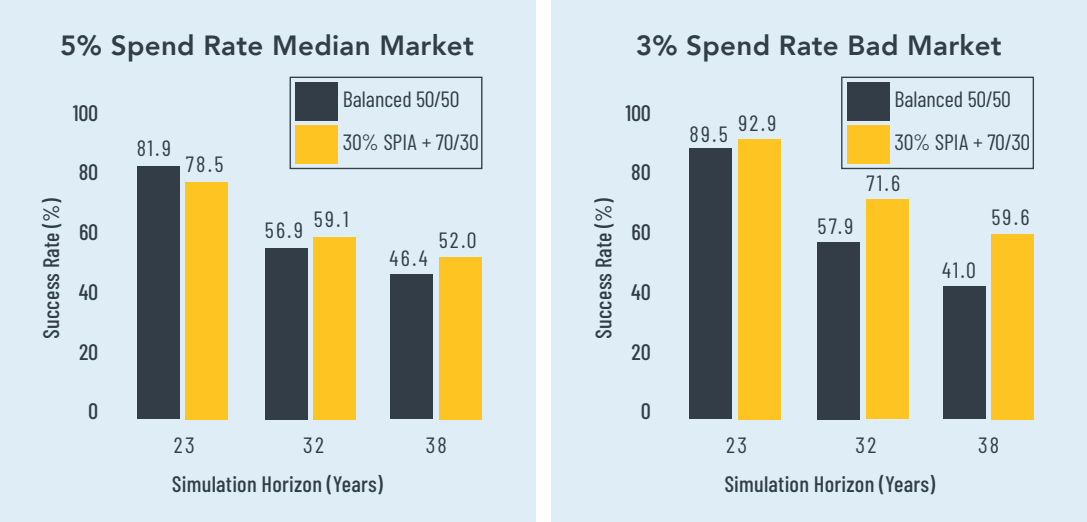
4.2 MEASURING SUCCESS

Table 2 can also help us understand the commonly used portfolio success rate introduced in the "Trinity Study" Cooley et al. [1998]. A portfolio success rate is typically defined as the percentage of simulated periods where all desired spending was achieved. In a fixed rate analysis like in Table 2, this tells us the exact spending rate that would be successful with an assumed fixed investment growth rate. However in a simulation analysis, the investment growth rate is not fixed, but varies from one simulated path to the other. For example, while simulated returns may have a 5% return on average, some periods are greater than 5% and some periods are less than 5%. Therefore a portfolio success rate in a simulation analysis can be thought of as a proxy for the percentage of simulations where the annualized rate of return was greater than or equal to the exact fixed rate needed to sustain the modeled level of spending.

When analyzing spending strategies, particularly annuities, the portfolio success rate doesn't tell us everything we would like to know about the attractiveness of the strategy, and we therefore turn to another statistic we call the "Legacy Success Ratio." The Legacy Success Ratio is the sum of two ratios: 1) the percentage of desired spend that was actually spent, what we call the funded rate, and 2) the real legacy wealth leftover as a fraction of initial wealth. For example, suppose that you would like to spend $5,000 per year and have access to an annuity that pays you $4,950 per year. A simulation would reveal that this annuity has a 0% portfolio success rate, when in fact you could spend 99% of your desired spend with certainty. Additionally, if all desired wealth was spent (i.e. 100% of desired spend was spent), and the plan still had funds leftover, the legacy success ratio would be greater than 100%. Therefore this ratio not only captures spending success but also legacy value in a single number that is valid for each simulation period. This allows us to evaluate the percentile rank over all simulations of a single statistic so that we can observe a range of likely outcomes, not just the average outcome. However an average can still be computed and presented as well. Intuitively this value is also more robust to outliers and is more realistic than the portfolio success rate alone. In practice, an individual would not exhaust all of his or her funds, but instead adjust spending down accordingly. This statistic can tell us just how "painful" those adjustments might be.

4.3 SIMULATION RESULTS AND DISCUSSION

Figure 3 Success rate of a 50/50 Balanced portfolio and a 30% SPIA + 70% 70/30 portfolio. We modeled a 5% and 3% spend rate where the distributions where adjusted for inflation at 3% per year each year after the first. Median markets assume the median 20-year returns from Table 1 while bad markets assume the 10th percentile 20-year returns from Table 1. The simulation horizons correspond to the 50th (23 years), 90th (32 years), and 99th (38 years) percentiles of life expectancy.



In this section we outline our main results found in each of the figures:

1. First, we compute the portfolio success rates found in Figure 3. At a 5% spend rate under a normal market, the success rate reveals marginal value. At short planning horizons the annuity adds no value, while at a 32 and 38 year planning horizon, i.e. the 90th and 99th percentile of life expectancy, we do observe higher success rates.
2. Figure 4 compares performance across the planning horizon while holding the spending rate and market performance constant. For the median planning horizon of 23 years we see no value for the annuity. However at the 99th percentile planning horizon of 38 years the annuity adds value for all outcomes, matching our expectations.
3. Figure 5 compares performance across spending rates and outcomes while holding the planning horizon constant at 32 years, the 90th percentile of life expectancy. The market type is also held constant as capital market assumptions use median 20-year returns from Table 1. We observe that the annuity adds value under all conditions. However, the value add of the annuity shrinks as the spending rate increases. Our interpretation is that for low spend rates the annuity is able to immunize much of the desired spend, allowing for larger equity allocations for the remainder of the portfolio. Therefore the enhanced growth of the remainder of the portfolio due to higher equity allocations contributes to larger amounts of legacy wealth. However at higher spend rates the annuity is not able to immunize a large enough portion of desired spend, and the long-run compounding of equity returns dominates as the spending rate increases. Therefore the use of an annuity adds more value at lower spend rates, and adds less value at higher spend rates.
4. Figure 6 compares performance across market type, holding spending rate and planning horizon constant. The results show that the annuity adds value under all conditions. We also observe that under poor market conditions the annuity adds more value than under normal market conditions, which again matches our expectations.

Figure 4 Legacy success ratio across planning horizon according to the parameters in Section 4.1. A simulation time of 23 years references median life expectancy while a simulation time of 38 years references the 99th percentile life expectancy. Performance per-centile ranks the outcomes such that 1st is nearly the worst case scenario and the 50th is the median outcome. Market returns assumes the median 20-year returns from Table 1.

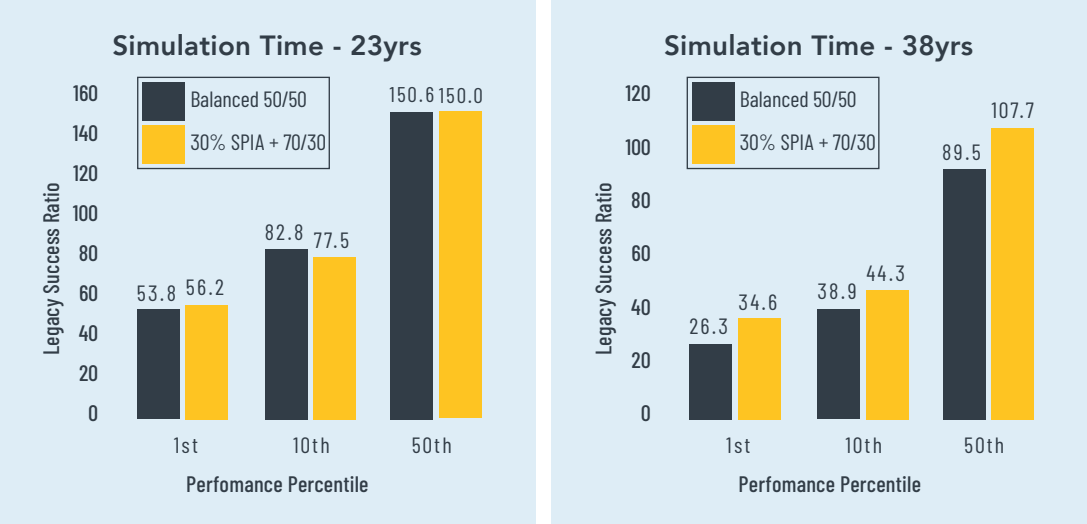


Figure 5 Legacy success ratio across spend rate according to the parameters in Section 4.1. Median outcome references performance as the 50th percentile of the legacy success ratio while poor outcome references performance as the 10th percentile of the legacy success ratio. A simulation time of 32 years was used, which references the 90th percentile life expectancy. Market returns assume the median 20-year returns from Table 1.

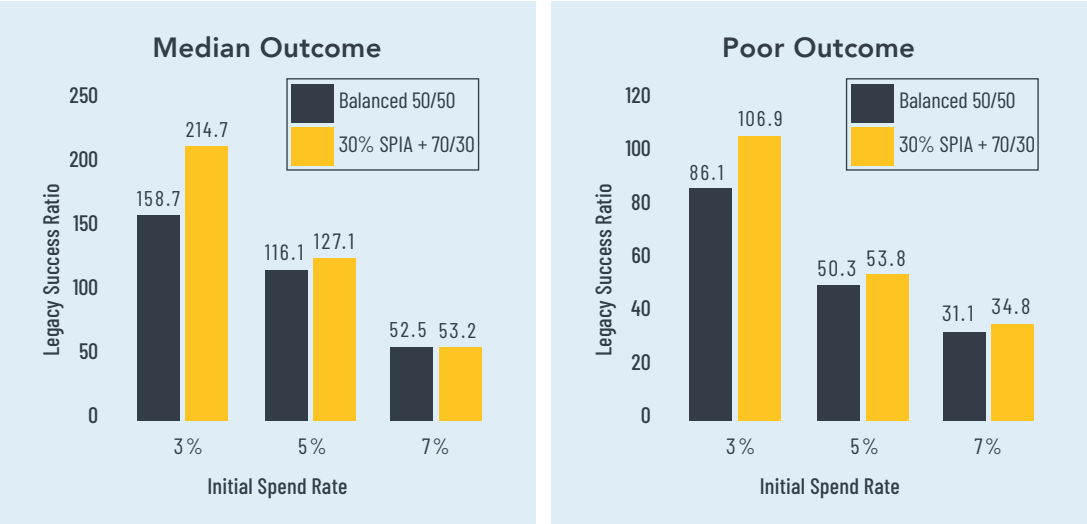
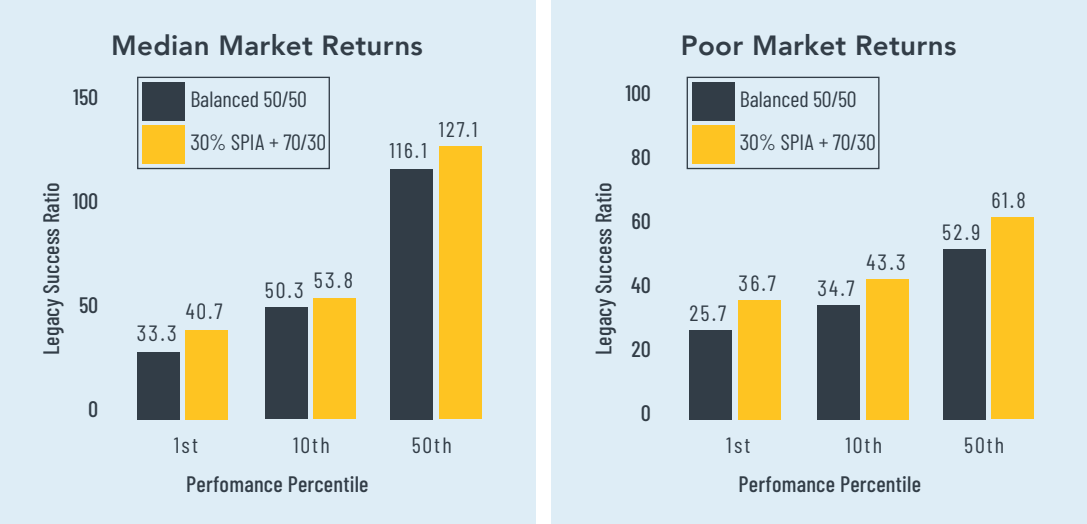


Figure 6 Legacy success ratio across market type according to the parameters in Section 4.1. A simulation time of 32 years was used which references the 90th percentile life expectancy. Performance percentile ranks the outcomes such that 1st is nearly the worst case, and the 50th is the median outcome. Median market returns references median 20-year returns from Table 1 while poor market returns references the 10th percentile of 20-year returns from Table 1.



CONCLUSION

Our goal in this study was to compare some basic tradeoffs and synergies that are available by combining managed money solutions and annuities for generating retirement income. To make the analysis tractable we focused only on annuitization and therefore modeled single premium immediate annuities (SPIA). Using mortality tables and market payout data made available by the Cannex Pay Index, our analysis revealed that at a median life expectancy, the internal rate of return from an annuity is less than what an investor could get risk-free by investing in U.S. government bonds. However, as life expectancy increased so did the return to the annuity purchaser. This evidence suggests that a SPIA may be an excellent substitute for bonds in an allocation framework to guarantee future income and immunize the portfolio from interest rate risk during a period of rising rates.

We conducted a simulation analysis to test theory using a balanced allocation with equal portfolio level equity exposure and a moderate annuity allocation under a variety of market conditions. Our analysis revealed that under average conditions, a SPIA did not add value but did not detract value either. However as the planning horizon increased, so did the value added by the SPIA. We also uncovered that a SPIA added the most value for low spend rates and these gains diminished as the

spending rate increased. Finally we observed that the value add of a SPIA increased as expected market conditions deteriorated. We would expect annuities to score better in this framework as payout rates rise with rising interest rates and worse as payout rates fall with falling interest rates. Under current market conditions with rising interest rates and fixed income markets facing headwinds, these results support the use of annuity products as substitutes for portions of fixed income in a financial plan. By insuring future income and immunizing interest rate risk, adding annuities may also allow for higher stock allocations in a managed money solution, thereby increasing measures of success without sacricing insurance against worst case scenarios.

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