Holistic planning: Integrating insurance products for better outcomes in retirement

2025 study

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01 Introduction

Despite having to navigate various macroeconomic, economic and social challenges, the US life insurance and retirement industry holds significant potential for growth.

Industry researchers project a $400 trillion global retirement savings gap by 2050 and equally daunting protection gaps in the coming decades. Insurers are uniquely positioned to address these gaps with products that offer legacy protection, tax-deferred savings growth and guaranteed income for life. Demographic changes, such as increasing longevity and the "Peak 65" phenomenon, will exacerbate these gaps, fueling the need for savings, protection, and pension or "pension-like" products. As lifespans increase, the aging population grows exponentially and cost of living inflationary pressures persist, the urgency for carriers to develop new solutions grows. More personalized offerings and smarter engagement strategies could help reduce these gaps by strengthening protections for diverse customer circumstances. Products must support customers in both the accumulation and decumulation phases, catering to different goals, income levels and types of workers. Accessible, affordable and high-quality advice from a broad base of financial planning and insurance professionals is key to unlocking the growth potential and addressing the needs of customers, including those involved in intergenerational wealth transfers. Enhanced and holistic planning strategies are essential to improve outcomes and reduce protection and retirement savings gaps.

This paper is a continuation of a series analyzing the impacts and potential benefits of including insurance products in retirement planning to help meet the savings and protection needs of consumers. The previous paper, "Benefits of integrating insurance products into a retirement plan," published in 2021, explored the performance of traditional asset-only portfolios against integrated portfolios, defined as a mix of traditional assets plus insurance products.

The performance of permanent life insurance (PLI), a deferred income annuity with increasing income potential (DIA with IIP), and a portfolio containing both PLI and DIA with IIP were compared against the asset-only portfolio.

The primary goal of this paper is to expand upon the 2021 analysis using a flexible premium product set with indexed crediting. This analysis is not intended to assess the performance of the products modeled in 2021 against the products modeled in this version. Changes in macroeconomic conditions, available product market offerings and features, and various modeling and projection assumptions make comparisons difficult. As stated, the purpose of both papers is to determine the potential benefits of integrating insurance into retirement planning. We will use indexed universal life (IUL) as the life insurance vehicle and a fixed index annuity (FIA) as a representative annuity. These products represent a growing proportion of the insurance product market with record sales of approximately $3.8 billion and $125 billion, increases of 4% and 31% over the previous year, for IUL and FIA, respectively.[1] These products are popular in today's market, allowing an investor to take on equity exposure through indexing mechanisms and providing increased upside return potential with principal protection, i.e., no downside risk. Additionally, they allow for flexibility in the ability to customize premium payments, death benefits and other various provisions, while retaining the tax benefits and life and income protection of the products used in other insurance products. Similar to the first paper, the analysis focused on the level of income that could be supported with a 90% probability of success, as well as the median legacy value at the end of the projection period.

This paper will also examine Social Security (SS) income, a crucial element in comprehensive retirement planning.[2] According to the SS Administration, SS serves as the primary source of retirement income for most individuals over the age of 65. However, the SS Administration's 2024 Annual Report indicates that the SS trust fund may be unable to pay out 100% of total benefits by 2033 under the best estimate assumptions.[3] A more holistic approach involves Americans engaging in comprehensive retirement planning that incorporates a diverse range of financial products. In our SS analysis, we explore various strategies to mitigate the impact of a hypothetical reduction in future SS income, such as a 50% decrease in benefits.[4]

[1] "LIMRA: U.S. Individual Life Insurance Premium Sets New Sales Record in 2024," LIMRA website, https://www.limra.com/en/newsroom/news-releases/2025/limra-u.s.-individual-life-insurance-premium-sets-new-sales-record-in-2024/, accessed May 2025; "LIMRA: 2024 Retail Annuity Sales Grow 13% to a Record $434.1 Billion," LIMRA website, https://www.limra.com/en/newsroom/news-releases/2025/limra-2024-retail-annuity-sales-grow-12-to-a-record-$434.1-billion/, accessed May 2025.

[2] "Fact Sheet: Social Security," *Social Security Administration website*, https://www.ssa.gov/news/press/factsheets/basicfact-alt.pdf, accessed May 2025.

[3] "A Summary of the 2024 Annual Reports," *Social Security Administration website*, https://www.ssa.gov/OACT/TRSUM/index.html, accessed May 2025.

[4] This assumption is simply intended to measure a significant shock to retirement income. The level of reduction is not intended to correlate to a specific likelihood of occurrence and should not be read as a forecast or projection of expected benefit reduction.

02 Process

To compare our six strategies, we employ a Monte Carlo analysis to generate 1,000 scenarios, each containing a time series of interest rates, inflation rates, equity returns and bond returns over the planning horizon.

We then evaluate two outcome metrics derived from these simulations. As will be shown in the analysis, each individual customer will determine their specific preference and collaborate with financial advisors to establish the right balance between the two metrics, tailored to their circumstances and long-term financial objectives.

The first metric is the after-tax retirement income that can be sustained at a 90% probability of success, unless otherwise stated. The income is derived from systematic withdrawals from investments, income payments from the FIA and single premium immediate annuity (SPIA), and surrenders or policy loans from the IUL cash value. When calculating retirement income, we apply ordinary income tax rates (federal and state) to withdrawals from qualified assets and FIA income. Income taxes typically do not apply to any cash flows from IUL since we assume that the investor surrenders the cash value until the basis is exhausted and then takes policy loans thereafter.[5]

The second metric is the legacy value at the end of the time horizon. We focus on the median legacy amount at the end of the projection period.[6] The legacy value is calculated as the sum of the face amount of life insurance (IUL), any residual value of the FIA plus the residual value of investments. All values are net of taxes on qualified assets and estate taxes, where applicable.

[5] IUL follows the first-in, first-out accounting principle, meaning that withdrawals come from the investor's contributions first (i.e., basis) and gains second. Once the basis is exhausted (i.e., the remaining cash value is considered gains), we assume the investor uses policy loans that provide tax-free access to the cash value. The investor is assumed to repay the policy loan once their portfolio recovers sufficiently from the down market. However, if the investor is unable to repay the loan and the policy lapses, then we apply income taxes to the gains.

[6] The legacy at the end of the time horizon is based on the investor spending the retirement income solved for at a 90% probability of success.

03 Methodology

Strategies[7] and product specifications[8]

01 **Investment-only:** With this strategy, the investor uses a mix of equity and fixed-income assets. We assume the investor follows Morningstar's moderate glide path asset allocation strategy[9] with annual rebalancing. The investor prioritizes savings to traditional qualified assets (up to the IRS contribution limit) and then saves to the taxable account after the limit is reached.

02 **IUL + investments:** With this strategy, the investor allocates a portion of their savings to IUL premiums and allocates the rest to investments. We assume an annual point-to-point cap rate approach using dynamic cap rate modeling. We use an IUL product representative of current industry offerings, in our analysis.

03 **FIA + investments:** With this strategy, the investor allocates a portion of their assets to FIA premiums and allocates the rest to investments. We model an annual point-to-point cap rate approach using dynamic cap rate modeling. We use an FIA product with a guaranteed living withdrawal benefits rider, which is representative of current industry offerings, in our analysis.

04 **SPIA + investments:** With this strategy, the investor allocates a portion of their assets to a SPIA premium at age 65. This strategy is employed for the 65-year-old persona only to analyze the relative performance of an FIA vs. a SPIA product in the at-retirement use case.

05 **IUL + FIA + investments:** This strategy combines strategies 2) and 3), with the investor incorporating both IUL and FIA products into their financial plan at their respective weights.

06 **IUL + SPIA + investments:** This strategy is employed for the 65-year-old persona only and combines strategies 2) and 4), incorporating both IUL and SPIA products into their financial plan at their respective weights.

For strategies that include IUL, FIA and SPIA, the value of these products is included in the total financial assets at an assumed ratio of 90-10 allocation to bonds and equities, respectively. This ratio was derived by estimating the effective asset allocation, using the method described by James Xiong et al. in published industry research.[10] Thus, for strategies where an investor allocates a portion of their wealth to an insurance product, there is a commensurate reduction in the bond and equity balances relative to an investment-only strategy, with the bond reduction being ninefold the equity reduction.

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[7] For full methodology of strategies, see Appendix A.

[8] For full methodology of product modeling, see Appendix B.

[9] "Morningstar Lifetime Allocation Indexes," Morningstar, Inc., 2021.

[10] Xiong, James and Idzorek, Thomas, et al., "Allocation to Deferred Variable Annuities with GMWB for Life," *Journal of Financial Planning*, 2010.

04 Case studies

Case study: Mike and Courtney, a 35-year-old couple

Table 1: Data and assumptions for 35-year-old couple

Household salary	Total annual savings	Qualified savings	Taxable savings
$192,000	20% of salary	20% of salary	$0
Total initial wealth	**Qualified initial wealth**	**Taxable initial wealth**	**Time horizon**
$230,000	$200,000	$30,000	60 years

The first case study we will review is a 35 year-old couple. We use Monte Carlo simulation to test each of the strategies listed on the preceding page.[11] We model various product allocation combinations in increments of 10% of the total annual savings for IUL and the projected wealth at age 55 for FIA. We cap the allocation percentage at 30% of the annual savings purchased at the starting age for IUL[12] and 30% of the projected wealth at age 55 for the FIA.

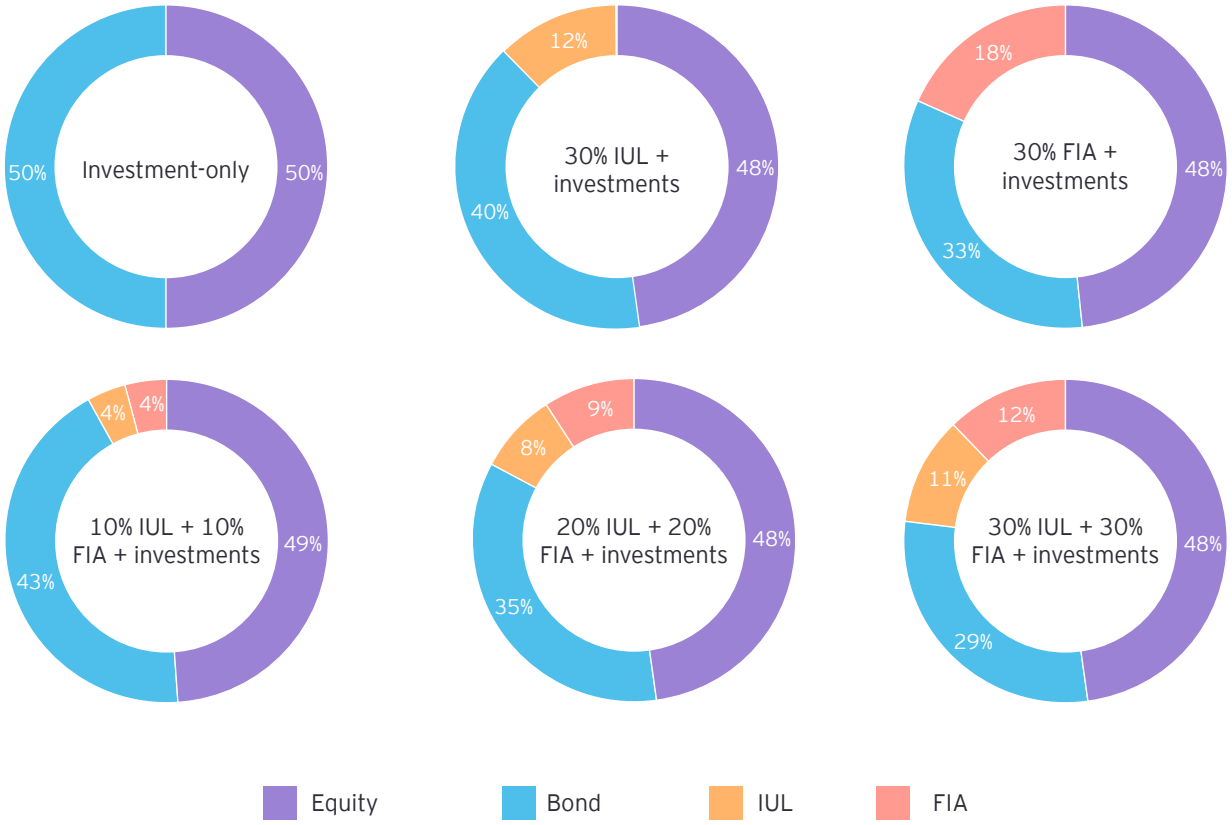
For example, the strategy 10% IUL + 10% FIA + investments indicates that Mike and Courtney allocate 10% of their savings to IUL premiums and allocate 10% of their wealth at age 55 toward an FIA. The remaining assets are put into investments.

[11] For full methodology of strategies, see Appendix A.

[12] IUL is funded with after-tax dollars, while the other strategies are typically funded by qualified dollars. To fairly compare strategies in scenarios where we use savings to purchase life insurance that would have otherwise been invested in qualified savings, we use a pretax savings amount such that the take-home pay is the same between the IUL + investments strategy and the investments-only strategy.

Figure 1 below shows sample product allocations as a percentage of the total wealth at age 65 to illustrate the composition of integrated strategies. These results are measured using the median scenario for the 35-year-old couple.

Figure 1: Sample product allocations as a percentage of total wealth at retirement



We analyzed the outcome metrics for all strategies and now will walk through the findings and results from our analysis.

01 IUL combined with investment strategies outperforms investment-only strategy for the given metrics.

Table 2 compares retirement income and legacy value metrics between the investment-only strategy and the three levels of IUL coverage. Retirement income is defined as the after-tax retirement income that can be sustained at a 90% probability of success. Legacy value is defined as the median legacy amount at the end of the projection period, adjusted to reflect the taxes due.

Table 2: Projected retirement income and legacy for investment-only strategy, IUL + investments strategies for 35-year-old couple

Strategy	Retirement income	% change vs. investment-only	Legacy at end of time horizon	% change vs. investment-only
Investment-only	$128,430	NA	$8,262,137	NA
10% IUL + investments	$129,031	0.5%	$8,360,640	1.2%
20% IUL + investments	$128,688	0.2%	$8,732,702	5.7%
30% IUL + investments	$128,462	0.0%	$8,930,043	8.1%

Retirement income values are on an after-tax basis and calculated at a 90% probability of success. Legacy values also reflect the impact of any applicable taxes (i.e., taxes on qualified assets or estate taxes) and are from the median of the distribution.

We find that 10%, 20% and 30% allocations to IUL outperform the investment-only strategy in both income and legacy metrics, with the majority of the benefit materializing as an increased median legacy value.

A review of the model outputs demonstrates tax efficiency as the primary driver of the outperformance, which is offset by a lesser impact of the reduced portfolio yields due to an insurance pricing spread.[13]

Next, we turn our attention to the investment-only strategy vs. three levels of FIA coverage, evaluated using the same metrics used in **Table 2** above.

[13] See Appendix B for product assumptions.

02 Integrating FIA with investment strategies significantly outperforms the investment-only strategy in generating retirement income, with an associated small reduction to legacy values.

Table 3 compares retirement income and legacy value metrics between the investment-only strategy and the three levels of FIA coverage. Retirement income is defined as the after-tax retirement income that can be sustained at a 90% probability of success. Legacy value is defined as the median legacy amount at the end of the projection period, adjusted to reflect the taxes due.

Table 3: Projected retirement income and legacy for investment-only strategy and FIA + investments strategies for 35-year-old couple

Strategy	Retirement income	% change vs. investment-only	Legacy at end of time horizon	% change vs. investment-only
Investment-only	$128,430	NA	$8,262,137	NA
10% FIA + investments	$140,375	9.3%	$7,990,841	-3.3%
20% FIA + investments	$149,484	16.4%	$8,252,799	-0.1%
30% FIA + investments	$157,764	22.8%	$8,302,403	0.5%

We find that the combination of FIA with investments yields significant gains in income, with an increasing income benefit as the proportion of FIA increases. We also note there is an associated cost to the legacy value for the 10% and 20% allocations, which do not have a monotonic relationship with the percentage allocation.

Careful examination of the model output demonstrates that there are second order impacts to legacy value, which vary depending on the resolution of the income solver routine and the specific Monte Carlo paths generated.

We find it prudent at this point to clarify that there is always an option to trade off income vs. legacy value within each stated strategy. If we relax the premium solver constraint to allow for greater than a 90% probability of success (i.e., reduction to taken income), we can easily eliminate the legacy cost while still maintaining income gains relative to the investment-only strategy. Using the strategy with the worst legacy performance above, 10% FIA + investments, we can adjust income slightly downward and achieve the following results as shown below.

Strategy	Retirement income	% change vs. investment-only	Probability of success	Legacy at end of time horizon	% change vs. investment-only
Investment-only	$128,430	NA	90.0%	$8,262,137	NA
10% FIA + investments	$136,500	6.3%	91.0%	$8,276,332	0.2%

This run demonstrates a higher probability of success, higher income taken and higher legacy values relative to investment-only.

Similar to the IUL analysis, a review of the model output demonstrates tax efficiency as the primary driver of the outperformance, which is offset by a lesser impact of the reduced portfolio yields due to the insurance pricing spread.[14]

It is beyond the scope of this paper to perform a detailed attribution by driver, though this may be incorporated into future research.

Next, we incorporate strategies bringing both IUL and FIA into our analysis, which leads to the next observation.

[14] See Appendix B for product assumptions.

03 Integrated strategies are more efficient than the investment-only strategy.

Table 4 contains income and legacy values for the investment-only strategy, plus three levels of IUL + FIA coverage. It also includes results from the strategies in **Table 2** and **Table 3**.

Table 4: Projected retirement income and legacy for investment-only strategy, IUL + FIA + investments, IUL + investments and FIA + investments strategies for 35-year-old couple

Strategy	Retirement income	% change vs. investment-only	Legacy at end of time horizon	% change vs. investment-only
Investment-only	$128,430	NA	$8,262,137	NA
10% IUL + 10% FIA + investments	$136,594	6.4%	$8,350,403	1.1%
20% IUL + 20% FIA + investments	$142,609	11.0%	$8,748,259	5.9%
30% IUL + 30% FIA + investments	$146,305	13.9%	$9,163,144	10.9%
10% IUL + investments	$129,031	0.5%	$8,360,640	1.2%
20% IUL + investments	$128,688	0.2%	$8,732,702	5.7%
30% IUL + investments	$128,462	0.0%	$8,930,043	8.1%
10% FIA + investments	$140,375	9.3%	$7,990,841	-3.3%
20% FIA + investments	$149,484	16.4%	$8,252,799	-0.1%
30% FIA + investments	$157,764	22.8%	$8,302,403	0.5%

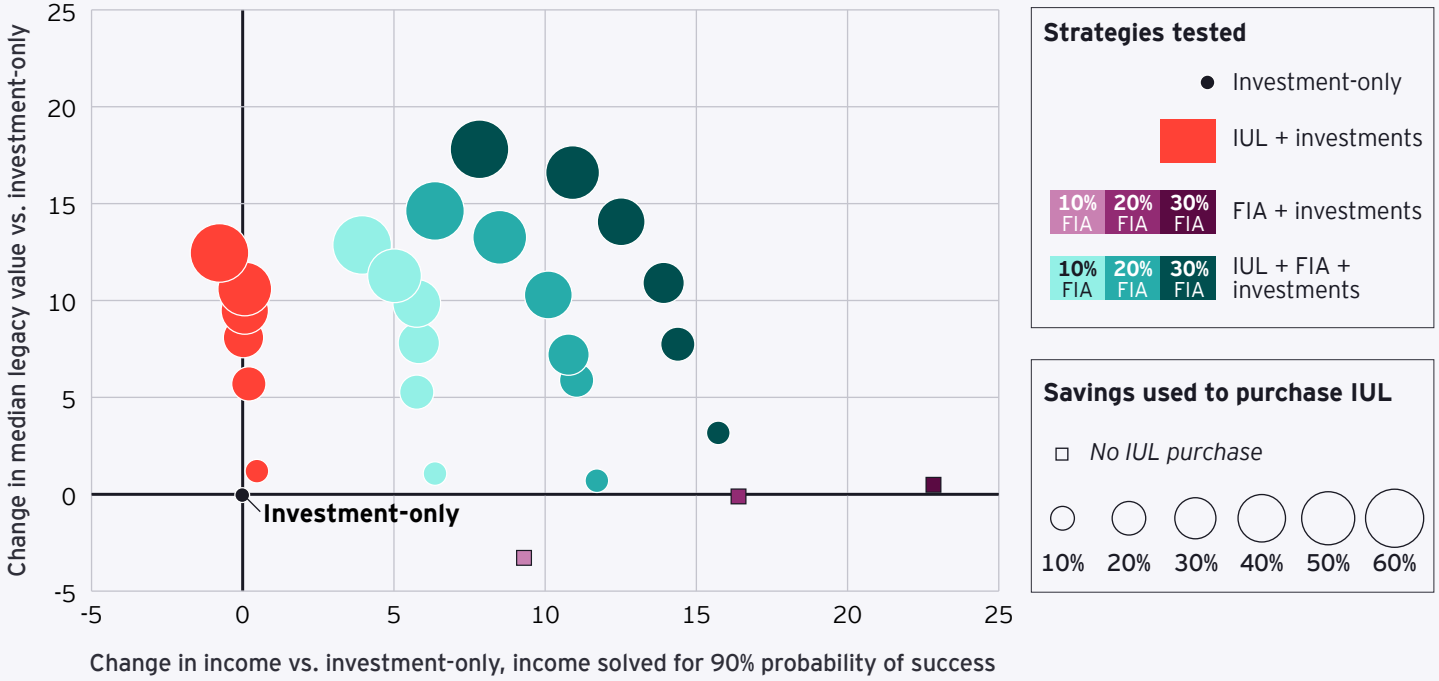
The above analysis demonstrates that the strategies integrating both FIA and IUL outperform the investment-only approach. At all three levels of coverage, there is a significant gain in income, increasing as the allocations increase. With the exception of the 10% FIA + investments strategy, there is also an increase in the legacy values. For the 10% allocation, the legacy shortfall is minor and is attributable to the income solver routine resolution. This minor shortfall can be eliminated by slightly adjusting the income level downward, as detailed and demonstrated in the FIA runs above.

Now we bring all of the results together and reintroduce a visualization tool used in our prior research.[15] **Figure 2** is a scatter plot of the above results, reflecting the percent improvements compared against the investment-only strategy in the retirement income (the x-axis) and in the median legacy value at death (the y-axis). The points are color coded by strategy, and those in darker shades represent higher allocations to FIA. The sizing of the points represents the relative allocation to life insurance, with larger points reflecting a higher allocation of savings to life insurance. For the scatter plot, we have also included IUL allocations of up to 60% of savings. The dot at the center of the axes represents the results for the investment-only strategy.

[15] "How life insurers can provide differentiated retirement benefits," *EY website*, https://www.ey.com/en_us/insights/insurance/how-life-insurers-can-provide-differentiated-retirement-benefits, October 2022.

Figure 2: Income vs. legacy for 35-year-old couple for all strategies at 90% probability of success

Change in median legacy value and income at 90% probability of success investment-only vs. incorporation of IUL and FIA products



This visualization illuminates a potential analytical approach for optimizing retirement outcomes. Plotting a multitude of product allocation combinations, we can see the emergence of an efficient frontier. The term is used here in an analogous manner to its definition within the mean-variance optimization in modern portfolio theory. The efficient frontier plots the arc of potential strategies that maximize income given a certain legacy, or that maximize legacy given a certain income. The exact blend and weight of products would be determined by the objective metrics selected, as well as the relative importance of income vs. legacy to a given investor.

This brings us to our next observation.

04 Integrated strategies offer investors the flexibility to prioritize their financial goals, whether it be maximizing retirement income, preserving a legacy or finding a balance between the two.

Per the analysis above, it is possible to isolate a set of optimal retirement strategies, conditional on model assumptions and the selection of target metrics to optimize. Each of these strategies will be optimal in the sense that they maximize income for a given legacy or maximize legacy for a given income. Strategies that lie on the interior of the efficient frontier are suboptimal (under these modeling assumptions and target metrics) because there exists an optimal strategy that outperforms on both an income and legacy basis.

Within the set of optimal strategies on the efficient frontier, there is no universally optimized strategy. The appropriate strategy for a given investor would be contingent on that investor's individual prioritization of income vs. legacy value.

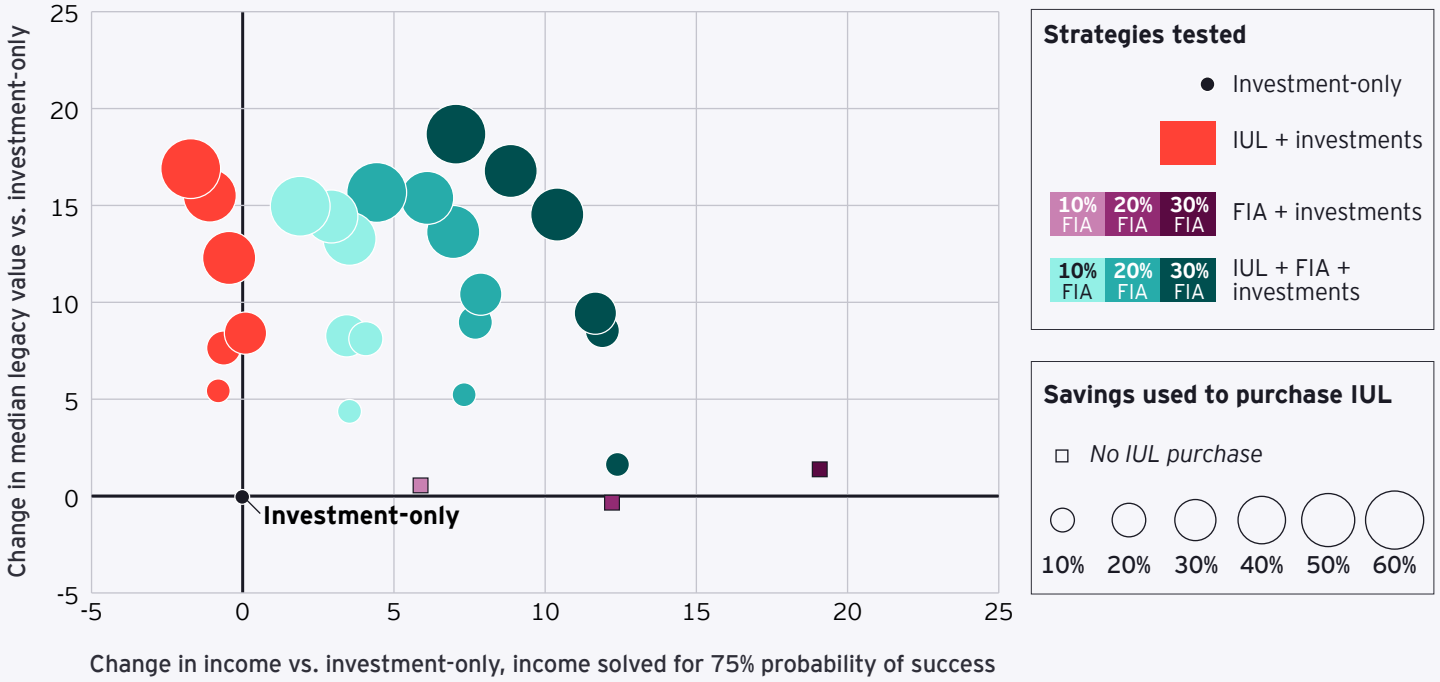
Finally, we examine the impact of a change in the target metric on the above conclusions, which provides our final observation.

05 For investors with a higher risk appetite, integrated strategies remain better.

To represent an investor with an increased risk tolerance and a more aggressive income draw, we will target a 75% probability of success rather than 90% for the solved income. The expected impact of this change would be to dampen the measured income benefit of the insurance products. An investor with an increased risk tolerance will value the stability of the annuity cash flows to a lesser degree than a risk-averse investor.

Figure 3: Income vs. legacy for 35-year-old couple for all strategies at 75% probability of success

Change in median legacy value and income at 75% probability of success investment-only vs. incorporation of IUL & FIA products



As seen in **Figure 3**, the results of the prior four observations still hold.

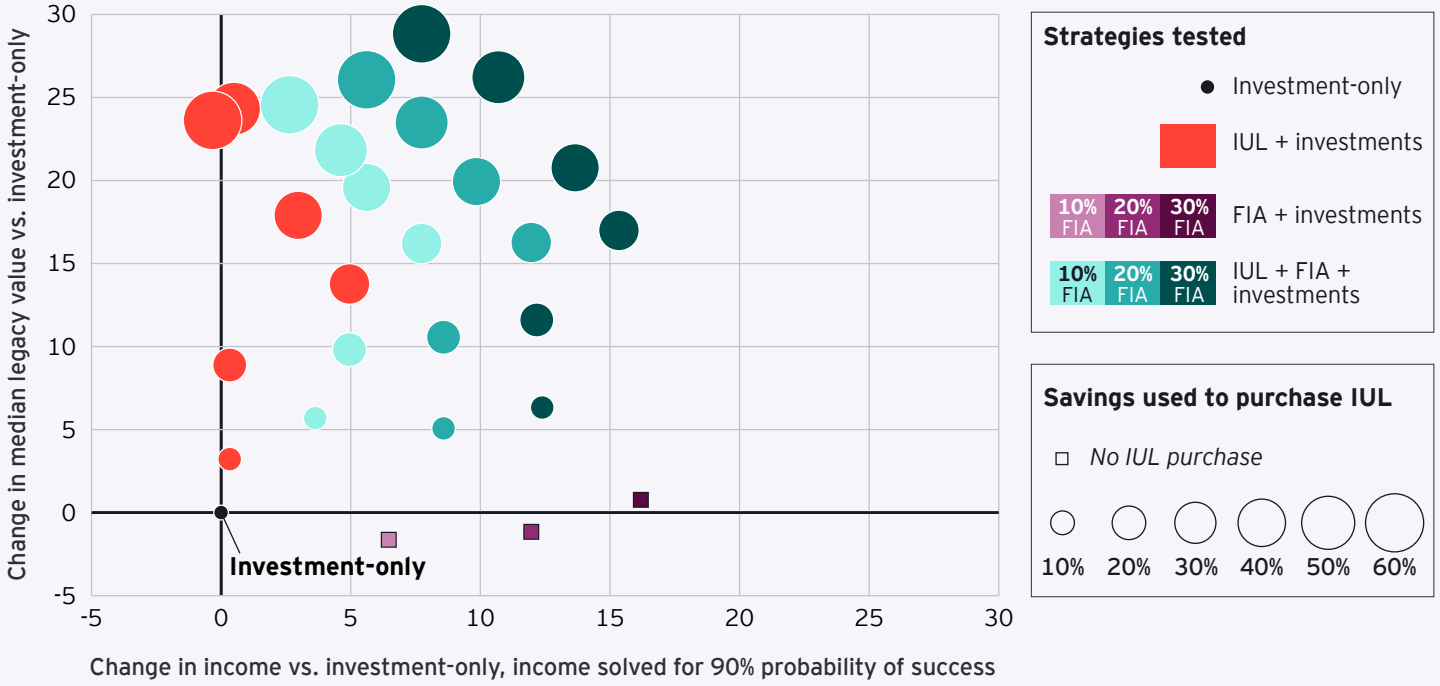
Case study: Arjun and Isabella, a 45-year-old couple

Table 5: Data and assumptions for 45-year-old couple

Household salary	Total annual savings	Qualified savings	Taxable savings
$250,000	20% of salary	15.6% of salary	4.4% of salary
Total initial wealth	**Qualified initial wealth**	**Taxable initial wealth**	**Time horizon**
$475,000	$400,000	$75,000	50 years

Figure 4: Income vs. legacy for 45-year-old couple for all strategies at 90% probability of success

Change in median legacy value and income at 90% probability of success investment-only vs. incorporation of IUL & FIA products



We conducted the same analysis for our 45-year-old couple. **Figure 4** displays the scatter plot.

The majority of the patterns and trends observed for the 45-year-old couple align with those previously observed for the 35-year-old couple. **Table 6**, which includes income and legacy values for specific strategies from **Figure 4**, provides further insight. Our findings and analysis are discussed in the following sections.

Table 6: Projected retirement income and legacy for higher level of product allocation strategies for 45-year-old couple

Strategy	Retirement income	% change vs. investment-only	Median legacy at end of time horizon	% change vs. investment-only
Investment-only	$94,687	NA	$5,124,691	NA
30% IUL + investments	$99,375	5.0%	$5,830,379	13.8%
30% FIA + investments	$110,020	16.2%	$5,164,199	0.8%
30% IUL + 30% FIA + investments	$109,219	15.3%	$5,995,454	17.0%

From our analysis, we find that the integrated portfolio strategy of FIA + investments continues to produce the highest retirement income for the 45-year-old couple. By increasing the exposure to both IUL and FIA, which outperform traditional fixed-income investments, the overall retirement income and legacy values are enhanced.

Therefore, the conclusions drawn from the 35-year-old persona appear to be applicable to our 45-year-old persona.

In keeping with the observation discussed previously, that the desired income level can be tailored within a given strategy to leverage the trade-off between income and legacy, we now present an additional means of comparing strategies. We can fix the income for all strategies at the same level (in this case, the investment-only solved income at a 90% probability of success) to assess the relative performance of each strategy while isolating a single metric — in this case, legacy value.

Table 7: Calculated probability of success and legacy for investment-only strategy, IUL + investments and FIA + investments strategies for 45-year-old couple

Strategy	Retirement income	Probability of success	Legacy at end of time horizon	% change vs. investment-only
Investment-only	$94,687	90.0%	$5,124,691	NA
30% IUL + investments	$94,687	92.1%	$6,197,107	20.9%
30% FIA + investments	$94,687	94.9%	$6,347,468	23.9%
30% IUL + 30% FIA + investments	$94,687	94.7%	$7,194,150	40.4%

Table 7 shows the relative performance of each strategy with the income fixed at $94,687 (e.g., for illustration purposes, let's assume this couple's annual income needs are $95,000 and analyze the impacts of this fixed-income need across integration scenarios). This illustrates two points: First, this change translates a higher solved income amount at a 90% probability of success into the same income level with a varied probability of success. Where the 90% solved income in Table 6 was the highest, we will see the largest increase in the probability of success. Second, this enables a direct comparison of legacy values, which gives another means of ranking the various strategies.

This approach again demonstrates the strong performance of the fully integrated portfolio, with a 4.7% increase in the probability of success and a 40% increase in the legacy value relative to investment-only. It is worth noting, however, that 30% FIA + investments still has the best probability of success, though by a small margin. We will next consider how the addition of SS income (as well as unexpected shocks to income) might impact the above analysis.

Addition of Social Security (SS), sensitivity testing decreased future benefits

To further validate our findings, we also integrated SS benefits into our analysis. This analysis builds upon the case study of Arjun and Isabella (the 45-year-old couple using the assumption set from Table 5 above). We maintained the same mix of strategies outlined in Table 6, with the addition of projected SS benefits[16] as an additional income source. Our aim was to set a baseline level of solved income and model performance from which we could measure the impact of a significant SS funding shortfall (a 50% reduction in benefits).

SS benefits are calculated using projected salary information for each persona, inflation levels in each scenario and assuming retirement at 65 (as above) but with SS benefits starting at the full retirement age (FRA) of 67.

[16] See Appendix A.

Table 8 contains retirement income and legacy results for various integrated strategies. The only change from the results in Table 6 is the addition of SS benefits. The table also includes results from the strategies in Table 6 to facilitate the comparison.

Table 8: Projected retirement income and legacy for investment-only strategy, IUL + investments and FIA + investments strategies for 45-year-old couple with and without SS retiring at FRA (67)

Strategy	Retirement income	% change vs. investment-only	Legacy at end of time horizon	% change vs. investment-only
Without SS				
Investment-only	$94,687	NA	$5,124,691	NA
30% IUL + investments	$99,375	5.0%	$5,830,379	13.8%
30% FIA + investments	$110,020	16.2%	$5,164,199	0.8%
30% IUL + 30% FIA + investments	$109,219	15.3%	$5,995,454	17.0%
SS retiring at FRA — 67				
Investment-only + SS at FRA	$161,670	NA	$5,083,385	NA
30% IUL + investments + SS at FRA	$165,273	2.2%	$5,824,698	14.6%
30% FIA + investments + SS at FRA	$177,285	9.7%	$5,113,319	0.6%
30% IUL + 30% FIA + investments	$175,684	8.7%	$6,006,820	18.2%

The results in **Table 8** demonstrate that the addition of SS income does not significantly impact the relative performance of each strategy. While the percent change in income appears to have decreased, this is simply the effect of the additional SS income significantly increasing income across the board. In absolute (dollar) terms, the impact of each strategy on the solved income is consistent both in direction and magnitude.

The legacy values as well show substantively the same results as prior runs, though they are slightly more favorable for insurance. This result is expected because the increased income increases the effective tax rate, leading to slightly higher tax efficiency than prior runs.

Our findings confirm that the optimal retirement strategy for the 45-year-old couple remains integrated strategies over the investment-only strategy.

However, a hypothetical scenario warrants consideration — long-term funding challenges in SS. According to projections by the SS trustees,[17] without legislative intervention the trust funds could face depletion by the mid-2030s, leading to a reduction in scheduled benefits.

To investigate the implications of underfunded SS on our findings, we introduced a hypothetical stress scenario where SS benefits are reduced by 50% but drawn income remains at the level calibrated to a 90% probability of success assuming full SS benefits under the investment-only approach. As the income level is fixed across strategies, we will use a probability of success as our metric to compare income levels across strategies. This analysis is intended to quantify the ability of insurance products to cover adverse events outside of market performance.

[17] "The 2024 OASDI Trustees Report," *Social Security Administration website*, https://www.ssa.gov/OACT/TR/2024/trTOC.html, accessed May 2025.

06 Insurance products can be used to mitigate risks beyond adverse market performance.

Table 9 contains retirement income, legacy and wealth at retirement dollar values that support this finding.

Table 9: Projected probability of success and legacy for investment-only strategy, IUL + investments and FIA + investments strategies for a 45-year- old couple.
Drawn income is set at the level solved for under the fully funded SS investment-only strategy. All strategies assume SS benefits start at age 67 (FRA) with a 50% reduction.

Strategy	Retirement income	Probability of success	Legacy at end of time horizon	% change vs. investment-only
SS retiring at age 67 (50% SS benefits)				
Investment-only + SS at FRA	$161,670	69.2%	$2,443,423	NA
30% IUL + investments + SS at FRA	$161,670	72.4%	$3,384,815	38.5%
30% FIA + investments + SS at FRA	$161,670	79.1%	$3,836,896	57.0%
30% IUL + 30% FIA + investments + SS at FRA	$161,670	79.0%	$4,354,144	78.2%

Table 9 demonstrates that a reduction in SS benefits **without** a commensurate reduction in drawn income will move the investment-only portfolio from a 90% probability of success to a 69.2% probability of success. In other words, there are an additional 208 failed scenarios (of 1,000 simulated) due to the SS benefit shortfall. Our results show that the integrated portfolios all outperform the investment-only strategy in both the income and legacy metrics. For the runs including 30% FIA, the SS benefit shortfall introduces only 109 (FIA only) or 110 (FIA plus IUL) newly failed scenarios compared to the 208 failed scenarios for the investment-only strategy. In other words, the FIA-only integrated strategy achieved a 99 / 208 = 47.6% reduction in additional failed scenarios, while the FIA plus IUL strategy achieved a 98 / 208 = 47.1% reduction in additional failed scenarios. The integrated portfolios also significantly increase the median legacy values (by 57% for FIA and by 78.2% for FIA plus IUL).

Similar to the previous analysis and results, additional risks that could impact a consumer's accumulation and decumulation of assets and associated retirement income could be mitigated through the use of various insurance products, e.g., life insurance or annuities with health-type rider benefits. An example of such a risk is an unexpected health shock event that would limit the consumer's ability to accumulate wealth and would increase their expense outflows. The authors intend on expanding on this type of health shock event analysis through future research and publications.

Case study: Ben and Jen, a 65-year-old couple

Table 10: Data and assumptions for 65-year-old couple

Household salary	Total annual savings	Qualified savings	Taxable savings
$350,000[18]	$0	$0	$0
Total initial wealth	**Qualified initial wealth**	**Taxable initial wealth**	**Time horizon**
$950,000	$800,000	$150,000	30 years

We continued our analysis from the 45-year-old couple with SS benefits starting at age 67 to our 65-year-old couple. The results and findings are discussed in the sections below.

Table 11: Projected retirement income and legacy for higher level of product allocation strategies for 65-year-old couple

Strategy	Retirement income	% change vs. investment-only	Legacy at end of time horizon	% change vs. investment-only
Investment-only + SS at FRA	$68,779	NA	$832,048	NA
30% IUL + investments + SS at FRA	$70,477	2.5%	$1,091,487	31.2%
30% FIA + investments + SS at FRA	$72,079	4.8%	$760,818	-8.6%
30% IUL + 30% FIA + investments + SS at FRA	$72,583	5.5%	$1,078,332	29.6%

[18] Note that we assumed our 65-year-old couple was receiving a salary of $350,000 as of age 64, just before retirement age (i.e., 65), for the purpose of the SS benefit projection.

The patterns observed in **Table 11** demonstrate that the addition of an FIA product for a 65-year-old couple at retirement does bolster the income that can be achieved with a 90% probability of success by 4.8%, though this does come at the expense of the median legacy value, which is reduced by 8.6% relative to the investment-only approach. The analysis relative to the age 35 and age 45 cases lends credence to the theory that some FIA product designs benefit from having a period of accumulation prior to annuitization.

However, as noted in prior examples, the cost to the legacy could likely be mitigated through a voluntary reduction of the income taken.

We note that the addition of IUL to the FIA plus investments run more than offsets the reduction in the median legacy value, leading to a 5.5% increase in income and a 29.6% increase in the median legacy value.

Sensitivity test: substituting SPIA for FIA, 65-year-old persona

Our final series in the analysis is intended to assess the impact of replacing the FIA product with a SPIA for the 65-year-old persona to test if this may be a better option for investors at or near retirement age.

We performed the same analysis as shown in **Table 11**, but each run containing the FIA product was repeated, swapping in a SPIA product using the same premium.

Table 12 contains retirement income and legacy dollar values for the investment-only and investment strategies where SPIA takes the place of FIA. It also includes results from the strategies in **Table 11.**

Table 12: Projected retirement income and legacy for investment-only and SPIA + investments strategies for 65-year-old couple

Strategy	Retirement income	% change vs. investment-only	Legacy at end of time horizon	% change vs. investment-only
Investment-only + SS at FRA	$68,779	NA	$832,048	NA
30% IUL + investments + SS at FRA	$70,477	2.5%	$1,091,487	31.2%
30% FIA + investments + SS at FRA	$72,079	4.8%	$760,818	-8.6%
30% SPIA + investments + SS at FRA	$71,411	3.8%	$729,253	-12.4%
30% IUL + 30% FIA + investments + SS at FRA	$72,583	5.5%	$1,078,332	29.6%
30% IUL + 30% SPIA + investments + SS at FRA	$70,056	1.9%	$1,236,936	48.7%

The results in **Table 12** demonstrate that both the FIA and SPIA bolster retirement income, but both come at the cost of the median legacy value. The FIA outperforms the SPIA both in income and legacy metrics in this case, which demonstrates the value of performing this type of detailed analysis across products. In the authors' estimation, the FIA products being offered at the time the model was constructed[19] appear to offer rich benefits. The conclusions drawn from this sort of comparison would be contingent on the specific product designs tested. A review of individual product illustrations with an advisor consultation may yield a benefit beyond optimizing for a particular product type.

To test one final dimension of the comparison, we held fixed the investment-only solved level of income for both the FIA and SPIA, results of which are summarized in **Table 13**.

Table 13: Calculated probability of success and legacy for investment-only, SPIA + investments and FIA + investments strategies for a 65-year-old couple meeting the same annual income needed as the fully funded investment-only strategy. All strategies assume SS benefits starting at age 67.

Strategy	Retirement income	Probability of success	Legacy at end of time horizon	% change vs. investment-only
Investment-only	$68,779	90.0%	$832,048	NA
30% FIA + investments	$68,779	95.5%	$1,045,425	25.6%
30% SPIA + investments	$68,779	96.0%	$955,437	14.8%

These results demonstrate that both the FIA and the SPIA result in a higher probability of success than the investment-only portfolio. The FIA passes an additional 55 scenarios relative to the investment-only strategy, while the SPIA passes an additional 60 scenarios relative to investment-only strategy.

The above result may seem counterintuitive given the fact that the FIA outperformed the SPIA in income at a 90% probability of success. However, the result is not incongruent with the prior results, but rather demonstrates the complexity inherent in measuring the relative performance of loss distributions. While the FIA provides more income at the 90th percentile, the SPIA maintains the investment-only level of income further into the tail in adverse scenarios.

The authors intend to expand on the current analysis in future research to incorporate additional metrics beyond the two metrics summarized to date, which may provide additional insight into the optimization of integrated retirement portfolios.

[19] First quarter of 2024.

05 Appendix A

Retirement strategy demonstrations

Case study: Mike and Courtney, a 35-year-old couple

Data and assumptions for 35-year-old couple

Household salary	Total annual savings	Qualified savings	Taxable savings
$192,000	20% of salary	20% of salary	$0
Total initial wealth	**Qualified initial wealth**	**Taxable initial wealth**	**Time horizon**
$230,000	$200,000	$30,000	60 years

01 **10% IUL + investments:** IUL premiums equal to $192,000 initial salary x 20% savings rate x 10% IUL weight = $3,840 annual premium, paid from age 35 to age 64 on $250,000 face amount

02 **20% IUL + investments:** IUL premiums equal to $192,000 initial salary x 20% savings rate x 20% IUL weight = $7,680 annual premium, paid from age 35 to age 64 on $500,000 face amount

03 **30% IUL + investments:** IUL premiums equal to $192,000 initial salary x 20% savings rate x 30% IUL weight = $11,520 annual premium, paid from age 35 to age 64 on $750,000 face amount

04 **10% FIA + investments:** FIA single premium at age 55 for median scenario equal to $1,492,756 total wealth at age 55 x 10% FIA allocation = $149,276

05 **20% FIA + investments:** FIA single premium at age 55 for median scenario equal to $1,492,756 total wealth at age 55 x 20% FIA allocation = $298,551

06 **30% FIA + investments:** FIA single premium at age 55 for median scenario equal to $1,492,756 total wealth at age 55 x 30% FIA allocation = $447,827

Appendix A

Retirement strategy demonstrations

Case study: Arjun and Isabella, a 45-year-old couple

Data and assumptions for 45-year-old couple

Household salary	Total annual savings	Qualified savings	Taxable savings
$250,000	20% of salary	15.6% of salary	4.4% of salary
Total initial wealth	**Qualified initial wealth**	**Taxable initial wealth**	**Time horizon**
$475,000	$400,000	$75,000	50 years

01 **10% IUL + investments:** IUL premiums equal to $250,000 initial salary x 20% savings rate x 10% IUL weight = $5,000 annual premium, paid from age 45 to age 64 on $250,000 face amount

02 **20% IUL + investments:** IUL premiums equal to $250,000 initial salary x 20% savings rate x 20% IUL weight = $10,000 annual premium, paid from age 45 to age 64 on $500,000 face amount

03 **30% IUL + investments:** IUL premiums equal to $250,000 initial salary x 20% savings rate x 30% IUL weight = $15,000 annual premium, paid from age 45 to age 64 on $750,000 face amount

04 **10% FIA + investments:** FIA single premium at age 55 for median scenario equal to $1,034,041 total wealth at age 55 x 10% FIA allocation = $103,404

05 **20% FIA + investments:** FIA single premium at age 55 for median scenario equal to $1,034,041 total wealth at age 55 x 20% FIA allocation = $206,808

06 **30% FIA + investments:** FIA single premium at age 55 for median scenario equal to $1,034,041 total wealth at age 55 x 30% FIA allocation = $310,212

Appendix A

Retirement strategy demonstrations

Case study: Ben and Jen, a 65-year-old couple

- Data and assumptions for 65-year-old couple

Household salary	Total annual savings	Qualified savings	Taxable savings
$350,000[20]	$0	$0	$0
Total initial wealth	**Qualified initial wealth**	**Taxable initial wealth**	**Time horizon**
$950,000	$800,000	$150,000	30 years

Note: For the 65-year-old couple, both the life and annuity purchase occur as a single premium at the projection start using an allocation-of-wealth approach because the formulaic approach used previously would not be applicable.

01 **10% IUL + investments:** IUL premium equal to $950,000 total initial wealth x 10% IUL weight = $95,000 single premium at age 65 on $333,333 face amount

02 **20% IUL + investments:** IUL premium equal to $950,000 total initial wealth x 20% IUL weight = $190,000 single premium at age 65 on $666,667 face amount

03 **30% IUL + investments:** IUL premium equal to $950,000 total initial wealth x 30% IUL weight = $285,000 single premium at age 65 on $1,000,000 face amount

04 **10% FIA + investments:** FIA premium equal to $950,000 total initial wealth x 10% FIA weight = $95,000 single premium at age 65

05 **20% FIA + investments:** FIA premium equal to $950,000 total initial wealth x 20% FIA weight = $190,000 single premium at age 65

06 **30% FIA + investments:** FIA premium equal to $950,000 total initial wealth x 30% FIA weight = $285,000 single premium at age 65

07 **10% SPIA + investments:** SPIA premium equal to $950,000 total initial wealth x 10% SPIA weight = $95,000 single premium at age 65

08 **20% SPIA + investments:** SPIA premium equal to $950,000 total initial wealth x 20% SPIA weight = $190,000 single premium at age 65

09 **30% SPIA + investments:** SPIA premium equal to $950,000 total initial wealth x 30% SPIA weight = $285,000 single premium at age 65

[20] Note that we assumed our 65-year-old couple was receiving a salary of $350,000 as of age 64, just before retirement age (i.e., 65), for the purpose of the SS benefit projection.

06 Appendix B

Product modeling assumptions

IUL product

The IUL product is modeled based on a blend of various carriers' products that were available for sale when the modeled product was constructed in the first quarter of 2024. These products all offer one-year point-to-point index crediting, with a floor of 0% and a cap rate that is set by the carrier on an ongoing basis at the start of each crediting cycle. All IUL product modeling is assumed to follow one-year point-to-point crediting on the US Diversified Equity index within the American Academy of Actuaries' economic scenario generator.[21]

Returns of the portfolio backing the insurance product are modeled individually for each Monte Carlo scenario and are assumed to follow the same bond and equity returns that the investor receives. The insurance portfolio is assumed to have a duration of 12 years and comprises 75% bonds and 25% equity.

The modeled insurance portfolio returns are then reduced by a 1.5% spread, and the remaining returns are used to purchase options to fully hedge the IUL product interest crediting at a solved-for cap rate.

That is to say, the model dynamically calculates the declared cap rate for each year and each scenario such that the insurance carrier can fully hedge the IUL interest crediting while taking a 1.5% annual profit margin on the IUL account value. In the authors' experience, this method of cap rate setting is commonly used both in the pricing and ongoing management of IUL products.

The dynamic cap rate solve utilizes Black-Scholes option pricing under the prevailing risk-free rates in a given scenario and year, with an assumed 20% volatility for one-year options on the US Diversified Equity index.

The IUL policy is assumed to be a joint life survivor policy written on the couple in each case study. All product charges, including premium loads, the cost of insurance charges and maintenance charges, use a blend of actual product charges from the various carriers' IUL products that were available for sale when the modeled product was constructed in the first quarter of 2024.

[21] "Economic Scenario Generators," *American Academy of Actuaries website*, https://www.actuary.org/content/economic-scenario-generators, accessed May 2025.

FIA product

The FIA product is modeled based on a blend of various carriers' products that were available for sale when the modeled product was constructed in the first quarter of 2024. These products all offer one-year point-to-point index crediting, with a floor of 0% and a cap rate that is set by the carrier on an ongoing basis at the start of each crediting cycle. All FIA product modeling is assumed to follow one-year point-to-point crediting on the US Diversified Equity index within the American Academy of Actuaries' economic scenario generator, similar to the IUL product.

The FIA policy is assumed to be a joint life survivor policy written on the couple in each case study. The observed FIA products all contained similar guaranteed lifetime withdrawal benefit (GLWB) riders, which were used to build a GLWB benefit rider in the modeled FIA product. The GLWB benefit rider allows the annuity stream to continue to grow in retirement using the same point-to-point cap rate crediting as the source of the annuity payment growth. Once the FIA account value is exhausted, the annuity benefit persists at the current payment amount but no longer grows, regardless of the index returns. The GLWB benefit rider has an associated annual charge, which is a blend of the various carriers' products that were used as the basis for modeling the FIA product.

Similar to the IUL product, returns of the portfolio backing the FIA product are modeled individually for each Monte Carlo scenario and they are assumed to follow the same bond and equity returns that the investor receives. The insurance portfolio is assumed to have a duration of 12 years and comprises 75% bonds and 25% equity.

Also in line with the IUL product modeling, the modeled FIA portfolio returns are reduced by a 1.5% spread and the remaining returns are used to purchase options to fully hedge the FIA product interest crediting at a solved-for cap rate. That is to say, the model dynamically calculates the declared cap rate for each year and each scenario such that the insurance carrier can fully hedge the FIA interest crediting while taking a 1.5% annual spread on the FIA account value. In the authors' experience, this method of cap rate setting is commonly used both in the pricing and ongoing management of FIA products.

The dynamic cap rate solve utilizes the same methodology as the IUL product: Black-Scholes option pricing under the prevailing risk-free rates in a given scenario and year with an assumed 20% volatility for one-year options on the US Diversified Equity index.

All product features, such as GLWB payout rates and charges, are constructed from a blend of the various carriers' FIA products that were available for sale when the modeled product was constructed in the first quarter of 2024.

SPIA product

The SPIA product was constructed using a blend of actual quotes received from various carriers when the modeled product was constructed in the first quarter of 2024.

07
Appendix C
Other model assumptions

Capital market assumptions

Using the American Academy of Actuaries' economic scenario generator, 1,000 Monte Carlo scenarios were created and calibrated to the first quarter 2024 interest rate environment. The generator is a stochastic log volatility model that produces scenarios that are correlated across years (autocorrelation) and within a given year (contemporaneous correlation). Additional details can be found on the American Academy of Actuaries website.[22]

Bond returns follow the US Long Term Corporate bond index returns from the economic scenario generator. Equity returns follow the US Diversified Equity index returns from the economic scenario generator.

Asset allocation assumptions

All case studies maintain the aggregate portfolio bond vs. equity allocations proportionate to the stock and bond weights in the Morningstar Moderate Lifetime Allocation Index[23] using age 65 as the target retirement age for all case studies. Weights are linearly interpolated for all years between the target retirement years, which are defined on a quinquennial basis.

Tax assumptions

Federal taxes use the 2024 bracket with the standard deduction applied. The state tax rate is assumed to be a 6% flat rate. The beneficiary tax rate is assumed to be 25%. The estate tax rate is assumed to be 40%.

Other assumptions

The advisory fee plus the investment management fee is assumed to be 1.00% total. The annual equity turnover is assumed to be 25%. The annual fixed-income turnover is assumed to be 0%. The equity dividend rate is assumed to be 2.5%. The initial taxable equity basis is assumed to be 50%.

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[22] "Economic Scenario Generators," *American Academy of Actuaries website*, https://www.actuary.org/content/economic-scenario-generators, accessed May 2025.

[23] "Morningstar Lifetime Allocation Indexes," Morningstar, Inc., 2021.

Ernst & Young LLP contacts

Phil Ferrari, ASA, MAAA
Managing Director

Ernst & Young LLP
philip.ferrari@ey.com

Steve Parry, FSA
Manager

Ernst & Young LLP
steve.parry@ey.com

Ben Yahr, FSA, MAAA
Managing Director

Ernst & Young LLP
ben.yahr@ey.com

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