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WHITE PAPER

Controllable Factors and Uncontrollable Risks in a Retirement Spending Plan

Using a Registered Index-Linked Annuity to Mitigate Risk Exposure

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Contents

ABSTRACT

When creating a retirement spending plan, an advisor and client seek to maximize consistent and sustainable spending. In doing so, they can control four factors: (1) the client's retirement age, i.e., when the client begins spending, (2) how much the client contributes to the portfolio before spending begins, (3) the amount to withdraw annually, and (4) the asset allocation of the portfolio. After identifying a spending plan based on what can be controlled, the plan is still exposed to four major uncontrollable risks: (1) longevity risk, (2) inflation risk, (3) market risk, and (4) portfolio shock risk. This paper examines the impact to probability of success when an advisor and client make changes to the factors they can control, then quantify the portfolio's exposure to uncontrollable risks they cannot control. The paper demonstrates that adding registered index-linked annuities (RILAs) with guaranteed lifetime income to a portfolio improves outcomes by reducing exposure to the four uncontrollable risks of retirement.

Introduction

Risk and reward in a retirement spending plan are not the same as they are in accumulation. In accumulation, risk is defined as volatility and reward is defined as expected return. During the accumulation phase, it makes sense to use volatility and expected returns (along with correlation) to create an efficient frontier. But when looking at a retirement spending plan (a decumulation portfolio), the risks and rewards differ from an accumulation-focused portfolio. **The four risks in a retirement spending plan are the following:**

1. **Longevity risk:** the risk of outliving your assets
2. **Inflation risk:** the risk that withdrawals from the spending plan need to be higher than originally planned
3. **Market risk:** the risk that equity and bond returns are lower than originally planned
4. **Portfolio shock risk:** the risk of a sudden, large decrease in portfolio value early in retirement.

This paper creates a new framework for evaluating these four risks.

Traditional research has shown that adding guaranteed lifetime income to a portfolio improves the portfolio's chances of fulfilling a client's spending needs. For example, an analysis by New York Life Insurance Company (2019) showed that "allocating 20% of a retirement portfolio to an income annuity improves portfolio longevity in many cases, based on historical results." However, this analysis used a single premium immediate annuity (SPIA) and was based on historical results, which are not a strong predictor of future results.

Blanchett (2020) also makes the point that much of the academic research to date has focused on immediate and nominal annuities:

> *If we assume the primary goal of most retirees is portfolio longevity (longevity alpha), though, and not just portfolio outperformance (investment alpha), the retirement income strategy and the underlying products that are considered and used, need to evolve. That means revisiting the potential value of annuities as a way to generate guaranteed lifetime income.*

The academic community traditionally has quantified the impact of lifetime income to a retiree's portfolio by examining SPIAs and deferred income annuities (DIAs) (see Finke 2015; Finke and Pfau 2015). Rarely do you see research that features more modern annuity designs, which are more widely used by advisors today. During the past five years, a new category of annuities has emerged. These registered index-linked annuities (RILAs) provide clients with lifetime income (which may be available through an additional-cost benefit rider) that also offers the potential to increase in retirement. These solutions are available in a variety of different contracts and provide the owner with flexibility in the form of a lifetime withdrawal benefit (not annuitization), as well as the ability to receive increases in income – in some cases, even after the contract value has been exhausted.

Additionally, a majority of the research that has been performed to demonstrate the efficacy of annuities within retirement portfolios has used either historical returns or a static assumptive rate (Cotton and Bodie 2019). The research rarely has incorporated forward-looking capital market assumptions. However, financial planners often use forward-looking capital market assumptions within their software. Therefore, we use forward-looking capital market assumptions in this research.

In this paper, we delve into the controllable factors in a retirement portfolio and their impact on uncontrollable risks. We examine the sensitivity of each factor and its impact to the overall longevity of the portfolio. Lastly, we demonstrate the efficacy of adding a RILA with guaranteed lifetime income to reduce the portfolio's exposure to the uncontrollable risks that impact a client in retirement.

RILAs with guaranteed lifetime income benefits are the next generation of annuities. At their core, RILAs can provide investors with the ability to participate in the upside potential of equity market growth while offering a level of protection against a portion of loss. They can be thought of as a hybrid between indexed and variable annuities. Depending on the product, RILAs offer a variety of allocation and protection choices that enable the advisor to customize strategies to fit a client's risk profile. Current industry offerings include a level of protection ranging from the first 10 percent to 30 percent of losses, whereas some RILAs offer strategies that provide the opportunity for full principal protection, similar to fixed index annuities.

As the need and demand for lifetime income has accelerated, insurance companies have taken notice and begun adding lifetime income benefits to these solutions. Traditionally, these products have been solely available through broker/dealers. In recent years, however, many fee-based versions have been created to meet the needs of registered investment advisers. These advisory RILAs have been designed to accommodate the fee-only business model and offer strategies that provide the opportunity for more or full accessibility, lower fees, and fee billing.

The features of RILAs with guaranteed lifetime income may be well suited to help reduce a client's exposure to the four uncontrollable risks mentioned above that can impact a retirement spending plan.

METHODOLOGY

1. **We used a Monte Carlo simulation** to analyze the probability of success based on demographic assumptions, portfolio allocation assumptions, and capital market assumptions.
2. **We used the capital market assumptions** to create 20,000 correlated paths of potential equity and bond returns. Equity returns are based on a geometric Brownian motion (GBM) process and bond returns utilize a Vasicek model with mean reversion.[1]
3. **We then valued the portfolio under each scenario** and calculated a probability of success – the percentage of the 20,000 scenarios that meet both the legacy goal and spending goal of the client.
4. **We then modified the key assumptions** that an advisor can control (retirement age, contributions, annual withdrawal rate, and asset allocation) to see how those assumptions impact the probability of success.
5. **Finally, we analyzed four of the risks** that an advisor cannot control (longevity risk, inflation risk, equity return risk, and portfolio shock risk) to show how adding a RILA with guaranteed lifetime income into a portfolio reduces exposure to these risks.

ANALYSIS

The base-case client used to begin this analysis is a 55-year-old looking to retire as soon as possible. This client would like to make an initial-year withdrawal of 4 percent ($120,000) from a $3 million portfolio and leave a $250,000 legacy at age 90. We assume that the client is not making contributions to the portfolio and that the portfolio is invested 60 percent in equities and 40 percent in bonds. We also assume that the individual's income needs will increase by 2 percent annually (inflation), that the total return for equities will be 7 percent per year (5.5 percent per year price return after 1.5 percent dividend yield) with a 16 percent annualized volatility, and bonds will return 2 percent per year with a 4 percent annualized volatility. We assume the correlation between equities and bonds will be negative 15 percent.

RILA CHARACTERISTICS

The RILA used throughout this paper offers return potential tied to the performance of the equity asset. During deferral (before the income benefit is turned on at retirement age), the RILA performance is equal to the price return of the equity asset up to a cap of 15 percent when the equity asset is positive. If the equity asset annual price return is negative, the RILA return is buffered from the first 10 percent of losses. After the income benefit is turned on, the annual performance of the RILA is equal to the price return of the equity asset up to a cap of 3 percent if the equity asset annual price return is positive. If the equity asset annual price return is negative during the income phase, the RILA return is zero.

The income benefit rider on this RILA offers an increasing income option; for a 55-year-old who elects the single payout, the income percentage would be 3.7 percent if the individual elected immediate income. For each year of deferral, the income payout percentage increases by 0.30 percent. So, for a 55-year-old who elects income at age 60, the income payout percentage would be 5.2 percent, which is the base 3.7 percent plus 1.5 percent (0.30 percent for each of the five years of deferral). For a 55-year-old who elects income at age 65, the income payout would be 6.7 percent, which is the base 3.7 percent plus 3.0 percent (0.30 percent for each of the 10 years of deferral). Once elected, the income payout amount has the potential to increase based on the price return performance of the equity asset. If the equity asset annual price return is positive, the income payout will increase by the price return of the equity asset up to a cap of 3.0 percent. If the equity asset annual price return is negative, the income payout will stay the same.

This paper assumes that the fee for the RILA is 0.95 percent.

Controllable Factors

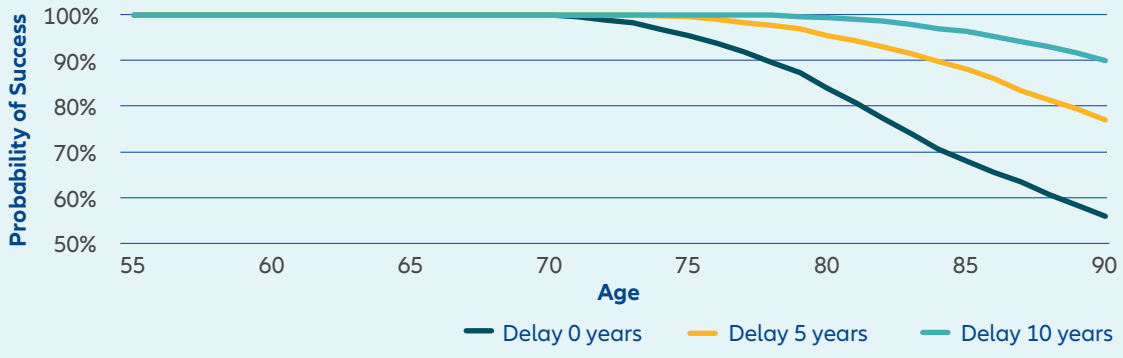
DELAY RETIREMENT

The first metric that an advisor and client control is the retirement age of the client. We calculated the probability of success for three different retirement ages: age 55 (immediate retirement), age 60 (delaying retirement for five years), and age 65 (delaying retirement for 10 years). As expected, delaying the client's retirement age can help increase the probability of success for the portfolio to deliver the desired income and meet the legacy goal (see table 1 and figure 1).

Table 1: DELAY RETIREMENT

	Delay 0 years (Base)	**Delay 5 years** (Update #1)	**Delay 10 years**
Age	55	55	55
Retirement Age	**55**	**60**	**65**
Plan Age	90	90	90
Annual Withdrawals	4% ($120,000 per year)	4% ($120,000 per year)	4% ($120,000 per year)
Legacy	$250,000	$250,000	$250,000
Value	$3,000,000	$3,000,000	$3,000,000
Contributions	$0	$0	$0
Equity	60%	60%	60%
Bond	40%	40%	40%
Inflation	2%	2%	2%
Equity Return/Vol/Div	7%/16%/1.5%	7%/16%/1.5%	7%/16%/1.5%
Bond Return/Vol	2%/4%	2%/4%	2%/4%
Equity Bond Correlation	–15%	–15%	–15%
Probability of Success at Plan Age	**56%**	**77%**	**90%**

Figure 1: DELAY RETIREMENT



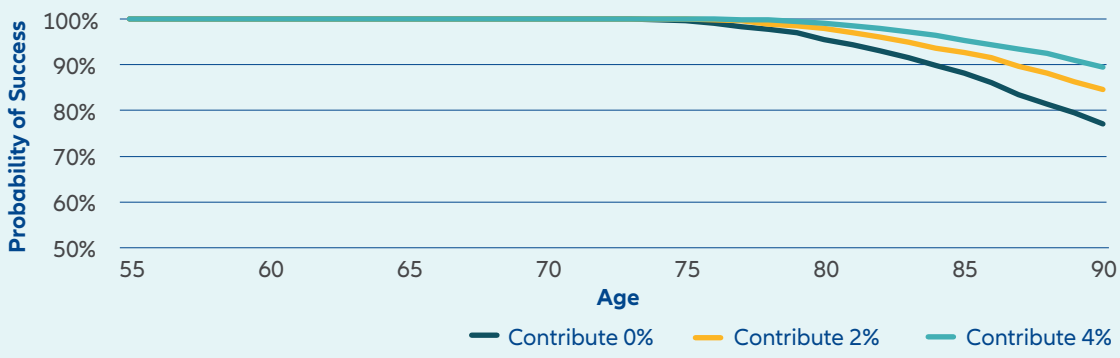
INCREASE CONTRIBUTIONS

The second metric analyzed was how adding contributions to the portfolio impacts the probability of success. We used the "Delay 5 years" assumptions from table 1 (with zero contributions) as Update #1. We then analyzed contributing 2 percent of the initial assets under management (AUM) ($60,000) annually during the five-year delay period and 4 percent of the initial AUM ($120,000) annually during the five-year delay period. As expected, increasing contributions improves the probability of success (see table 2 and figure 2).

Table 2: INCREASE CONTRIBUTIONS

	Contribution 0% (Update #1)	**Contribution 2%** (Update #2)	**Contribution 4%**
Age	55	55	55
Retirement Age	**60**	**60**	**60**
Plan Age	90	90	90
Annual Withdrawals	4% ($120,000 per year)	4% ($120,000 per year)	4% ($120,000 per year)
Legacy	$250,000	$250,000	$250,000
Value	$3,000,000	$3,000,000	$3,000,000
Contributions	**$0**	**$60,000 annually**	**$120,000 annually**
Equity	60%	60%	60%
Bond	40%	40%	40%
Inflation	2%	2%	2%
Equity Return/Vol/Div	7%/16%/1.5%	7%/16%/1.5%	7%/16%/1.5%
Bond Return/Vol	2%/4%	2%/4%	2%/4%
Equity Bond Correlation	–15%	–15%	–15%
Probability of Success at Plan Age	**77%**	**85%**	**89%**

Figure 2: INCREASE CONTRIBUTIONS



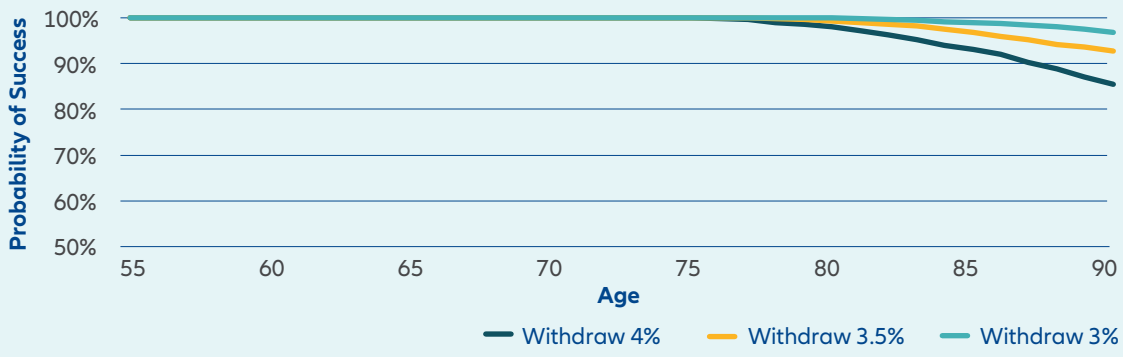
WITHDRAW LESS

The third metric that an advisor and client control is how much to withdraw in retirement. We used the 2 percent annual contribution assumption from table 2 as Update #2. Update #2 assumes a fixed (in real inflation-adjusted terms) 4 percent initial withdrawal rate through retirement. We then analyzed the impact on the probability of success of reducing the initial withdrawal rate from 4 percent ($120,000 per year) to 3.5 percent ($105,000 per year) and to 3.0 percent ($90,000 per year). As expected, reducing the amount of income that the client withdraws from the portfolio increases the probability of success (see table 3 and figure 3).

Table 3: WITHDRAW LESS

	Withdraw 4% (Update #2)	**Withdraw 3.5%** (Update #3)	**Withdraw 3%**
Age	55	55	55
Retirement Age	**60**	**60**	**60**
Plan Age	90	90	90
Annual Withdrawals	4% ($120,000 per year)	3.5% ($105,000 per year)	3% ($90,000 per year)
Legacy	$250,000	$250,000	$250,000
Value	$3,000,000	$3,000,000	$3,000,000
Contributions	**$60,000 annually**	**$60,000 annually**	**$60,000 annually**
Equity	60%	60%	60%
Bond	40%	40%	40%
Inflation	2%	2%	2%
Equity Return/Vol/Div	7%/16%/1.5%	7%/16%/1.5%	7%/16%/1.5%
Bond Return/Vol	2%/4%	2%/4%	2%/4%
Equity Bond Correlation	–15%	–15%	–15%
Probability of Success at Plan Age	**85%**	**92%**	**97%**

Figure 3: WITHDRAW LESS



As Pfau (2019) showed, even "small changes to the initial distribution rate can have a large impact on portfolio sustainability."

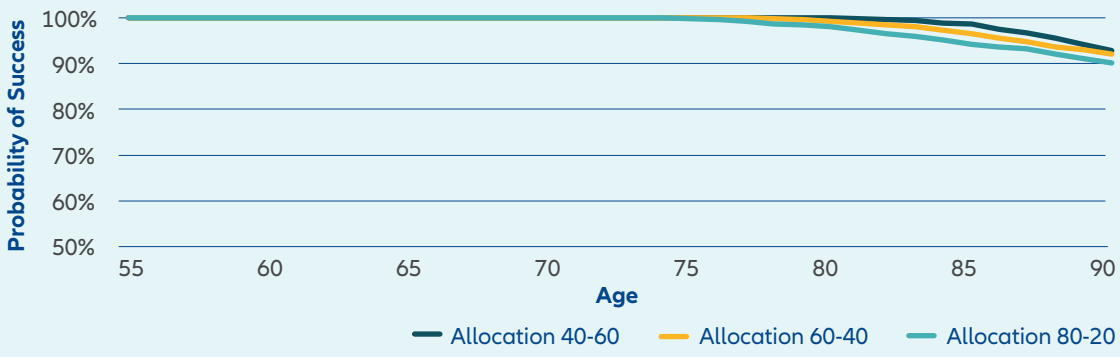
ASSET ALLOCATION

Advisors and their clients also control the asset allocation. Thus far in our analysis, we've focused on a portfolio that consists of 60 percent equities and 40 percent bonds. However, clients may have more or less tolerance for risk. We used the 3.5 percent withdrawal assumptions from table 3 with a 60 percent equity allocation and a 40 percent bond allocation as Update #3. We then analyzed a 40 percent equity and 60 percent bond portfolio, as well as a portfolio that consists of 80 percent equities and 20 percent bonds. Surprisingly, when planning to age 90, the selection of portfolio allocation does not have a large impact on the probability of success: All three figures are between 90 percent and 93 percent (see table 4 and figure 4).

Table 4: ASSET ALLOCATION

	40/60 Allocation	40/60 Allocation (Update #3)	80/20 Allocation
Age	55	55	55
Retirement Age	**60**	**60**	**60**
Plan Age	90	90	90
Income	3.5% ($105,000 per year)	3.5% ($105,000 per year)	3.5% ($105,000 per year)
Legacy	$250,000	$250,000	$250,000
Value	$3,000,000	$3,000,000	$3,000,000
Contributions	**$60,000 annually**	**$60,000 annually**	**$120,000 annually**
Equity	40%	60%	80%
Bond	60%	40%	20%
Inflation	2%	2%	2%
Equity Return/Vol/Div	7%/16%/1.5%	7%/16%/1.5%	7%/16%/1.5%
Bond Return/Vol	2%/4%	2%/4%	2%/4%
Equity Bond Correlation	–15%	–15%	–15%
Probability of Success at Plan Age	**93%**	**92%**	**90%**

Figure 4: ASSET ALLOCATION TO AGE 90



SUMMARY OF CONTROLLABLE RISKS WHEN PLANNING TO AGE 90

As our initial base case, we used a 55-year-old who wants to retire as soon as possible. By delaying retirement five years (Update #1), the client increased the probability of success by 21 percentage points (from 56 percent to 77 percent). By adding contributions equal to 2 percent of the initial portfolio value ($60,000 per year for 5 years, Update #2), the client increased the probability of success another 8 percentage points (from 77 percent to 85 percent). Finally, by reducing the withdrawal rate from 4 percent of initial portfolio value ($120,000 per year) to 3.5 percent of initial portfolio value ($105,000 per year, Update #3), the client increased the probability of success another 7 percentage points (from 85 percent to 92 percent).

At this point, we looked at the asset allocation of the portfolio and observed that when planning to age 90, the impact of risking up to an 80 percent equity and 20 percent bond portfolio and the impact of de-risking to a 40 percent equity and 60 percent bond portfolio did not have a large impact on the probability of success.

Table 5: PROBABILITY OF SUCCESS AT AGE 90

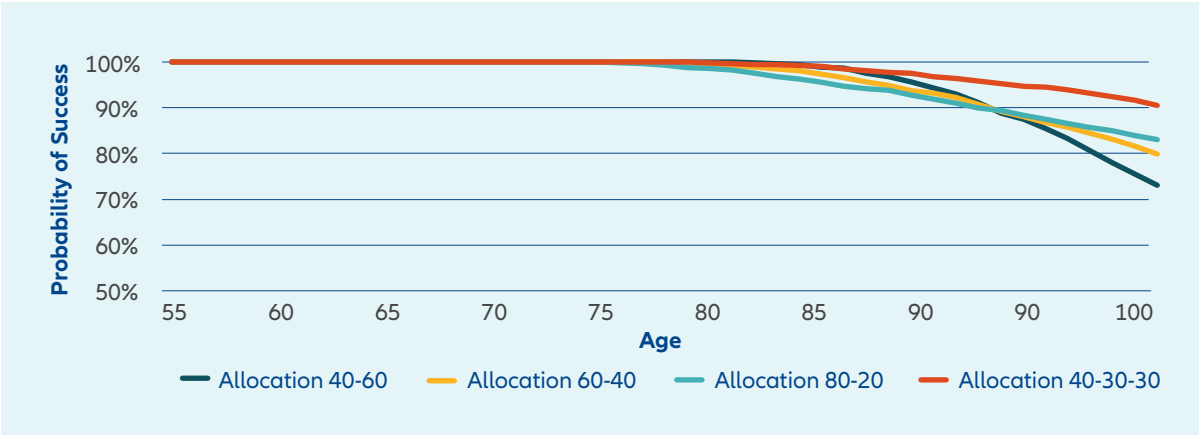
Controllable Risks	Base	Delay 5 years (Update #1)	Contribute 2% (Update #2)	Withdraw 3.5% (Update #3)
40% Equity/60% Bond	37%	70%	82%	93%
60% Equity/40% Bond	56%	77%	85%	92%
80% Equity/20% Bond	63%	79%	84%	90%
40% Equity/30% Bond/30% Annuity	45%	83%	90%	96%

ADD A REGISTERED INDEX-LINKED ANNUITY TO THE ASSET ALLOCATION

From here, we propose to add a RILA with a lifetime income benefit to the asset allocation. The lifetime income benefit on this particular annuity has the opportunity to increase based on the underlying price return of the equity asset.

When we add this annuity to the portfolio allocation (40 percent equity, 30 percent bond, and 30 percent allocated to the annuity), we see that the probability of success under the "Delay 5 years," "Contribute 2%," and "Withdraw 3.5%" assumptions has increased to 96 percent (see table 5). So, even if things go according to plan, allocating 30 percent of the portfolio to a RILA improves the probability of success. As we will see in the next section, adding the annuity to the portfolio also reduces exposure to some of the risks that an advisor and client cannot control.

Figure 5: ASSET ALLOCATION TO AGE 100 WITH ANNUITY



Uncontrollable Risks

We analyzed four uncontrollable risks: longevity risk (living beyond plan age of 90), equity returns risk (equity returns underperforming the assumed 7 percent return), inflation risk (needing to increase withdrawals by more than the 2 percent annual assumption), and portfolio shock risk (a large market shock early in the retirement-income stream).

LONGEVITY RISK

So far, we based our analysis and calculated our probability of success based on a plan age of 90. But what happens if the client needs income beyond age 90? How does each portfolio (40/60, 60/40, 80/20, and 40/30/30) hold up to age 100? Based on figure 5 and table 6, we can see that the non-annuity portfolio with the highest probability of success at age 90 (40/60) has the lowest probability of success at age 100. And the non-annuity portfolio with the lowest probability of success at age 90 (80/20) has the highest probability of success at age 100. This would imply that adding equity exposure to a client's portfolio reduces exposure to longevity risk at the expense of a lower probability of success at younger ages due to increased volatility. However, the most interesting observation is that the annuity portfolio (40/30/30) has the highest probability of success of all four portfolios at both age 90 and age 100. The portfolio with the annuity is better at reducing longevity risk than a portfolio without an annuity.

Table 6: LONGEVITY RISK

Asset Allocation	Age 90	Age 100	Exposure
40% Equity/60% Bond	93%	73%	-20%
60% Equity/40% Bond	92%	80%	-12%
80% Equity/20% Bond	90%	82%	-8%
40% Equity/30% Bond/30% Annuity	96%	90%	-6%

EQUITY RETURN RISK

What if the returns on equities average 5 percent per year instead of the 7 percent originally assumed? Based on table 7, we see that the probability of success for the non-annuity portfolios drops between 15 and 17 percentage points, whereas the probability of success for the annuity portfolio drops by only 10 percentage points. So, adding an annuity to the portfolio reduces the exposure to risk of lower-than-expected equity returns.

Table 7: EQUITY RETURN RISK

Asset Allocation	6% Equity Return	5% Equity Return	Exposure
40% Equity/60% Bond	93%	78%	-15%
60% Equity/40% Bond	92%	76%	-16%
80% Equity/20% Bond	90%	73%	-17%
40% Equity/30% Bond/30% Annuity	96%	87%	-9%

INFLATION RISK

What if the client needs to increase withdrawals by 3 percent annually instead of the 2 percent originally assumed? Based on table 8, we see that the probability of success for the non-annuity portfolios and the annuity portfolio drops between 9 and 19 percentage points, but the annuity portfolio is on the low end of that range. Increasing exposure to equities reduces exposure to inflation, but the starting point for the 80 percent equity and 20 percent bond portfolio was 6 percentage points behind the annuity portfolio.

Table 8: INFLATION RISK

Asset Allocation	2% Inflation	3% Inflation	Exposure
40% Equity/60% Bond	93%	74%	-19%
60% Equity/40% Bond	92%	80%	-12%
80% Equity/20% Bond	90%	81%	-9%
40% Equity/30% Bond/30% Annuity	96%	85%	-11%

PORTFOLIO SHOCK RISK

What if the equity market drops 30 percent and the bond market drops 5 percent at age 65 (five years into the client's retirement)? Based on table 9, we see that a large market shock early in retirement reduces the probability of success for the non-annuity portfolios (by 13 to 15 percentage points). Meanwhile, the probability of success for the portfolio with the annuity has much less exposure to such a market shock, dropping by only 6 percentage points.

Table 9: PORTFOLIO SHOCK RISK

Asset Allocation	Unshocked	Shocked	Exposure
40% Equity/60% Bond	93%	78%	-15%
60% Equity/40% Bond	92%	78%	-14%
80% Equity/20% Bond	90%	77%	-13%
40% Equity/30% Bond/30% Annuity	96%	90%	-6%

Conclusion

This paper has shown the extent to which an advisor and client can influence client outcomes through modifying the client's retirement age, contribution level, withdrawal rate, and asset allocation.

But when faced with increasing longevity, lower equity returns, higher inflation, and portfolio shocks, the level to which they can control outcomes by modifying controllable factors may not be enough. Adding equity exposure to the portfolio reduces the portfolio's exposure to longevity risk and inflation risk at the expense of increasing the portfolio's exposure to equity returns risk and portfolio shock risk. Allocating 30 percent of the client's assets to a RILA with guaranteed lifetime income payments reduces the client's exposure to all four of the uncontrollable risks when compared to portfolios without a RILA. Advisors should consider performing a deeper analysis of these uncontrollable risks, which their clients are likely to face in retirement (see table 10). Adding a RILA with guaranteed lifetime income payments can provide advisor and client with more protection from uncontrollable risks, thereby improving the probability of a successful retirement spending plan.

Table 10: RISK EXPOSURE BY ASSET ALLOCATION

Asset Allocation	**40/60**		**60/40**		**80/20**		**40/30/30**	
Base Probabiliy of Success	93%		92%		90%		96%	
Longevity Risk	73%	-20%	80%	-12%	82%	-8%	90%	-6%
Equity Risk	78%	-15%	76%	c%	73%	-17%	87%	-9%
Inflation Risk	74%	-19%	80%	-12%	81%	-9%	85%	-11%
Portfolio Shock Risk	78%	-15%	78%	-14%	77%	-13%	90%	-6%

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[1] Equity prices are modeled with geometric Brownian motion (GBM) and bond yields are modeled with a Vasicek model. GBM is a continuous-time stochastic process in which the logarithm of the price return is a Brownian motion. The Vasicek model is another type of continuous-time stochastic process for the short rate that includes a mean-reversion term to account for the fact that interest rates (and therefore bond prices) cannot rise or fall indefinitely; the bond price is then obtained from the short rate by assuming a flat yield curve and a constant seven-year duration. These processes are calibrated to the capital market assumptions. For example, in the base case, the equity returns are 7 percent with a volatility of 16 percent, bond price returns are 2 percent with a volatility of 4 percent, and there is a –15 percent correlation of these returns.

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Variable annuities and RILAs are subject to investment risk, including possible loss of principal. Investment returns and principal value will fluctuate with market conditions so that units, upon distribution, may be worth more or less than the original cost.

Clients could experience a loss during an index period if the index declines more than the level of downside protection and may not be able to participate fully in a market recovery due to the capped upside potential in subsequent index periods.

Annuity guarantees are backed by the financial strength and claims-paying ability of the issuing company. Variable annuities do not guarantee the performance of subaccounts, which will fluctuate based on the market.

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