MILLIMAN WHITE PAPER

Registered index-linked annuity cap-setting methodologies

Implications of common industry practices

Fiona Ng, FSA, CFA, CERA, MAAA
Jordan Rosenfeld
Ricardo Trachtman, FSA, MAAA
Karthik Yadatore, FSA, MAAA

Milliman

Carriers use a variety of methods to set registered index-linked annuity cap rates, each with unique hedging and cost of capital considerations.

We explain common industry practices for cap rate-setting and quantitively compare outcomes of several methodologies using historical asset and option pricing models. Identifying the important trade-offs in methodologies could provide useful guidance to life insurance product and management teams, as the variations have significant implications for policyholder experience, capital efficiency, hedging costs, and profitability.

Executive Summary

Registered index-linked annuity (RILA) carriers seek to maximize the spread between asset earned rates and the cost of hedging, which is primarily affected by the cap rate and thus the method used to set it (asset allocation and derivatives hedging program operational efficiencies are out of the scope of this paper). Management teams must strike a balance when setting cap rates, because a higher rate positively impacts policyholder account value growth potential and sales efforts, but negatively impacts net interest margins.

We use real-world point-in-time data to model historical asset portfolios, target spreads, risk-based capital charges, and option prices to compute historical cap rates and demonstrate trade-offs from both policyholder and issuer viewpoints under the following common industry cap-setting frameworks:

1. **New money rate:** Option budget is tied to the spread-adjusted yield of a portfolio of new fixed income assets.
2. **Portfolio rate:** Option budget is tied to the spread-adjusted yield of a portfolio of legacy fixed income assets.
3. **Asymmetric method:** Option budget is tied to the spread-adjusted yield of a blended portfolio of new and legacy fixed income assets.

While many carriers will dynamically switch between these methodologies to address evolving economic objectives, we hold them fixed over time to assess long-term trade-offs.

Additionally, given the recent innovation of RILA-like structured buffer funds* in variable annuity (VA) products, we also explore two fund constructions utilizing the following option budgets:

1. **Risk-free rate:** Asset portfolio consists of a U.S. Treasury bill.
2. **Generic fixed income portfolio yield:** Asset portfolio consists of a mix of U.S. Treasury instruments and corporate bonds (or their derivatives).

We seek to identify the key factors for management teams and examine the following:

- **Differences in option budgets and hedging costs**.
  - Holding spreads constant, lower hedging costs imply wider net interest margins if caps remain constant.
- **Net cap rates.**
  - Differences in absolute cap rates can drive sales and marketing efforts.
- **Account value growth.**
  - Enhanced account value growth potential is a benefit to the policyholder and can help fund guarantees.
- **Differences in cost of capital.**
  - C1 and other capital charges that impact balance sheet usage and profitability.
  - C3 capital and VM-21 reserves.

* A more detailed explanation of structured funds is provided below in the Background and Additional Information on Structured Funds sections.

FIGURE 1: COMPARISON BETWEEN RILAS AND VA-BASED STRUCTURED FUNDS

	TRADITIONAL RILA	STRUCTURED FUND
Tax deferral?	✓	✓
Exposed to Issuer Credit Risk?	✓	
Exposed to Fixed Income Asset Performance?		✓
Transparent daily market value?		✓
Surrender charges? *	✓	
Competitive cap rates?	✓	✓
Carrier balance sheet utilization?	✓	
Deterministic renewal rates?		✓

* While there may be a surrender charge for terminating the VA policy, there is no surrender charge for selling a fund to reset buffers or access higher cap rates by reinvesting in newer vintages.

OPTION BUDGETS

Depending on the rate-setting methodology, differences in option budgets can arise given changes to the economic environment after the product is issued. Some rate-setting methodologies offer more competitive rates while others provide steadier sources of income to the companies issuing the policies. Figure 2 shows a generalized summary of the performance of distinct methodologies given changes in the interest rate environment.

FIGURE 2: IMPACT OF CHANGES IN INTEREST RATES

	RISING INTEREST RATES		FALLING INTEREST RATES	
RATE-SETTING STRATEGY	**CAPS**	**TARGET SPREADS**	**CAPS**	**TARGET SPREADS**
New Money	↑	↓	↓	↑
Portfolio	=	=	=	=
Asymmetric	↑	↓	↓	↑
Structured Funds	↑	N/A	↓	N/A

In rising interest rate environments, the new money strategy and the structured funds will provide the most competitive caps followed by the asymmetric strategy and finally the portfolio strategy. In falling interest rate environments, the new money strategy and the structured funds will provide the least competitive caps. The asymmetric strategy follows next while the portfolio strategy will remain the most competitive.

NET CAP RATES

We find that RILAs utilizing the new money rate and asymmetric methods for cap-setting offer similar net cap rates and account value growth potential. Given the downward trend in interest rates over time, the portfolio rate method has resulted in higher average net cap rates and thus greater account value growth potential than the new money rate and asymmetric methods. The structured fund composition generating option budget with the risk-free rate offered median net cap rates in line with traditional RILAs using the new money rate and asymmetric methods and was 1% below traditional RILAs using the portfolio rate method under a 2% target spread assumption. The structured fund composition utilizing the hypothetical fixed income portfolio described in the Additional Information on Structured Funds section below offered median net cap rates 8% to 11% higher than the risk-free structured fund and traditional RILAs using any of the three cap-setting methods under 1.5% or 2% target spread assumptions.

ACCOUNT VALUE GROWTH

Historical account value (AV) growth modeled using real-world data shows minimal realized differences between the three RILA cap-setting methods, with the portfolio rate median 6-year total return only 4% to 5% higher than the new money rate and asymmetric methods. The fixed income structured fund resulted in the highest historical AV growth compared to any of the model RILA policies or the risk-free structured fund. The outperformance in historical AV growth is due to two reasons, the higher cap rates allowing for greater upside capture potential and the positive average performance of the fixed income portfolio. The fixed income structured fund median 6-year total return was 15% to 20% higher than the three model RILA median 6-year returns. Contrarily, the risk-free structured fund median 6-year total return was 6% to 11% below the three model RILA median 6-year returns and 26% below the fixed income structured fund.

DIFFERENCES IN COST OF CAPITAL

Traditional RILAs that rely on spread income generated by investing policyholder premium deposits into fixed income assets can cause significant increases in an insurer's capital levels by generating asset-based charges. The asset-based charges are calculated using the statutory risk-based capital requirements. However, structured funds are self-contained unitized separate account assets and hence do not produce asset-based capital requirements. Our illustrative models indicate that 2.6% to 3.4% of policyholder premium is required to set up additional capital in traditional RILAs compared to structured fund-based VAs.

On the other hand, the synergies between VAs with guarantees and RILAs can help reduce principle-based reserving (PBR) reserves and C3 capital charges for insurers that offer both products. This reason makes it attractive for companies that have VAs with guarantees to offer RILAs as well.

Background

WHAT IS A REGISTERED INDEX-LINKED ANNUITY?

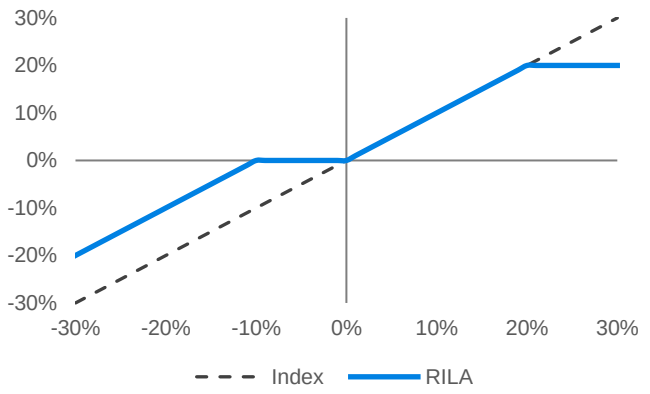
Registered index-linked annuities (RILAs), or structured annuities, are investment products offered by insurance companies that provide policyholders with returns based on the performance of an underlying index, such as the S&P 500. Policyholders specify a level of protection and term (generally 1-year, 3-year, 5-year, or 6-year) and receive an upside crediting rate commensurate with the chosen level of risk and tenor. RILAs are between fixed index annuities (FIAs) and variable annuities (VAs) on the risk spectrum, exposing policyholders to measured risk of principal loss in exchange for greater upside potential.

While there are many index-based upside crediting mechanisms for RILAs such as participation rates and trigger rates, we focus exclusively on cap rates in this paper. The cap is the maximum rate of growth of the policy over the term. For example, if the cap rate is 8% and the underlying index returns 10%, the policyholder would only receive 8% interest credited. Below the cap level, the policyholder is credited the index performance.

RILAs offer two main downside protection options, the buffer and the floor. Buffers protect against the first percentage points of negative index returns while floors protect against the last percentage points. For example, with a -10% buffer, the policyholder is protected against negative index performance from 0% to -10%. With a -10% floor, the policyholder absorbs the first 10% of index losses but is protected from all losses beyond -10%. Because floor products provide more tail protection than buffer products, generally upside crediting rates are lower.

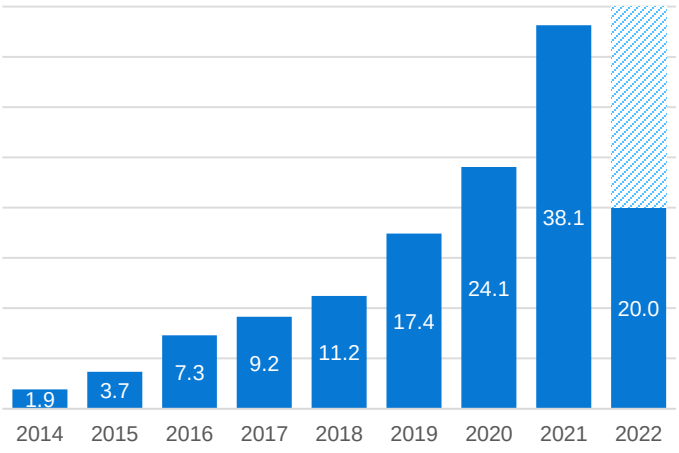
One of the most commonly issued RILA policies is a 1-year reset 10% buffer with cap,[1] which protects against the first 10% of reference index losses while limiting upside index performance beyond the cap rate. In this paper we will focus exclusively on this construction, although noting many alternatives exist.

FIGURE 3: CREDITING PROFILE OF A RILA WITH 10% BUFFER AND 20% CAP



RILAs have gained popularity during the low interest rate regime that followed the global financial crisis, as crediting rates on fully principal-protected products such as FIAs declined, making risk sharing more attractive. Additionally, positive drift in equity markets over the last several years has rewarded the larger upside capture of RILAs without demonstrating the advantages of a 0% floor, resulting in flows shifting from FIAs to RILAs. There are also advantages for VA writers to issue RILAs as they provide a natural offset to some of the existing VA guarantees. Given turbulent equity markets and rising risk-free rates in 2022 year-to-date as the Federal Reserve rapidly raises the federal funds rate, it is possible that the industry may see sales trends shifting back toward FIAs.

FIGURE 4: STRUCTURED ANNUITY SALES IN USD BILLIONS



Source: LIMRA (2022 data through 2Q)

[1] Secure Retirement Institute, A Deeper Dive: 2020 Registered Index Linked Sales.

As RILAs have attracted an increasing percentage of indexed and variable annuity premiums over the last several years, RILAs themselves have found competition from RILA-like "defined outcome" structured funds. Defined Outcome exchange-traded funds (ETFs) provide buffered exposure to equity indices at low cost. They entered the market in 2018 and captured meaningful new assets even without the tax deferral advantages of a RILA.

WHAT IS A STRUCTURED FUND?

Structured funds, also known as defined outcome funds, deliver shareholders returns linked to reference asset performance over a specified time window (the "outcome period"). While there are many different types of structured funds, with many issuers borrowing common payoffs from the structured notes market, the most popular strategy is the S&P 500 15% buffer with cap.[2]

Structured fund managers use exchange-traded Flexible Exchange (FLEX) options, which are centrally cleared to the Options Clearing Corporation but have over-the-counter (OTC)-like customizable terms, to tailor very precise synthetic exposures to the reference asset without the credit risk and operational complexities of facing counterparties bilaterally.

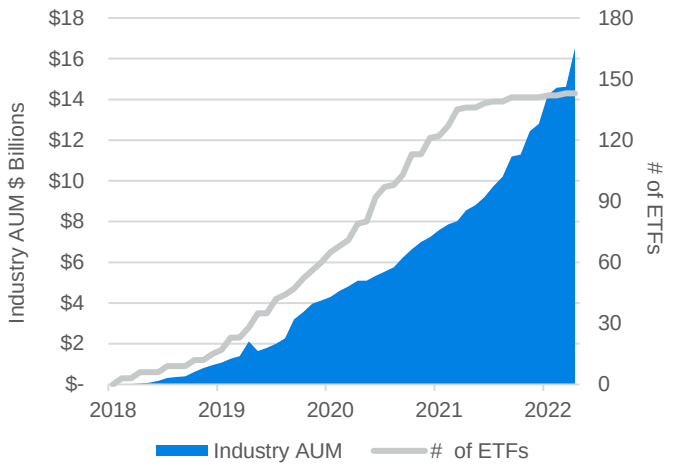
Innovator Capital Management was the first asset manager to bring structured funds to the ETF wrapper, closely followed by First Trust and then many others. The funds have been popular with financial advisers, particularly in the registered investment adviser (RIA) channel, which favors the cost-effectiveness, liquidity, tax efficiency, and absence of credit risk of the ETFs versus traditional structured notes and RILAs. Additionally, ETFs can be bought and sold directly from a brokerage account with low transaction costs.

Seeing the success of the buffer ETFs and noting the similarities to RILAs, several life insurance companies, such as Lincoln Financial Group, AIG Life & Retirement, Nationwide, and TransAmerica, have recently issued VA products with buffer funds as investment options. In traditional RILA products, similarly to FIAs, the insurer invests the policyholder premium in fixed income assets. The investment income generated from these assets, and the premium received from writing put options in the case of a RILA, are used as the option budget to set a cap rate or equity upside participation rate for the policyholder.

Some carriers without RILA products, due to lack of investment and hedging expertise, an aversion to the expense of managing assets, or otherwise, view structured funds as a simple, alternative way to access the strong sales of the structured annuities market without intensive capital investment. Additionally, some carriers may prefer the simplicity and transparency of the structured fund's daily market value calculations via widely accepted net asset value (NAV) accounting principles, rather than requiring the policyholder to rely on the insurer's definition of the contract interim value.

Carriers that do issue RILA products also have seen value in VA-based structured fund offerings, finding advantages in a differentiated income stream (fee revenue vs. spread revenue) and risk-based capital (RBC) savings versus standard equity funds.

FIGURE 5: DEFINED OUTCOME ETF INDUSTRY GROWTH



Source: Bloomberg, ETF.com

We include historical structured fund cap rates in our analysis of RILA rate-setting methodologies, as VA-based structured funds are increasing in popularity and their advantages and disadvantages are of particular relevance to RILA/VA dual writers.

Spread product mechanics

HOW ASSET YIELDS TRANSLATE TO CREDITING RATES

When issuing spread products such as fixed annuities, multiyear guaranteed annuities (MYGAs), FIAs, and RILAs, insurance companies guarantee policyholders a crediting rate (fixed or index-based) backed by the faith and credit of the issuer.

The insurance company earns the spread between the performance of the general account asset portfolio (net of defaults, impairments, investment management expenses, etc.) and the interest credited to policyholders.

[2] As of November 2022, 51% of Innovator ETF total assets under management is allocated to the 15% buffer series ($4.96 billion of $9.68 billion).

For indexed annuities, the insurance company generally utilizes a standard asset-liability management (ALM) hedging program that matches liabilities with options-based assets. For a point-to-point FIA contract, the simple hedge asset is a bull call spread with the long option struck at-the-money (ATM) and the short option struck out-of-the-money (OTM) at the cap level. In the case of a RILA, the policyholder is implicitly short a put or put spread (buffer or floor, respectively) to the insurance company, partially offsetting the cost of the call spread hedge asset, allowing for superior cap rates. For RILA/VA dual writers, there are additional synergies as the downside put options supplied by the RILA may act as natural hedges for the VA guarantees.

Carriers deduct the target spread from the asset earned rate to determine the option budget (i.e., the hedge budget) and set the cap rate based on the width of the call spread the budget allows for. The larger the option budget, the higher the cap rate, because the policyholder can "sell" a further OTM call to cover the cost of the ATM call.

FIGURE 6: INDEXED ANNUITY HEDGE ASSETS

1.	**FIA CAP/FLOOR = ATM CALL - OTM CALL**
2.	**RILA Cap/Buffer = ATM Call - OTM Call - OTM Put**

Note: Some carriers may run futures-based dynamic hedge programs.

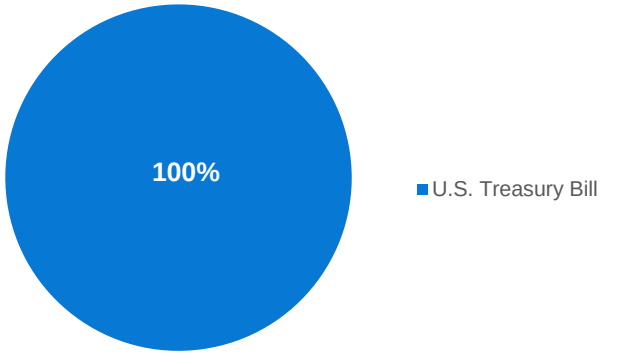
Additional information on structured funds

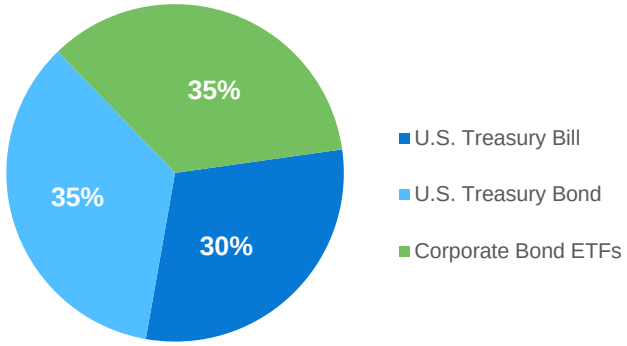
On a topical level, VA-based structured funds replicate RILA payoff profiles by reconstructing the hedge asset portfolio within a mutual fund wrapper. For a RILA, premiums are commingled with general account assets and the policyholder receives a guarantee that they will be credited interest based on the policy parameters. For a VA, premiums are segregated in the subaccount and policyholders own shares of the assets used to deliver the payoff directly.

While there are several ways to construct the 10% buffered payoff profile, managers tend to hold an options portfolio collateralized by U.S. Treasury bills (T-bills). Managers seeking an enhanced option budget will swap out T-bills for fixed income collateral with greater duration and credit risk. We do not consider the all-options approach favored by defined outcome ETFs, as IRS Rule 817(h), also known as the diversification rule for variable contracts, makes it challenging to implement in the insurance space.

For the purposes of this analysis, we explore two flavors of structured funds: a construction that generates option budget entirely from the risk-free instrument and a riskier construction that allocates 30% to U.S. Treasury bills, 35% to ETFs that track the Bloomberg U.S. Intermediate Corporate Bond Index, and 35% to a long duration U.S. Treasury bond.

FIGURE 7: STRUCTURED FUND COLLATERAL COMPOSITIONS*





* The generic credit portfolio in this figure holds non-accrual adjusted allocations of 30% in T-bills, 35% in T-bonds, and 35% in ETFs that track the Bloomberg U.S. Intermediate Corporate Bond Index.

Note: The above allocations are not adjusted for expected interest accruals and can be considered face value equivalents of theoretical zero-coupon bonds.

The options holdings are the same in both examples and mirror the indexed annuity hedge assets shown in the table in Figure 8.

FIGURE 8: OPTION HOLDINGS

1.	**SHORT 10% OTM PUT**
2.	**LONG ATM CALL**
3.	**SHORT X% OTM CALL**

The short 10% OTM put creates 1:1 downside exposure beyond the put strike, the long ATM call creates 1:1 upside starting at the initial index level, and the short OTM call caps index performance at the variable strike cap rate.

The short put premium is added to the expected investment income of the fixed income portfolio and constitutes the option budget. Generally, the option budget is not high enough to provide uncapped upside exposure (in other words, pay for the ATM call outright) and an OTM call must be sold to make up the shortfall. Formulaically:

Shortfall = ATM Call Premium - (OTM Put Premium + Asset Yield)

The cap rate is the strike of the nearest OTM call with a price equal to the shortfall. Structured fund managers trade the options on market close to align strikes with the closing price of the reference asset on the reset date.

Note that the cap rate of a structured fund is market-implied and maximal for a given option budget whereas the cap rate of a RILA is set by the carrier based on target spread according to business objectives.

EXAMPLE CASH FLOWS

Consider a hypothetical fund with $1 million in net assets and prevailing interest rates of 5%. In this example we use the risk-free option budget for simplicity, although the same logic can be applied to any fixed income portfolio by calculating the aggregate present value of all component instruments and discounting with proper compounding conventions.

On reset date, the fund manager will buy $1 million face value of a U.S. Treasury bill for $952,381: $1,000,000 / (1 + 5%). The discount to par of $47,619—$1,000,000 - $952,381—will be netted with the OTM put premium and used to buy the upside exposure.

To create the proper equity exposures, the manager will sell $1 million notional of the OTM put and buy $1 million notional of the ATM call. The 1-year 10% OTM put costs approximately 5%, or $50,000, as of November 13, 2022, resulting in a total option budget of $97,619 ($47,619 + $50,000). The ATM call costs approximately 11%, or $110,000, creating a shortfall of $12,381 ($110,000 - $97,619). To raise the additional $12,381, the manager will sell an OTM call with a price of 1.2381%. As of November 13, the 127% strike call costs 1.2381%, implying a 27% cap rate.

Once the fund is parameterized, the assets are fixed for the duration of the outcome period. Dollar inflows and outflows intra-period are allocated pro rata to the existing assets. For example, if a $100,000 policy is sold on t+n, where t is reset date, the fund manager will buy $100,000 face value of the T-bill and trade $100,000 notional of each option leg. Because the market values of the T-bill and the options will have changed between t and t+n, the policyholder entering intra-period will experience a different outcome from those holding the fund at the reference NAV on the parameterization date. The assets must remain fixed to ensure the initial cap and buffer are fully effective from one reset date to the next for investors holding shares for the full outcome period.

How do traditional RILAs and structured funds compare?

Although both RILAs and VA-based structured funds deliver similar return profiles and tax advantages, there are many important distinctions for both the carrier and the policyholder.

SALES AND MARKETING IMPLICATIONS

Currently, both RILAs and structured funds are generally marketed as investment products, with the latter primarily offered in investment-only variable annuity (IOVA) products with weak riders such as Return of Premium Death Benefit or no riders at all. However, because the structured funds have embedded hedges, the risk-based capital savings could be used to subsidize premium discounts in traditional Vas with stronger guarantees.

Although RILAs have issuer credit risk, the stable nature of the investments allows for stable and predictable cap rates, allowing financial advisers and platforms to advertise set cap rates on widely distributed “rate sheets.” In contrast, structured funds set cap rates at the best available market price for the derivatives package constituting the fund holdings each reset date, so the rates are unknown ahead of time and advisers can only sell a projected cap range. The actual cap rate is not guaranteed to fall within the range, introducing unpredictability and complicating the sales story.

INTERIM VALUES

Another advantage of traditional RILAs is their simplicity—they are easier to understand and explain than structured funds, giving them a leg up with financial advisers who are often time-constrained and look unfavorably upon complexity. The RILA policyholder receives the stated buffer and cap rate no matter what day they purchase the policy and client money can be put to work right away.

On the other hand, structured funds parameterize on predetermined reset dates and anchor the outcome period's cap and buffer to the fund starting NAV. Investors who buy structured funds intra-period will experience different caps and buffers from those set on the parameterization date, because the market price will likely differ from the initial NAV due to market movement and option time decay. For example, if an annual reset 10% buffer fund is launched on December 31 with an initial NAV of $10.00 and the reference index finishes the year -5%, then the ending NAV will still be $10.00 because the first 10% of losses are buffered. However, an investor buying the fund six months into the outcome period on June 30 at a market price of $10.25 will experience a 2.5% loss because the buffer is operative from the initial NAV of $10.00 and not $10.25. Similarly, the investor will be unable to achieve the full stated capped return rate because the outcome was already 2.5% "in-the-money."

It is essential for fund sponsors to develop web-based tools and educational materials for advisers so they can convey accurate information and intra-period parameters to end-clients. To avoid this problem, some advisers selling structured funds simply wait for a reset date to deploy client capital. Carriers address the problem by issuing structured funds on a quarterly or monthly cadence to minimize timing mismatch between the contract issuance date and the nearest fund vintage.

LIQUIDITY

A big advantage of structured funds is that they offer daily liquidity via the primary or secondary market. Fund holders can redeem or sell their shares for cash at fair market value without incurring surrender charges, allowing them to reinvest in other subaccount funds either to reset parameters in a newer buffer fund series to lock in gains or to take advantage of changing market trends. RILA policyholders are generally subject to 6-year surrender periods and must pay penalties for early withdrawals.

TRANSPARENCY

RILAs shield the policyholder from implicit fees and interim values, potentially creating a better client experience for buy-and-hold investors at the cost of transparency. Fund-based solutions, subject to the strict regulatory requirements of the Investment Company Act of 1940, must disseminate fair NAVs daily and disclose full fund and product fee schedules.

While some advisers may not want clients reviewing daily statements and making suboptimal decisions based on volatility in interim values, transparency is important for investors. Recognizing this, insurance regulators, specifically the Index-Linked Variable Annuity Subgroup of the National Association of Insurance Commissioners (NAIC), are questioning the way some RILA interim values are calculated. At the time this paper was written, the NAIC subgroup has released a draft for a new actuarial guideline that will set the nonforfeiture requirements for RILAs to have a daily interim value based on the market value of the embedded options backing the policies, which would even the playing field.

MARKET-IMPLIED RENEWAL RATES

Structured funds always deliver cap rates precisely tied to the asset yield, whereas cap rates set by the insurer are subject to proprietary and arbitrary target spreads. On renewal dates, structured funds will continue to deliver the unadjusted "new money rate" caps defined by its asset mix whereas RILAs may lag implied new money cap rates depending on the cap-setting method used. If renewal cap rates are significantly below new money cap rates due to the insurer utilizing the portfolio rate or asymmetric methods, then the policyholder generally cannot terminate their policy and access the higher new money cap rates without paying punitive surrender charges or market value adjustments (MVAs). Although the renewal cap rates for structured funds cannot be known ahead of time as the forward Black-Scholes parameters and option bid/offer spreads can only be estimated to a certain degree of precision, the cap-setting method is known and predictable. Structured funds will always offer the new money cap rates on renewals because the asset portfolio is rebalanced on each reset date to align with the fund objectives as outlined in the prospectus.

Overview of common frameworks for cap-setting

For traditional RILAs, the crediting strategy that is used as a framework for cap rate-setting can be broadly classified into three categories:

PORTFOLIO STRATEGY

As explained above, in traditional RILAs, insurers invest policyholder premium in fixed income assets to generate investment income revenue. Insurers can rely on this investment income revenue to support an option budget, which in turn is used to determine the option budget.

NEW MONEY STRATEGY

Under this strategy, the option budget is solely determined by what an insurer would expect to earn from newly invested assets as opposed to from an in-force portfolio of fixed income assets under a portfolio strategy.

COMPETITOR-BASED STRATEGY

Under this strategy, the insurer determines cap rates based on the cap rates provided by its competitors. Insurers may decide to scale up and scale down their current cap rates to a perceived competitor cap rate while subjecting the increase or decrease to caps and floors, respectively. In this paper, we added a variation

of this strategy labeled as the “asymmetric method.” It varies from the competitor-based strategy in that it moves asymmetrically from the past rates only 25% to increase caps and 75% to decrease them.

INDUSTRY PRACTICES

In reality, most insurance companies use a combination of the above three strategies. We recently surveyed 10 RILA carriers and found that the majority of the companies said that the portfolio earned rate is the primary driver of their crediting strategy. However, the competitive landscape and internal factors such as sales targets and profitability requirements also influence the option budget and cap rate-setting. A minority of the companies said that they use the new money rate as the sole or primary driver of the crediting strategy. A few companies also said that they try to maintain a consistent level of cap rates across the index terms but also consider profitability requirements and the competitive landscape.

In volatile markets, the put options associated with floors and buffers become sufficiently valuable such that their value when combined with fixed asset investment income produces excess option budget. In our experience, most companies try to pass on any excess option budget to the policyholder. A few companies like to maintain a degree of consistency in the level of cap rates, and they do have limits on passing any excess option budget to the policyholders.

Methodology for generating historical cap rates

CONSTRUCTING THE HISTORICAL ASSET PORTFOLIO MODEL

The proxy asset portfolio used to back the RILA product for this analysis is developed based on common characteristics observed in asset portfolios of traditional RILA carriers with regard to asset types, credit quality, maturities, and the respective allocations for these traits. A five-year and seven-year strategy are developed separately, and the hypothetical portfolio takes on the average of these two strategies. The asset portfolio is developed quarterly from March 31, 2010, to June 30, 2022. Yields for each asset class are determined based on spreads as of the date of the investment strategy. Spreads for each of the asset classes are based on data from industry sources such as Bloomberg Composite Public Corporate Spreads and ACLI Commercial Mortgage bulletins. Private assets are assumed to be above public corporate spreads by 25 to 60 basis points (bps) depending on their credit quality and time period. Investment expenses are assumed to be at the industry level of 10bps for a well-diversified portfolio. Default assumptions are based on “Moody’s Default and Recovery Rates of Corporate Bond Issuers, 1920-2020,” using experience period 1983 through 2022. Default costs on private bonds are assumed to be two-thirds of the public asset of same credit quality.

According to a recently conducted survey by Milliman, the RILA Survey Report of May 2022, some of the RILA carriers noted that they use the same or similar portfolios to back RILAs as they do for FIAs. Some FIA carriers, especially those with partnerships with private equity firms for asset management, may have wider access to direct origination capabilities and high-yielding asset classes such as private structured and alternative assets like private equities, including mortgage-backed securities (MBS), commercial mortgage-backed securities (CMBS), asset-backed securities (ABS), and capital market lines (CML). The investment strategies utilized by these firms typically enhance the overall capital-adjusted yields of the portfolio.

FIGURE 9: HYPOTHETICAL ASSET PORTFOLIO ALLOCATION

ASSET CLASS	AVG. MATURITY	RATING	WEIGHT	AFTER TAX C1 CHARGE
U.S. Treasury	6 Years	AAA	2.55%	0.13%
Corporate Bond	6 Years	A	27.96%	0.68%
Corporate Bond	6 Years	BBB	27.96%	1.27%
CMBS/MBS	6 Years	AAA	17.55%	0.13%
ABS	6 Years	A	2.42%	0.68%
CML	6 Years	NR	21.56%	1.12%

Note: Hypothetical portfolio corresponds to a generic RILA with 6-year surrender charge.

DERIVING OPTION BUDGETS FROM THE HYPOTHETICAL ASSET EARNED RATES

Following the most common methods for rate-setting of RILAs, we developed historical option budgets under three distinct methodologies: new money, portfolio, and asymmetric market rate movement. Each of these methodologies utilize the asset portfolios described in the previous section. We calculated the asset portfolios at the end of each calendar quarter from March 31, 2010, to June 29, 2022, and followed them over a 6-year period. We then subtracted an average investment expense and default rate to come up with a net investment earnings rate (NIER).

We calculated option budgets, which are the amounts that insurance companies set aside to purchase the options that back the crediting strategies offered in the RILA products, assuming

two different levels of target spread. Target spread is an amount set aside by insurance companies to cover expenses and profit. As the RILA market has been maturing and more companies have entered the market, the target spreads the companies take have become increasingly more competitive. For this analysis we used 1.50% and 2.00% as target spreads. The initial option budget was calculated as follows:

$$OptBudg = \frac{(1 + NIER - TargSpd)^t - 1}{(1 + NIER)^t}$$

where *t* is the time to maturity of the crediting strategy.

The three methodologies all start with the same initial option budget at the issue of the policy. The variations within these strategies occur when the crediting strategy matures and a new cap needs to be set for the following crediting period. The new money strategy calculates the caps after the initial period assuming a new portfolio of assets would be purchased at that point in time. This strategy will have the fastest reaction to interest rate movements out of the three selected strategies.

The second strategy, the portfolio methodology, follows the portfolio earned rate for the life of the RILA policy. In this case, it will maintain a level NIER for the five additional reset periods in the analysis. This strategy will have the slowest reaction to interest rate movements out of the three selected strategies.

The third and final strategy, the asymmetric movement methodology, will move asymmetrically to follow the new money rates. This rate-setting strategy will go up 25% of the difference between the prior set option budget and the new money rate and it will go down 75% of the difference between the prior set option budget and the new money rate. This strategy falls between the new money strategy and the portfolio strategy in terms of reaction to interest rate movements.

CALCULATING THE HISTORICAL CAP RATES

As outlined above, we used sample balance sheet data from two large RILA carriers to model hypothetical asset portfolio earned rates quarterly from March 2010 through June 2022. To simplify the analysis given data constraints, we held the credit and duration profiles constant over time.

Using these earned rates, we derived two sets of historical level option budgets by reducing the earned rates by high and low estimates of target spread and the default and investment expense assumptions.

We then modeled 50 6-year RILA policies written each quarter-end from March 2010 through June 2022, including annual resets where appropriate. For each of the 50 policies, we derived six option budgets on each of the 240 reset dates:

- **New money rate**
  - 1.5% target spread
  - 2.0% target spread
- **Portfolio rate**
  - 1.5% target spread
  - 2.0% target spread
- **Asymmetric method**
  - 1.5% target spread
  - 2.0% target spread

We also derived option budgets for the following two structured funds on each of the reset dates:

- **Risk-free**
- **Generic fixed income**

For the risk-free construction, we replaced the hypothetical portfolio earned rate with the yield-to-maturity (YTM) of a 12-month Treasury bill. For the generic credit construction, we replaced the hypothetical portfolio earned rate with the weighted sum of a 12-month Treasury bill YTM, approximately a 15-year Treasury bond YTM, and the Bloomberg U.S. Intermediate Corporate Bond Total Return Index aggregate YTM. Because the structured funds pass on the full asset yield, we used target spreads of 0%.

To calculate the cap rates, we used historical S&P 500 volatility surfaces from Cboe and an option pricing model from MerQube to compute the premiums of the sold OTM puts and purchased ATM calls. After netting the asset yield with the collected premium from the short put, we again used the MerQube option pricing model and interpolated across OTM call strikes, solving for the minimum OTM strike such that:

OTM Call Premium = ATM Call Premium - Put Premium - Asset Yield

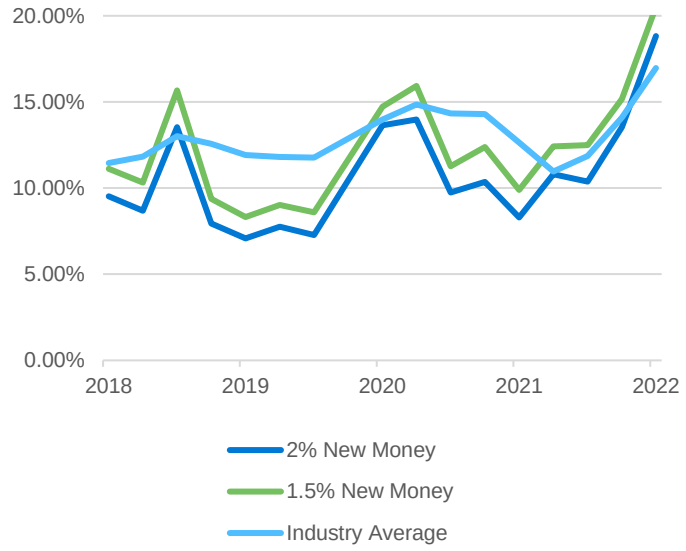
Were our assumptions reasonable? How do real-world data points compare?

As a sanity check, we compared new money cap rates using our asset mix and spread assumptions to actual historical RILA new money cap rates from July 2018 through September 2022 for the following products:[3]

- Allianz Index Advantage
- Brighthouse Shield Level
- Equitable Structured Capital Strategies
- Jackson Market Link Pro
- Lincoln Level Advantage
- Pruco FlexGuard
- RiverSource Structured Solutions
- SymetraTrek

Our spread estimates resulted in model cap rates in line with the industry average over that period, evidencing the reasonableness of our assumptions.

FIGURE 10: MODEL CAP RATES VS. INDUSTRY AVERAGE

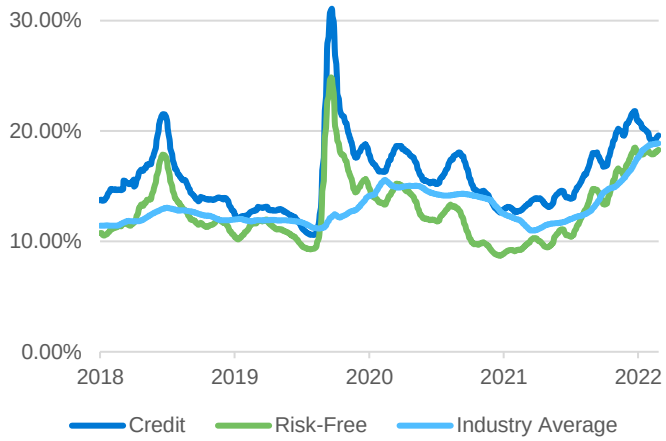


Note: March 31, 2020, was an outlier and was removed. Model cap rates were significantly higher than the industry average as volatility levels spiked during the COVID-19 shock, resulting in greater premiums received from the OTM options. RILA carriers were slow to respond to the heightened volatility regime and gradually raised cap rates (and held them above model rates for quite some time into 2021).

Our model new money cap rates showed more variance than the industry average and understated actual cap rates in periods with low risk-free rates, confirming the conservativeness of our asset mix and indicating carriers may dynamically smooth out new money cap rates for sales purposes.

We also compare historical structured fund cap rates (net of fund fees) to the RILA industry average new money rates and show fairly tight correlation to the risk-free construction, evidencing that carriers largely retain asset portfolio excess risk premia via the spread.

FIGURE 11: STRUCTURED FUND CAP RATES VS. RILA INDUSTRY AVERAGE



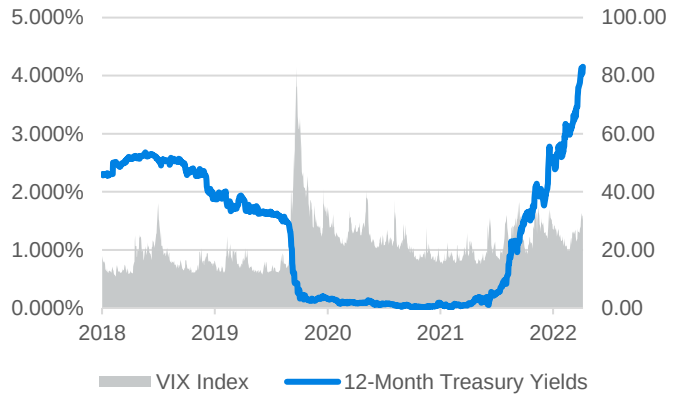
Note: Cap rates were smoothed with a 20-day moving average to reduce noisiness. Structured fund cap rates are net of estimated 0.905% fund expenses (average of Milliman, Goldman Sachs Asset Management, Invesco, and Principal VIT expense ratios).

It is important to note that the above industry average cap rates are all new money rates offered only on new policies sold, unless carriers utilize solely the new money rate cap-setting method on renewal rates. While Figure 11 is a representative depiction of how sales teams and agents may be impacted by cap differences between traditional RILAs and structured funds, because they are principally focused on new contracts, policyholders are likely to be affected differently. Renewal rates are likely to lag new money rates in rising interest rate regimes, such as in 2021 and 2022, as carriers may be more inclined to use the portfolio rate or asymmetric methods given their lower-yielding assets. Renewal rates could be significantly lower than new money rates on new policies—surrender charges and market value adjustments could prevent policyholders from withdrawing money and buying a new policy to take advantage of the higher new money rates.

[3] Wink's AnnuitySpecs analysis tool.

Because structured funds always deliver market-implied cap rates without any filtering by the carrier, we left in the COVID-19 shock to demonstrate the trade-off between delivering the best possible market cap rate and delivering stable, predictable cap rates. While predictable cap rates may be preferable to agents, policyholders may have greater account value growth potential with structured funds rather than traditional RILAs due to the pass-through of excess volatility premium. During volatility events, such as in December 2018 and March 2020, market-implied cap rates were significantly higher than new money cap rates offered by the RILA carriers. As shown in Figure 12, the Cboe Volatility Index (VIX) rapidly increased 10 points and 70 points during the divergent cap periods in 2018 and 2020, respectively.

FIGURE 12: CBOE VOLATILITY INDEX AND 12-MONTH T-BILL YIELDS



Source: Bloomberg

Carriers do not appear to adjust new money cap rates higher in response to rapid volatility spikes, potentially due to the infrequency of modeling hedging costs and the lag time of preparing marketing material such as rate sheets. This dynamic could negatively impact policyholder experience, as high caps are valuable during periods of heightened volatility because these periods tend to coincide with declines in the equity market and thus have the greatest expected future returns.

Carriers do appear to keep pace with the structured funds in adjusting new money cap rates to shifting interest rate regimes, as evidenced by the RILA industry average cap rate moving up in tandem with the two structured funds during the 2022 rate hiking cycle. This makes sense as interest rate trend changes generally take a longer time to play out and can be captured even with the lags associated with RILAs.

To summarize, in the long term both structured fund and traditional RILA new money cap rates are primarily driven by interest rates, while in the short term volatility levels are a key driver of structured fund cap rates.

Differences in hedging costs

Once the companies decide on their option budget, then they need to purchase the hedges that will replicate the crediting strategies. Depending on the hedging program, dynamic or static, this may require additional investment expenses, higher capital requirements for those assets, and setting aside collateral amounts to back up the options purchased. Collateral requirements would necessitate investing those amounts in highly liquid assets of high quality, potentially lowering the overall investment earnings rate. All these items should be taken into account when determining cap rate-setting strategies and target spreads. These additional hedging costs can limit the competitive power of a specific company.

Structured funds on the other hand do not have these types of costs because the option assets are embedded as part of the fund itself along with the costs of those assets.

For purposes of this study, we assumed that the budgets set up by each of the distinct rate-setting methodologies were equal to the cost of the assets needed to hedge the crediting strategies.

In scenarios where interest rates are increasing, the new money rate strategy will increase the budget the most, hence generating higher caps and lowering the target spread the most. The portfolio rate strategy will not change the option budget and therefore will have the lowest caps of all the strategies, but it will retain the same level target spread. Finally, the asymmetric strategy will increase the option budget only a quarter of the way, generating higher caps and lowering the target spread partially.

In scenarios where interest rates are decreasing, the new money rate strategy will decrease the option budget the most, generating the lowest caps and increasing the target spread the company will retain. The portfolio rate strategy will not change the option budget, providing the highest caps out of all the strategies while maintaining the target spread retained by the company. The asymmetric strategy will reduce the option budgets faster than it would increase the budgets. It will provide lower caps and will increase the target spread retained by the company.

For the purpose of this analysis, the three methodologies selected were used in isolation and the target spreads were fixed. That is, we followed the same methodology and kept the same target spread throughout the historical period studied. It is important to note that in actuality companies have the opportunity to change their methodologies and spreads. Rate-setting occurs often and, during periods of uncertainty or great economic changes, companies can adjust their methodologies and spreads to minimize risk, increase or decrease market spread, adjust for past unalignment of experience versus pricing assumptions, and for additional in-force management needs.

FIGURE 13: OPTION BUDGET SUMMARY STATISTICS

	1.5% TARGET SPREAD			2% TARGET SPREAD				
SUMMARY STATISTICS	**NEW MONEY RATE**	**PORTFOLIO RATE**	**ASYMMETRIC METHOD**	**NEW MONEY RATE**	**PORTFOLIO RATE**	**ASYMMETRIC METHOD**	**RISK-FREE STRUCTURED FUND**	**CREDIT STRUCTURED FUND**
Average	1.16%	1.22%	1.00%	0.68%	0.74%	0.52%	0.83%	1.96%
Standard Deviation	0.64%	0.65%	0.48%	0.64%	0.66%	0.48%	0.86%	0.61%
5th Percentile	**0.02%**	**0.12%**	**0.19%**	**-0.47%**	**-0.37%**	**-0.30%**	0.06%	0.82%
Median	**1.22%**	**1.25%**	**1.01%**	**0.73%**	**0.76%**	**0.52%**	0.28%	1.99%
95th Percentile	**2.19%**	**2.24%**	**1.89%**	**1.71%**	**1.76%**	**1.40%**	2.55%	3.10%

Differences in net cap rates

FIGURE 14: NET CAP RATE SUMMARY STATISTICS

	1.5% TARGET SPREAD			2% TARGET SPREAD				
SUMMARY STATISTICS	**NEW MONEY RATE**	**PORTFOLIO RATE**	**ASYMMETRIC METHOD**	**NEW MONEY RATE**	**PORTFOLIO RATE**	**ASYMMETRIC METHOD**	**RISK-FREE STRUCTURED FUND**	**CREDIT STRUCTURED FUND**
Average	16.59%	25.42%	15.80%	12.66%	17.09%	12.41%	11.38%	49.16%
Standard Deviation	14.49%	28.69%	14.66%	7.85%	19.32%	9.74%	3.41%	40.41%
5th Percentile	**8.61%**	**7.69%**	**8.32%**	**7.28%**	**6.36%**	**6.91%**	7.79%	11.51%
Median	**13.40%**	**14.47%**	**12.81%**	**11.18%**	**11.84%**	**10.76%**	10.72%	22.35%
95th Percentile	**28.34%**	**.00.00%**	**28.26%**	**22.56%**	**55.34%**	**23.32%**	18.31%	100.00%

Note: Uncapped data points were replaced with 100% cap rates. This approach has real-world precedents, with many carriers setting an upper limit on cap rates of 100% multiplied by the contract term. Structured fund cap rates are net of 0.905% expected fund fees.

TRADITIONAL RILAS

It is important to note that the different RILA cap-setting methodologies only affect contract renewals, as new policies always receive the new money rate. Thus, there are no implications to marketability and sales efforts between the various methods, only to policyholder experience via account value growth potential.

As expected, RILA products with lower target spreads benefit from the increased option budgets and have higher cap rates at all percentiles. For example, the modeled contracts with 1.5% target spreads had an additional 0.5% of option budget versus the contracts with 2% target spreads, which directly corresponds to higher cap rates.

The new money rate and asymmetric methods resulted in similar cap rates, with the former slightly higher than the latter. The projected differences are not material enough for there to be any significant trade-offs between the two methods in terms of policyholder benefit.

The portfolio rate method resulted in significantly higher average cap rates and moderately higher median cap rates than the new money rate and asymmetric methods. Intuitively, these results make sense because interest rates trended lower during the last 12 years (the back-test window), so the mean cap rates would be higher by locking in the earliest asset earned rates possible and holding them constant for the life of the contract. Carriers exclusively using the portfolio rate method would offer higher cap rates than those using the new money rate or asymmetric methods on the majority of contracts sold, benefiting policyholders via higher expected account value growth.

It is worth exploring the significant differences between the average and median portfolio rate caps (10.95% difference for the 1.5% target spread, 5.25% difference for the 2% target spread). We examine the tails and see a heavily skewed distribution with 5th percentile cap rates only 5% to 7% below the median and 95th percentile cap rates 43% to 86% higher than the median. The asymmetry between the 5th and 95th percentile portfolio rate caps is an interesting result and stems from the elasticity of far OTM option prices. Deep OTM, the volatility surface loses granularity and option prices asymptotically approach zero, meaning each marginal dollar of option budget results in an exponentially higher cap rate. For example, assume the following 1-year S&P 500 option prices:[4]

1. 106% call: $295
2. 107% call: $274
3. 130% call: $27
4. 145% call: $6

For a base cap rate of 106%, an additional $21 of option budget (and thus a $21 lesser shortfall) results in only a 1% higher cap rate, whereas for a base cap rate of 130% an additional $21 of option budget results in a 15% higher cap rate.

Comparing the shapes of the distributions of the three methods, we see that the 5th percentile cap rates were the lowest using the portfolio rate method. Portfolio 5th percentile cap rates were 0.55% to 0.92% lower than new money or asymmetric cap rates. Examining why, we find this is the result of the hypothetical contracts sold in the second half of 2012 through the first quarter of 2013 during an ultra-low interest rate environment. Contracts sold during this period benefited using the new money rate and asymmetric methods on subsequent renewals, as interest rates normalized. Inversely, the portfolio rate methodology significantly outperformed in the right tail, with the 95th percentile cap rates 32% to 72% higher than the other methodologies, as a result of locking in the high level budgets of 2010 until contract renewal in 2016. Carriers likely would have adjusted cap rates higher in the left tail to remain competitive and lower in the right tail to improve spread revenue by switching from the portfolio rate method to one of the other cap-setting methods.

STRUCTURED FUNDS

The risk-free structured fund delivers similar, but slightly lower, median net cap rates to RILAs under the new money and asymmetric cap-setting methodologies with 2% target spread. Compared to RILAs under the portfolio rate cap-setting method with 2% target spread and any of the methods with 1.5% target spread, the risk-free structured fund under-delivers. The standard deviation is significantly lower, however, resulting in skinnier tails with more consistent cap rates. While this seems unintuitive given prior commentary that insurers tend to smooth out new money cap rates and the other methods have additional modulating effects, our analysis assumed fixed target spreads, which, given the greater variance of asset portfolio yields over risk-free rates during the back-test window, resulted in a greater range of caps. In reality, insurers would likely make some adjustments in target spread to cushion rapid changes in cap rates.

The fixed income structured fund, which holds a similar asset mix to an insurance general account asset portfolio, delivers superior cap rates to any of the RILA cap-setting methods with 1.5% or 2% target spreads. The average fixed income structured fund cap rate is over 23% higher than the next-best configuration (portfolio method with 1.5% target spread) due to the high number of uncapped data points, where we used a rules-based approach and set the cap rates to 100%. Thirty-eight percent of our contract issuance or renewal dates showed uncapped upside for the fixed income structured fund, skewing the average cap rate higher.

A product is considered uncapped if the cost of the ATM call is fully covered by the asset portfolio investment income and the short put premium. Because forward prices are lower than spot prices when dividend yields are higher than risk-free rates due to positive cost of carry, and because risk-free rates were low for the majority of our back-test window, call options were generally “cheap” and put options were generally “rich” as an ATM spot corresponded to an OTM call and ITM put.

Forward Price = Spot Price - Cost of Carry

This dynamic helps reduce the budget shortfall, because the policyholder sells a more expensive put to generate budget and buys a cheaper call to acquire the upside exposure. For the risk-free structured fund, the lower forward price dynamic is

[4] From Bloomberg, as of December 3, 2022.

overshadowed by the direct 1:1 impact by low rates on asset yield reduction. However, the fixed income structured fund retains a positive spread to the risk-free rate via credit and duration risk premia. The excess risk premia resulted in adequate asset yield for a large number of periods with uncapped upside.

In exchange for these higher cap rates, the structured fund shareholder must absorb any mark-to-market impact from the fixed income asset portfolio, whereas a RILA policyholder is shielded from these impacts. We will explore potential drag from the asset portfolio in the next section, Differences in Account Value Growth.

We provide histograms in Figures 15 to 19 of the historical model RILA and structured fund cap rates to help visualize the distribution of caps by methodology.

FIGURE 15: NEW MONEY RATE CAP DISTRIBUTION

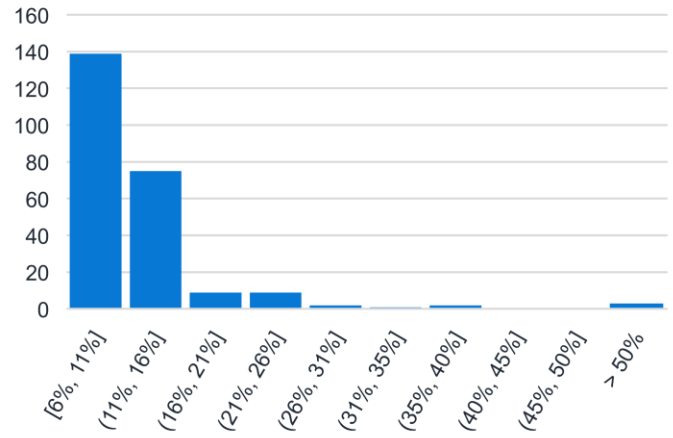


FIGURE 16: ASYMMETRIC METHOD CAP DISTRIBUTION

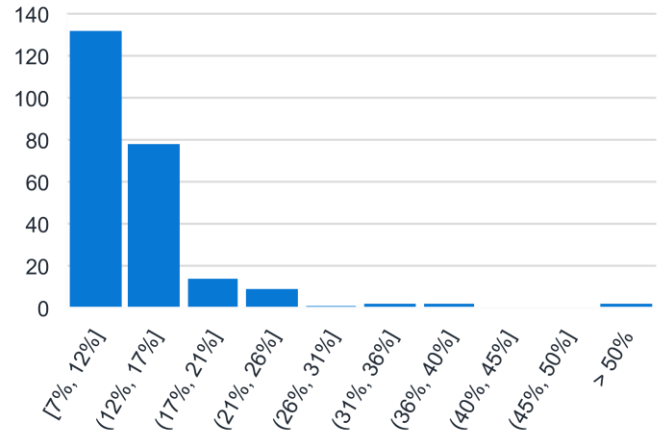


FIGURE 17: PORTFOLIO RATE CAP DISTRIBUTION

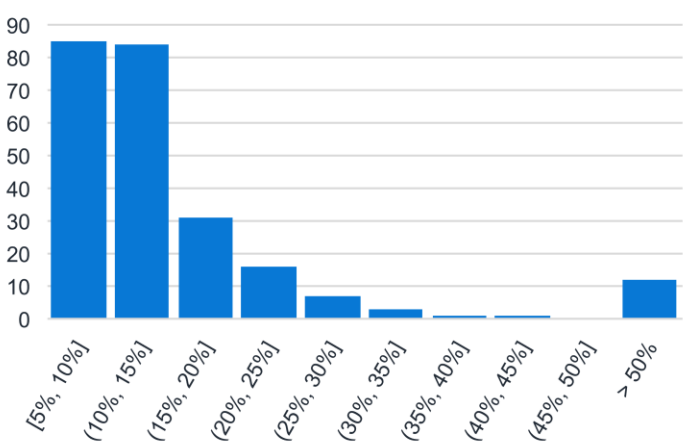


FIGURE 18: RISK-FREE STRUCTURED FUND CAP DISTRIBUTION

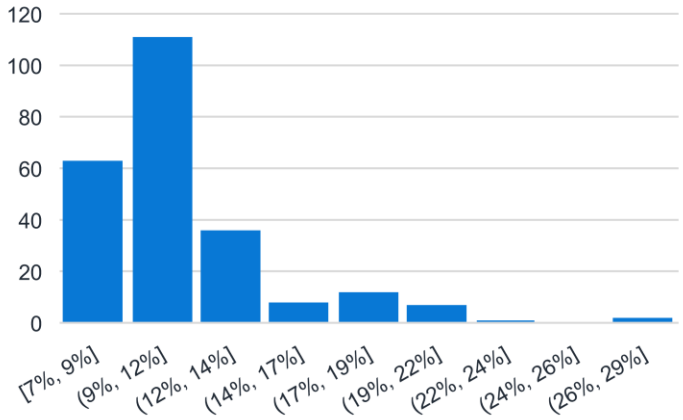
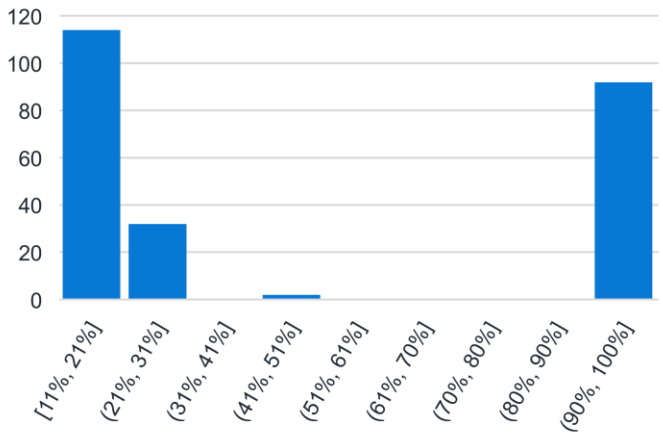


FIGURE 19: FIXED INCOME STRUCTURED FUND CAP DISTRIBUTION



Differences in account value growth

One of the key factors in determining positive policyholder experience is account value (AV) growth potential. Because RILAs and IOVAs are principally investment products, higher maximum returns are beneficial. Although current RILA products and VA products offering structured fund subaccount options generally do not offer strong guarantees, the market is shifting toward the inclusion of death benefit (DB) and return of premium (ROP) riders and the enhanced AV growth potential could be valuable to help fund these policies.

Trivially, cap-setting methods resulting in higher average net cap rates have the greatest AV growth potential, as by definition the maximum return is greater. As shown in our analysis above, traditional RILAs using the portfolio rate method and fixed income structured funds would provide the greatest AV growth potential. However, cap rates above a certain threshold do not provide real-world benefit due to the infrequency of extreme positive S&P 500 annual returns. For example, according to Bloomberg data, there are only nine instances of S&P 500 annual returns greater than 30% and three instances of annual returns greater than 40% since the index's inception in 1927, with a maximum historical return of 44% in 1933. Additionally, VA policyholders invested in structured funds with risky fixed income assets are exposed to the market movement of those assets, which may result in negative performance drag over time.

We tracked the performance of 27 model RILA contracts issued between March 31, 2010, and September 30, 2016, as the remaining contracts have not yet matured and are still within the 6-year surrender period. We back-tested the performance with three sets of cap rates: the new money rate method, the asymmetric method, and the portfolio rate method. We also back-tested the performance of 27 VA-based structured funds using the risk-free rate and a fixed income asset portfolio to generate the option budget, corresponding to the 27 equivalent RILA issuances and surrender periods.

As mentioned previously, policyholders invested in credit-exposed structured funds own the underlying fixed income assets backing the option budget and thus are affected by the fixed income portfolio performance. We calculated the 6-year total returns of the fixed income asset portfolios for the 27 in-scope policies, deducted the projected investment income used to buy the options packages, and found an average net cumulative return of 1.9% and average net annualized return of 0.29%. As expected, due to the downward drift in interest rates over the majority of the back-test window and stable credit spreads, the duration factor generated positive tracking error to the equity return.

Therefore, structured funds with fixed income outperformed risk-free structured funds not just due to higher cap rates, but also additive performance from the fixed income asset portfolio.

Due to the large number of model policies, we compute the median, 5th percentile, and 95th percentile historical returns from year 0 to year 6 using a 1.5% target spread assumption and display them in Figures 20 to 24.

FIGURE 20: RISK-FREE STRUCTURED FUND AV GROWTH

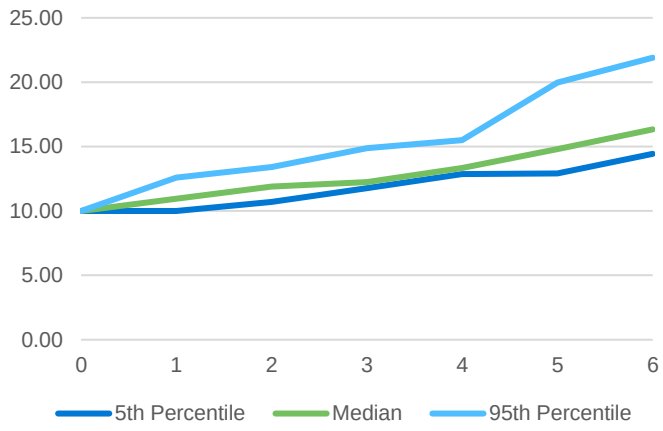


FIGURE 21: FIXED INCOME STRUCTURED FUND AV GROWTH

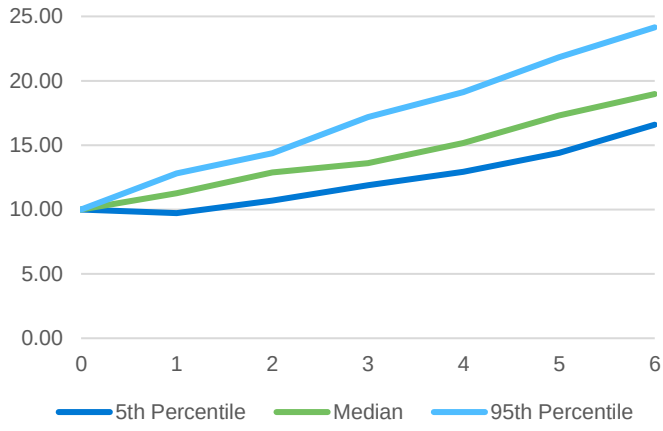


FIGURE 22: RILA (NEW MONEY RATE) AV GROWTH

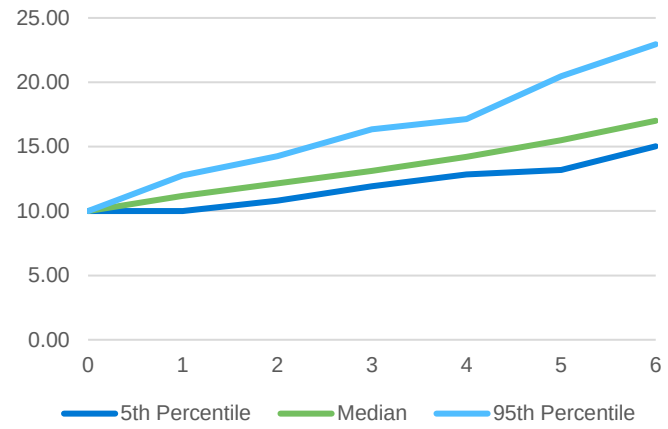


FIGURE 23: RILA (ASYMMETRIC) AV GROWTH

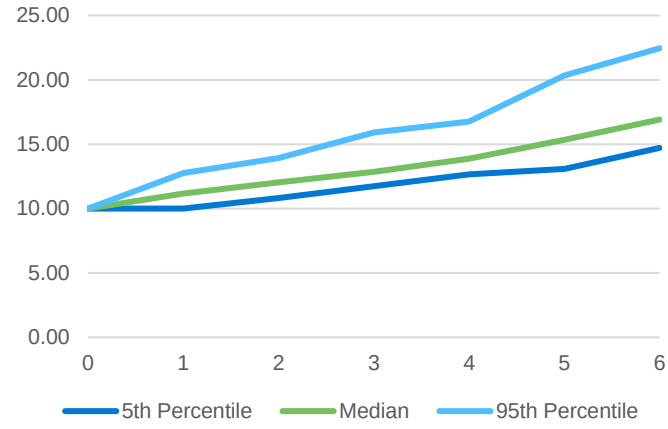
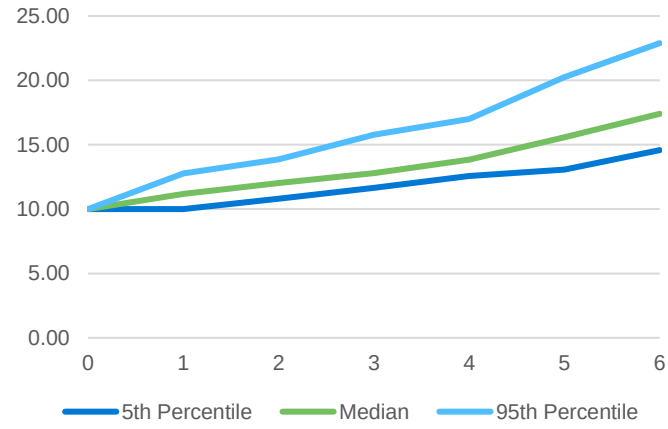
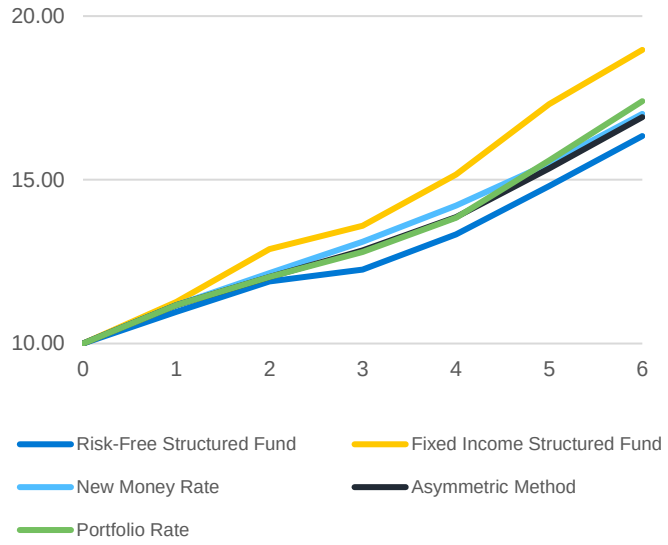


FIGURE 24: RILA (PORTFOLIO RATE) AV GROWTH



Historically, we note minimal actual AV growth differentials between the three RILA cap-setting methods, with the slight advantage going to the portfolio rate method with a median 6-year total return of 74% versus 70.1% for the new money rate method and 69.10% for the asymmetric method. For the structured funds, we see significant outperformance from the fixed income structured fund with a median 6-year total return of 89.7% versus 63.4% for the risk-free fund. We graph the medians of all the back-tested AVs in Figure 25 for comparison purposes.

FIGURE 25: COMPARING THE MEDIANS OF ALL METHODS



Differences in cost of capital

CAPITAL CHARGES

Both RILAs and VAs, as with any insurance product, are subject to the NAIC's authorized company level (ACL) as per the NAIC's risk-based capital (RBC) requirements. The actual capital that companies hold tends to be between 350% and 450% of the company action level (CAL) to maintain the desired level of credit rating from rating agencies.

One of the main drivers of the capital levels is the NAIC RBC's C1 requirement, which determines the capital requirement needed to protect the insurer from the risk of assets' default of principal and interest or fluctuation in fair value.

As explained above, in traditional RILAs insurers invest policyholder premium in fixed income assets to generate investment income revenue. They may also purchase option assets to hedge against the index-based interest credited to the policyholder account value. All these invested assets generate a C1 capital requirement.

However, if an insurer uses a structured fund, the structured fund is the policyholder's asset, and it is not the insurer's invested asset. Hence structured funds when embedded in a VA do not generate a C1 capital requirement, which reduces the cost of capital to the insurer.

Our hypothetical asset portfolio funding the RILA product incurs a C1 charge of 0.93%, which is in line with real-world conservative to moderate asset allocation models. This is calculated based on NAIC-prescribed C1 charges, which vary by credit quality and asset types. As explained previously, many insurance companies maintain 350% to 450% RBC ratios for credit rating purposes. Therefore, using an assumed RBC covariance impact of 80%, we can hypothesize that every dollar of premium paid by the policyholder results in a capital increase of 2.6% to 3.4% (C1 charge of 0.93% x covariance impact of 80% x capital ratio of 350% to 450%).[5] The covariance impact could be higher or lower depending on the mix of liability business as well as asset portfolio composition of equity-like assets and fixed income investments. VAs, which are separate account products, are not subject to C1 charges and as such have no implications to balance sheet. Carriers would likely deploy the retained C1 charge for use with another product.

SYNERGIES BETWEEN RILAS AND VAS WITH GUARANTEES

RILAs and VAs are both subject to principle-based reserving (PBR) and capital requirements (VM-21 and C3 Phase II). On a standalone basis, RILAs would require insurers to hold additional C3 capital and reserves. When combined with VAs with guarantees for purposes of calculating reserves and capital, it may reduce the overall requirements of reserves and capital. The reason for this is the natural offset that exists between these two products.

When equities fall beyond the buffer protection of the RILAs, the account value, and hence the policyholder benefits, will be reduced. VAs with underlying guarantees will have an opposite effect. The VA account value will still be decreased with the reduction in equities, but the cost of underlying guarantees offered by the insurers to policyholders will increase, thereby enhancing the benefits policyholders receive compared to their reduced account values. Similarly, when equities increase, RILA account values will increase, and policyholder benefits will be enhanced. For VAs with guarantees, the account value will also increase, but the cost of the underlying guarantees in the product will decrease as the account value will cover more of the policyholder benefits. Therefore, a natural hedge is generated if the two products are combined. Even when RILAs and VAs with guarantees are hedged independently, there are advantages to the insurers to have these two products on their balance sheets. When the reserves and capital for both products are calculated on a combined basis, the fees from the RILAs can help offset the cost of the underlying guarantees for the VA products.

Conclusion

Although in practice carriers dynamically switch between RILA cap-setting methods to respond to shifting economic conditions and evolving business objectives, we examined the long-term impacts of holding the cap-setting methods fixed over time. Additionally, given the emergence of new RILA look-alike fund options in VAs and the significance to RILA/VA dual writers, we identified and explained the salient trade-offs.

In rising interest rate environments, the new money strategy requires the largest hedge budget whereas the portfolio strategy hedge cost remains unchanged and the asymmetric strategy hedge cost increases only 25% of the change in the new money hedge budget. In falling interest rate environments, the new money strategy requires the smallest hedge budget whereas the portfolio strategy hedge cost remains unchanged and the asymmetric strategy hedge cost decreases only 25% of the change in the new money hedge budget. Structured funds do not require any hedging because the assets are embedded into the fund vehicle.

RILAs utilizing the new money rate and asymmetric methods for cap-setting offer similar net cap rates and account value growth potential, whereas those utilizing the portfolio rate method resulted in higher average net cap rates and thus greater account value growth potential than the new money rate and asymmetric methods. Fixed income structured funds offered the highest median net cap rates out of any of the methods and risk-free structured funds offered the lowest.

Historical AV growth modeled using real-world data shows minimal realized differences between the three RILA cap-setting methods. The fixed income structured fund resulted in the highest historical AV growth compared to any of the model RILA

[5] For illustration purposes, we have assumed all policyholder premium deposit is invested in fixed income assets. In reality, assets usually equal the statutory reserve amount. Statutory reserves for RILA products tend to be around the cash surrender value.

policies or the risk-free structured fund. Although higher net cap rates always result in higher AV growth *potential*, in reality cap rates higher than a certain point deliver decreasing marginal utility due to the infrequency of right tail events.

Traditional RILAs that rely on the spread income generated by investing policyholder premium deposits into fixed income assets can cause significant increases in an insurer's capital levels by generating asset-based charges. However, structured funds are self-contained unitized separate account assets and hence do not produce asset-based capital requirements. Our illustrative models indicate that 2.6% to 3.4% of policyholder premium is required to set up additional capital in traditional RILAs compared to structured fund-based VAs.

On the other hand, the synergies between VAs with guarantees and RILAs can help reduce PBR reserves and C3 capital charges for insurers that offer both products. This reason makes it attractive for companies that have VAs with guarantees to offer RILAs as well.

DISCLOSURE

The information, products, or services described or referenced herein are intended to be for informational and educational purposes only. This material is not intended to be a recommendation, offer, solicitation or advertisement to buy or sell any securities, securities related product or service, or investment strategy, nor is it intended to be to be relied upon as a forecast, research or investment advice.

The products or services described or referenced herein may not be suitable or appropriate for the recipient. Many of the products and services described or referenced herein involve significant risks, and the recipient should not make any decision or enter into any transaction unless the recipient has fully understood all such risks and has independently determined that such decisions or transactions are appropriate for the recipient. Investment involves risks. Any discussion of risks contained herein with respect to any product or service should not be considered to

be a disclosure of all risks or a complete discussion of the risks involved.

The recipient should not construe any of the material contained herein as investment, hedging, trading, legal, regulatory, tax, accounting or other advice. The recipient should not act on any information in this document without consulting its investment, hedging, trading, legal, regulatory, tax, accounting and other advisors. Information herein has been obtained from sources we believe to be reliable but neither Milliman Financial Risk Management LLC ("Milliman FRM") nor its parents, subsidiaries or affiliates warrant its completeness or accuracy. No responsibility can be accepted for errors of facts obtained from third parties.

Certain results shown are historical, for informational purposes only, not reflective of any investment, and do not guarantee future results.

CERTAIN RESULTS BASED ON SIMULATED OR HYPOTHETICAL PERFORMANCE RESULTS HAVE CERTAIN INHERENT LIMITATIONS. UNLIKE THE RESULTS SHOWN IN AN ACTUAL PERFORMANCE RECORD, THESE RESULTS DO NOT REPRESENT ACTUAL TRADING. ALSO, BECAUSE THESE TRADES HAVE NOT ACTUALLY BEEN EXECUTED, THESE RESULTS MAY HAVE UNDER-OR OVER-COMPENSATED FOR THE IMPACT, IF ANY, OF CERTAIN MARKET FACTORS, SUCH AS LACK OF LIQUIDITY. SIMULATED OR HYPOTHETICAL TRADING PROGRAMS IN GENERAL ARE ALSO SUBJECT TO THE FACT THAT THEY ARE DESIGNED WITH THE BENEFIT OF HINDSIGHT. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THESE BEING SHOWN.

Milliman

Milliman is among the world's largest providers of actuarial, risk management, and technology solutions. Our consulting and advanced analytics capabilities encompass healthcare, property & casualty insurance, life insurance and financial services, and employee benefits. Founded in 1947, Milliman is an independent firm with offices in major cities around the globe.

milliman.com

CONTACT

Fiona Ng
fiona.ng@milliman.com

Jordan Rosenfeld
jordan.rosenfeld@milliman.com

Ricardo Trachtman
ricardo.trachtman@milliman.com

Karthik Yadatore
karthik.yadatore@milliman.com