

MILLIMAN RESEARCH REPORT

Principle-based reserving impact on fixed indexed annuity pricing

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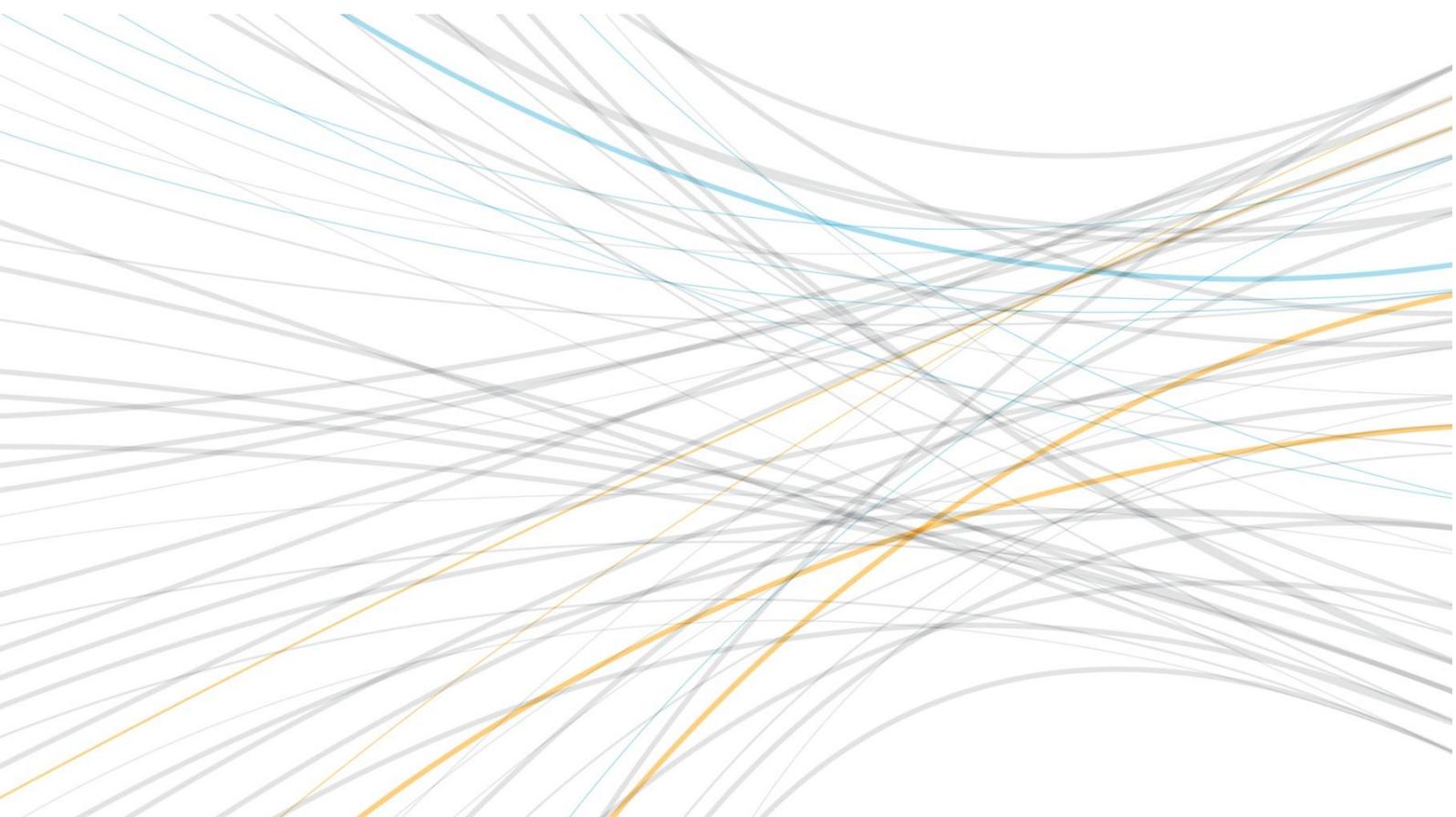


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Executive summary

Current statutory reserves for fixed and fixed-index deferred annuities and fixed immediate annuities are formula-based with prescribed mortality and interest rates and no allowance for company's own lapse or other policyholder behavior assumptions. Instead, the current framework requires optimal utilization of benefits. In reality, not every policy owner will utilize elective benefits in an optimal manner. These current statutory requirements may result in onerous reserves, especially for deferred annuities with living and death benefit guarantees.

With the advent of principle-based reserving (PBR) regulation for life insurance products (VM-20) and variable annuities (VM-21), many industry practitioners and actuaries expect that a PBR framework for non-variable annuities will be approved by the regulators with a (current) target effective date of January 1, 2023.

In this report, we have performed a profitability study to analyze the impact of the American Academy of Actuaries' (AAA) Proposed PBR Framework for non-variable annuities on the pricing of a typical fixed indexed annuity (FIA) with a guaranteed lifetime withdrawal benefit (GLWB) rider. The AAA's Proposed PBR Framework largely leverages the existing requirements prescribed in VM-20 and VM-21.

We measured the impact of the AAA's Proposed PBR Framework using various pricing metrics for an industry-typical FIA product with a 10-year, 6% annually compounding GLWB benefit with a maximum withdrawal allowable amount (MAWA) that ranges from 4.5% to 6%. We have also compared the statutory reserve patterns over the lifetime of the policy under both the current statutory framework and the Proposed PBR Framework.

Some of the key insights we gained from this profitability study include:

- The PBR reserves are significantly lower than the reserves under the current requirements in the deferral periods. As policies start to utilize their GLWB and deplete their account values, reserves under the two regimes start converging. The lower initial reserves under the Proposed PBR Framework compared to the reserves under the current requirements result in a front loading of profits, thus significantly increasing the internal rate of return (IRR).
- The liability assumptions such as mortality, lapses, partial withdrawal, and GLWB utilization under the Proposed PBR Framework are the company's best estimate assumption plus a margin for adverse deviation. As such, reserves under the Proposed PBR Framework are much more sensitive to changes or deviations from best estimate assumptions. In contrast, reserves under the current requirements are calculated using prescribed statutory assumptions, and do not reflect the company's experience for either mortality or policyholder behavior.
- Based on our sensitivity analysis:
 - Under the Proposed PBR Framework, the magnitude of the increase in profitability due to a reduction in richness of the GLWB benefit is much more than the magnitude of decrease in profitability due to an increase in richness of the GLWB benefit.
 - An increase in the propensity of policyholders not utilizing the GLWB will result in a significant increase to profitability under the Proposed PBR Framework. In contrast, since the current reserving framework does not allow for inclusion of a GLWB utilization assumption, we do not see much improvement in profitability under the current reserving framework.
 - Shocking the initial yield curve by 100 basis points in either direction causes a significant change to the profitability under both the Proposed PBR Framework and current reserving framework. However, we note that the impacts under the Proposed PBR Framework are much more pronounced.
- There are arguably more complexities and modeling effort involved in pricing and analysis under the Proposed PBR Framework due to the stochastic nature of PBR. Companies will need to consider the technical complexities in setting up their models, the subsequent increase to model runtime, and the higher level of scrutiny to assumptions and documentation. These are indirect and intangible costs not reflected in the pricing metrics that we have calculated in our analysis.

Lastly, it is important to note that the Proposed PBR Framework as outlined by the Annuity Reserve Working Group (ARWG) is still a working draft. Accordingly, the reader should be mindful that certain provisions may change between now and actual implementation.

Introduction

In this report we seek to analyze, understand and discuss the impact of the upcoming Principle-Based Reserving (PBR) on non-variable deferred annuities. Specifically, this report focuses on the potential impact that PBR may have on the pricing of fixed indexed annuities (FIAs) with guaranteed living withdrawal benefit (GLWB) riders. Given the (current) target effective date of January 1, 2023, the PBR guideline requirements for non-variable deferred annuities are still very much in the drafting stage as of the time of writing this report. Accordingly, while our analysis should be considered preliminary, we still believe it may be helpful in understanding the range of potential outcomes that might be realized once PBR becomes effective.

FIAs with GLWB riders have been available in the U.S. marketplace for a number of years. Since the global financial crisis of 2007 to 2009, FIAs have seen a healthy increase in popularity that can be attributed to the product design offering both downside protection from bear markets and upside participation in bull markets. Moreover, the presence of a GLWB rider also provides the policyholder with guaranteed income over their lifetime.

The current statutory reserving and capital framework for FIAs is generally viewed by many industry practitioners and actuaries to be overly onerous particularly in the deferral period, thereby restricting companies from pursuing more innovative product designs that completely meet the policyholder's investment and income needs. The proposed PBR framework for non-variable annuities (VA), including FIAs with GLWB riders, strives to ensure that reserving requirements will be aligned with the product risk profile and the company's exposure to prevailing market conditions. We anticipate that the new framework will have a significant impact on the development, design, and future sales of FIAs.

In this report, we have quantified the impact of the proposed PBR framework on the pricing of an industry-typical FIA with GLWB rider. In particular, we have compared the profitability and the reserve pattern for various scenarios, under both the proposed PBR and current reserving requirements.

BACKGROUND ON PBR

The life insurance and annuity industry and the actuarial community in the U.S. periodically propose changes to existing statutory valuation framework in light of emerging or new products, market needs and advancing technology. These changes are proposed via the AAA's Life Valuation Committee. The AAA's Life Valuation Committee or its sub-committees put forth their proposals to the National Association of Insurance Commissioner's (NAIC) Life Actuarial Task Force (LATF), which votes to approve (or reject) the changes. These changes may be relatively minor or may be more substantial in nature. Once approved by the LATF and adopted by the NAIC, the new regulation will be final. Typically, the regulators for a few states may impose additional requirements or require the use of a modified version of the NAIC's newly adopted regulation.

Traditionally, statutory reserving for various life insurance and annuity products used formulaic approaches with the use of prescriptive valuation mortality and interest rates and no allowance for company's own policyholder lapse and utilization behavior assumptions. These approaches produce a minimum reserve requirement that covers a wide range of economic and non-economic scenarios, but that is generally viewed as overly conservative by many practitioners. To avoid the strain of these overly conservative reserves, some writers have engaged in surplus relief arrangements with external parties to fund the difference between the statutory reserve and the corresponding economic reserve (with the latter developed using company best estimate assumptions). However, as more and more innovative products were introduced over the years, the complexity of product designs and the changing risk profiles meant that further modification to the existing reserving structure was becoming impractical and that an overhaul to the framework was needed.

After the global financial crisis, the industry and the actuarial community started working on outlining a new holistic statutory reserving framework that would better recognize and reflect the material risks in all types of products. In 2009, the NAIC adopted a revised Standard Valuation Law that authorized a new Statutory Valuation Manual that details methodology for determining appropriate principle-based reserves for life insurance and annuity products. The PBR framework for life insurance products was eventually finalized under VM-20 (the relevant section in the Statutory Valuation Manual) with an effective date of January 1, 2017, to be mandatory for new business sold in 2020 and later.

For variable annuities, the introduction of C-3 Phase II in 2005 for determining capital requirements and Actuarial Guideline XLIII in 2009 for statutory reserves represented a shift to a principle-based approach. In 2015, the NAIC commissioned an initiative to identify potential reforms to the then-current VA statutory framework that aimed to encourage stronger risk management, discourage the use of captive reinsurance, promote comparability across companies, and minimize complexity of implementation. After two rounds of industry-level quantitative impact studies, the NAIC published a draft of redline updates to the then existing Actuarial Guideline XLIII for industry exposure and feedback. Soon after, these updates formed the basis for VM-21, "Requirements for Principle-Based Reserves for Variable Annuities" in the Statutory Valuation Manual. The requirements of VM-21 became effective for all VA business (both existing and new business) on January 1, 2020.

The ARWG is a sub-committee of the AAA's Life Valuation Committee. Over the years, the ARWG explored various statutory reserving approaches for FIAs with GLWB (along with other non-VA annuity products) with the goal of aligning the reserves with the products' risk profiles. In recent years, the ARWG developed and presented to LATF a proposed PBR framework for non-VAs that borrows and leverages the existing and approved VM-20 and VM-21 methodologies. Many industry practitioners and actuaries expect that the LATF will approve this PBR-based approach and that the NAIC will adopt a PBR framework for non-VAs.

PBR framework for non-variable annuities

CURRENT STATUTORY RESERVING METHOD

The existing statutory framework for FIAs under the Standard Valuation Law (SVL) follows Actuarial Guidelines XXXIII (AG 33) and XXXV (AG 35). Both of these Actuarial Guidelines are based on a formulaic or rules-based approach that follows the Commissioners' Annuity Reserving Valuation Method (CARVM).

Under AG 33, guaranteed policyholder benefits and contract charges are projected deterministically using prescribed mortality rates under a number of (and theoretically all) possible elective policyholder behavior scenarios. The present value (PV) of guaranteed elective and non-elective policyholder benefits under each elective policyholder behavior scenario is then calculated using appropriate regulatory valuation interest rates. The greatest PV of the total integrated benefits across all possible elective policyholder behavior scenarios is then held as the final CARVM reserve.

In addition, AG 35 applies to annuities that provide policyholders interest credited into their account value that is determined based on an external equity index growth (such as in the case of FIAs). AG 35 provides guidance on computational methods that are deemed consistent with CARVM for the purposes of crediting interest to the equity-based index accounts, while taking into account the current market value of options that are backing the interest crediting strategies.

Many view the optimal elective policyholder behavior scenario under AG 33 as extremely unlikely and therefore consider the resulting statutory reserve as overly conservative while the policyholder has not elected their benefits. Due to the prescriptive nature of AG 33, companies are not able to reflect the probability of policyholder behavior actions associated with lapse and utilization of the GLWB rider in the reserve calculation. These restrictions contribute to the conservatism of the CARVM reserves.

PROPOSED PBR FRAMEWORK

As mentioned in the prior section, the ARWG has presented to LATF an initial PBR framework for non-VAs (referred to herein as the "Proposed PBR Framework"). Given the similarity to VA products with guaranteed benefit riders, the ARWG's Proposed PBR Framework for non-VAs significantly draws upon the existing VM-20 and VM-21 regulations. In the following sub-sections, we have outlined the currently proposed PBR provisions for non-VAs with a comparison against VM-20 and VM-21 regulations as appropriate. Note that this is not intended to be an exhaustive or binding comparison given that the PBR framework for non-VAs is still very much evolving.

INTENDED SCOPE

The ARWG recommends that the Proposed PBR Framework apply to both deferred annuity and payout fixed or fixed indexed annuity policies, irrespective of whether these policies are written on a direct or assumed basis. As of the date of this report, the Proposed PBR Framework is not applicable to guaranteed investment contracts, funding agreements, or stable value contracts. The ARWG is undecided on whether to recommend using PBR for non-VAs for structured annuities instead of VM-21.

The VM-20 framework has an operative date of January 1, 2017, and is mandatory for new business policies issued after January 1, 2020, while the VM-21 framework applies retrospectively to both in-force policies and new business issues. As of the date of this report, the ARWG has not decided whether the Proposed PBR Framework will be applied retrospectively.

POTENTIAL EFFECTIVE DATE

The Proposed PBR Framework is still in early draft form and the ARWG has set an initial target effective date of January 1, 2023. Similar to VM-20, the Proposed PBR Framework suggests a three-year optional implementation period for new business policies sold after the effective date.

In the period leading up to the target implementation date, the ARWG has proposed industry-level field testing (similar to the quantitative impact studies performed for VM-21) to be carried out in 2021 followed by the finalization of the framework in 2022. This may be subject to change, particularly in light of the COVID-19 pandemic.

KEY COMPONENTS OF PROPOSED PBR FRAMEWORK

In this sub-section we have outlined the key provisions of the Proposed PBR Framework and how they align with the existing VM-20 and VM-21 frameworks. Given that the Proposed PBR Framework as outlined by ARWG is still a working draft, the reader should be mindful that certain provisions may change between now and actual implementation. In addition, note that this sub-section is not intended to be an exhaustive summary but rather a high-level overview that highlights the key components of the Proposed PBR Framework.

EXCLUSION TESTS

Under the Proposed PBR Framework, it is likely that there will be a form of exclusion test similar to the stochastic exclusion test that is currently in the VM-20 framework.¹ Products that do not have material market or policyholder optionality risks are likely to pass the exclusion test, allowing companies the option to continue using current CARVM reserve methods.

Fixed annuity policies that contain guarantees similar in nature to guaranteed minimum death benefits (GMDB) or GLWBs will likely fail the exclusion test and therefore fall under the purview of the Proposed PBR Framework.

STOCHASTIC RESERVE METHODOLOGY

Similar to VM-21, the Proposed PBR Framework will rely on the Conditional Tail Expectation at the 70th percentile (CTE 70) stochastic reserve calculation. In particular:

- Scenario reserves will be calculated as starting assets plus the greatest PV of accumulated asset deficiencies, with a cash surrender value floor. The term accumulated asset deficiencies is defined in VM-01: Definitions for Terms in Requirements in the Standard Valuation Manual, and refers to an amount measured as of the end of a projection year, equaling the negative of the projected statement value of general account and separate account assets. Furthermore, it is noted that accumulated asset deficiencies may be positive (a cumulative asset shortfall) or negative (a cumulative asset surplus). Starting assets are set to equal the approximate value of statutory reserves as of the valuation date, plus the amount of interest maintenance reserve allocated to the supporting general account assets (if any) on a pre-tax basis.
- All base policy and rider cash flows, asset, hedging, and reinsurance cash flows, will be reflected and projected on a pre-tax basis using company prudent estimate assumptions.

ECONOMIC SCENARIOS

Under VM-21, the stochastic set of scenarios are generated using the American Academy of Actuaries' Interest Rate Generator (AIRG) with parameters that are consistent with prescribed regulatory requirements. It is likely that the Proposed PBR Framework will follow the same approach with calibrations as appropriate for non-VA policies.

Note that the Academy may make significant changes to its AIRG due to the known deficiencies that exist in the current version of the generator. These changes may include (but may not necessarily be limited to) allowing for the modeling of negative interest rates, the behavior in low interest rate environments, introducing correlation between equity growth rates and interest rates and (for FIAs) the ability to deduct a specified dividend rate in order to derive price returns rather than total returns.

AGGREGATION BENEFIT

Under VM-20, aggregation of policies is allowed within similar product types while VM-21 allows aggregation across all policies under the purview of VM-21. While the Proposed PBR Framework will allow aggregation across non-VA policies, the ARWG is undecided on the criteria for grouping policies together. Broadly, the principle underpinning aggregation is that it should be consistent with an insurance entities' risk management policy across the policies intended for aggregation. For example, it might be logical for companies to group policies that are part of the same hedging or risk management program. The same level of aggregation applies to both the stochastic projection and the exclusion test. Consistent with other statutory valuation and testing exercises, aggregation is to be limited to policies within a legal entity – that is, aggregation across policies from different legal entities is not allowed.

¹ The stochastic exclusion test for VM-20 is described in Section 6 of VM-20: Requirements for Principles-Based Reserves for Life Products in the Standard Valuation Manual

NET ASSET EARNED RATES AND DISCOUNTING

The VM-21 regulation defines a portfolio of Additional Invested Assets (AIA) that comprises general account assets and/or cash available to the company that is currently not already backing the block of liabilities in question. The starting amount of this portfolio is to be solved such that the book value of the projected portfolio of assets equals or exceeds any accumulated deficiencies that may arise in all future projection periods. The projection of the AIA portfolio is meant to be carried out independently of the liabilities. The net asset earned rates (NAERs) produced by projecting this AIA portfolio (which are reinvested according to the company's stated reinvestment strategy) are then used as the discount rates for the scenario reserve calculation.

Alternatively, VM-21 prescribes a direct iteration method where the starting asset amount for each scenario is directly (and iteratively) solved for such that no projected deficiencies arise when projected together with all base policy and rider liability cash flows.

Based on ARWG's Proposed PBR Framework, the calculation of scenario reserves for non-variable annuities will follow a very similar methodology as VM-21.

GENERAL ACCOUNT ASSET MODELING

Both VM-20 and VM-21 follow the same general account asset modeling framework, which specifies prescribed default cost and reinvestment spread calculations for fixed income assets. There is also a prescribed reinvestment strategy (or "guardrail") comprising 50% credit quality "A" and 50% credit quality "AA" fixed income assets. Companies need to calculate the stochastic reserve under their own company reinvestment strategy as well as the guardrail strategy, and use the larger of the two quantities as the binding requirement.

In comparison to products that fall under VM-20 and VM-21 frameworks, fixed annuity policies are largely driven by general account asset performance. As such, there is a greater scrutiny on the modeling of general account assets for fixed annuity policies. Under the Proposed PBR Framework, the general account asset modeling will follow the same existing methodology as VM-20 and VM-21. However, the ARWG has proposed a different reinvestment strategy "guardrail" that comprises of 5% Treasury, 15% credit quality "AA", 40% credit quality "A", and 40% credit quality "BBB" fixed income assets. Since the Proposed PBR Framework is evolving, our profitability study neither considers nor reflects ARWG's proposed reinvestment strategy "guardrail."

ADDITIONAL STANDARD PROJECTION AMOUNT

Under the VM-21 framework, companies are required to calculate an Additional Standard Projection Amount² that could potentially be an add-on to the Company stochastic reserve. The calculation is similar to the stochastic projection with the exception that prescribed assumptions need to be used instead of Company's prudent estimate assumptions. The Additional Standard Projection Amount acts as a binding constraint to the Company stochastic reserve under VM-21, where it is meant to come into play if the Company prudent estimate assumptions are in some sense outliers as compared to the prescribed assumptions.

The ARWG has not opined on whether there will be an Additional Standard Projection Amount under the Proposed PBR Framework, and if so, whether it will be a binding constraint or a disclosure-only item. As such, the profitability study in this report does not consider the potential Additional Standard Projection Amount.

HEDGE REQUIREMENTS

Under VM-21, the costs and benefits of hedge assets currently held by the company (often referred to as static hedges) must be reflected in the calculation of stochastic reserves. If a company follows a Clearly Defined Hedging Strategy (CDHS), the company would also have to project the future costs and benefits of hedge assets (often referred to as dynamic hedges) using either the Explicit Method or Implicit Method.³ In addition, for companies that model a CDHS, the VM-21 framework requires companies to apply an Error Factor for purposes of accounting for any overstatement of the impact from the CDHS.

² Details on the Additional Standard Projection Amount for VM-21 can be found in Section 6 of VM-21: Requirements for Principles-Based Reserves for Variable Annuities in the Standard Valuation Manual.

³ Details on CDHS modeling methods can be found in Section 9 of VM-21: Requirements for Principle-Based Reserves for Variable Annuities.

The Proposed PBR Framework suggests that the reflection (or modeling) of hedge assets (whether defined as a CDHS or not) that are in support of riders with guarantees will follow that of the requirements under VM-21. The ARWG also suggests the modeling of an additional hedge-breakage expense for hedges backing indexed-related interest credits to reflect any potential basis risk and hedge transaction timing mismatch (against reality). This hedge-breakage expense can be modeled either as an expense or as a reduction to hedge payoffs.

EXPENSE, MORTALITY, AND POLICYHOLDER BEHAVIOR ASSUMPTION

As noted above, the Proposed PBR Framework will leverage company prudent estimate assumptions for mortality, expenses, and all policyholder behavior assumptions. As with VM-21, prudent estimate assumptions reflect an anticipated experience assumption (developed from credible actual company data) and a margin for uncertainty where the margin should serve to increase the reserve. The margins should be set at the individual assumption level but calibrated in such a way that does not distort the overall level of risk.

As the ARWG has not yet opined on whether there will be an Additional Standard Projection Amount under the Proposed PBR Framework, the topic of prescribed assumptions to be used under a Standard Projection construct is not relevant at the current time.

Profitability study: Fixed index annuity with GLWB

This section of the report presents a profitability study for an industry-typical FIA with GLWB rider that has been modeled using Milliman's MG-ALFA[®] actuarial software platform. The goal of this profitability study is to illustrate and juxtapose the profit and reserve pattern under the current CARVM reserving regime against those under the Proposed PBR Framework for a typical FIA product that is commonly found in the market. We have also performed sensitivities on product design aspects, assumptions, and economic scenarios that further highlight the sensitivity of the profit and reserve patterns under the Proposed PBR Framework versus that under the current CARVM reserving regime.

As noted earlier, the Proposed PBR Framework is still evolving and so readers should be mindful that any changes may have a corresponding impact on the results of our analysis presented herein.

FIA WITH GLWB RIDER

For this profitability study, we have chosen to focus on an FIA product with a GLWB rider. GLWB riders on FIAs often produce onerous reserves under AG 33 and AG 35 primarily due to the optimal⁴ utilization of contractual guarantees that are made available to the policyholders, in the form of roll-ups or ratchets on the benefit base during the accumulation phase, along with guaranteed lifetime withdrawal benefits during the payout phase.

It is important to note that in practice, companies might incorporate an aggregation benefit when pricing a new product to take advantage of some offsetting of risk across various rider designs. This aggregation benefit is realized when companies calculate and report reserves across different products and rider designs under a PBR framework. Given that the focus of our profitability study is on GLWB riders only, we have not reflected any potential aggregation benefit that could be gained from other rider designs.

We have assumed that the entire account value is invested in a one-year, annual point-to-point index crediting funds with an annual reset cap strategy. The annual cap rate is guaranteed to never fall below 1.00%.

In this profitability study, the GLWB rider has a benefit base with 6% annual compound roll-up for the first ten years or until activation of the GLWB benefit, whichever comes first. The maximum annual withdrawal amounts (MAWA) are a percentage of the benefit base, and vary with attained age at commencement of the rider benefits. They range from 4.5% to 6.5%.

In the following sub-sections, we have described, at a high level, our modeling approach for this profitability study. We encourage the reader to refer to the Appendix for complete details on the product and rider specifications and for a summary of the pricing actuarial assumptions that we have employed.

MODELING APPROACH

We project cash flows and policy values using a set of pricing assumptions and a deterministic economic scenario that is based on the expected Treasury forward curve as of December 31, 2019. We refer to this as the outer loop for the remainder of this report. In this outer loop, the index-related interest credited rate is modeled using the "Equity Kicker" method as follows:

$$\text{Index-related interest credited rate} = \text{Option budget} * (1 + \text{Equity Kicker} \%)$$

Our Equity Kicker assumption is 10%. This represents the risk premium a policyholder can expect for participating in the equity market compared to interest credited based on bond yields.

CARVM RESERVE MODELING

We calculate reserves under CARVM at all valuation points within our projection. The CARVM reserve calculation is based on a projection of account value and other policy values in the outer loop up until future valuation dates (which we refer to as "pivot points") where the policyholder benefits are then projected as prescribed under AG 33 and AG 35. We refer to these reserve projections at each pivot point as the inner loops for the remainder of this report. As described below, pivot points and inner loops apply to the PBR reserve modeling as well.

⁴ Recall that AG 33 requires policyholders to act in a self-optimal way that maximizes their benefits.

PBR RESERVE MODELING

The stochastic reserve calculation under the Proposed PBR Framework requires the use of a set of stochastic scenarios generated using the AIRG. For this purpose, we used the outer loop's yield curve at each pivot point as the input to the AIRG to generate 200 stochastic scenarios for each inner loop reserve calculation. The equity index returns generated from the AIRG are adjusted to be net of dividends assuming a dividend rate of 2.0%. Note that our model assumes the AIRG's mean reversion parameter used to generate the stochastic scenarios at each future pivot point remains unchanged.

For purposes of deriving the NAERs, we assume an AIA portfolio that is comprised of 100% cash that is immediately invested (along with any future proceeds) in a reinvestment portfolio mix of 5-, 10- and 15-year non-callable corporate bonds. Our model performs an asset-only projection of the AIA portfolio across the generated stochastic scenarios for each pivot point to derive a set of NAER vectors. The NAER vectors are then used for purposes of discounting when calculating the principle-based stochastic reserves. The details and assumptions for this reinvestment portfolio can be found in the Appendix.

To reduce the modeling complexity and model runtime, we limited the calculation of the stochastic reserve to fifteen pivot points—specifically, the end of the first quarter, end of years 1 to 5, and years 10, 15, 20, 25, 30, 35, 40, 45, and 50. We linearly interpolated the calculated stochastic reserves to estimate the reserves at all projection periods between each pivot point.

Cash flows and policy values projected under the Proposed PBR Framework in the inner loop reserve calculation are based on applying a margin to the baseline pricing assumptions. In addition, assets are modeled as per the VM-21 general account asset modeling framework with the assignment of the PBR Credit Rating and the use of prescribed VM-20 spreads and base default rates. We direct the reader to the Appendix for additional details on these assumptions.

For this profitability study, we have ignored the Additional Standard Projection Amount component as the ARWG or LATF has not decided whether it will be a binding constraint under the PBR for non-VAs framework.

PROFIT MEASURES

We have used the following profit measures to illustrate and discuss the profitability of a typical FIA with GLWB priced under the existing CARVM regime and the Proposed PBR Framework:

- Internal Rate of Return (IRR): The discount rate at which the present value of distributable earnings (PVDE) is equal to zero.
- PVDE as a percentage of the present value of assets (PVDE / PVA or ROA): We present this profit margin metric under two discount rate assumptions:
 - The pre-tax net investment earned rate (NIER) on the portfolio assets backing the liability and surplus.
 - A fixed 10% hurdle rate.
- First Year DE as a percentage of premium (Initial Strain): The aggregate distributable earnings in the first year is divided by the initial and the only premium paid.

Base results and analysis

As shown in Figure 1 below, the IRR increases by a significant 7.6% under the Proposed PBR Framework as compared to pricing under CARVM. While the ROA at NIER increases by a modest 11 bps, the ROA at the hurdle rate has a larger increase similar to that of the IRR. It can also be seen that the Initial Strain is much higher under the CARVM reserving framework as compared to the Proposed PBR Framework.

FIGURE 1: BASE RESULTS

RESERVING METHODOLOGY	IRR	ROA (@ NIER)	ROA (@ 10%)	INITIAL STRAIN
CARVM	9.5%	0.66%	-0.06%	-9.2%
Proposed PBR	17.1%	0.77%	0.37%	-1.9%

A comparison of the projected reserves in Figure 2 below provides insights into the varying degrees of change across the three profit metrics. The PBR reserve is noticeably lower than the CARVM reserve until policy year 22 as:

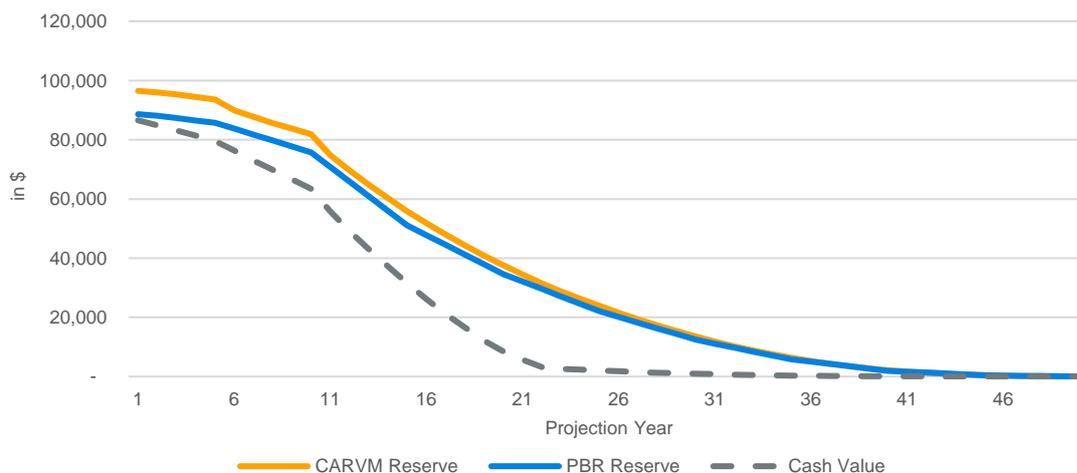
- There is sufficient account value to fund future GLWB withdrawal payments up to this duration.
- The PBR framework allows the reflection of the company’s own prudent estimate assumptions for policyholder behavior and therefore lends itself to a less conservative outcome than CARVM. This is especially apparent in the early durations where some policies have not elected their GLWB payments in the outer loop.

Thereafter, as the account value starts depleting due to continued GLWB payments in the outer loop, the two reserves start converging until they become almost equal from policy year 31 onwards. Upon account value depletion, the projected policyholder benefits in the inner loops are the same under both reserving regimes. Any difference between the two statutory reserves at this point is then due to:

- Differences in discount rates and mortality assumptions.
- Continued maintenance expenses under the PBR reserve calculation that are absent under CARVM.

We can conclude that the lower statutory reserve under the Proposed PBR Framework up to policy year 22 essentially front-loads the statutory profits. Hence, the higher the IRR generated or higher the discount rate used to calculate the ROA, the greater the profitability of the product.

FIGURE 2: BASE COMPARISON OF PROJECTED RESERVE



Sensitivity results and analysis

We have performed a robust set of sensitivities to highlight the impact of product design, actuarial assumptions, and economic environments on product profitability under the two reserving regimes. These sensitivities have been grouped into the following categories: Product Design, Mortality and Policyholder Behavior, Company Action, Economic and Asset Strategy.

PRODUCT DESIGN

For the product design sensitivities, we increased and decreased the GLWB benefit base roll-up rate by 1% from a base of 6%. We also increased and decreased the MAWA by 0.5% across all attained ages. As explained above, for the base scenario, the MAWA varies by the attained age and is in the range of 4.5% to 6.5%. Since these are sensitivities on product design aspects, they apply to both the outer and inner loop projections.

In Figure 3, we have shown the change in the profit measures for the sensitivities relative to the base.

Under both CARVM and the Proposed PBR Framework, there is a non-trivial change to the profit measures due to an increase in the richness of GLWB benefits. However, the decrease in profitability is much more pronounced under the Proposed PBR Framework. Conversely, upon decreasing the richness in benefits (either via reduced benefit base roll-up rates or MAWA), the profitability increases significantly and more asymmetrically (as compared to an increase in richness of benefits) under the Proposed PBR Framework as compared to CARVM.

FIGURE 3: PRODUCT DESIGN SENSITIVITY RESULTS (DIFFERENCE RELATIVE TO BASE)

Sensitivity	IRR	CARVM			Proposed PBR Framework		
		ROA (@ NIER)	Initial Strain	IRR	ROA (@ NIER)	Initial Strain	
Roll-up rate -1%	4.5%	0.21%	3.5%	19.8%	0.22%	1.9%	
Roll-up rate +1%	-2.4%	-0.21%	-4.0%	-7.6%	-0.23%	-5.0%	
MAWA + 0.5%	-3.0%	-0.30%	-3.8%	-8.8%	-0.33%	-5.2%	
MAWA - 0.5%	5.2%	0.31%	2.7%	24.0%	0.34%	2.0%	

In Figures 4 and 5, we have shown the projected reserve ratios (PBR over CARVM) for all sensitivities. Note that we have graphed the projected reserve ratios up to policy year 20 to highlight the impact of product design sensitivities in the durations where there is a significant difference in the reserves between the two regimes. In earlier durations, an increase to the richness of the GLWB benefits widens the gap between PBR reserve and CARVM reserve where the PBR reserves are significantly lower than CARVM compared to their respective values in the base case. Conversely, the decrease to the richness of the GLWB benefits results in a narrower gap between the PBR and CARVM reserves.

FIGURE 4: COMPARISON OF PROJECTED RESERVE RATIO (PBR / CARVM) FOR ROLL-UP RATE SENSITIVITY

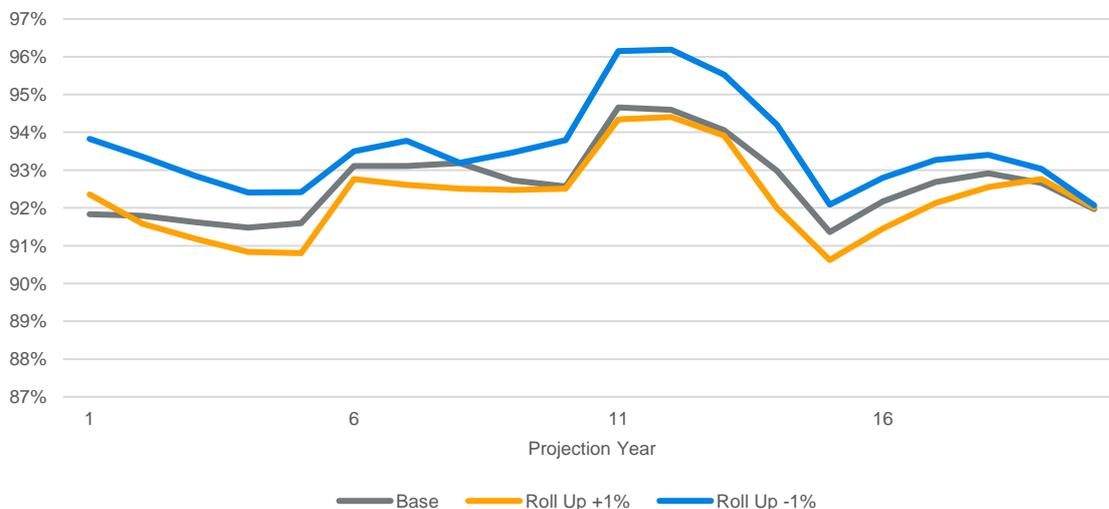
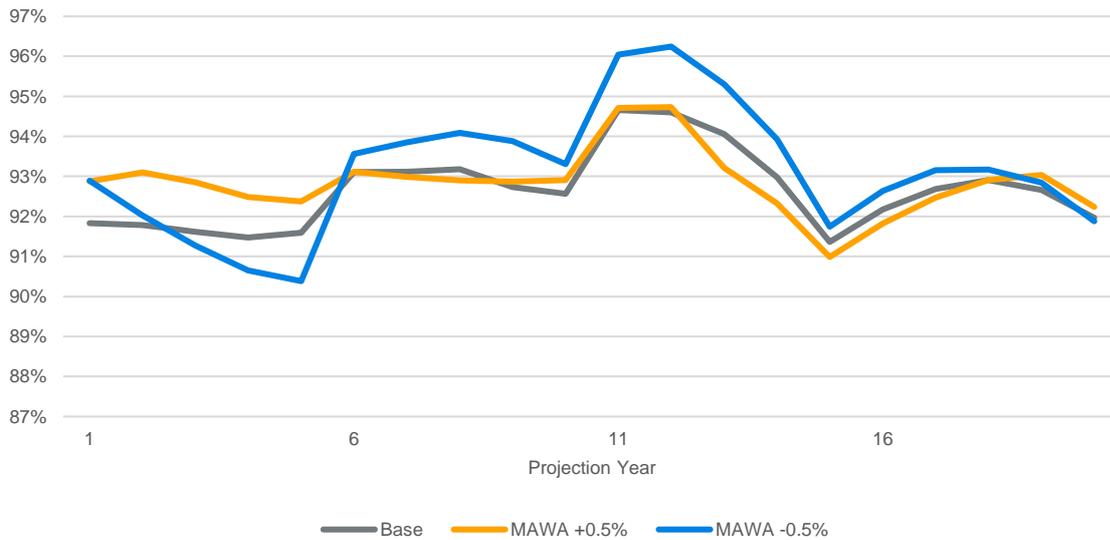


FIGURE 5: COMPARISON OF PROJECTED RESERVE RATIO (PBR / CARVM) FOR MAXIMUM ANNUAL WITHDRAWAL RATE SENSITIVITY



MORTALITY AND POLICYHOLDER BEHAVIOR

In this set of sensitivities, we increased and decreased both the mortality and lapse assumptions separately by a multiplicative factor of 10%. For the GLWB utilization sensitivities, we performed two separate sensitivities where we:

- Increased the never-elect cohort from 10% to 30%.
- Assumed all policies elect at the end of the GLWB roll-up period of 10 years (thereby maximizing their benefit base upon election).

Changing these assumptions impacts the outer loop's cash flows and policy values in the same manner when pricing under both reserving regimes. However, the profitability measures as shown in Figure 6 and the projected reserve ratios as shown in Figures 7, 8, and 9 are significantly more sensitive under the Proposed PBR Framework than under CARVM. This is due to the limited impact that changes to outer loop assumptions have on the CARVM reserves. Specifically:

- The mortality assumptions for CARVM are prescribed and remain unchanged.
- CARVM does not prescribe or permit the use of any lapse assumptions.
- CARVM tests all potential election points irrespective of the company's own prudent estimate assumption on GLWB utilization.

In contrast, under the Proposed PBR Framework:

- For the inner loop calculations, we have used the outer loop or pricing assumptions with margins added for prudence. As such, changing the outer loop mortality and lapse assumptions impacts the inner loop assumptions and hence the reserve projections. Hence, profitability under the Proposed PBR Framework is relatively more sensitive than under CARVM;
- The GLWB utilization sensitivities have a greater impact on profit measures and reserves than the lapse and mortality sensitivities. This is due to the general design of the GLWB rider where the guaranteed living benefit amount is calculated based on the age of utilization and the number of years of compounded roll-up rates applied to the benefit base. As such, changes in the GLWB utilization assumption have a direct influence on how much value the policyholder extracts from the GLWB rider and hence also to the profitability to the company.
- For the first GLWB utilization sensitivity, where the never-elect cohort is increased from 10% to 30%, the inner loop's never-elect assumption (that is based off baseline assumption plus a margin) increased from 5% to 20%. This contributes to the significant decrease in PBR reserves as shown in Figure 9 where there is a wider gap between PBR and CARVM reserves (i.e., decrease in reserve ratio). As such, this results in a large increase in profitability. It is also noted that there is a limit to how much the PBR reserve could decrease due to the cash surrender value floor.

- For the second GLWB utilization sensitivity, where we assume all policies elect at the end of the GLWB roll-up period in both the outer and inner loop, policies that did not elect under the base scenario will now elect and hence additional GLWB benefits are incurred. However, on a present value basis, this is offset to some extent by policies with older issue ages that are now electing at a much later period (compared to the base scenario) and would receive less GLWB benefits due to the shape of the mortality curve at higher ages. Hence, this sensitivity has a relatively lesser impact compared to the first GLWB utilization sensitivity described in the prior bullet.

FIGURE 6: MORTALITY AND POLICYHOLDER BEHAVIOR SENSITIVITY RESULTS (DIFFERENCE RELATIVE TO BASE)

Sensitivity	CARVM			Proposed PBR Framework		
	IRR	ROA (@ NIER)	Initial Strain	IRR	ROA (@ NIER)	Initial Strain
Mortality +10%	0.2%	0.04%	0.0%	4.0%	0.06%	0.8%
Mortality -10%	-0.2%	-0.05%	0.0%	-3.2%	-0.07%	-1.2%
Lapse +10%	0.2%	0.02%	0.0%	1.3%	0.02%	0.4%
Lapse -10%	-0.2%	-0.02%	0.0%	-1.3%	-0.02%	-0.4%
Never-elect 30%	1.2%	0.21%	-0.2%	20.8%	0.28%	1.9%
Election at year 11	-0.9%	-0.11%	-0.8%	-4.0%	-0.13%	-1.2%

FIGURE 7: COMPARISON OF PROJECTED RESERVE RATIO (PBR / CARVM) FOR MORTALITY SENSITIVITY

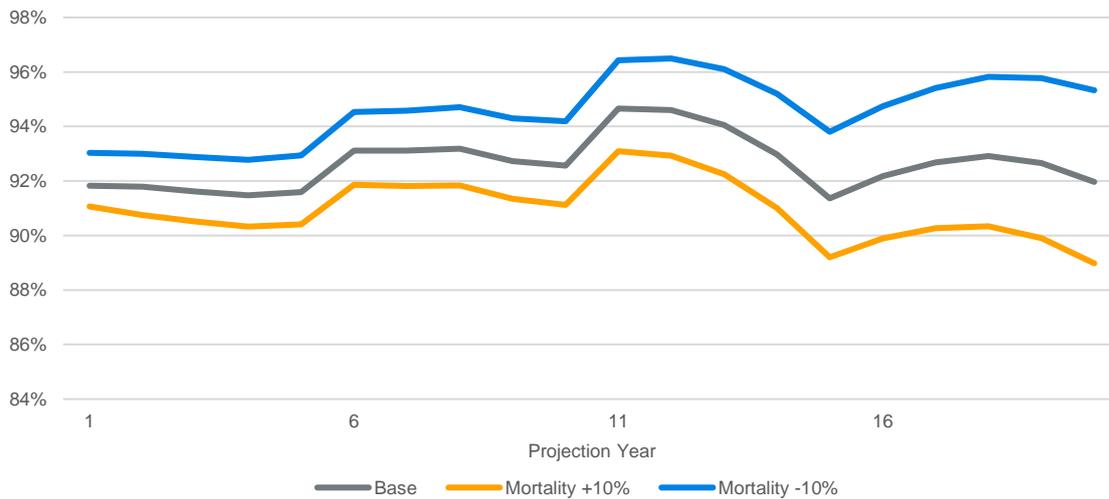


FIGURE 8: COMPARISON OF PROJECTED RESERVE RATIO (PBR / CARVM) FOR LAPSE SENSITIVITY

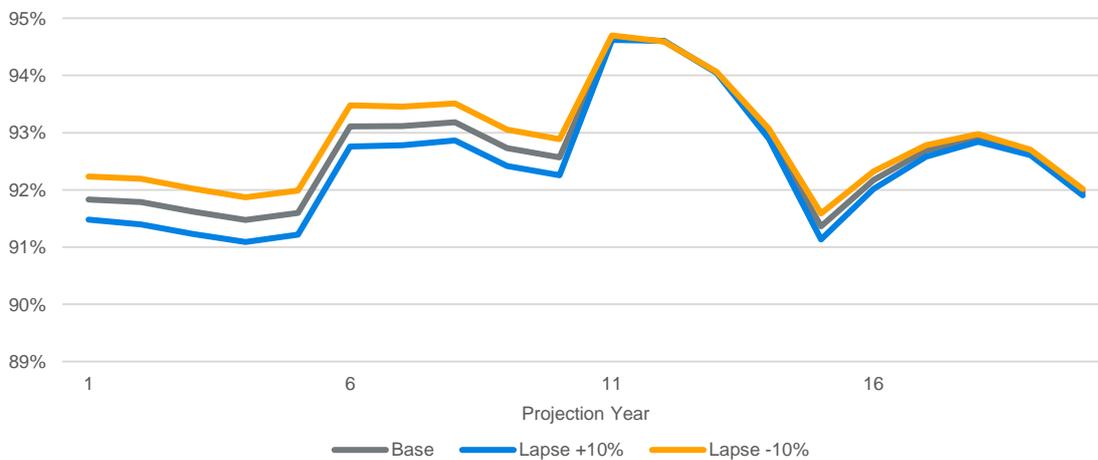
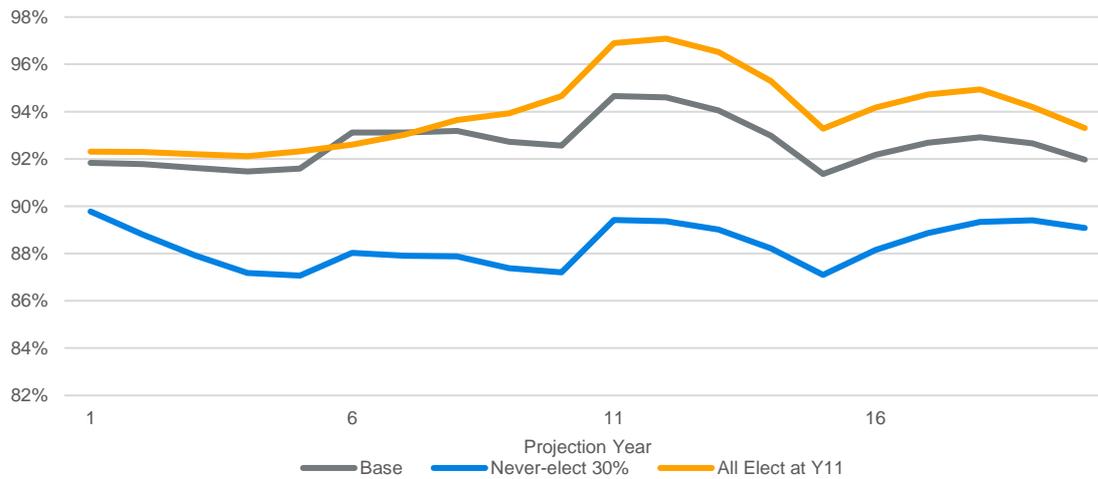


FIGURE 9: COMPARISON OF PROJECTED RESERVE RATIO (PBR / CARVM) FOR GLWB ELECTION SENSITIVITY



COMPANY ACTION

In this set of company action sensitivities, we separately increased and decreased company maintenance expenses by a multiplicative factor of 10% and also separately increased acquisition expense by a multiplicative factor of 10%. For the company target spread that is deducted from the net investment earned rate, we performed minus 25 basis points and minus 50 basis points sensitivities.

As shown in Figure 10, profit measures under the Proposed PBR Framework are relatively more sensitive compared to CARVM. This is because the change in these assumptions has limited or no impact to the CARVM reserve calculation.

In contrast, under the Proposed PBR Framework:

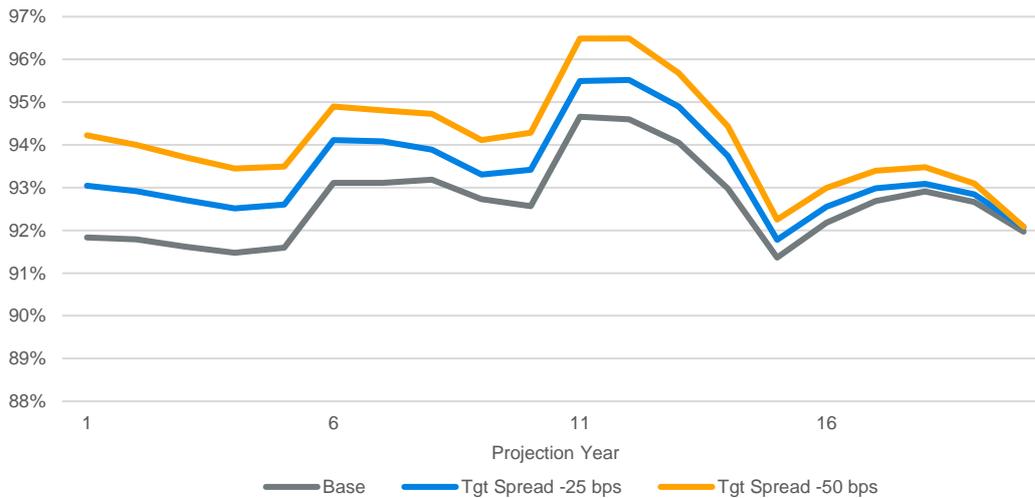
- For the inner loop calculations, we have used the outer loop or pricing assumptions with margins added for prudence. As such, changing expense assumptions impacts the inner loop assumptions and hence the reserve projections.
- The option budget is calculated by taking the net investment earned rate minus the company target spread. In the inner loop, the option budget is then used to solve for cap rates at the end of each year to calculate the interest credited. The higher the projected option budget, the greater the option payoff amount. Given that we assume a 5% hedge-breakage expense (modeled as a haircut to option payoff) under the Proposed PBR Framework, the higher option payoffs increase the hedge-breakage expense, which then translates to higher PBR reserves as shown in Figure 11.

Given that there are relatively small changes to the reserves under the expense sensitivities, we have not shown the projected reserve ratios for these.

FIGURE 10: COMPANY ACTION SENSITIVITY RESULTS (DIFFERENCE RELATIVE TO BASE)

Sensitivity	IRR	CARVM		Proposed PBR Framework		
		ROA (@ NIER)	Initial Strain	IRR	ROA (@ NIER)	Initial Strain
Expense +10%	-0.1%	-0.01%	0.0%	-0.5%	-0.01%	-0.1%
Expense -10%	0.1%	0.01%	0.0%	0.5%	0.01%	0.1%
Acq Expense +10%	-0.5%	-0.04%	-0.5%	-1.8%	-0.04%	-0.5%
Target Spread -25bps	-0.4%	-0.05%	-0.1%	-3.0%	-0.06%	-1.3%
Target Spread -50bps	-0.8%	-0.10%	-0.1%	-5.0%	-0.13%	-2.5%

FIGURE 11: COMPARISON OF PROJECTED RESERVE RATIO (PBR / CARVM) FOR TARGET SPREAD SENSITIVITY



ECONOMIC

We performed the following economic sensitivities:

- Increase and decrease the initial yield curve separately by 100 basis points. Using this shocked initial yield curve, we regenerate the expected Treasury forward curves and the AIRG generated scenarios.
- The AIRG does not have the ability to project negative interest rates. In order to simulate an economic situation where prevailing risk-free rates are negative, we reduced the corporate bond spreads to simulate what the net corporate bond yields would be if interest rates were negative. Specifically, we:
 - Set the corporate bond spreads to zero in the outer loop for pricing under both reserve regimes.
 - For the Proposed PBR Framework, the VM-20 current spreads are reduced to 0 basis points while the long-term spreads are reduced by 100 basis points and floored at 0.

As shown in Figure 12, the change in profit measures relative to base scenario is more pronounced when pricing under the Proposed PBR Framework compared to pricing under CARVM.

Shocking the initial yield curve by a positive 100 basis points and pricing under the Proposed PBR Framework results in the largest increase to the profit measures across all economic sensitivities. Shocking the initial yield curve by plus 100 basis points has a two-fold effect:

- The net investment earned rate in the inner and outer loop increases. Hence, interest earned on cash flows increases resulting in greater profits.
- The NAER discount rates increase, thus reducing the cost of the accumulated deficiencies.

Conversely, the shock in initial yield curve by negative 100 basis points results in a relatively smaller decrease in profit measures compared to the up 100 basis points sensitivity. This is due to the low initial yields that are floored at 0% after the down shock has been applied.

Reducing the corporate bond spreads to zero results in a big decrease in IRR under the Proposed PBR Framework to the extent that it reaches a similar IRR level to pricing under the existing CARVM reserving framework. The reasons for this are as follows:

- For both reserve regimes, the reduction to corporate bond spreads in the outer loop results in lower interest margins. This is partly due to spread compression stemming from the need to fund the guaranteed cap rates.
- Under the CARVM reserving framework, there is no direct impact to the reserves per unit.
- Under the Proposed PBR Framework, we approximated what the prescribed VM-20 spread rates would look like in this scenario. Assuming there is a lag between the economic event and the published rates, we reduced long-term spreads by 100 basis points instead of setting them to 0. With lower VM-20 spreads, accumulated deficiencies are discounted at lower NAER rates, therefore resulting in higher PBR reserves. This further contributes to lower profitability under the Proposed PBR Framework.

FIGURE 12: ECONOMIC SENSITIVITY RESULTS (DIFFERENCE RELATIVE TO BASE)

Sensitivity	IRR	CARVM		Proposed PBR Framework		
		ROA (@ NIER)	Initial Strain	IRR	ROA (@ NIER)	Initial Strain
Interest Rate +100bps	5.7%	0.47%	0.7%	38.5%	0.55%	1.3%
Interest Rate -100bps	-4.9%	-0.45%	-0.7%	-11.8%	-0.52%	-2.4%
Depressed Spreads	-9.9%	-1.06%	-1.2%	-17.3%	-1.13%	-15.4%

FIGURE 13: COMPARISON OF PROJECTED RESERVE RATIO (PBR / CARVM) FOR INTEREST RATE SENSITIVITY

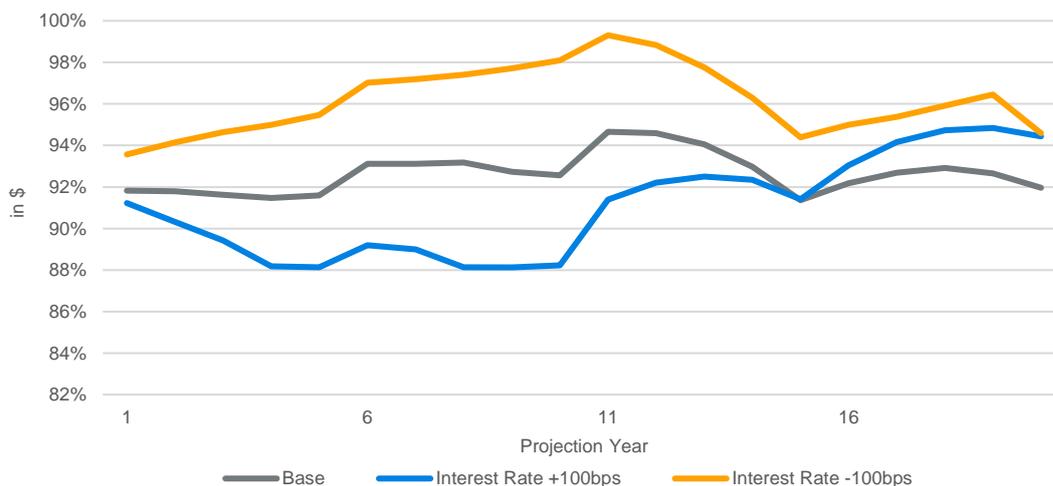
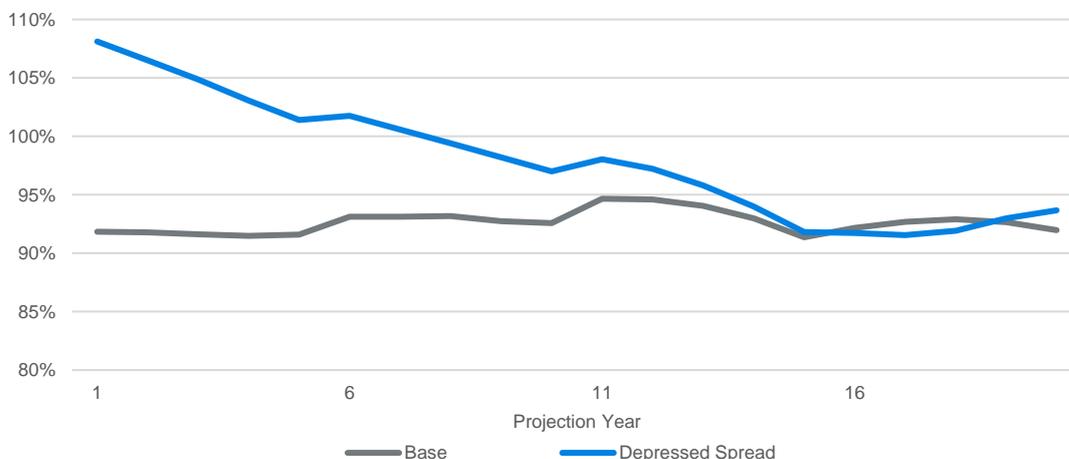


FIGURE 14: COMPARISON OF PROJECTED RESERVE RATIO (PBR / CARVM) FOR DEPRESSED SPREAD SENSITIVITY



ASSET STRATEGY

We performed the following asset strategy sensitivities:

- For the aggressive asset strategy, we assumed that invested assets are riskier by increasing corporate bond spreads by 100 basis points across all maturities. In addition, the PBR Credit Rating is increased from “8” to “11” to approximate a similar increase in spreads for the PBR inner loop reserve projection.
- For the conservative asset strategy, we assumed that invested assets are less risky by decreasing corporate bond spreads by 100 basis points across all maturities. In addition, the PBR Credit Rating is decreased from “8” to “2” to approximate a similar decrease in spreads for the PBR inner loop reserve projection.

As shown in Figure 15, changing to an aggressive asset strategy results in an increase in profit measures pricing under both reserve regimes. This is primarily due to an increase in investment margins earned from higher yielding assets. We also note from Figure 16 that the projected PBR reserve under the aggressive asset strategy is now much closer to the CARVM reserve (i.e., PBR reserve is now higher in this sensitivity compared to the base). This can be explained by the following:

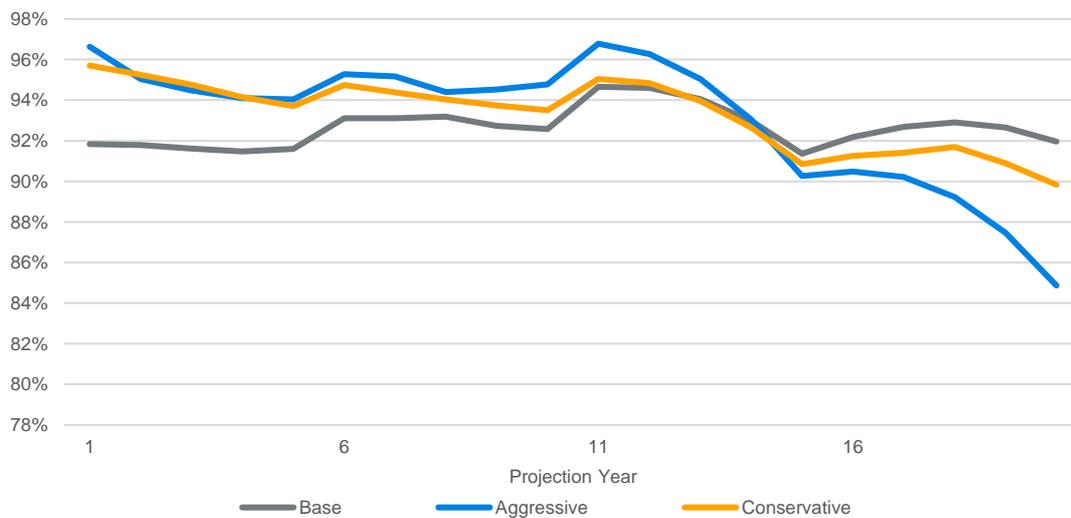
- The switch to riskier assets generates higher yields but also requires higher prescribed VM-20 default rates.
- The higher net investment earned rates results in higher projected option budgets (since target spread remains unchanged) and this then translates to higher option payoffs. Given that we assume a 5% hedge-breakage expense (modeled as a haircut to option payoff) under the Proposed PBR Framework, the higher option payoffs increase the hedge-breakage expense, which then translates to higher PBR reserves.

Conversely, for the conservative asset strategy we can see from Figure 15 that the decrease in profit measures relative to base scenario is more pronounced when pricing under the Proposed PBR Framework compared to pricing under CARVM. The additional reduction to profitability under the Proposed PBR Framework is mainly due to lower NAER discount rates driving the increase in PBR reserves.

FIGURE 15: ASSET STRATEGY SENSITIVITY RESULTS (DIFFERENCE RELATIVE TO BASE)

Sensitivity	CARVM			Proposed PBR Framework		
	IRR	ROA (@ NIER)	Initial Strain	IRR	ROA (@ NIER)	Initial Strain
Aggressive	5.4%	0.45%	0.6%	5.1%	0.46%	-4.3%
Conservative	-4.8%	-0.44%	-0.6%	-11.2%	-0.49%	-4.4%

FIGURE 16: COMPARISON OF PROJECTED RESERVE RATIO (PBR / CARVM) FOR ASSET STRATEGY SENSITIVITY



Additional considerations

PRODUCT DESIGN, PRICING, AND MANAGEMENT

Product development is one of the most important company operations affected by PBR since the shift to a completely new statutory reserving framework may require companies to reprice products in order to remain competitive. Actuaries will likely have to collaborate with other departments (e.g., marketing and IT infrastructure teams) to redesign subsequent eras of existing products. Given that the PBR framework for non-VAs is still a few years away, companies may prefer to consider getting a head start on repricing and redesigning products to avoid the risk of costly delays.

The actual choices made in the design of deferred annuity products, especially guaranteed living benefit riders, will be affected by the introduction of PBR. As shown in the profitability study, a PBR framework may result in front loading of pre-tax statutory profits, which then enables companies to incorporate richer benefits to remain competitive and increase sales volume. Under the current CARVM reserving framework, it is quite common to assume or have in place financing or reserve relief transactions as part of the pricing process. In moving to pricing under the PBR framework, companies will likely be able to avoid having to assume financing or reserve relief transactions if their goal is to minimize reserve and/or capital strain.

Depending on whether the PBR framework applies retrospectively, companies might want to think about in-force management strategies to release CARVM reserves (e.g., via buybacks) and shift blocks of business to the new PBR framework.

FINANCIAL REPORTING

The results shown in this report suggest that statutory reserves calculated under the Proposed PBR Framework may be lower than the CARVM reserves under the existing statutory regime. For new business issued after the proposed target effective date of January 1, 2023, this may have implications on whether companies choose to engage in surplus relief transactions with an external party (such as a reinsurance company) when writing the new products. Such transactions have been relatively common when writing FIA with GLWB business under the existing statutory framework.

An added wrinkle to this relates to the impact to existing surplus relief transactions should the ARWG decide to apply the Proposed PBR Framework retrospectively. If this occurred, some direct writers may conclude that the need for surplus relief is obviated if the statutory reserve is lower (and closer to the associated economic reserve).

To the extent insurance companies use economic reserves in their permitted practices by their state regulator either for reinsurance or financial reporting for in-force blocks, they may be required to use PBR reserves as the economic reserves.

There will be disclosure requirements that valuation actuaries will need to satisfy. At the current time, The ARWG envisions that this will largely be the same as VM-20 and VM-21, with potential new requests focusing on (for example) documentation of company investment strategies, exclusion testing and support for the hedge-breakage expense assumption and hedging of the index credits on the underlying liability. To the extent that the Proposed PBR Framework does not allow aggregation between FIAs and VAs (a decision that ARWG has yet to opine on), it may be that the PBR Actuarial Report⁵ should also have separate sections for these product types.

ACTUARIAL MODELING

For companies that are already undergoing system conversions in order to model VM-20 and/or VM-21, it is likely that they may also be able to leverage this functionality for the Proposed PBR Framework for non-VA products within their existing system. However, for companies with valuation platforms that are unable to handle the technical requirements of PBR, the adoption of a new actuarial modeling vendor or system may be needed. If the Proposed PBR Framework only applies to new business written after the proposed target effective date of January 1, 2023, then the valuation platform will need functionality to reflect both the existing statutory framework (AG 33 and AG 35) on existing business issued prior to that date, as well as the new PBR framework. This will need care to ensure that a given policy is receiving the correct reserve treatment. From an operational perspective, it may well be simpler if the ARWG decides to make the Proposed PBR Framework retrospective so that all business is modeled in the same way from a statutory reserving perspective.

⁵ Details on the PBR Report can be found in VM-31: PBR Actuarial Report Requirements for Business Subject to a Principle-Based Valuation.

In addition to valuation considerations, there may also be forecasting needs for pricing and business plan purposes that requires stochastic on deterministic or stochastic on stochastic modeling. This will further require systems that have both the capability to handle such tasks but that also allow the ability to test and audit the underlying functionality in order to gain comfort that the models are working as intended and are fit for purpose. To the extent that there are run-time concerns, model efficiency solutions such as scenario reduction techniques and/or asset and liability clustering will also become increasingly important. Alternatively, cloud-based distributed processing may become more popular. Such solutions are relatively common for VM-21 calculations, but may not be for FIAs (since the existing statutory valuation framework does not require stochastic testing).

Next steps

We intend to update our analysis as the ARWG provides additional guidance on the Standard Projection and/or makes further changes to the Proposed PBR Framework. We may consider performing an impact analysis for an illustrative in-force block if it becomes apparent that the NAIC and LATF will allow a full retrospective application of PBR instead of business issued on or after the target effective date of January 1, 2023.

Appendix

PRODUCT SPECIFICATIONS

Index Features

We have assumed that 100% of the policy funds are invested in a one-year, point-to-point cap strategy based on the S&P 500 index with annual reset of the cap rate. The cap rate is guaranteed to never fall below 1.00%.

Rider Design

The illustrated Guaranteed Living Withdrawal Benefit (GLWB) rider has a benefit base with 6% annual compound roll-up for the first 10 years or until activation of the GLWB benefit, whichever comes first.

The maximum annual withdrawal amounts are a percentage of the benefit base and vary with attained age at activation. The maximum annual withdrawal rates are summarized in the table below.

Age at First Withdrawal	Maximum Annual Withdrawal Rate (% of Benefit Base)
60	4.50%
65	5.00%
70	5.50%
75	6.00%
80	6.50%

Rider charges are 1.20% of the benefit base per annum.

Surrender Charge Schedule

Policy Year	1	2	3	4	5	6	7	8	9	10	11+
Surrender Charge	10%	9%	8%	7%	6%	5%	4%	3%	2%	1%	0%

Minimum Guaranteed Cash Surrender Value (MGCSV) of 87.5% of premium growing at 1.00% per annum.

Model Office

The model office consists of male and females with issue ages 55, 65, and 75, with initial premiums distributed as shown in the table below.

Issue Age	Female	Male
55	20%	20%
65	20%	20%
75	10%	10%

ASSUMPTIONS

Mortality Rates

Base mortality rates are assumed to follow the 2012 IAM Basic ANB table.

Mortality improvement factors are equal to the Projection Scale G2 Factors.

Mortality improvement is applied relative to a base year of 2012 and capped at 15 years.

Surrender Rates

The surrender rates vary by In-the-moneyness (ITM) and policy year relative to surrender charge schedule:

ITM	Within Surrender Charge Period	First Policy Year After Surrender Charge Period	Subsequent Years
Under 50%	4.0%	25.0%	15.0%
50% <= x < 75%	3.0%	18.0%	10.0%
75% <= x < 100%	2.5%	12.0%	7.0%
100% <= x < 125%	2.5%	8.0%	4.5%
125% <= x < 150%	2.5%	6.0%	3.0%
150% <= x < 175%	2.5%	5.0%	2.5%
175% <= x < 200%	2.5%	4.5%	2.0%
Over 200%	2.5%	4.0%	2.0%

ITM is calculated as the actuarial present value of guaranteed benefits over the account value. The actuarial present value is derived using the IAM 2012 Basic ANB mortality table as the base mortality rate with Projection Scale G2 mortality improvement factors applied for 5 years and the 10-year treasury yield as discount rates.

For policies that have started utilizing the GLWB benefit, an additional 0.6 scalar is applied to the surrender rates.

Acquisition Expenses

\$150 per policy and 1% of initial premium.

Maintenance Expenses

\$80 per year per policy expenses increasing at 2% fixed inflation per annum.

Commissions

5% of initial premium.

Option Budget and Interest Crediting

Option budgets are forecast using an asset portfolio book yield less spread approach, where the company target spread is assumed to be 150 basis points.

The interest credited is modeled as the option budget plus an equity kicker, where the kicker is a 110% multiplicative scalar.

GLWB Activation & Utilization

No partial withdrawals are assumed prior to the activation of the GLWB benefit.

Upon activation of the GLWB benefit, the policyholder is assumed to take 100% of the maximum annual withdrawal amount.

The table below summarizes the assumed GLWB activation distribution for each issue age.

Issue Age	At Issue	5-Year Delay	10-Year Delay	Never-Elect
55	0%	9%	81%	10%
65	22.5%	40.5%	27%	10%
75	45%	36%	9%	10%

Pricing Scenario

The deterministic scenario uses the forward rates as of December 31, 2019.

Tax Assumptions

Corporate tax rate of 21%.

Proxy DAC tax rate of 2.09%.

Tax reserves is 92.81% of reserves floored at the cash surrender value.

Target Surplus

350% of the following RBC factors:

C1: 1.00% of reserves

C3: 1.00% of reserves when surrender charge > 5%
2.00% of reserves thereafter

C4: 2.00% of premium (in the year of premium)

A covariance adjustment based on the square-root of the sum of squares of C1 and C3 charges is applied.

ASSET ASSUMPTIONS**Asset Type, Spreads and Defaults**

The asset portfolio is assumed to comprise of non-callable corporate bonds as follows:

Term to maturity (years)	Allocation	Spread (bps)	Default Cost (bps)
5	25%	150	10
10	50%	225	10
15	25%	225	10

Investment Expense

15 basis points.

ACTUARIAL GUIDELINE 33 ASSUMPTIONS**Valuation Mortality**

Base mortality rates are based off the 2012 IAM Period Table.

Mortality improvement factors are equal to the Projection Scale G2 Factors.

Mortality improvement is applied relative to a base year of 2012 indefinitely.

GLWB Election Points

Tested annually for policy years 1 to 20.

Valuation Interest Rates

Valuation rates are based on issue year (2019) as prescribed in the SVL.

PRINCIPLE-BASED RESERVING ASSUMPTIONS**Prudent Estimate Assumptions**

Mortality: 90% of baseline assumptions.

Surrenders: 90% of baseline assumptions.

Maintenance Expense: 110% of baseline assumptions.

Hedge-Breakage Expense: 5% haircut applied to option payoff.

GLWB Election:

- The never-elect cohort is reduced by 5% for each issue age band with the difference redistributed to the 10-year election wait period.
- Policies with 5-year election wait period are redistributed to the 10-year election wait period.

Interest Crediting Approach

In the inner loop projections for PBR reserves, cap rates are solved for dynamically based on the Black-Scholes closed form solution with the specified option budget. The option budget is defined as the net investment earned rate less a target spread of 150 basis points.

Asset Spreads and Default Costs

All modeled reinvestment assets are assumed to have PBR Credit Rating of 8.

Asset spreads and default costs are calculated based on the instructions prescribed for reinvestment assets in VM-20 Section 9.F. The model uses the VM-20 current spread, long-term spread and base default rate tables (that vary by PBR Credit Rating and weighted average life) published by NAIC as of December 2019.

Scenarios

The set of economic scenarios has been generated using the American Academy of Actuaries (AAA) Interest Rate Generator version 7.1.201905, using the constant maturity Treasury yield curve as of December 31, 2019.

The equity index return is adjusted to be net of dividends assuming a dividend rate of 2.0%.

Volatility

The 1-year implied volatility surface for S&P-500 index as of December 31, 2019. The volatility surface is kept constant in the model projection.

SENSITIVITY ASSUMPTIONS

Product Design

Roll up rate -1%

The GLWB rider benefit base is updated to have a 5% annual compound roll-up for the first 10 years or until activation of the GLWB benefit, whichever comes first.

Roll up rate +1%

The GLWB rider benefit base is updated to have a 7% annual compound roll-up for the first 10 years or until activation of the GLWB benefit, whichever comes first.

MAWA Sensitivities

The maximum annual withdrawal rates are updated as follows:

Age at First Withdrawal	Maximum Annual Withdrawal Rate +0.5% (% of Benefit Base)	Maximum Annual Withdrawal Rate - 0.5% (% of Benefit Base)
60	5.00%	4.00%
65	5.50%	4.50%
70	6.00%	5.00%
75	6.50%	5.50%
80	7.00%	6.00%

Mortality and Policyholder Behavior

Mortality +10%

A 110% multiplicative scalar is applied to the experience mortality rates and the PBR prudent estimate mortality assumption.

Mortality -10%

A 90% multiplicative scalar is applied to the experience mortality rates and the PBR prudent estimate mortality assumption.

Lapse +10%

A 110% multiplicative scalar is applied to the experience lapse rates and the PBR prudent estimate lapse assumption.

Lapse -10%

A 90% multiplicative scalar is applied to the experience lapse rates and the PBR prudent estimate lapse assumption.

Never-elect 30%

The proportion of never-elect policies for each issue age is updated to be 30% via proportional redistribution from the other wait periods. The following table illustrates the distribution of wait periods:

Issue Age	At Issue	5-Year Delay	10-Year Delay	Never-Elect
55	0%	7%	63%	30%
65	18%	32%	21%	30%
75	35%	28%	7%	30%

For PBR reserve calculation:

- The never-elect cohort is reduced by 10% for each issue age band with the difference redistributed to the 10-year election wait period.
- Policies with 5-year election wait period are redistributed to the 10-year election wait period.

All Elections at Year 11

All policies are assumed to start utilization of their GLWB payments at the start of policy year 11 (i.e., 10-year election wait period). The same assumption is used for the PBR reserve calculation.

Company Action

Expense +10%

The baseline per policy maintenance expense is increased by 10% to be \$88.

Expense -10%

The baseline per policy maintenance expense is decreased by 10% to be \$72.

Acquisition Expense +10%

The baseline acquisition expense is increased by 10% to be \$165 per policy and 1.1% of initial premium.

Target Spread -25 basis points

The company target spread (that is deducted from the option budget) is reduced by 25 basis points to be 125 basis points.

Target Spread -50 basis points

The company target spread (that is deducted from the option budget) is reduced by 50 basis points to be 100 basis points.

Economic

Interest Rate +100 basis points

A plus 100 basis points parallel shock in the Treasury yield curve is applied. Accordingly, the stochastic scenarios and NAER vectors are regenerated for the PBR reserve calculation.

Interest Rate -100 basis points

A minus 100 basis points parallel shock in the treasury yield curve is applied, along with a floor of 0%. Accordingly, the stochastic scenarios and NAER vectors are regenerated for the PBR reserve calculation.

Depressed Spreads

The corporate bond spreads for all bond maturities in the asset reinvestment strategy are reduced to 0 basis points. For PBR reserve calculation, the VM-20 current spreads are reduced to 0 basis points while the long-term spreads are reduced by 100 basis points and floored at 0.

Asset Strategy

Aggressive

The corporate bond spreads for all bond maturities in the asset reinvestment strategy are increased by 100 basis points. For PBR reserve calculation, the PBR Credit Rating is set to "11" for all corporate bond assets.

Conservative

The corporate bond spreads for all bond maturities in the asset reinvestment strategy are reduced by 100 basis points. For PBR reserve calculation, the PBR Credit Rating is set to "2" for all corporate bond assets.



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