Session 53 PD, Non-Variable Annuity PBR's Impact on Product Development

**Moderator:**
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2018 Life and Annuity Symposium
Session 53 & 75:
Non-Variable Annuity PBR’s Impact on Product Development
Chanseo Lee, FSA, MAAA  MassMutual Financial Group
Contents

- What is VM-22?
- VM-22 Status up to August 2017
- VM-22 Status Update since September 2017
- Impact of VM-22 on Product Development
What is VM-22?
Valuation Manual (VM)

- VM-20 Life Insurance PBR
- VM-21 Variable Annuity PBR
- VM-22 Non-Variable Annuity PBR

**VM-20 Life Insurance PBR**
- Net premium reserve
- Deterministic reserve based on deterministic scenario
- If fail on stochastic exclusion test, calculate stochastic reserve based on multiple stochastic scenarios
- CTE calibration on stochastic reserve
- Reserve = max of 3 reserves
- Adjusted with DDPA

**VM-21 Variable Annuity PBR**
- Standard reserve based on deterministic scenario
- Stochastic reserve based on multiple stochastic scenarios
- CTE calibration on stochastic reserve
- Reserve = max of 2 reserves
- C 3 Phase 2 risk based capital requirement (RBC) in addition to VM-21 PBR
What is VM-22?
Organization and Committees Involved

National Association of Insurance Commissioners (NAIC)
- Life and Annuity Task Force (LATF)
- VM-22 (A) Subgroup

American Academy of Actuaries (AAA)
- Annuity Reserves Work Group (ARWG)
- Standard Valuation Law (SVL) Interest Rate Modernization Group
Annuity Reserve Working Group ("ARWG") has been assisting the VM-22 (A) subgroup of the Life and Annuity Task Force ("LATF") with the development of a principle-based approach to the valuation of non-variable annuities.

### Objectives

- A floor reserve that does not dominate the modeled reserve
- "Right-Size" reserves for fixed indexed annuities with guaranteed living and/or death benefits
- Exclude payout and fixed annuities without guaranteed living and/or death benefits from stochastic calculations and continue with current reserve methodologies
- Consistency in reserve methodologies for all annuities
- Consistency in methodologies between reserves and capital calculations

### Products

- Non-variable individual and group annuities
  - Deferred annuities
  - Payout annuities
  - Deposit type fund products
VM-22 Status up to August 2017
VM-22 Status up to August 2017
Initial Approach - Options

VM-22
Develop a principle-based approach to the valuation of non-variable annuities

Option 1
Representative Scenarios Method (RSM)
- Small set of scenarios
- Manageable run times
- Key risks modeled stochastically

Option 2
VM-20 Replication
- Create an annuity version of VM-20, which is the life principle-based approach

Option 3
AG-33 Modifications
- Alter AG-33 so that it can appropriately handle modern product designs, including living benefits
VM-22 Status up to August 2017
Initial Approach – Aspects Considered

- Right Size Reserves
- Transparent and Adequate Margins
- Auditable Modeled Reserve
- Appropriate Tax Reserves
- Modeled Reserve Scenarios
- Formulaic Floor Reserve
Reserve Methodology

- Minimum Reserve = Floor Reserve Amount + max {0, Modeled Reserve – Floor Reserve Amount}
  - Floor Reserve Amount = \( \sum k \) Floor Reserve contract k
  - Floor Reserve contract k = \max \{FR1, FR2, FR3\}

Floor Reserve Objectives

- Serves as a yardstick with which to establish a reasonable floor for the minimum reserve
- Serves as a possible model for the computation of tax reserves
- Not necessary that the floor reserve be an adequate reserve for each contract valued
- Not designed to reflect the differences in product design to the same degree as the modeled reserve
VM-22 Status up to August 2017
Floor Reserve Methodology Considered

Floor Reserve 1 (FR1)
- Normal CARVM with a couple of differences
  - Assume listed benefits are terminated as of the valuation date
  - Non-listed benefits – Prescribed lapse rates adjusted for in-the-moneyness
    Listed benefits – GLIBs, annuitizations other than GLIB elections, and
    annuitization within the annuitization tier of a two-tiered annuity

Floor Reserve 2 (FR2)
- CARVM = GPV {all Integrated Benefit Streams}
  - FR2 considers one of those Integrated Benefit Streams for each listed benefit
- Calculation Rules
  - Each listed benefit is assumed to be elected eventually
  - Each listed benefit is assumed to be elected according to a corresponding
    listed benefit utilization function (LBUF)
  - If a single contract has multiple listed benefits, FR2 shall be calculated for each
    listed benefit k.

Floor Reserve 3 (FR3)
- FR3 is based on the amount available for the contractholder to withdraw from the
  contract as of the statement date


**VM-22 Status up to August 2017**

Modeled Reserve Methodology Considered

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**Modeled Reserve**

- Small number of primary risk drivers
- Scenario projections with company’s anticipated experience assumptions
- Results derived from the scenarios called the Current Estimate Reserve (CER)
- Aggregate Margin will be added to CER to produce modeled reserve
- Will be compared to floor reserve
- Make audit process more manageable

**Representative Scenarios Method**

- Generalized, multi-risk
- Model separated into model segment
  - Blocks of business with similar risk profiles for both liabilities and assets
- Each model segment reflects its key risk drivers (KRD)
- Modeled reserve – reserve as if all KRDs were modeled stochastically
  - But more practical to calculate and easier to audit
Goals

- Test the practicality of using the RSM for the modeled reserve

Approach

- Reserve calculations for actual business in force.
  - Compare results using:
    - AG33
    - AG43 standard scenario
    - AG 43 stochastic reserve
    - Proposed VM-22
  - 2 volunteer companies, 5 different plans

Results

- Results shared with ARWG, & ARWG not involved in design or performance of test
- Proposed approach produced reserves higher than CARVM, while expecting reserves lower than CARVM
- So discarded RSM
VM-22 Status up to August 2017

New Direction
- Abandon the RSM (late 2015)
- Consistency for all annuities
  - Modeled reserve consistent with VM-21
  - Must take into account the Variable Annuities Issue Working Group improvement items
- Evaluate previously proposed floor reserve approaches
- Incorporate a modeled reserve exclusion test

Reformation
- Regrouped the ARWG to support the new direction of VM-22
- Solicited new volunteers
- Divided the ARWG into two sections (focus areas)
  - Floor reserve / Exclusion test section
  - Modeled reserve section
### Variable Annuities Issues Working Group proposal (VM-21)

- Study and address regulatory issues resulting in VA captives
- Hired Oliver Wyman (OW) to support the project
- VA framework for changes adopted by NAIC
- VA IWG exposed OW’s report with proposed changes to AG 43 and C3P2

### C-3 Capital treatment of Indexed Annuities proposal

- Align hedge assets with liability valuation
- Reform standard scenarios
- Align Total Asset Requirement (TAR) and reserves
- Revise asset admittance for derivatives and DTAs
- Standardize capital market assumptions
The above diagram is the latest approach presented by the ARWG at the NAIC August 2017 meeting. This approach has evolved considerably from prior iterations for several reasons, including:

- Desire for consistency, practicality, and simplicity
- Variable Annuities Issues Working Group proposal
- C-3 Capital treatment of Indexed Annuities proposal

The flowchart shows the decision process:

1. **VM-22 Calculations**
   - **Exclusion Test**
     - Not Passed: Follow VM-21 (AG 43) like Framework
     - Passed: Follow Current Actuarial Guidelines
VM-22 Status up to August 2017
Proposal at NAIC August 2017

- Exclusion test (Risk-based criteria) – likely to fail on products with optionality
- Modeled reserve/standard scenario requirements for non-variable annuities

**Initial Focus**
- Hedge modeling
- Discount rates
- Stochastic scenarios
- CTE calibration
- Aggregation
- Net asset yields
- Standard scenario policyholder behavior

**Secondary Focus**
- Standard scenario expenses
- Reinsurance
- Tax reserves
- Reporting
- Small company exemption
- Transition
The proposed approach still leaves several decisions left to be made:

**Floor Reserve / Exclusion Test Section**
- Evaluate previously proposed Floor Reserve approaches
  - ARWG proposed approach from November 2015
  - Formulate a simplified approach?
- Incorporate a Modeled Reserve Exclusion Test

**Modeled Reserve Section**
- Development of standard scenario assumptions
- Calibration of standard scenarios
- Implementation issues
- Inforce/new business
### VM-22 Status up to August 2017

#### How Can You Prepare?

<table>
<thead>
<tr>
<th>Floor Reserve</th>
<th>Modeled Reserve</th>
<th>Income Annuity Valuation Interest Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Follow current Actuarial Guidelines</td>
<td>▪ Standard scenario assumptions to be determined</td>
<td>▪ Maximum, but not perfect, valuation rates for income annuities</td>
</tr>
<tr>
<td>▪ Floor reserve does not dominate modeled reserve</td>
<td>▪ Standard scenarios are calibrated to not dominate modeled reserve</td>
<td>▪ Valuation rates more responsive to liability duration and interest market</td>
</tr>
<tr>
<td>▪ Exclude payout and fixed annuities without guaranteed living and/or death benefits from stochastic calculations</td>
<td>▪ All inforce or only new business?</td>
<td>▪ Effective for contracts issued on or after January 1, 2018</td>
</tr>
<tr>
<td>▪ Determine tax reserves</td>
<td>▪ Determine tax reserves</td>
<td></td>
</tr>
<tr>
<td>▪ Aggregation across lines of business</td>
<td>▪ Aggregation across lines of business</td>
<td></td>
</tr>
</tbody>
</table>
VM-22 Status Update since September 2017
VM-22 Status Update since September 2017
Report of VM-22 (A) Subgroup at NAIC March 22, 2018

- Development of valuation rate-setting system
- Reasons of re-drafting VM-22
- Important aspects of the new draft
Impact of VM-22 on Product Development
Impact of VM-22 on Income Annuity
Part VM-22 is effective on January 1, 2018 but Re-draft VM-22

Implications
- Close relationship between valuation rate and product development
- Cover more income annuity products
- Domestic commissioner approval for contracts under AG 33, AG 18, or VM-21
- Design of non-life-contingent payment beyond life-contingent payments to get the highest valuation rate available
- Need to calculate the appropriate valuation rate in anticipation of new product development
Impact of VM-22 on Fixed Indexed Annuity
Waiting for development of VM-21

Implication

➢ FIA based on VA framework using VM-21 (AG43) reserves
➢ Need of multiple stochastic scenario running capability for pricing
➢ C3 capital requirement
➢ Close relationship between statutory reserve calculation and product development

Consideration of Pricing Methods

➢ Base product - Real World scenarios vs Risk Neutral scenarios
➢ Riders such as GLBs - Real World scenarios vs Risk Neutral scenarios
➢ Risk measure vs hedging
➢ If allowed, simplistic pricing method similar to Representative Scenarios Method (RSM)
2018 Life and Annuity Symposium

Setting of Maximum Valuation Interest Rates

Amber Ruiz, FSA, MAAA

May 8, 2018
Agenda

- Overview
- Proposed Changes
- What’s Next?
Background
Original Creation of VM-22

Working Groups

**NAIC:** VM-22 Subgroup of the Life and Annuity Task Force (LATF)

**AAA:** Standard Valuation Law (SVL)
Interest Rate Modernization Work Group

Shared Goals

- “Review the current methodology, and if appropriate, recommend changes to the current methodology for establishing ‘dynamic’ valuation interest rates in the Standard Valuation Law (SVL)”
- Focus areas:
  - Interest rate basis
  - Appropriate valuation rate for liabilities offered on a non-uniform basis
  - Minimum valuation interest rate, if any
Why was this update necessary?

Key findings from the working group’s review

| Prior Standard Valuation Law process is no longer appropriate | Moody’s index does not match SPIA liabilities | Credit quality of index has drifted lower since the 1980s | Valuation rates now more responsive to liability duration and interest market | Asset adequacy testing adjustments still likely, but at lower levels |
## Prior Method vs. New Method
### Comparison of Key Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Prior (before January 1, 2018)</th>
<th>Current (as of January 1, 2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Index</td>
<td>Moody’s Long Term Corporate Bond Index</td>
<td>Treasuries plus VM-20 Spreads</td>
</tr>
<tr>
<td>Credit Quality</td>
<td>Moody’s index (i.e., average of industrial and public utilities)</td>
<td>Average Life Insurer Bond Portfolio</td>
</tr>
<tr>
<td>Provisions for Adverse Deviation</td>
<td>20% of Reference Rate in Excess of 3%</td>
<td>VM-20 Baseline Defaults 25 bps for Expenses and Stat Margin</td>
</tr>
<tr>
<td>Floor</td>
<td>None, but bias toward 3%</td>
<td>None</td>
</tr>
<tr>
<td>Duration Buckets</td>
<td>1</td>
<td>4</td>
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<tr>
<td>Frequency of Updates</td>
<td>Annual</td>
<td>Non-jumbos: Quarterly Jumbos: Daily</td>
</tr>
<tr>
<td>Multiple Premiums</td>
<td>N/A</td>
<td>Separate rate for each premium</td>
</tr>
<tr>
<td>Rounding</td>
<td>Nearest 25 basis points</td>
<td>Non-jumbos: Nearest 25 basis points Jumbos: Nearest basis point</td>
</tr>
</tbody>
</table>
VM-22: Maximum Valuation Interest Rates for Income Annuities

What You Need to Know

- Effective for contracts issued on or after January 1, 2018
- Effective for all states that have adopted the valuation manual (VM)
- Interest rates for VM-22 are stored on the NAIC home page (under the Industry tab), rather than on the LATF page

Overall Methodology

- Provides the methodology for determining valuation interest rates for income annuities
- Designed to be more responsive to the economic environment than the prior method
- Valuation rates are split between jumbo annuities (premium >= $250 million) and non-jumbo annuities (premium < $250 million)
- Jumbo valuation rates are determined daily, while non-jumbo are determined quarterly
- Once determined at the “Premium Determination Date”, the rate will remain fixed for the duration of the payout
- The reserve method will not be changing at this time, just the method to determine the valuation rate for income annuities
Proposed Changes
Purpose of VM-22 Redraft

- Interpretation questions after VM-22 became effective on January 1, 2018
- NAIC determined more clarity was needed so began working on a redraft
- New draft aims to preserve the original content and intent of the framework and methodology, but provides more detail and precision

- Key updates as part of the proposed redraft include:
  - Updated descriptions of products in scope
  - Clarification of responsibility for calculation of rates
  - Updated definitions of premium determination date and reference period
  - Enhanced appendices showing full calculation details for each component and the resulting final rates
Products Included

- Immediate annuity contracts (life contingent and certain only) issued after December 31, 2017
- Deferred income annuity contracts issued after December 31, 2017
- Structured settlements (in payout or deferred status), issued after December 31, 2017
- Fixed payout annuities resulting from the exercise of settlement options or annuitizations after December 31, 2017, regardless of the issue date of the host contract, and regardless of whether a new contract is issued
- Supplementary contracts issued after December 31, 2017, regardless of the issue date of the host contract
- Fixed income payment streams attributable to contingent deferred annuities issued after December 31, 2017, once the underlying contract funds are exhausted
- Fixed income payment streams attributable to guaranteed lifetime income benefits associated with deferred annuity contracts issued after December 31, 2017, once the contract funds are exhausted
- Group annuity and pure endowment contracts specified in Model #820, Section 5.C.2, purchased for the purpose of providing certificate holders benefits upon their retirement, issued after December 31, 2017
In the current version of VM-22, extensive detail regarding the calculation of the maximum valuation interest rates is provided:

- The process of calculating the rates involves a set of spreads, a set of weights, a set of default costs, a set of corporate bond rates, and a set of average US Treasury rates.

The proposed redraft of VM-22 focuses on the selection of rates rather than the calculation of them, as the resulting statutory maximum valuation interest rates are published by the NAIC:

- The user is expected to select the appropriate rate from the published rates.
- The user is not expected to complete the calculations themselves.
- The processes for re-determining the weights, default costs, spreads, reference rates, and daily corporate rates are described, and sample calculations are illustrated in Appendices 1-5.
- The process of calculating the statutory maximum valuation interest rates is described in Appendix 6.
Selection of Rates: Duration Rate Buckets (A-D)

- For the purpose of selecting the statutory maximum valuation interest rate, the contract, certificate or contract feature being valued must be assigned to one of four valuation rate buckets labeled A through D. In order to match the duration of the assets backing the liabilities, four groupings are used:
  - Based on contract and annuitant characteristics
  - Easy to both implement and audit

<table>
<thead>
<tr>
<th>Initial age</th>
<th>Length of Reference Period (RP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;= 5 years</td>
</tr>
<tr>
<td></td>
<td>More than 5 years, up to 10 years</td>
</tr>
<tr>
<td></td>
<td>More than 10 years, up to 15 years</td>
</tr>
<tr>
<td></td>
<td>More than 15 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Without life contingencies</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>With life contingencies</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>90+</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>80-89</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>70-79</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>&lt;70</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
</tbody>
</table>
Premium Determination Date

- The current definition for premium determination date is:
  - This term means the date upon which the premium is determined by the insurance company and is committed to by the client. This term is generally defined as the issue date. For supplementary contracts and annuitizations, this would normally be the date of election of the supplementary contracts and the annuitizations, but a company may use the valuation rate basis in effect when the original contract was issued with domestic commissioner approval.

- The VM-22 subgroup determined that this definition is not ideal for a couple of reasons:
  - It assumes SPIA logic, rather than logic that varies by type of contract
  - The reference to “domestic commissioner approval” is unclear and is not accurately reflecting what was intended

- The proposed redraft has been updated to:
  - Include a table of decision rules to clarify the decision date for different types of contracts
  - Add a new section (2c) to show exemptions which clarifies the domestic commissioner approval terminology
The following table specifies the decision rules for setting the premium determination date for each of the contracts, certificates and contract features included:

- If the premium determination date is based on the consideration, and if the consideration changes by an immaterial amount subsequent to the original premium determination date, such as due to a data correction, then the original premium determination date shall be retained.

<table>
<thead>
<tr>
<th>Item # in Section 2</th>
<th>Item Description</th>
<th>Premium Determination Date</th>
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</thead>
<tbody>
<tr>
<td>2.B.1</td>
<td>Immediate annuity</td>
<td>Date consideration determined and committed to by contract holder</td>
</tr>
<tr>
<td>2.B.2</td>
<td>Deferred income annuity</td>
<td>Date consideration determined and committed to by contract holder</td>
</tr>
<tr>
<td>2.B.3</td>
<td>Structured settlements</td>
<td>Date consideration determined and committed to by contract holder</td>
</tr>
<tr>
<td>2.B.4</td>
<td>Payout annuities resulting from settlement options or annuitizations from other contracts</td>
<td>Benefit commencement date</td>
</tr>
<tr>
<td>2.B.5</td>
<td>Supplementary contracts</td>
<td>Date of issue of supplementary contract</td>
</tr>
<tr>
<td>2.B.6</td>
<td>Fixed income payment streams from contingent deferred annuities, AV=0</td>
<td>Payment stream commencement date</td>
</tr>
<tr>
<td>2.B.7</td>
<td>Fixed income payment streams from guaranteed living benefits, AV=0</td>
<td>Payment stream commencement date</td>
</tr>
<tr>
<td>2.B.8</td>
<td>Group annuity, and related certificates</td>
<td>Date consideration determined and committed to by contract holder</td>
</tr>
</tbody>
</table>
Premium Determination Date – Exemptions

- With the permission of the domiciliary commissioner, when a deferred annuity contract is being valued in accordance with Actuarial Guideline XXXIII, Actuarial Guideline XVIII or Part VM-21, the company may select the valuation interest rate for the annuitization stream as of the issue date of the contract in accordance with applicable guidance and may use the same valuation interest rate upon actual annuitization (Section 2.B.4 or 2.B.5, whichever is applicable), rather than the statutory maximum valuation interest rate prescribed in this Part. In order to obtain such permission, the company must demonstrate that its investment policy and practices are consistent with this approach.

- With the permission of the domiciliary commissioner, when a deferred annuity contract is being valued in accordance with Actuarial Guideline XXXIII, Actuarial Guideline XVIII or Part VM-21, the company may select the valuation interest rate for the projected fixed payment stream that arises once the account value is exhausted as of the issue date of the contract in accordance with the applicable guidance and may use the same valuation interest rate for the actual fixed payment stream that arises once the account value is exhausted (Section 2.B.7), rather than the statutory maximum valuation interest rate prescribed in this Part. In order to obtain such permission, the company must demonstrate that its investment policy and practices are consistent with this approach.
Reference Period

- The current definition for reference period is:
  - This term means the length of time, rounded to the nearest year, from the Premium Determination Date to the date of the last non-life-contingent payment under the individual contract or group certificate, as applicable.
    - Guidance Note: The definition of Reference Period assumes a series of material, substantially similar payments and materiality is relative to the life-contingent payments. If the payments are not level, the actuary should apply Actuarial Guideline IX-B exercise prudent judgment to measure the Reference Period.

- There has been concern regarding this definition, as the reference period is solely determined based on the date of the last non-life contingent payment
  - This allows for an opportunity to take advantage of the definition to get a longer reference period, since a single non-life contingent payment in a very late period would extend the reference period

- In the proposed redraft, the definition has been refined to eliminate this limitation:
  - The term “reference period” means the length of time, rounded to the nearest year, from the premium determination date to the earlier of:
    (a) the date of the last non-life-contingent payment under the contract, certificate or contract feature
    (b) the date of the first life-contingent payment under the contract, certificate or contract feature
What’s Next?
What’s Next?

- The current proposed redraft can be found on the NAIC VM-22 subgroup page and the NAIC LATF page
  - One version includes tracked changes to the current adopted version of VM-22

- The NAIC VM-22 subgroup voted during the March 12\textsuperscript{th} meeting to advance the draft to LATF
  - This includes several minor editorial changes in addition to the content changes discussed

- The redraft of VM-22 was presented to LATF at the spring NAIC meeting
  - The redraft was exposed for comment through May 3, 2018
  - The goal would be for it to become effective in 2019. This means it would need to be final and voted on at the summer NAIC meeting
Summary

- A new maximum valuation interest rate methodology (VM-22) was adopted for income annuities, effective for contracts issued on or after January 1, 2018
- A redraft of VM-22 has been written by the NAIC subgroup, and is in the process of being advanced through LATF
- Key updates as part of the proposed redraft include updated descriptions of products, clarification on calculation responsibility, updated definitions, and appendices with calculation details
- The redraft was discussed at the spring NAIC meeting, after which it was exposed for comments
- Pending feedback, the expectation is that the redraft of VM-22 may become effective in 2019
NON-VARIABLE ANNUITY PBR’S IMPACT ON PRODUCT DEVELOPMENT (SESSIONS 53/75)

2018 Life and Annuity Symposium

May 8, 2018

Bryan Lindsley, FSA, MAAA
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Agenda

1. AG 33/35 vs. principles-based framework for modeled reserve

2. VM-22 impacts on reserving and product design
AG 33/35 primer – FIA with GLWB

Greatest present value of benefits under AG 33/35 by wait period*

*Issue age 62 with a 8% simple rollup capped at 10 years and income rates varying by attained age

Contract level reserves are set to the greatest present value of future guaranteed benefits, generating redundant reserves
# AG 33/35 vs. a principles-based reserving (PBR)

<table>
<thead>
<tr>
<th>Methodology</th>
<th>AG33/35</th>
<th>PBR modeled reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contract level reserves are set to the greatest present value (&quot;GPV&quot;) of future guaranteed benefits, as described under CARVM</td>
<td>Initial assets are determined to sufficiently cover all future liability payments at a specified conditional tail expectation level (e.g., CTE70) for a set of stochastic scenarios</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Policyholder behavior / mortality</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AG 33/35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Mortality: Prescribed - IAR 2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Surrenders: GPV considers full surrenders along each path</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Free partial withdrawals: Paths with and without free partial withdrawals are considered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• GLWB utilization: All potential election points are considered</td>
<td></td>
<td></td>
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<tr>
<td>PBR modeled reserve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• AG 43 does not prescribe behavior for stochastic calculations, but requires prudent estimates</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Expenses</th>
<th>AG33/35</th>
<th>PBR modeled reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG33/35</td>
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<table>
<thead>
<tr>
<th>Discount rate / investment income</th>
<th>AG33/35</th>
<th>PBR modeled reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG33/35</td>
<td>Prescribed based on standard valuation law</td>
<td>Investment income is projected based on actual asset portfolio and assumed reinvestment strategy with applicable limitations (e.g., VM-20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deficiencies are discounted and added to initial assets (discount rate for VM-22 to be determined)</td>
</tr>
</tbody>
</table>
Initial view on principles-based CTE calculation for an FIA with GLWB

**Initial reserve for a representative model point***

*Issue age 62 with a 8% simple rollup capped at 10 years and income rates varying by attained age

VM-22 methodologies for a principle-based CTE calculation are not defined; the final manual will affect the principle-based reserve levels
Open VM-22 considerations on reserving and product design

1. Aggregation level

2. VM-21 considerations (discount rate setting, level of hedging to include, cap on general account earned rate, etc.)

3. Economic scenario calibration

4. Standard scenario
Key takeaways

1. VM-22 prescription for modeled reserves is still open (influenced by VM-21)

2. Product designs may change due to adoption of VM-22

3. Pricing models must be enhanced to handle stochastic modeled reserves
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