Session 125 L - Proposed NAIC VA Reserve and Capital Reform Case Study

Moderator:
Richard Laurent Hayes, ASA, CERA

Presenters:
Richard Laurent Hayes, ASA, CERA
Aaron Joseph Sarfatti, ASA
NAIC VA Reserve Reform Case Study

2017 SOA Annual Meeting

October 17, 2017
Agenda

- Case Study Motivation & Background
- AG43 Standard Scenario – Current to Proposed Framework
- Proposed Standard Scenario Reform Waterfall Analysis
- Summary
Case Study Motivation & Background
Case Study Motivation

- The proposed NAIC VA Reserve and Capital Reform will impact standard scenario & CTE-based AG43 reserves, and CTE-based C3 Phase II amounts. The C3 Phase II standard scenario amount will be eliminated.

- The resulting impact will vary by VA block based on the sensitivity to changes such as:
  - Economic scenarios (generation / calibration / standard scenarios)
  - Alignment of hedge assets with liability valuations
  - Standard scenario calculation, reflection of actual product cash flows, and policyholder behavior

- Many VA writers are participating in Quantitative Impact Studies (QIS) to allow them to provide both company results and feedback during the refinement process.

- QIS non-participants have been in more of a “wait and see” mode, where internal impact studies vary in terms of completeness, due to the ongoing process.

- Due to the significant changes in the proposal, both QIS and non-QIS participants can benefit from a waterfall impact analysis on an illustrative block of VAs.

- This case study focuses on the standard scenario AG43 reserve calculation without hedging, reinsurance or aggregation.
Case Study Background
Illustrative VA Block

- The illustrative VA block is comprised of GMDB and GMWB riders
- 7-year surrender charge schedule grading linearly down from 7%
- M&E fee of 1.25%
- Three GMDB rider types
  - Return of premium, with no additional charge
  - Maximum anniversary value, with an additional 20bps charge
  - Rollup with 5% annual compounding, with a 200% cap and an additional 40bps rider charge
- A maximum anniversary value lifetime WB with a 1.25% rider charge
- “Seriatim” listing of over 200,000 policies

<table>
<thead>
<tr>
<th>Rider Combination</th>
<th>Policies (%)</th>
<th>AV ($ millions)</th>
<th>WB BB ($ millions)</th>
<th>DB BB ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMWB &amp; ROP GMDB</td>
<td>19%</td>
<td>6,100</td>
<td>6,133</td>
<td>5,275</td>
</tr>
<tr>
<td>ROP GMDB</td>
<td>46%</td>
<td>6,200</td>
<td>0</td>
<td>5,242</td>
</tr>
<tr>
<td>MAV GMDB</td>
<td>34%</td>
<td>4,500</td>
<td>0</td>
<td>4,391</td>
</tr>
<tr>
<td>Rollup GMDB</td>
<td>1%</td>
<td>200</td>
<td>0</td>
<td>204</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>17,000</strong></td>
<td><strong>6,133</strong></td>
<td><strong>15,112</strong></td>
</tr>
</tbody>
</table>
Case Study Background
Illustrative VA Block

- Fund breakdown

<table>
<thead>
<tr>
<th>Fund Type</th>
<th>AV ($millions)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed</td>
<td>1,200</td>
<td>7%</td>
</tr>
<tr>
<td>Equity</td>
<td>1,500</td>
<td>9%</td>
</tr>
<tr>
<td>Bond</td>
<td>1,000</td>
<td>6%</td>
</tr>
<tr>
<td>Balanced</td>
<td>13,300</td>
<td>78%</td>
</tr>
<tr>
<td>Total</td>
<td>17,000</td>
<td>100%</td>
</tr>
</tbody>
</table>

- Fund management fees of 60 bps with a 30 bps investment fee refund

- Expenses & commissions
  - No trail commission
  - $100 per policy maintenance expense

- 80% of policies have tax qualified status
AG43 Standard Scenario – Current to Proposed Framework
Current AG43 Standard Scenario Requirements

- Calculated as the sum of
  - Basic Adjusted Reserve (BAR)
  - Greatest Present Value of Accumulated Net Revenue (at valuation interest rates) - GPVANR
  - Hedging and reinsurance credits

- Single drop and recovery scenario

- Prescribed assumptions for
  - Mortality (1994 MGDB table)
  - Policyholder behavior and dynamic functionality
    - No partial withdrawals for GMDBs
    - GMWBs withdraw at earliest possible time
    - ITM-based lapses
  - Prescribed net revenue calculations
    - Prescribed margin calculations
    - Includes contractually guaranteed revenue sharing

- Seriatim level calculations with simple sum to produce total reserve. No aggregation benefit or diversification adjustment.
## Proposed Standard Scenario Reform

<table>
<thead>
<tr>
<th>Proposal 2A&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Proposal 2C&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Proposal 2D&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Align AG43 Standard Scenario calculations more closely to the stochastic CTE framework</td>
<td>Specify a fuller set of risk factors informed by prevailing conditions and test multiple paths</td>
<td>Refresh prescribed policyholder behavior assumptions to align with industry experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Partial withdrawal assumptions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full surrender assumptions</td>
</tr>
</tbody>
</table>

- Given the proposed framework is still in flux, this case study is based on the documented proposal following QIS 1

<sup>1</sup>Referenced from Oliver Wyman presentation titled ‘NAIC VA RESERVE AND CAPITAL REFORM RECOMMENDED REVISIONS TO AG43 & C3P2’, dated August 23, 2016
Proposed Standard Scenario Reform

Proposal 2A: Align AG43 Standard Scenario calculations more closely to the stochastic CTE framework

- Standard Scenario now calculated as the sum of
  - Starting Assets
  - Greatest Present Value of Accumulated Deficiencies (GPVAD)
- Reflection of assets currently available on balance sheet
- Reflection of reinvestment rates
- Seriatim calculations
- Reinsurance modeled as in the CTE calculation
- Evolving guidance on reflection of CDHS / Hedging
- Proposal for aggregation to be allowed, with a seriatim level cap
Proposed Standard Scenario Reform

**Proposal 2C:** Specify a fuller set of risk factors informed by prevailing conditions and test multiple paths

- Reserves are now calculated as the maximum under the following three scenarios

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Linear equity drop of 13.5% over the first year</td>
<td>▪ No equity shock</td>
<td>▪ Linear equity drop of scenario -9.5% over the first year</td>
</tr>
<tr>
<td>▪ No interest rate shock</td>
<td>▪ Linear interest rate shock of max (50 bps, 25% of 10-year CMT) over the first year</td>
<td>▪ 70.7% of scenario 2 shock</td>
</tr>
<tr>
<td>▪ Bond fund return is 20% of equity shock and 6 x IR shock</td>
<td>▪ Bond fund return is 20% of equity shock and 6 x IR shock</td>
<td>▪ Bond fund return is 20% of equity shock and 6 x IR shock</td>
</tr>
</tbody>
</table>

- All scenarios follow the forward interest rates implied by shocked swap curve after the first year
Proposed Standard Scenario Reform

Proposal 2D: Refresh prescribed policyholder behavior assumptions to align with industry experience

- Industry based policyholder behavior assumptions will now be employed

- Change to GMWB withdrawal behavior
  - Issue age based withdrawal cohorts to be scaled as policies age
  - Requires a super-seriatim calculation approach

- Change to dynamic lapses
  - New ITM definition
  - More granular ITM-based lapse table varying by CDSC, first post-CDSC year, and following years

- Partial withdrawals now assumed for stand-alone GMDBs
Proposed Standard Scenario Reform
Waterfall Analysis
Proposed Standard Scenario Reform

Waterfall Steps

1. Current AG 43 Standard Scenario

2. Introduce new calculation framework (GPVAD + Starting Assets) and product cash flows

3. Introduce new prescribed mortality assumption

4. Introduce new prescribed lapse assumption

5. Introduce GMWB withdrawal cohorts and GMDB partial withdrawals

6. Introduce new economic scenarios
Proposed Standard Scenario Reform

Waterfall Step 1

- Calculations were performed under the current AG43 standard scenario prescribed methods
- GPAVNR + BAR doesn’t add up to total reserve as there is seriatim level cash value floor being applied

<table>
<thead>
<tr>
<th>Waterfall</th>
<th>GPVANR ($000s)</th>
<th>BAR ($000s)</th>
<th>Total Reserve ($000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>1,000</td>
<td>16,377,813</td>
<td>16,460,732</td>
</tr>
</tbody>
</table>
Proposed Standard Scenario Reform
Waterfall Step 2

- Two major changes in this waterfall step
  - Actual product cash flows are being reflected as opposed to the caps / floors applied under the current framework
  - Altered calculations to align with the new framework
    - GPVAD + starting assets, where starting assets are the cash surrender value
    - Asset yields and discount rates are based on the valuation interest rates
    - No working reserve

- Some offsetting components are introduced here
  - Maintenance expenses which didn’t get reflected under the current Standard Scenario construct
    - Max of company’s assumptions or $100 per policy + 7bps of AV, with 2% inflation
  - Full M&E fees flowing through profits under new framework
  - Grade non-guaranteed revenue sharing from 100% to 50% over 5 years

<table>
<thead>
<tr>
<th>Waterfall Element</th>
<th>GPVANR / GPVAD ($000s)</th>
<th>Δ GPVAD ($000s)</th>
<th>Δ GPVAD (%)</th>
<th>Reserve ($000s)</th>
<th>Δ Reserve ($000s)</th>
<th>Δ Reserve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 – Current Framework</td>
<td>1,000</td>
<td></td>
<td></td>
<td>16,460,732</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2 – GPVAD + Starting Assets</td>
<td>2,801</td>
<td>1,801</td>
<td>180%</td>
<td>16,424,427</td>
<td>(36,305)</td>
<td>-0.2%</td>
</tr>
</tbody>
</table>
Proposed Standard Scenario Reform

Waterfall Step 3

- Move away from the 1994 MGDB mortality table to the 2012 IAM Basic table with projection scale G2, with no improvement cap

- Higher WB claims related to increased longevity was, for the most part, offset by fewer GMDB claims

<table>
<thead>
<tr>
<th>Waterfall Element</th>
<th>GPVANR / GPVAD ($000s)</th>
<th>Δ GPVAD ($000s)</th>
<th>Δ GPVAD (%)</th>
<th>Reserve ($000s)</th>
<th>Δ Reserve ($000s)</th>
<th>Δ Reserve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2 – GPVAD + Starting Assets</td>
<td>2,801</td>
<td></td>
<td></td>
<td>16,424,427</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3 – Proposed mortality &amp; improvement</td>
<td>2,821</td>
<td>20</td>
<td>1%</td>
<td>16,424,446</td>
<td>20</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Proposed Standard Scenario Reform
Waterfall Step 4

- Introduced the new lapse assumptions
- The current framework prescribed the following GMDB lapses

<table>
<thead>
<tr>
<th>CDSC Period</th>
<th>Post-CDS C</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>

- The current framework prescribed the following GMWB lapses

<table>
<thead>
<tr>
<th>Moneyness</th>
<th>CDSC</th>
<th>Post-CDS C</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTM</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>&lt;10% ITM</td>
<td>3%</td>
<td>7%</td>
</tr>
<tr>
<td>10-20% ITM</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>&gt;20% ITM</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Proposed Standard Scenario Reform
Waterfall Step 4

- The proposed framework prescribed the following standard ITM table

<table>
<thead>
<tr>
<th>Moneyness</th>
<th>CDSC</th>
<th>First Year Post-CDSC</th>
<th>Post-CDSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50%</td>
<td>2%</td>
<td>30%</td>
<td>15%</td>
</tr>
<tr>
<td>50-75%</td>
<td>2%</td>
<td>18%</td>
<td>9%</td>
</tr>
<tr>
<td>75-100%</td>
<td>2%</td>
<td>12%</td>
<td>6%</td>
</tr>
<tr>
<td>100-125%</td>
<td>2%</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td>125-150%</td>
<td>2%</td>
<td>6%</td>
<td>3%</td>
</tr>
<tr>
<td>150-175%</td>
<td>2%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>175-200%</td>
<td>2%</td>
<td>3%</td>
<td>1.5%</td>
</tr>
<tr>
<td>&gt;200%</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
</tr>
</tbody>
</table>

- Standalone GMDBs use 100% of the table, whereas withdrawing WB policyholders use 75% and 100% otherwise
  - Subject to a 1% floor
Proposed Standard Scenario Reform

Waterfall Step 4

- The ITM definitions were also updated for dynamic lapse purposes to be based on the Guaranteed Actuarial Present Value (GAPV)
  - 75% x GMDB GAPV / AV, for standalone GMDBs
  - 100% x Max GMWB GAPV / AV

<table>
<thead>
<tr>
<th>Waterfall Element</th>
<th>GPVANR / GPVAD ($000s)</th>
<th>Δ GPVAD ($000s)</th>
<th>Δ GPVAD (%)</th>
<th>Reserve ($000s)</th>
<th>Δ Reserve ($000s)</th>
<th>Δ Reserve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 3</strong> – Proposed mortality &amp; improvement</td>
<td>2,821</td>
<td></td>
<td></td>
<td>16,424,446</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> – New base lapse and dynamics</td>
<td>3,195</td>
<td>374</td>
<td>13%</td>
<td>16,424,820</td>
<td>374</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

- 13% increase in GPVAD due to increased lapse dynamics, with generally lower baseline lapse assumptions
Proposed Standard Scenario Reform
Waterfall Step 5

- Introduce new GMWB withdrawal cohorts and GMDB partial withdrawal assumptions
- The current framework has no assumption for standalone GMDB partial withdrawals, but this is reflected in the proposed framework
  - 1.5% of GMDB benefit base, per annum, for rollup GMDBs
  - 3.0% of GMDB benefit base, per annum, for non-rollup GMDBs

- The current framework has the following GMWB partial withdrawal assumption
  - Assume immediate withdrawals
    - 50% of maximum for attained ages < 50
    - 75% of maximum for attained ages between 50 and 60
    - 100% of maximum for attained ages greater than 60

- The proposed GMWB withdrawal method is cohort based and assumes 90% of maximum withdrawals until AV exhaustion
Proposed Standard Scenario Reform

Waterfall Step 5

- The GMWB withdrawal cohort-based approach is as follows:
  - Has the policyholder taken a withdrawal in the previous year which doesn’t exceed the maximum amount?
    - If so, assume 90% of maximum withdrawals are taken until account exhaustion. Then assume full maximum amount
    - If not, follow the issue age-based cumulative withdrawal curve upon which cohorts are defined
  - The proposed guidance is to calculate bi-annual cohorts for each issue age and rider design combination
  - The cohorts are based on the GAPV for each year of starting withdrawals, where the PV is a fixed 10-year CMT of 3.0%
  - The GAPVs are transformed and normalized to construct the cumulative withdrawal curve
    - Adjustments made to policies with rollups or bonuses immediately after rollup/bonus term ends
    - Adjustments made to qualified policies at attained age 70.5
    - Non-qualified policies assume a 20% non-withdrawal cohort
    - Qualified policies assume a 5% non-withdrawal cohort
  - Given the fixed discount rate, as policies age, remaining cohorts are rescaled back to 100%
Proposed Standard Scenario Reform

Waterfall Step 5

- For simplicity, we constructed 8 withdrawal cohorts, including non-withdrawals, based on the following issue age buckets, and then adjusted (re-scaled) cohorts based on elapsed years by policy
  - Issue age <= 40
  - 40 < issue age <= 50
  - 50 < issue age <= 60
  - 60 < issue age <= 70
  - Issue age >= 71

- This resulted in roughly doubling the in-force data file size
- Introduction of GMDB partial withdrawals reduces fees
- GMWB withdrawal cohorts distribute timing of initial withdrawals
- Higher percentage of GMWB maximum withdrawals drives higher claims and increased GPVAD by 8%

<table>
<thead>
<tr>
<th>Waterfall Element</th>
<th>GPVANR / GPVAD ($000s)</th>
<th>Δ GPVAD ($000s)</th>
<th>Δ GPVAD (%)</th>
<th>Reserve ($000s)</th>
<th>Δ Reserve ($000s)</th>
<th>Δ Reserve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 4</strong> – New base lapse and dynamics</td>
<td>3,195</td>
<td></td>
<td></td>
<td>16,424,820</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> – New withdrawal assumptions</td>
<td>3,453</td>
<td>259</td>
<td>8%</td>
<td>16,425,079</td>
<td>259</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Proposed Standard Scenario Reform

- Waterfall Step 6

- Reserves are now calculated as the maximum under the following three scenarios
  - Scenario 1
    - Linear equity drop of 13.5% over the first year
    - No interest rate shock
    - Bond fund return is 20% of the equity shock + 6 x interest rate shock
  - Scenario 2
    - No equity shock
    - Linear interest rate shock of max (50 bps, 25% of 10-year CMT) over the first year
    - Bond fund return is 20% of the equity shock + 6 x interest rate shock
  - Scenario 3
    - Linear equity drop of scenario -9.5% over the first year
    - 70.7% of interest rate shock in scenario 2
    - Bond fund return is 20% of the equity shock + 6 x interest rate shock

- All scenarios follow the forward interest rates implied by shocked swap curve after the first year
Proposed Standard Scenario Reform

Waterfall Step 6

- Introducing forward interest rates to replace locked-in valuation interest rates, very impactful
- Interest rate shock sensitivities nearly drive total SS reserve requirement back to current framework level

<table>
<thead>
<tr>
<th>Waterfall Element</th>
<th>GPVANR / GPVAD ($000s)</th>
<th>Δ GPVAD ($000s)</th>
<th>Δ GPVAD (%)</th>
<th>Reserve ($000s)</th>
<th>Δ Reserve ($000s)</th>
<th>Δ Reserve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 5 – New withdrawal assumptions</strong></td>
<td>3,453</td>
<td></td>
<td></td>
<td>16,425,079</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 6 – New economic scenarios</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scenario 1 (equity shock only)</td>
<td>15,245</td>
<td>11,772</td>
<td>339%</td>
<td>16,436,870</td>
<td>11,772</td>
<td>0.1%</td>
</tr>
<tr>
<td>Scenario 2 (Interest rate shock only)</td>
<td>18,007</td>
<td>14,535</td>
<td>418%</td>
<td>16,439,633</td>
<td>14,535</td>
<td>0.1%</td>
</tr>
<tr>
<td>Scenario 3 (equity and interest rate shock)</td>
<td>23,873</td>
<td>20,400</td>
<td>587%</td>
<td>16,445,498</td>
<td>20,400</td>
<td>0.1%</td>
</tr>
</tbody>
</table>
# Proposed Standard Scenario Reform

## Waterfall Summary

<table>
<thead>
<tr>
<th>Waterfall Element</th>
<th>GPVANR / GPVAD ($000s)</th>
<th>Δ GPVAD ($000s)</th>
<th>Δ GPVAD (%)</th>
<th>Reserve ($000s)</th>
<th>Δ Reserve ($000s)</th>
<th>Δ Reserve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1 – Current Framework</strong></td>
<td>1,000</td>
<td></td>
<td></td>
<td>16,460,732</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2 – GPVAD + Starting Assets</strong></td>
<td>2,801</td>
<td>1,801</td>
<td>180%</td>
<td>16,424,427</td>
<td>(36,305)</td>
<td>-0.2%</td>
</tr>
<tr>
<td><strong>Step 3 – Proposed mortality &amp; improvement</strong></td>
<td>2,821</td>
<td>20</td>
<td>1%</td>
<td>16,424,446</td>
<td>20</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Step 4 – New base lapse and dynamics</strong></td>
<td>3,195</td>
<td>374</td>
<td>13%</td>
<td>16,424,820</td>
<td>374</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Step 5 – New withdrawal assumptions</strong></td>
<td>3,453</td>
<td>259</td>
<td>8%</td>
<td>16,425,079</td>
<td>259</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Step 6 – New economic scenarios</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ Scenario 1 (equity shock only)</td>
<td>15,245</td>
<td>11,772</td>
<td>339%</td>
<td>16,436,870</td>
<td>11,772</td>
<td>0.1%</td>
</tr>
<tr>
<td>▪ Scenario 2 (Interest rate shock only)</td>
<td>18,007</td>
<td>14,535</td>
<td>418%</td>
<td>16,439,633</td>
<td>14,535</td>
<td>0.1%</td>
</tr>
<tr>
<td>▪ Scenario 3 (equity and interest rate shock)</td>
<td>23,873</td>
<td>20,400</td>
<td>587%</td>
<td>16,445,498</td>
<td>20,400</td>
<td>0.1%</td>
</tr>
</tbody>
</table>
Summary
Summary

- Given ongoing nature of the proposed reform and QIS, have not incorporated hedging or aggregation into this analysis, but worthwhile to add once methods are finalized.

- Shifting from drop and recovery scenarios to three-scenario approach with forward interest rate recovery most impactful, based on illustrative example.
  - Potential to change given latest round of QIS, but notable nonetheless.

- New prescribed assumptions, particularly policyholder behavior related, may have significant impact on blocks of business heavily weighted towards GMWBs.

- Case study waterfall aimed to provide QIS and non-QIS participants alike with impact comparison to their own VA blocks of business.
Rick Hayes, ASA, MAAA, CERA
Senior Consultant

1800 McGill College Avenue, Montréal, H3A 3J6, Canada

T   +1 514 982 3031
E   Rick.Hayes@willistowerswatson.com
Our clients’ industries are extremely competitive, and the maintenance of confidentiality with respect to our clients’ plans and data is critical. Oliver Wyman rigorously applies internal confidentiality practices to protect the confidentiality of all client information.

Similarly, our industry is very competitive. We view our approaches and insights as proprietary and therefore look to our clients to protect our interests in our proposals, presentations, methodologies and analytical techniques. Under no circumstances should this material be shared with any third party without the prior written consent of Oliver Wyman.

© Oliver Wyman
Agenda

• Original 2016 recommendations and QIS2 timeline
• Recap stated purpose and target properties of the Standard Scenario
• Discuss alternative “self-calibrated” Standard Scenario market path construct
• Discuss other potential candidates for an alternative Standard Scenario construct
Timeframe for VA Reserve and Capital Reform “Quantitative Impact Study 2”

QIS II timeline

- **Start of QIS II**
- **June 9, 2017**
  - Discussions for Test Cycle 3 specifications begin
- **End of Cycle I**
  - “Stochastic test”
- **End of Cycle II**
  - “Standard Scenario” Test
- **End of Cycle III**
  - “Combined Test”
  - Presentation of final recommendations

Group meetings:
- **June 29**
  - Cycle 1 results
- **August 3**
  - Behavioral assumptions
- **Sept. 19**
  - Cycle 2 results
- **Oct. 31**
  - Cycle 3 results

Discussions with NAIC, regulators, and industry on QIS II conclusions and recommended framework revisions to be implemented.
## Summary of Oliver Wyman’s 2016 recommendations

<table>
<thead>
<tr>
<th>Ideas</th>
<th>Specific proposals</th>
</tr>
</thead>
</table>
| **1** Align economically-focused hedge assets with liability valuations | **1A** • Endorse hedge accounting for derivatives originated as part of a VA hedge program  
**1B** • Remove the Working Reserve when calculating scenario GPVAD  
**1C** • Permit simplified reflection of hedging in liability projections  
**1D** • Allow higher credit for liability projections with modeled CDHS, but require back-testing |
| **2** Reform Standard Scenarios (AG43 and C3 Phase II) | **2A** • Align AG43 Standard Scenario calculations more closely to the stochastic CTE framework  
**2B** • Remove the C3 Phase II Standard Scenario  
**2C** • Specify a fuller set of risk factors informed by prevailing conditions and test multiple paths  
**2D** • Refresh prescribed policyholder behavior assumptions to align with industry experience |
| Focus for today | |
| **3** Align TAR and reserves | **3A** • Require Starting Assets used in liability projections to remain close to the final reserve  
**3B** • Calculate C3 as the difference between reserves and a tail CTE on the same distribution |
| **4** Revise asset admissibility for derivatives and DTAs | **4A** • Increase admissibility limit for designated VA hedges  
**4B** • Increase admissibility limit for DTAs associated with VA portfolios |
| **5** Standardize capital markets assumptions | **5A** • Harmonize interest rate and general account net investment income assumptions  
**5B** • Evaluate alternative calibration criteria for equities and other market risk factors |
Recap of stated purpose and target properties of Standard Scenario
The VAIWG articulated the purpose of the Standard Scenario as governing company-defined model choices – not to add stringency to CTE scenarios.

VAIWG’s stated purposes for the Standard Scenario

- Govern company-defined modeling choices used in the CTE calculation
- Actuarial assumptions
- Model point compression
- Hedge program reflection

For effective governance, the Standard Scenario Amount should be binding if and only if:

- A company uses assumptions or practices that substantially deviate from industry experience or accepted practices
- Such deviations result in materially-lower CTE 70-based reserves

Accordingly, if the same actuarial assumptions, model points, and hedge reflections were used in both the Standard Scenario and CTE calculations, the Standard Scenario Amount should be slightly below CTE 70.
### Summary of revised AG43 Standard Scenario behavior assumptions

<table>
<thead>
<tr>
<th>Rider type</th>
<th>Sub-type</th>
<th>Partial withdrawal</th>
<th>Full surrender</th>
<th>Annuitzation</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standalone GMDB</td>
<td>Rollup</td>
<td>• [1.5%] of DB base p.a.</td>
<td>• [100%] of Standard ITM Table for Full Surrenders</td>
<td>• None</td>
<td>• 2012 IAM Basic</td>
</tr>
<tr>
<td></td>
<td>Non-rollup</td>
<td>• [3.0%] of DB base p.a.</td>
<td>• [75%] of Standard ITM Table for Full Surrenders</td>
<td></td>
<td>• Projection Scale G2; no improvement cap</td>
</tr>
<tr>
<td>GMAB</td>
<td>All</td>
<td>• [2.0%] of AB base p.a.</td>
<td>• [75%] of Standard ITM Table for Full Surrenders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional GMIB</td>
<td>Rollup</td>
<td>• [1.0%] of IB base p.a.</td>
<td>• [100%] of Standard ITM Table for Full Surrenders</td>
<td>• Follows Standard ITM Table for Annuitzations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-rollup</td>
<td>• [2.0%] of IB base p.a.</td>
<td>• [100%] of Standard ITM Table for Annuitzations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid, or “dollar-for-dollar” GMIB</td>
<td>All</td>
<td>• Cumulative withdrawal rates developed using GAPV-based method • [90%] of guaranteed max after withdrawals begin</td>
<td>• [100%] of Standard ITM Table if not withdrawing • [75%] of Standard ITM Table after withdrawing, subject to a 1.0% floor</td>
<td>• Follows Standard ITM Table when the GMIB is more valuable than a comparable GMWB</td>
<td></td>
</tr>
<tr>
<td>Non-lifetime GMWB</td>
<td>All</td>
<td>• [100%] guaranteed max after account depletion</td>
<td></td>
<td>• None</td>
<td></td>
</tr>
<tr>
<td>Lifetime GMWB</td>
<td>All</td>
<td>• [N/A]</td>
<td>• First year post-CDSC: • First year eligible:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard ITM Table</td>
<td>For Full Surrenders and Annuitzations</td>
<td></td>
<td>• First year post-CDSC: • First year eligible:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– Min. when ITM: [2%] • – Min. when ITM: [5%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– Max. when OTM: [30%] • – Max. when ITM: [25%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Subsequent years: • Subsequent years:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– Min. when ITM: [1%] • – Min. when ITM: [2.5%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– Max. when OTM: [15%] • – Max. when ITM: [12.5%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• In CDSC period: [2%] • Last exercise date: [30%]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** ITM under the revised assumptions is calculated differently from the current AG43 Standard Scenario and depends on the product – see subsequent pages for specifications.
Two target properties for the Standard Scenario construct to meet purpose (1/2)

Target Property #1

... Standard Scenario Amount should be slightly below CTE 70 for most companies in industry

A suitable Standard Scenario construct should be effective in governing most, if not all, of the in-force portfolios within the scope of AG 43

- If Standard Scenario Amount is too far below CTE 70, it may not strengthen reserves even if a company’s own assumptions were materially deviant
- If Standard Scenario Amount exceeds CTE 70, it forces a company with reasonable assumptions to hold a reserve that is more conservative than the CTE 70-level

Target Property #2

... for a given company, Standard Scenario Amount should have similar market-sensitivity as CTE 70

A suitable Standard Scenario construct should ensure effective assumption governance – which requires staying close to CTE 70 – across all market conditions

- Ensures that Target Property #1 can be satisfied under all valuation date market conditions
- If the Standard Scenario Amount has a different market-sensitivity than CTE 70, Target Property #1 will eventually be breached under some market conditions
Two target properties for the Standard Scenario construct to meet purpose (2/2)

If target properties are **not** met (e.g., current framework)
Reserves across different market conditions

**Sample company with actuarial assumptions that are materially less conservative than those in the Standard Scenario**

If target properties are **met**
Reserves across different market conditions

If target properties are **not** met (e.g., current framework)

If target properties are **met**

**Reserves evolution through time**

**Reserve**

**Interest rates**

**If target properties are not met (e.g., current framework)**

**Reserves evolution through time**

**Reserve**

**Time**

**SSA << CTE 70 and is therefore ineffective at assumption governance**

**If target properties are met**

**Reserve**

**Time**

**SSA exceeds CTE 70 by a consistent amount**

- Allows effective assumption governance in all market conditions
- Easier to hedge market sensitivity of reserves without need for captives

**Evolution of SSA is similar to CTE 70, allowing effective assumption governance throughout portfolio lifetime**

**Reserve**

**Interest rates**

**Reserve**

**CTE 70**

**Standard Scenario Amt.**

**CTE 70**

**Standard Scenario Amt.**

**Reserve**

**Time**

**SSA >> CTE 70, penalizing all companies – incl. those with reasonable assumptions**

**Difficult for companies to hedge point where SSA and CTE 70 switch**

© Oliver Wyman
2 Standard Scenario testing
QIS “Cycle II” tested 52 market paths, generated via three constructs

<table>
<thead>
<tr>
<th>Scenario construct</th>
<th>Initial stress</th>
<th>Subsequent market path</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> “Intrinsic value” with bond spread</td>
<td>• One path tested with no stress</td>
<td>• Equity returns follow the implied forward curve as of the Valuation Date</td>
</tr>
<tr>
<td></td>
<td>• Remaining paths have equity and interest rate stress in the first projection year</td>
<td>• Bond returns incorporate 100 bps p.a. of earned spread, reflecting a ~50/50 Aa2/A2 credit quality</td>
</tr>
<tr>
<td><strong>B</strong> Stress and constant rate of recovery</td>
<td>• Equity and interest rate stress in the first projection year</td>
<td>• Equity returns follow a constant rate p.a.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bond returns follow mean interest rate path from the Academy IR generator, with 100 bps p.a. of earned spread</td>
</tr>
<tr>
<td><strong>C</strong> Paths corresponding to specific percentiles of stochastic scenarios</td>
<td>• Cumulative returns for equity and bond funds are consistent with specified percentiles, derived from the Academy’s pre-packaged scenarios, at all projection intervals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Interest rates follow the mean interest rate path from the Academy IR generator</td>
<td></td>
</tr>
</tbody>
</table>
Results for each market path were compared against CTE results to identify the “equivalent CTE”

**Standard Scenario projections tested**
Conducted in Cycle 2 with companies’ own actuarial assumptions

- In-force contracts
- Actuarial assumptions
- Hedge reflection
- Single market path

**Stochastic CTE projections tested**
Conducted in Cycle 1 – i.e., including OW recommendations

- In-force contracts
- Actuarial assumptions
- Hedge reflection
- Stochastic market paths

**Equivalent CTE**: the CTE level – applied to the distribution of GPVADs from the stochastic calculation – that equals the Standard Scenario Amount

**Identical between Standard Scenario and CTE**
- Standard Scenario calculation only
- Stochastic CTE calculation only

© Oliver Wyman
For a given market path tested, we then plotted the distribution of “equivalent CTEs” of the resultant Standard Scenario Amounts across the industry.

Distribution of “equivalent CTEs” across participants

X-axis: market conditions on valuation date:
- Up IR: interest rates +300 bps
- Dn IR: interest rates -100 bps
- Dn All: equities -40%, interest rates -100 bps

Desirable property #1 – most, if not all, companies have equivalent CTE between 50-70

Desirable property #2 – distribution of “equivalent CTE” groups stays constant across market conditions

Valuation date market conditions

Different colored bars represent different CTE equivalency ranges
3 Alternative Standard Scenario framework
3. Alternative Standard Scenario framework

We propose to focus Standard Scenario on governing actuarial assumptions and model point compression, but leave CDHS governance to the “E factor”

VAIWG’s stated purposes for the Standard Scenario

- Govern actuarial assumptions used in CTE calculation
- Govern model point compression practices used in CTE calculation
- Govern hedge reflection in CTE calculation

Means for addressing in the proposed framework

- **Governed via the Standard Scenario**
  - All actuarial assumptions in the Standard Scenario are fully prescribed
  - Standard Scenario calculation should be conducted on a seriatim basis – i.e., without using compressed model points that incorporate multiple contracts
- Additional Reserve calculated as difference between Standard Scenario Amount and CTE (adjusted), then added onto CTE (reported)
- Results in a consistent amount of reserves to be held above CTE (reported) if company assumptions are more aggressive than prescribed

- **Standard Scenario conducted without CDHS reflection**
- **Explicit governance of CDHS conducted via the “E factor”**
  - “E factor” already governs model risk in CDHS reflection
  - Avoids interactions between “E factor” and Standard Scenario
  - Allows Standard Scenario to focus on achieving one purpose

- Discussed further in next section
To govern actuarial assumptions robustly for each company, the Standard Scenario path should be calibrated to each company’s portfolio composition.

Consider three types of VA contracts found across the industry today …
All three types of contracts currently exist in industry in-force.

- **Invested primarily in equity funds**
- **Invested primarily in bond funds or fixed account**
- **New VAs sensitive to equity outperformance**

For each type of contract, the relationships between CTE reserve and performance metrics (Equity and IR performance) are illustrated.
Theory supports a company-specific initial market shock

Potential alternative Standard Scenario market path construct
Based on company-specific calibrations

### Stress period
- Initial stress occurring over full year, calibrated on a company-specific basis
- Calibrated such that Standard Scenario Amount is between CTE 65-70 from the “adjusted” run – i.e., no CDHS – when using Prudent Estimate assumptions
- Hedge reflection should be consistent with “adjusted” CTE run – i.e., run-off of currently-held hedges only; no CDHS

### Recovery period
- Uniform prescribed market path
  - Separate account returns follow constant p.a. returns
  - Interest rates follow “mean path” from Academy ESG, reverting back to the NAIC-defined MRP
- Run-off of currently-held hedges only
Under this proposal, companies would run a standard set of paths under own assumptions, then re-run “equivalent” scenario with prescribed assumptions.

### 1. Run standard set of market paths with companies’ own assumptions

<table>
<thead>
<tr>
<th>Stress</th>
<th>Recovery</th>
<th>SSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>2</td>
<td>-2%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>3</td>
<td>-4%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>4</td>
<td>-6%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>5</td>
<td>-8%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>6</td>
<td>-10%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>7</td>
<td>-12%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>8</td>
<td>-14%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>9</td>
<td>-16%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>10</td>
<td>-18%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>11</td>
<td>-20%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>12</td>
<td>-22%</td>
<td>3.0% p.a.</td>
</tr>
</tbody>
</table>

### 2. Select market path with result closest to but below CTE 65

- **Standard Scenario Amount (Step 2)**
  - Standard Scenario: 210
  - CTE 65 ("adjusted run"): 220

### 3. Re-run under prescribed behavioral assumptions

- **Standard Scenario Amount (Step 3)**: 270
- **Additional Reserve**: 20

**Final reserve requirement** equals: CTE(Reported) + max(0, Additional Reserve)
As a portfolio characteristics change – e.g., as the portfolio ages or after a market shock, the CTE 65-equivalent scenario shifts correspondingly.

### Run standard set of market paths with companies’ own assumptions

<table>
<thead>
<tr>
<th>Stress</th>
<th>Recovery</th>
<th>SSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>2</td>
<td>-2%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>3</td>
<td>-4%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>4</td>
<td>-6%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>5</td>
<td>-8%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>6</td>
<td>-10%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>7</td>
<td>-12%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>8</td>
<td>-14%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>9</td>
<td>-16%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>10</td>
<td>-18%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>11</td>
<td>-20%</td>
<td>3.0% p.a.</td>
</tr>
<tr>
<td>12</td>
<td>-22%</td>
<td>3.0% p.a.</td>
</tr>
</tbody>
</table>

### Select market path with result closest to but below CTE 65

- **CTE 65 (“adjusted run”)**
  - 570

### Re-run under prescribed behavioral assumptions

- **CTE 70 (“adjusted run”)**
  - 600

### Additional Reserve

- 30

### Final reserve requirement equals:

$$\text{CTE(Reported)} + \max(0, \text{Additional Reserve})$$
The difference between CTE 65 and 70 represents a “benefit of doubt” buffer; size of this buffer determines definition of “outlier” caught by Std. Scenario

Illustrative Standard Scenario results
For a sample company for which the Standard Scenario is binding

- **CTE 70**
- **CTE 65**

**Standard Scenario**
- Prescribed assumptions
- Company assumptions

**Additional Reserve**
Amount added to CTE (reported)

**Buffer: non-binding region**
Prevents Standard Scenario from becoming binding as a result of small assumption differences that do not drive material impact to overall funding requirements
The proposed construct satisfies both target properties per the VAIWG

Assuming that the same actuarial assumptions, model points, and hedge reflections were used in both the Standard Scenario and CTE calculations across the industry at all times, then ...

Target Property #1

... Standard Scenario Amount should be slightly below CTE 70 for most companies in industry

A suitable Standard Scenario construct should be effective in governing most, if not all, of the in-force portfolios within the scope of AG 43

The market path selected for Standard Scenario Amount – from the panel of standardized paths – is based on each company's own CTE 65

Target Property #2

... for a given company, Standard Scenario Amount should have similar market-sensitivity as CTE 70

A suitable Standard Scenario construct should ensure effective assumption governance – which requires staying close to CTE 70 – across all market conditions

The market path is re-selected on every valuation date, thereby ensuring that Standard Scenario Amount has the same sensitivity as CTE 65
Other Standard Scenario constructs were evaluated, with the company-specific path (Option C) and Stochastic (Option D) gaining the most traction.

- **A** Current Standard Scenario construct
- **B** Revised Standard Scenario construct recommended in 2016, with different market paths that are still standardized across industry
- **C** Revised Standard Scenario construct recommended in 2016, but with market paths that are company-specific
- **D** Stochastic CTE with prescribed actuarial assumptions, but calculated at a lower CTE level
This report is for the exclusive use of the Oliver Wyman client named herein. This report is not intended for general circulation or publication, nor is it to be reproduced, quoted or distributed for any purpose without the prior written permission of Oliver Wyman. There are no third party beneficiaries with respect to this report, and Oliver Wyman does not accept any liability to any third party.

Information furnished by others, upon which all or portions of this report are based, is believed to be reliable but has not been independently verified, unless otherwise expressly indicated. Public information and industry and statistical data are from sources we deem to be reliable; however, we make no representation as to the accuracy or completeness of such information. The findings contained in this report may contain predictions based on current data and historical trends. Any such predictions are subject to inherent risks and uncertainties. Oliver Wyman accepts no responsibility for actual results or future events.

The opinions expressed in this report are valid only for the purpose stated herein and as of the date of this report. No obligation is assumed to revise this report to reflect changes, events or conditions, which occur subsequent to the date hereof.

All decisions in connection with the implementation or use of advice or recommendations contained in this report are the sole responsibility of the client. This report does not represent investment advice nor does it provide an opinion regarding the fairness of any transaction to any and all parties.