Session 67PD: Impact of VM-20 on Product Development: SOA Research

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Presenters:
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Uri Sobel FSA, MAAA
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Agenda

- Phase 2 Case Studies
- Phase 2 Interviews
- Observations / Commentary / Impacts
- Links to Research Reports
Phase 2

- Phase 2 expands on the Phase 1 case studies to include the following situations:
  - Small company with limited data
  - Simplified issue term product
  - Guaranteed YRT premiums
  - Level term product with post-level-term projection
  - 30-year level term product
  - Short pay ULSG product
Deterministic Reserve Attribution

- **DR Baseline**: DR from the Phase 1 Situation 5

- **DR1 Remove Mortality Margins**: For each future DR calculation, mortality improvement is included in cash flows beyond the valuation date, or node, and the VM-20 margin is omitted. This effectively brings the mortality assumption back to the company’s anticipated experience. Note that for Phase 1 term, because of the assumed availability of credible mortality data, there was no grading to industry tables over the level term period.

- **DR2 Remove Lapse Margins**: Starting with DR1 assumptions, the lapse margin is omitted from the inner loop cash flows

- **DR3 Remove Expense Margin**: Starting with DR2 assumptions, the expense margin is omitted from the inner loop cash flows

- **DR4 4% Discount Rate**: Starting with DR3 assumptions, the Deterministic Reserve discount rate is assumed to be 4% level
Term Phase 1 Case Study: DR Attribution

Term DR Attribution

- **DR1**: Remove mortality margins
- **DR2**: Remove lapse margins
- **DR3**: Remove expense margin
- **DR4**: Level discount rate (4%)
ULSG Phase 1 Case Study: DR Attribution

1. DR1: Remove mortality margins
2. DR2: Remove lapse margins
3. DR3: Remove expense margin
4. DR4: Level discount rate (5.2%)
The Phase 1 case studies reflected characteristics of a large company in that the mortality experience was assumed to be fully credible with a 15-year sufficient data period.

<table>
<thead>
<tr>
<th>Step</th>
<th>Acquisition Expense per Unit</th>
<th>Mortality Credibility &amp; Sufficient Data Period</th>
<th>Reinsurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>$0.20</td>
<td>100% and 15 years</td>
<td>Non-Guaranteed YRT, $1,000,000 Retention</td>
</tr>
<tr>
<td>Step 1</td>
<td>$1.00</td>
<td>100% and 15 years</td>
<td>Non-Guaranteed YRT, $1,000,000 Retention</td>
</tr>
<tr>
<td>Step 2</td>
<td>$1.00</td>
<td>28% and 3 years</td>
<td>Non-Guaranteed YRT, $1,000,000 Retention</td>
</tr>
<tr>
<td>Step 3</td>
<td>$1.00</td>
<td>28% and 3 years</td>
<td>80% Coinsurance with $100,000 limit on retention* Expense allowances are 100% first year, 11% renewal years</td>
</tr>
</tbody>
</table>
# Term: Small Company Pricing Results

<table>
<thead>
<tr>
<th>Small Company 20 Year Level Term</th>
<th>Pretax Profit Margin&lt;sup&gt;1&lt;/sup&gt;</th>
<th>After-Tax Profit Margin&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Adjusted After-Tax Profit Margin&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Surplus Strain</th>
<th>IRR Adjusted After-Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-Band Model Office</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 1 Situation 5</td>
<td>19.9%</td>
<td>11.9%</td>
<td>6.7%</td>
<td>-147%</td>
<td>10.4%</td>
</tr>
<tr>
<td>Step 1: Increase Per Unit Acquisition to $1.00</td>
<td>14.7%</td>
<td>8.5%</td>
<td>3.3%</td>
<td>-178%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Step 2: Inner loop mortality 28% credibility; 3 Yr SDP</td>
<td>14.7%</td>
<td>1.0%</td>
<td>-4.5%</td>
<td>-472%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Step 3: Coinsurance</td>
<td>8.1%</td>
<td>1.9%</td>
<td>-0.5%</td>
<td>-75%</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

<sup>1</sup> Pretax profit margin is calculated with discount at the pretax net investment earnings rate (NIER).

<sup>2</sup> After-tax profit margin is calculated with discount at the pretax NIER.

<sup>3</sup> Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pretax NIER.
Term Small Company: Reserve Levels

- Step 1: Higher Acquisition Expenses
- Step 2: Lower Mortality Credibility
- Step 3: Coinsurance

20-Year Plan $350k
20-Year Term, Low Band

Phase 1 DR
Phase 1 NPR
Step 1\(^1\) DR
Step 2\(^2\) DR
Step 3\(^3\) DR
Step 3 NPR
XXX 2017 CSO

\(^1\)Step 1: Higher Acquisition Expenses
\(^2\)Step 2: Lower Mortality Credibility
\(^3\)Step 3: Coinsurance
## Small Company Sensitivity - ULSG

<table>
<thead>
<tr>
<th>ULSG with Level Premiums for Coverage to A110</th>
<th>PT Profit Margin*</th>
<th>AT Profit Margin**</th>
<th>Adjusted AT Profit Margin***</th>
<th>Surplus Strain</th>
<th>IRR Adjusted After-Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Band Model Office</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1) Phase 1 Pricing Situation 5</td>
<td>19.5%</td>
<td>4.4%</td>
<td>2.6%</td>
<td>-285%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Step 2) Small Company Reserve Assumptions</td>
<td>18.5%</td>
<td>-1.1%</td>
<td>-3.0%</td>
<td>-503%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Step 3) Small Company with Coinsurance</td>
<td>4.9%</td>
<td>2.5%</td>
<td>2.3%</td>
<td>-31%</td>
<td>13.4%</td>
</tr>
</tbody>
</table>

*Pre-tax profit margin is calculated with discount at the pre-tax NIER
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*** Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pre-tax NIER
Small Company Sensitivity - ULSG

Small Company Reserve Patterns - $1.2M Band

- Small Co w Coin DR
- Small Co NPR
- Phase 1 with Coin

Preliminary Draft - Subject to Change
# Guaranteed YRT Sensitivity

<table>
<thead>
<tr>
<th>Term</th>
<th>Outer Loop</th>
<th>Inner Loop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>Company anticipated experience, includes improvement into future</td>
<td>Company anticipated experience with VM-20 margin, but assuming improvement only to the point of valuation, i.e. the future node</td>
</tr>
<tr>
<td>YRT premiums – Baseline with $200,000 retention (YRT premiums not guaranteed)</td>
<td>YRT premiums are assessed at a level equal to 110% of the mortality rates in the outer loop</td>
<td>DR calculation assumes YRT premiums equal to 110% of the mortality level in the inner loop which includes the VM-20 margin and improvement only to the point of valuation, i.e. the future node</td>
</tr>
<tr>
<td>YRT premiums – Guaranteed 120%</td>
<td>YRT premiums are assessed at a level equal to 120% of the mortality rates in the outer loop</td>
<td>DR calculation assumes YRT charge level equal to 120% of the best estimate mortality rates, therefore the inner loop YRT premiums are the same as the outer loop YRT premiums</td>
</tr>
</tbody>
</table>
## Guaranteed YRT Sensitivity - ULSG

<table>
<thead>
<tr>
<th>ULSG with Level Premiums for Coverage to A110</th>
<th>PT Profit Margin*</th>
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</tr>
<tr>
<td>Situation 5 from Phase 1 report</td>
<td>19.5%</td>
<td>4.4%</td>
<td>2.6%</td>
<td>-285%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Revised Baseline with $200,000 retention</td>
<td>14.0%</td>
<td>-2.6%</td>
<td>-4.2%</td>
<td>-393%</td>
<td>4.6%</td>
</tr>
<tr>
<td>YRT premiums at 120% of expected mortality</td>
<td>10.1%</td>
<td>4.9%</td>
<td>3.7%</td>
<td>-64%</td>
<td>13.9%</td>
</tr>
</tbody>
</table>

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Guaranteed YRT Sensitivity - ULSG

Total VM-20 ULSG Reserve - Guaranteed YRT Study

- Increased Reinsurance (New Baseline)
- Guaranteed YRT
## Guaranteed YRT Sensitivity – 20 Year Term

<table>
<thead>
<tr>
<th>Term</th>
<th>PT Profit Margin*</th>
<th>AT Profit Margin**</th>
<th>Adjusted AT Profit Margin***</th>
<th>Surplus Strain</th>
<th>IRR Adjusted After-Tax</th>
</tr>
</thead>
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<tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Situation 5 from Phase 1 report</td>
<td>19.9%</td>
<td>11.9%</td>
<td>6.7%</td>
<td>-147%</td>
<td>10.4%</td>
</tr>
<tr>
<td>Revised Baseline with $200,000 retention</td>
<td>12.9%</td>
<td>7.1%</td>
<td>5.8%</td>
<td>-55%</td>
<td>15.0%</td>
</tr>
<tr>
<td>YRT premiums at 120% of expected mortality</td>
<td>7.2%</td>
<td>3.6%</td>
<td>2.4%</td>
<td>-55%</td>
<td>11.7%</td>
</tr>
</tbody>
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Guaranteed YRT Sensitivity – 20 Year Term

20-year Plan $1.2 MM
DR, NPR

- DR Baseline ($200K retention)
- DR 120%²
- NPR
## Simplified Issue – 20-year Term Single Cell

<table>
<thead>
<tr>
<th>Simplified Issue (Single Cell) 20-year Term</th>
<th>Pretax Profit Margin¹</th>
<th>After-Tax Profit Margin²</th>
<th>Adjusted After-Tax Profit Margin³</th>
<th>Surplus Strain</th>
<th>IRR Adjusted After-Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1, Situation 3</td>
<td>20.9%</td>
<td>12.8%</td>
<td>8.5%</td>
<td>-164%</td>
<td>8.3%</td>
</tr>
<tr>
<td>SI_1: SI Experience Assumptions</td>
<td>-53.1%</td>
<td>-37.3%</td>
<td>-40.7%</td>
<td>-356%</td>
<td>-13.6%</td>
</tr>
<tr>
<td>SI_2: $100,000 Average Policy Size; Higher Per Unit Premium</td>
<td>10.9%</td>
<td>6.3%</td>
<td>4.8%</td>
<td>-120%</td>
<td>8.8%</td>
</tr>
<tr>
<td>SI_3: Implement VM-20 Reserves</td>
<td>10.9%</td>
<td>6.1%</td>
<td>4.6%</td>
<td>-120%</td>
<td>10.6%</td>
</tr>
</tbody>
</table>

¹ Pretax profit margin is calculated with discount at the pretax net investment earnings rate (NIER).
² After-tax profit margin is calculated with discount at the pretax NIER.
³ Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pretax NIER.
Simplified Issue VM-20 Impact

![Simplified Issue Single Cell](image)

- **SI_1¹**: Simplified issue assumptions
- **SI_2²**: Simplified issue average size and premiums
- **SI_3³**: Simplified issue VM-20

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**Notes**

1. SI_1: Simplified issue assumptions
2. SI_2: Simplified issue average size and premiums
3. SI_3: Simplified issue VM-20
Simplified Issue VM-20 Impact

- DR is negative at issue because the cell has been priced for statutory profit
- NPR prevails from issue until the 6th duration
- Reserve build up is delayed compared to XXX
- DR is higher than NPR reserve after duration 6 which creates tax inefficiencies during those years

Other considerations:
- Is 2017 CSO appropriate table to use
- What if mortality expectations are higher than any available industry tables?
- With partial credibility, the company must choose what table to grade to
- How does the actuary demonstrate a mapping to the industry table?
## 30 Year Term Case Study: Pricing Results

### Low Band, Single Cell

<table>
<thead>
<tr>
<th>30-Year Term (Single Cell)</th>
<th>Pretax Profit Margin(^1)</th>
<th>After-Tax Profit Margin(^2)</th>
<th>Adjusted After-Tax Profit Margin(^3)</th>
<th>Surplus Strain</th>
<th>IRR Adjusted After-Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell: Issue age 45 Male N3, $350,000 Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Situation 3) XXX Stat/Tax, 2017 CSO</td>
<td>25.2%</td>
<td>14.8%</td>
<td>12.4%</td>
<td>-351%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Situation 5) VM-20 NPR+DR Excess Stat, NPR Tax, 2017 CSO</td>
<td>25.2%</td>
<td>15.7%</td>
<td>13.5%</td>
<td>-112%</td>
<td>15.0%</td>
</tr>
</tbody>
</table>

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2. After-tax profit margin is calculated with discount at the pretax NIER.
3. Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pretax NIER.
## Short Pay - ULSG

<table>
<thead>
<tr>
<th>ULSG - Short Pay Single Cell</th>
<th>PT Profit Margin*</th>
<th>AT Profit Margin**</th>
<th>Adjusted AT Profit Margin***</th>
<th>Surplus Strain</th>
<th>IRR Adjusted After-Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Level Pay 55 MN</td>
<td>30.4%</td>
<td>15.5%</td>
<td>14.0%</td>
<td>-61%</td>
<td>15.4%</td>
</tr>
<tr>
<td>2) Ten Pay 55 MN</td>
<td>22.3%</td>
<td>12.9%</td>
<td>10.9%</td>
<td>-94%</td>
<td>10.2%</td>
</tr>
<tr>
<td>3) Single Pay MN</td>
<td>27.2%</td>
<td>16.9%</td>
<td>15.0%</td>
<td>-11%</td>
<td>19.8%</td>
</tr>
</tbody>
</table>

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Short Pay Study - ULSG

Total VM-20 Reserve - Short Pay Study

Level Pay  Ten Pay  Single Pay
Phase 2 – Interviews

- One hour discussions with product development actuaries
- Fourteen different companies
- Consistent set of open-ended questions
Phase 2 – Interviews

- Preparedness
- Implementation
- Collaboration
- Pricing
- Process
- Simplifications
Phase 2 – Interviews (Preparedness)

- VM-20 “Czar” or special VM-20 committee.
- Valuation area lead effort in some companies. In others, pricing lead.
- Companies doing AG48 reserve financing ahead and valuation focused.
- Resources: conferences, webinars, boot camps, and pilot studies, individual reading, outside consultants.
- Many companies doing trial runs with VM-20, but only a few planning product launches in 2017 or early 2018. Term likely to come before ULSG.
- VM-20 may eventually produce Term and ULSG product design changes, but no company indicated they worked through all the details. Most taking a “wait-and-see” approach.
Phase 2 – Interviews (Implementation Concerns)

- Fluctuation of reserves and profits
  - Unlocking of assumptions and potential future changes in methodology
  - Explaining movements to senior management

- Definition of tax reserves

- Guidance for assumptions and margins, particularly for newer features and underwriting regimes with limited experience (e.g., accelerated underwriting)

- Lower profitability
  - Small companies with limited or near-zero credibility
  - Companies currently engaged in reserve financing

- Allocation of VM-20 excess reserves to profit cells
Phase 2 – Interviews (Implementation Concerns, cont.)

- Complexity of calculations
  - Most systems can handle, but effort still required: upgrading, custom coding, training
  - Separate inner-loop versus outer-loop assumptions
  - Auditability
  - Coordinating multiple systems (e.g., NPR versus DR and SR)
  - Moving to asset / liability approach (for companies previously using liability only)
  - Runtime

- Longer time-to-market in initial years following VM-20 implementation
Phase 2 – Interviews (Collaboration)

- Almost all companies noted increased cooperation and communication between company areas:
  - Pricing and Valuation
  - Corporate
  - Modeling
  - Tax
- Promote consistency in assumptions
- More cross functional meetings, work groups, and governance committees
  - Variety of levels of formality
- Common theme: VM-20 accelerating or strengthening already existing governance structures and plans
Phase 2 – Interviews (Changes to Pricing Process)

- Same basic steps to pricing process as currently
- Slower process expected, at least initially, due to:
  - Collaboration / Communication (interdepartmental, regulators, reinsurers)
  - Initial decision-making regarding various aspects of VM-20 calculations
  - Increased runtime
  - More sensitivity testing
  - More challenging auditing and validation
  - More reserves to calculate than currently (NPR, DR, SR)
- Potential adjustments to reinsurance agreements/rates; reinsurer input being sought more often throughout pricing process
- Stochastic pricing exacerbates the challenges
Phase 2 – Interviews (Anticipated Simplifications)

Likely to start with fewer shortcuts and after gauging materiality

- Liability grouping, cluster modeling, asset grouping
- Setting certain assumptions in the outer loop equal to the VM-20 compliant assumptions of the inner loop
- Using an aggregate margin rather than margins on specific assumptions
- Calculate DR discount rates and SR only at selected nodes
- Assume no changes to future credibility or sufficient data period
- Particularly for sensitivity testing, use relationship between DR and SR to approximate the SR, or only change outer loop assumptions
VM-20 Research Wrap Up – Phase 1

- Term, not Financed: PBR increases internal rates of return (IRRs)
- Term, Financed: PBR decreases internal rates of return (IRRs)
- ULSG, not Financed: PBR has no material impact internal rates of return (IRRs)
- ULSG, Financed: PBR decreases internal rates of return (IRRs)
- Companies that finance statutory reserves may have incentive to delay implementation
- The intuitive idea of PBR reducing reserves and therefore premiums is not a given under VM-20
VM-20 Research Wrap Up – Phase 2 Case Studies

- For both term and ULSG, moving from anticipated experience mortality to VM-20 mortality assumptions had the biggest impact on the level of reserves.
- Small Company Study: Deterministic Reserves is as great as, or greater than, XXX reserves in many durations.
- Guaranteed YRT case studies produced different results for the term and ULSG products.
- SI: VM-20 reserving methods may improve IRR compared to Model 830 methods.
VM-20 Research Wrap Up – Phase 2 Industry Interviews

- Even mix between the pricing and valuation areas regarding where VM-20 expertise resided
- Higher level of unpredictability and fluctuation in their reserves and anticipated profits under VM-20
- Intensiveness and complexity of the computations necessary for VM-20
- Lower anticipated profitability upon moving to VM-20 reserving
- “Wait-and-see” approach on product design changes
- Not much thought to “other” products in a VM-20 context
Links to Research Reports

Complete research reports can be found here:

- **Phase 1:**

- **Phase 2:**