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

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# Impact of VM-20 on Product Development SOA Research

## Valuation Actuary Symposium, 2017

Kelly Rabin, Karen Rudolph, Uri Sobel, Andrew Steenman

August 29, 2017

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# Agenda

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

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## Phase 2

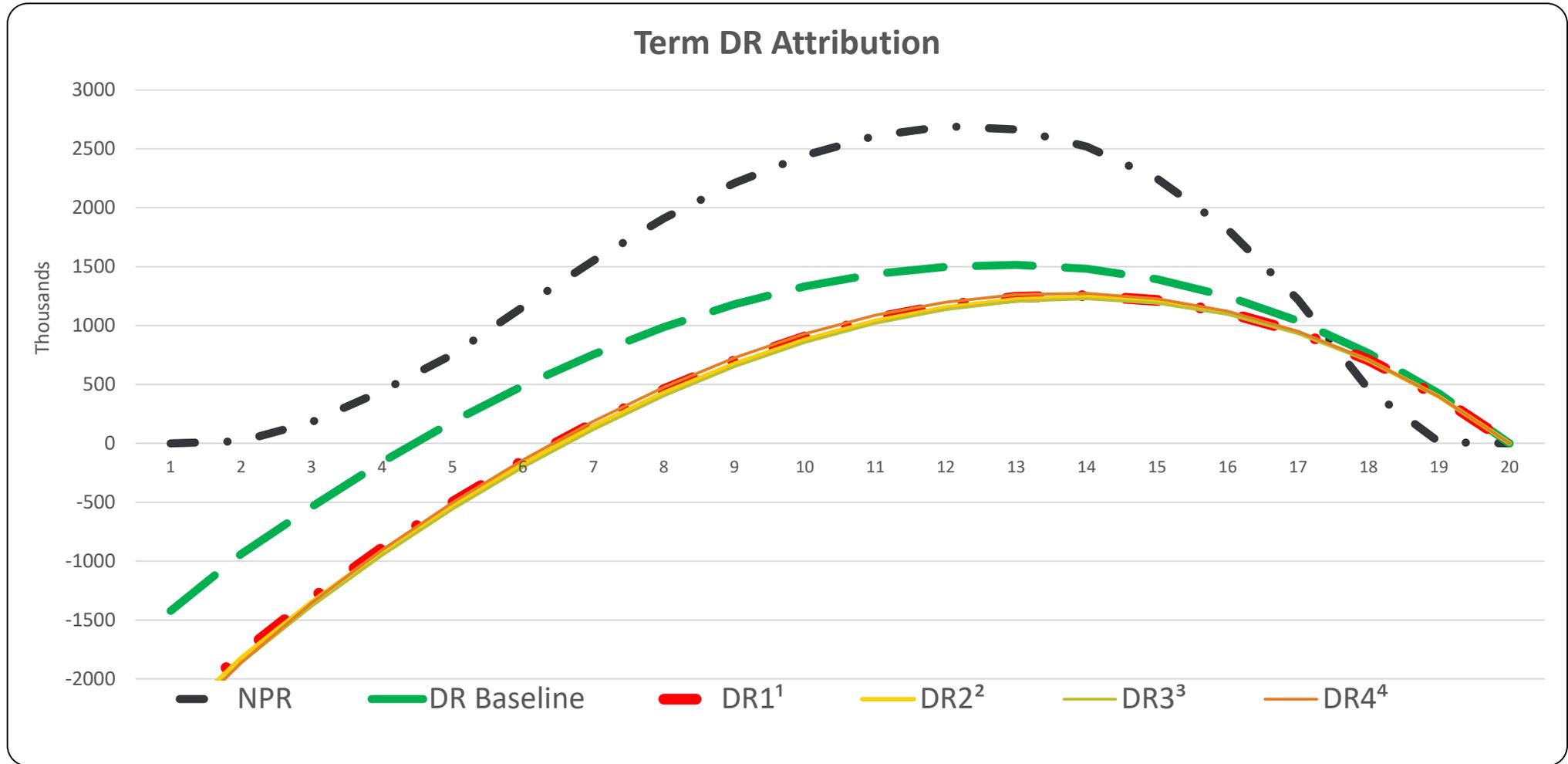
- Phase 2 expands on the Phase 1 case studies to include the following situations:
  - Small company with limited data
  - Simplified issue term product
  - Guaranteed YRT premiums
  - Level term product with post-level-term projection
  - 30-year level term product
  - Short pay ULSG product

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# Deterministic Reserve Attribution

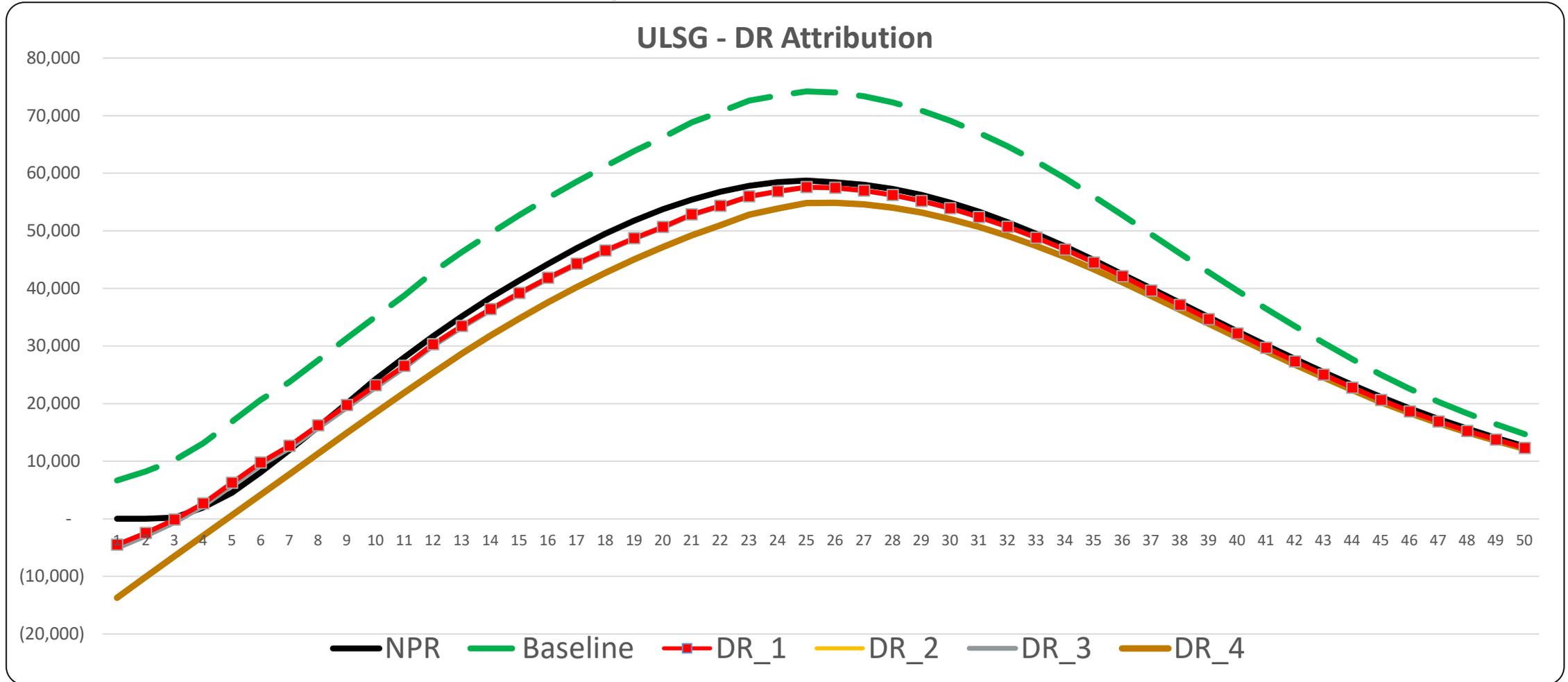
- **DR Baseline:** DR from the Phase 1 Situation 5
- **DR1 Remove Mortality Margins:** For each future DR calculation, mortality improvement is included in cash flows beyond the valuation date, or node, and the VM-20 margin is omitted. This effectively brings the mortality assumption back to the company's 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



- <sup>1</sup> DR1: Remove mortality margins
- <sup>2</sup> DR2: Remove lapse margins
- <sup>3</sup> DR3: Remove expense margin
- <sup>4</sup> DR4: Level discount rate (4%)

# ULSG Phase 1 Case Study: DR Attribution



- <sup>1</sup> DR1: Remove mortality margins
- <sup>2</sup> DR2: Remove lapse margins
- <sup>3</sup> DR3: Remove expense margin
- <sup>4</sup> DR4: Level discount rate (5.2%)

# Small Company Case Study

- 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

Step	Acquisition Expense per Unit	Mortality Credibility & Sufficient Data Period	Reinsurance
Phase 1	\$0.20	100% and 15 years	Non-Guaranteed YRT, \$1,000,000 Retention
Step 1	<b>\$1.00</b>	100% and 15 years	Non-Guaranteed YRT, \$1,000,000 Retention
Step 2	\$1.00	<b>28% and 3 years</b>	Non-Guaranteed YRT, \$1,000,000 Retention
Step 3	\$1.00	28% and 3 years	80% Coinsurance with \$100,000 limit on retention* Expense allowances are 100% first year, 11% renewal years

# Term: Small Company Pricing Results

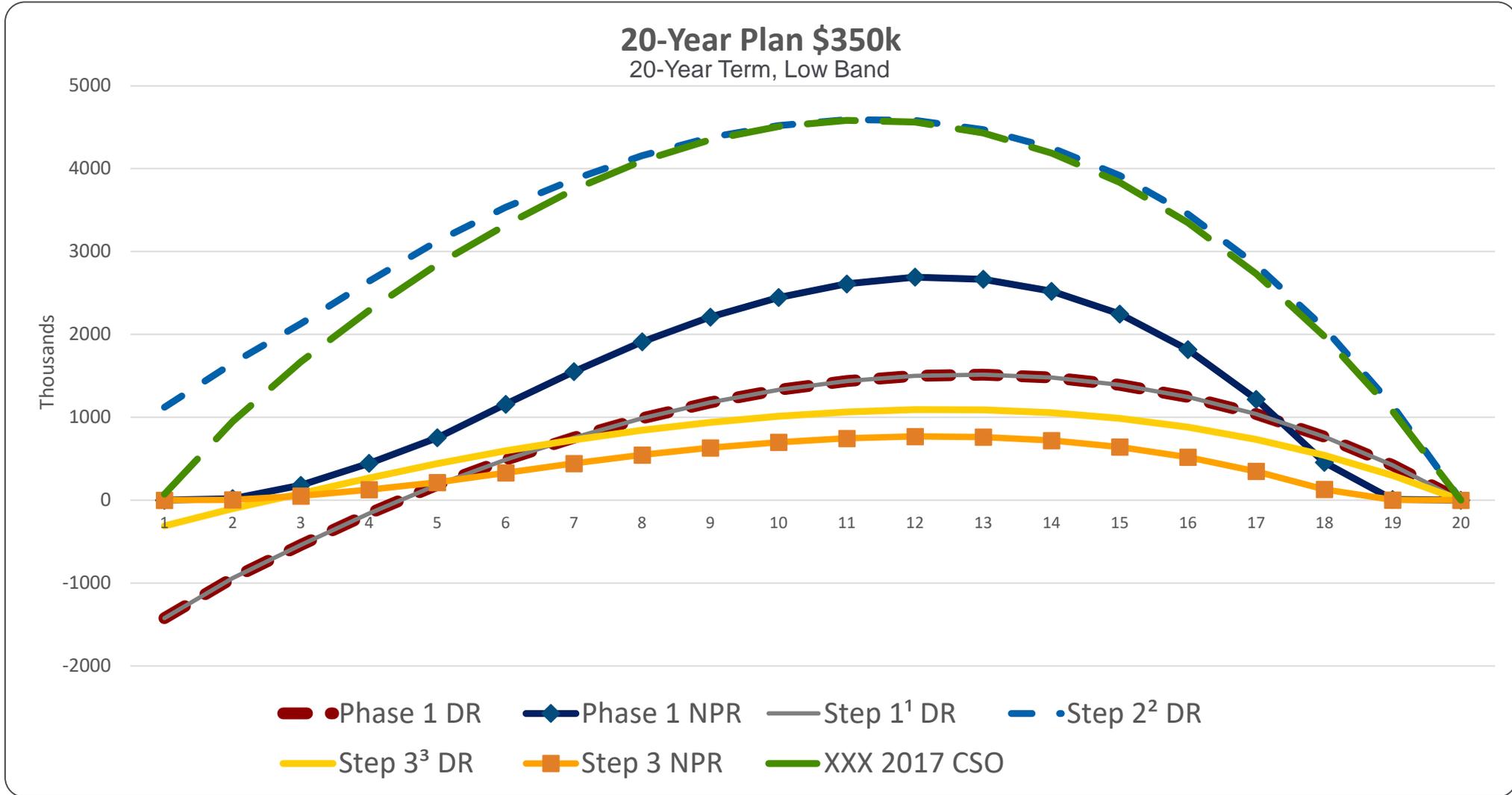
Small Company 20 Year Level Term	Pretax Profit Margin <sup>1</sup>	After-Tax Profit Margin <sup>2</sup>	Adjusted After-Tax Profit Margin <sup>3</sup>	Surplus Strain	IRR Adjusted After-Tax
<u>High-Band Model Office</u>					
Phase 1 Situation 5	19.9%	11.9%	6.7%	-147%	10.4%
Step 1: Increase Per Unit Acquisition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

<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



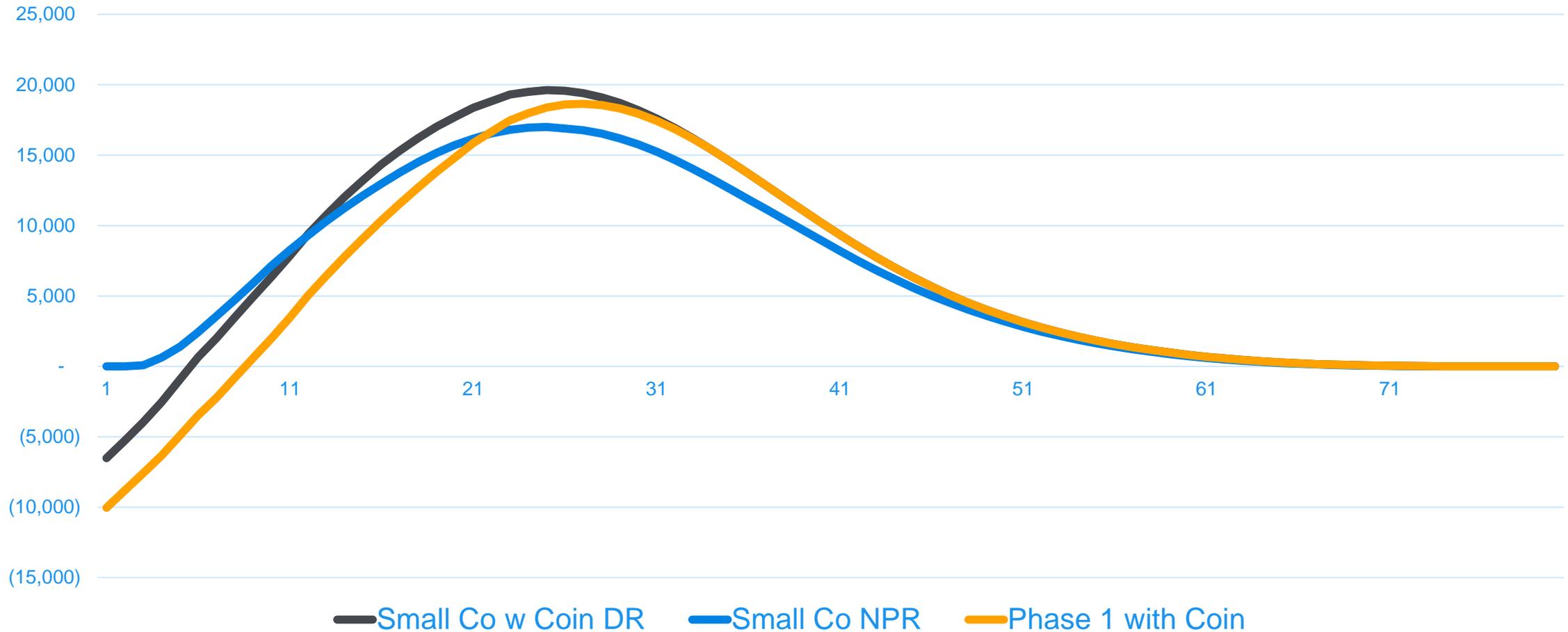
- <sup>1</sup>Step 1: Higher Acquisition Expenses
- <sup>2</sup>Step 2: Lower Mortality Credibility
- <sup>3</sup>Step 3: Coinsurance

# Small Company Sensitivity - ULSG

ULSG with Level Premiums for Coverage to A110	PT Profit Margin*	AT Profit Margin**	Adjusted AT Profit Margin***	Surplus Strain	IRR Adjusted After-Tax
<b><u>High Band Model Office</u></b>					
Step 1) Phase 1 Pricing Situation 5	19.5%	4.4%	2.6%	-285%	5.9%
Step 2) Small Company Reserve Assumptions	18.5%	-1.1%	-3.0%	-503%	4.9%
Step 3) Small Company with Coinsurance	4.9%	2.5%	2.3%	-31%	13.4%
<p>*Pre-tax profit margin is calculated with discount at the pre-tax NIER  **After-tax profit margin is calculated with discount at the pre-tax NIER  *** Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pre-tax NIER</p>					

# Small Company Sensitivity - ULSG

## Small Company Reserve Patterns - \$1.2M Band



# Guaranteed YRT Sensitivity

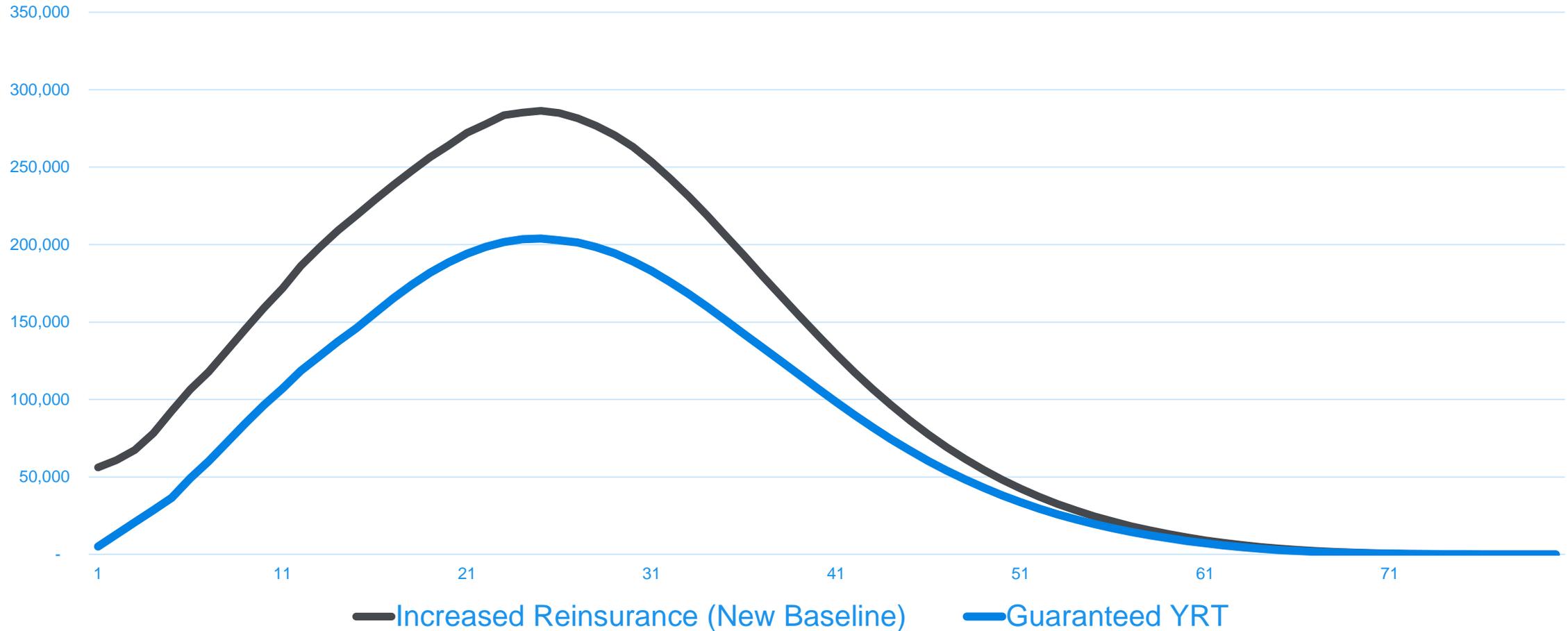
Term	Outer Loop	Inner Loop
<b>Mortality</b>	Company anticipated experience, includes improvement into future	Company anticipated experience with VM-20 margin, but assuming improvement only to the point of valuation, i.e. the future node
<b>YRT premiums – Baseline with \$200,000 retention (YRT premiums not guaranteed)</b>	YRT premiums are assessed at a level equal to 110% of the mortality rates in the outer loop	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
<b>YRT premiums – Guaranteed 120%</b>	YRT premiums are assessed at a level equal to 120% of the mortality rates in the outer loop	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

# Guaranteed YRT Sensitivity - ULSG

ULSG with Level Premiums for Coverage to A110	PT Profit Margin*	AT Profit Margin**	Adjusted AT Profit Margin***	Surplus Strain	IRR Adjusted After-Tax
<b><u>High Band Model Office</u></b>					
Situation 5 from Phase 1 report	19.5%	4.4%	2.6%	-285%	5.9%
Revised Baseline with \$200,000 retention	14.0%	-2.6%	-4.2%	-393%	4.6%
YRT premiums at 120% of expected mortality	10.1%	4.9%	3.7%	-64%	13.9%
<p>*Pre-tax profit margin is calculated with discount at the pre-tax NIER  **After-tax profit margin is calculated with discount at the pre-tax NIER  *** Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pre-tax NIER</p>					

# Guaranteed YRT Sensitivity - ULSG

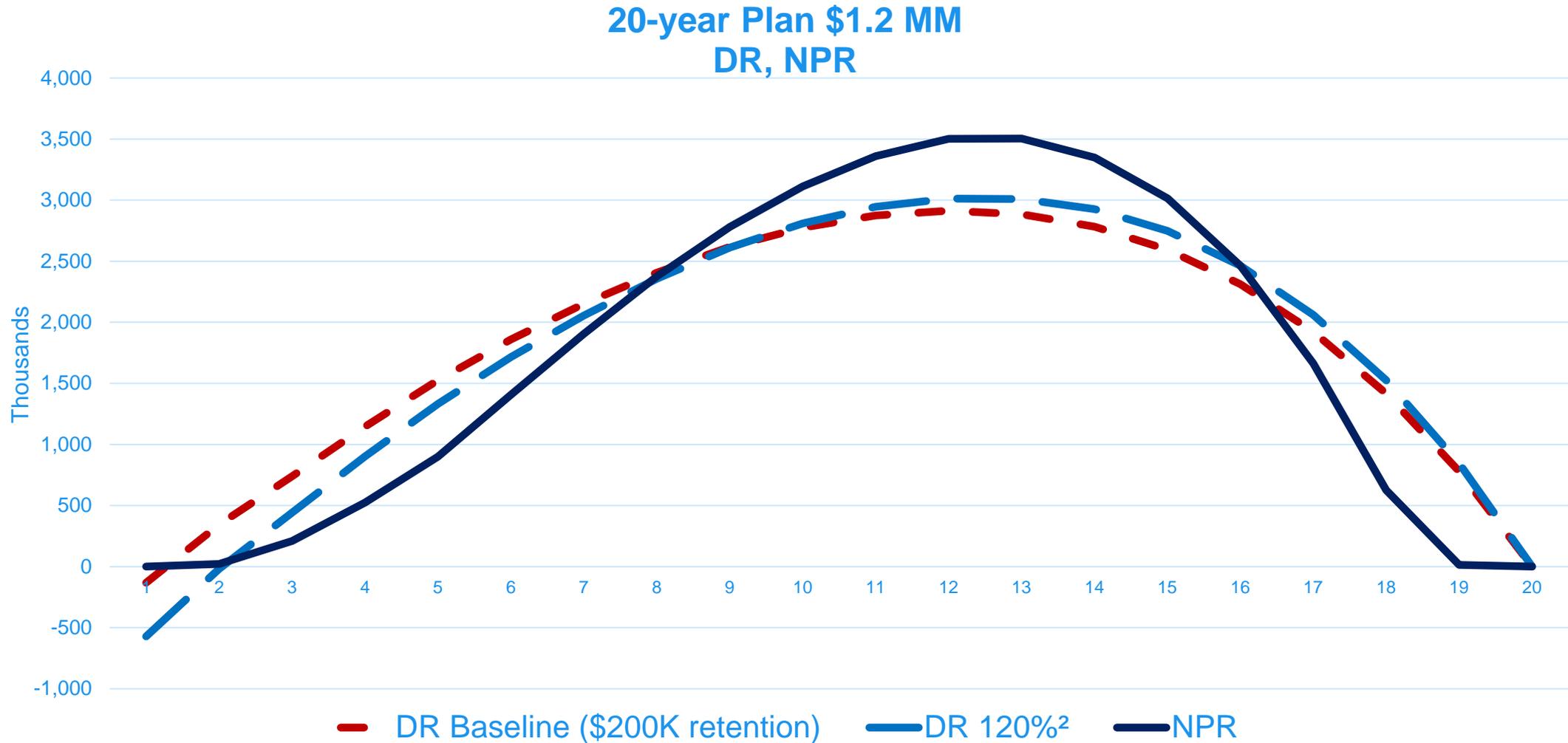
## Total VM-20 ULSG Reserve - Guaranteed YRT Study



# Guaranteed YRT Sensitivity – 20 Year Term

Term	PT Profit Margin*	AT Profit Margin**	Adjusted AT Profit Margin***	Surplus Strain	IRR Adjusted After-Tax
<b><u>High Band Model Office</u></b>					
Situation 5 from Phase 1 report	19.9%	11.9%	6.7%	-147%	10.4%
Revised Baseline with \$200,000 retention	12.9%	7.1%	5.8%	-55%	15.0%
YRT premiums at 120% of expected mortality	7.2%	3.6%	2.4%	-55%	11.7%
<p>*Pre-tax profit margin is calculated with discount at the pre-tax NIER  **After-tax profit margin is calculated with discount at the pre-tax NIER  *** Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pre-tax NIER</p>					

# Guaranteed YRT Sensitivity – 20 Year Term



# Simplified Issue – 20-year Term Single Cell

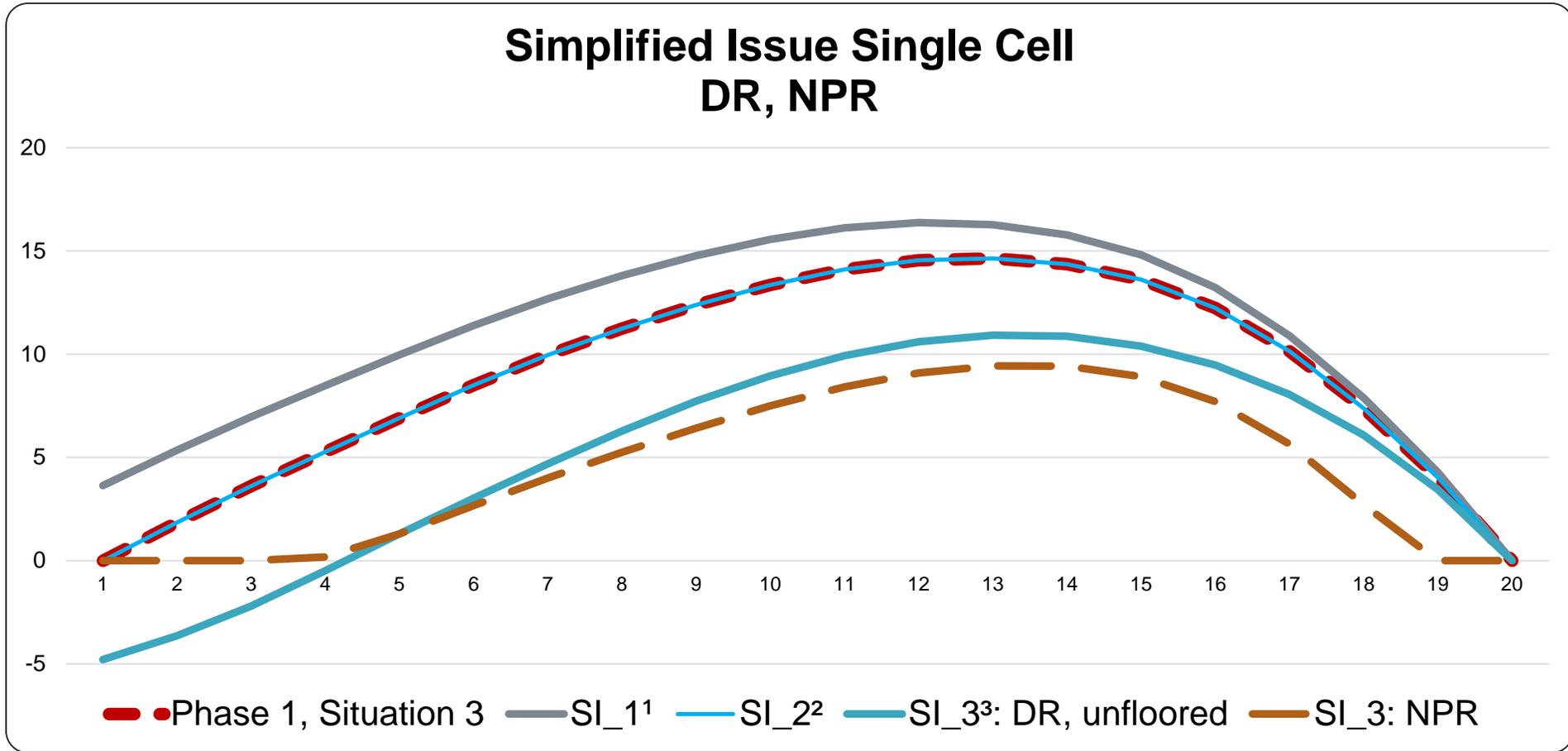
Simplified Issue (Single Cell) 20-year Term	Pretax Profit Margin <sup>1</sup>	After-Tax Profit Margin <sup>2</sup>	Adjusted After-Tax Profit Margin <sup>3</sup>	Surplus Strain	IRR Adjusted After-Tax
	20-Year Term				
Phase 1, Situation 3	20.9%	12.8%	8.5%	-164%	8.3%
SI_1: SI Experience Assumptions	-53.1%	-37.3%	-40.7%	-356%	-13.6%
SI_2: \$100,000 Average Policy Size; Higher Per Unit Premium	10.9%	6.3%	4.8%	-120%	8.8%
SI_3: Implement VM-20 Reserves	10.9%	6.1%	4.6%	-120%	10.6%

<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.

# Simplified Issue VM-20 Impact



- <sup>1</sup> SI\_1: Simplified issue assumptions
- <sup>3</sup> SI\_3: Simplified issue VM-20

- <sup>2</sup> SI\_2: Simplified issue average size and premiums

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# 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 6<sup>th</sup> 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

30-Year Term (Single Cell)	Pretax Profit Margin <sup>1</sup>	After-Tax Profit Margin <sup>2</sup>	Adjusted After-Tax Profit Margin <sup>3</sup>	Surplus Strain	IRR Adjusted After-Tax
<u>Cell: Issue age 45 Male N3, \$350,000 Size</u>					
Situation 3) XXX Stat/Tax, 2017 CSO	25.2%	14.8%	12.4%	-351%	7.5%
Situation 5) VM-20 NPR+DR Excess Stat, NPR Tax, 2017 CSO	25.2%	15.7%	13.5%	-112%	15.0%
<p><sup>1</sup> Pretax profit margin is calculated with discount at the pretax net investment earnings rate (NIER).</p> <p><sup>2</sup> After-tax profit margin is calculated with discount at the pretax NIER.</p> <p><sup>3</sup> Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pretax NIER.</p>					

# Short Pay - ULSG

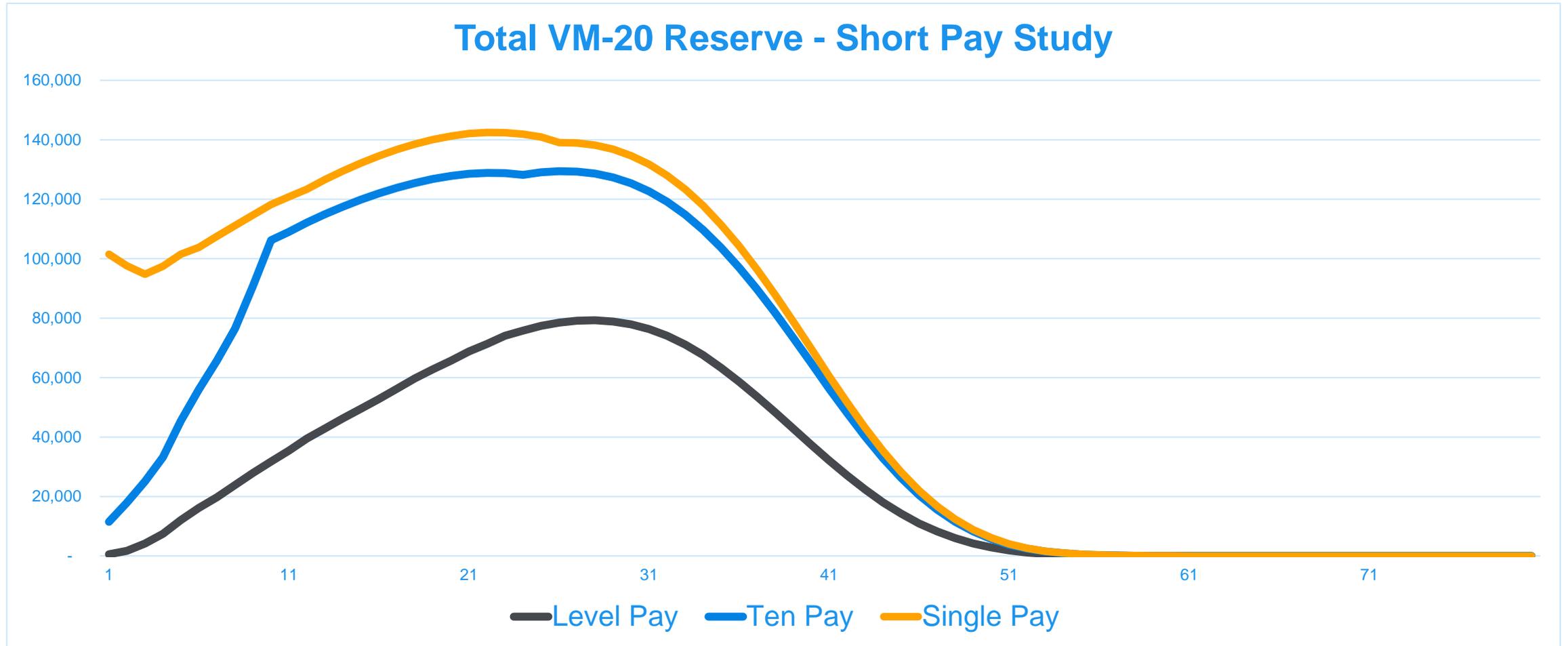
ULSG - Short Pay Single Cell	PT Profit Margin*	AT Profit Margin**	Adjusted AT Profit Margin***	Surplus Strain	IRR Adjusted After-Tax
<b>1) Level Pay 55 MN</b>	<b>30.4%</b>	<b>15.5%</b>	<b>14.0%</b>	<b>-61%</b>	<b>15.4%</b>
<b>2) Ten Pay 55 MN</b>	<b>22.3%</b>	<b>12.9%</b>	<b>10.9%</b>	<b>-94%</b>	<b>10.2%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

\*Pre-tax profit margin is calculated with discount at the pre-tax NIER

\*\*After-tax profit margin is calculated with discount at the pre-tax NIER

\*\*\* Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pre-tax NIER

# Short Pay Study - ULSG



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## 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

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## 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.

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## 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

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## 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

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## 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

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## 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

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## 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

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## 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

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## 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

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## 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

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## Links to Research Reports

Complete research reports can be found here:

- Phase 1:

<https://www.soa.org/Files/Research/Projects/2016-impact-vm20-life-insurance-product.pdf>

- Phase 2:

<https://www.soa.org/Files/Research/Projects/2017-impact-vm20-life-insurance-product-phase-2.pdf>