Principle-Based Reserve Projections Questions… Answered!

American Academy of Actuaries
PBA Projections Practice Note Work Group

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PBA Projections Practice Note Overview

Ben Slutsker, FSA, MAAA

PBA Projections

Principle-Based Approach (PBA) Projections refers to projecting future principle-based reserves and/or capital at future valuation dates.

This is distinct from point-in-time valuation, which refers to calculating principle-based reserves and/or capital at the current valuation date. Principle-based projections, in contrast, forecasts this calculation at future periods.

Academy PBA Projections Practice Note

- **Joint effort from Academy PBR Governance Work Group and Life Valuation and Life Product Committees**
  - Released in December 2019
  - Centralized repository for PBA projection and nested modeling industry resources
  - Builds on VM-20 practice note with focus on projections
- **Practice note on common methods / techniques for projecting PBA reserves**
  - Asset complexities: spreads, defaults, starting assets
  - Mortality grading, credibility, improvement
  - Simplifications
  - Visuals for projections and nested modeling
- **Practice note scope**
  - Focuses on VM-20
  - Also applicable to VM-21 and RBC C3 Phase II

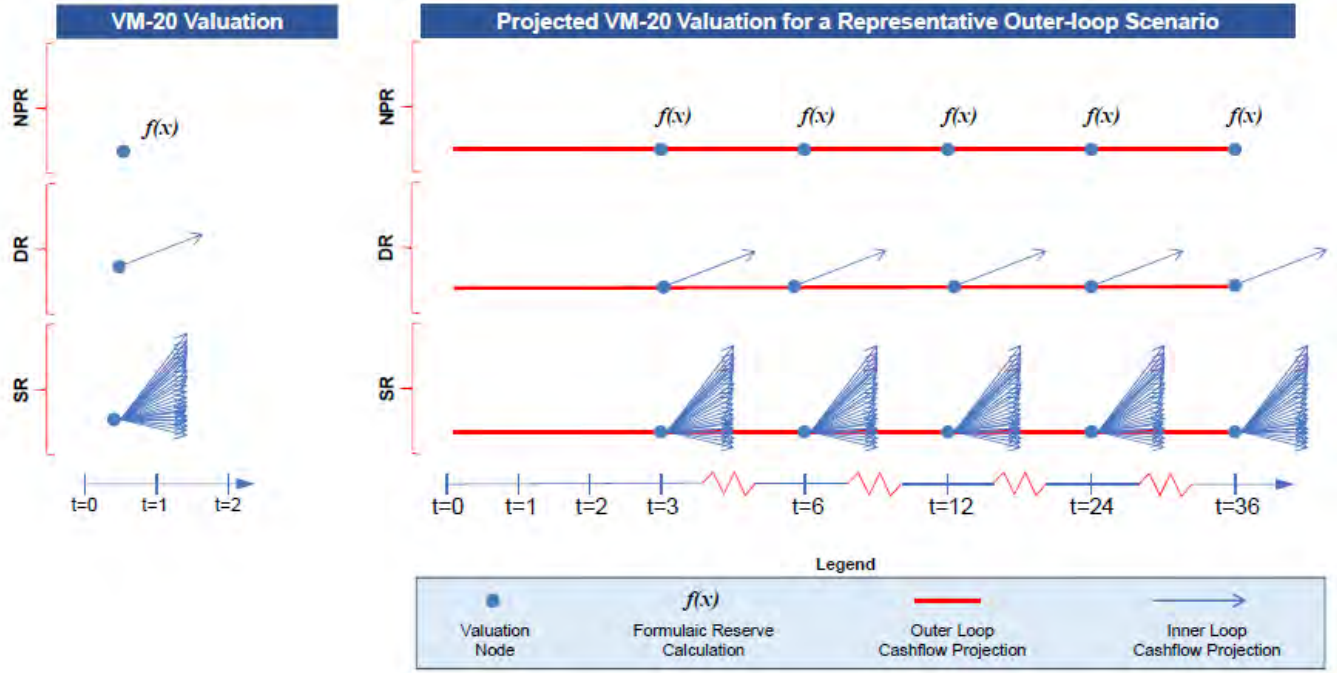
PBA Projections Practice Note Contents

- **Overview**
  - Visual and Definitions
  - Overview Q&A
- **High-Level Subject Areas**
  - General PBA Projections
  - Analysis and Reporting
  - Governance and Validation
  - Pricing
  - Model Efficiency and Reserve Estimation
- **Specific Topics**
  - Mortality
  - Policyholder Behavior and Non-Guaranteed Elements
  - Reinsurance
  - Economic Scenario Generation
  - Assets

Beginnings of PBA Projections Practice Note

- As companies implemented VM-20 point-in-time reserves, there appeared to still be significant ambiguity around projections
- Various industry articles/presentations on certain aspects of PBA projections, but no single centralized repository
- Therefore, the Academy decided to develop a practice note that could be a go-to reference for such questions
- Serves as a complement to the Academy VM-20 Practice Note, which is a great resource for understanding VM-20 requirements and point-in-time valuations

Nested Modeling Framework



How Do Actuaries Use Nested Models?

Valuation models can be nested within more general projection models (pricing, ALM, etc.) to forecast PBR and other calculations that require their own separate cashflow projections

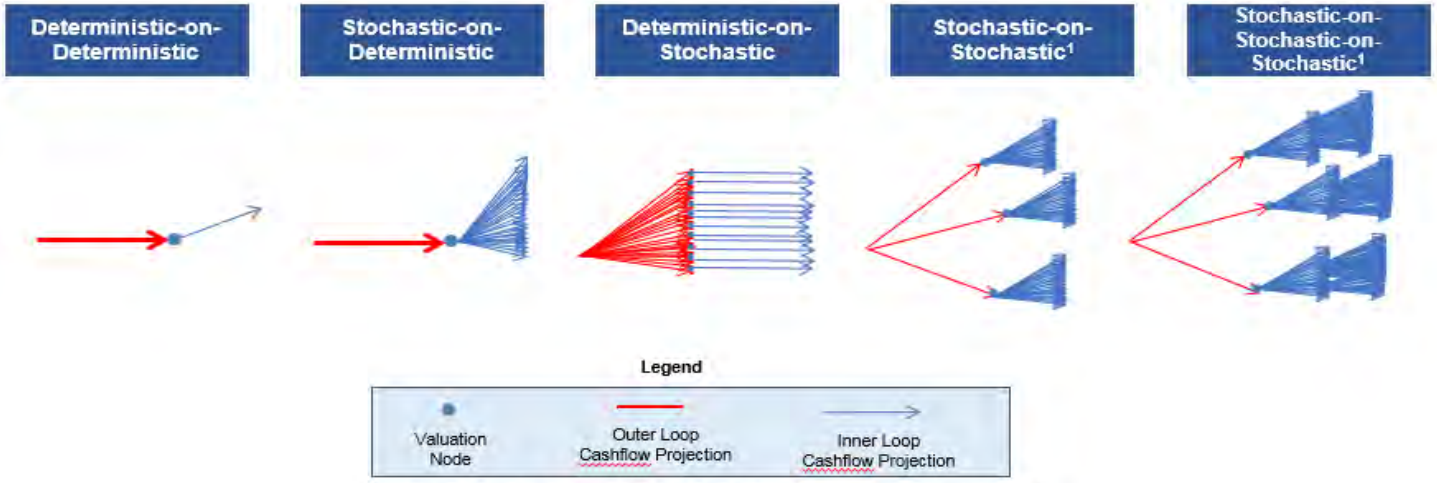
Examples of general earnings projection models (outer loops)	Examples of projected items that require their own separate cash flow models (inner loops)
• Planning/Forecasting • Product Pricing • ALM/Risk Management • Inforce Management	• VM-20 reserves (separate inner loops for DR and SR) • VM-21 reserves • GAAP FIA reserves (VED and Host) • Economic reserves/capital

Types of Nested Modeling

Nested Modeling Type	Outer Loop / Inner Loop	Example
Deterministic on Deterministic	Deterministic Outer Loop, Deterministic Inner Loop	Term VM-20 deterministic reserves (inner loop) under pricing best estimate scenario (outer loop)
Stochastic on Deterministic	Deterministic Outer Loop, Stochastic Inner Loop	ULSG VM-20 stochastic reserves (inner loop) under pricing best estimate scenario (outer loop)
Deterministic on Stochastic	Stochastic Outer Loop, Deterministic Inner Loop	VUL VM-20 deterministic reserves (inner loop) under risk-based pricing stochastic scenarios (outer loop)
Stochastic on Stochastic	Stochastic Outer Loop, Stochastic Inner Loop	ULSG VM-20 stochastic reserves (inner loop) under risk-based pricing stochastic scenarios (outer loop)
Stochastic-on-Stochastic-on-Stochastic	Stochastic Outer Loop, Stochastic Inner Loop, Stochastic calculations within the inner loop	IUL VM-20 stochastic reserves (inner loop) under risk-based pricing stochastic scenarios (outer loop), with hedge value projections (inner inner loop)

Types of Nested Modeling

Visual example of nested modeling at a single node



[1]For visualization purposes only three stochastic outer loop scenarios are shown

Future of Nested Modeling

- VM-20 business will emerge as a larger portion of companies' inforce life insurance blocks over time
- Enhanced vendor solutions and computing technology
- Future regulatory initiatives, such as possible fixed annuity PBR and C3 Phase II frameworks

Specific topics

- Mortality
- Assets

PBA Mortality Projections

Kevin Piotrowski, FSA, MAAA

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NPR mortality

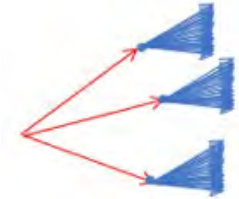
- Projection of future mortality improvement in the form of a new CSO table

> **Guidance Note:** The *Valuation Manual* can be updated by the NAIC to define a new valuation table. Because of the various implications to systems, form filings and related issues (such as product tax issues), lead time is needed to implement new requirements without market disruption. It is recommended that this transition be for a period of about 4.5 years—that is, that the table be adopted by July 1 of a given year, that it be permitted to be used starting Jan. 1 of the second following calendar year, that it be optional until Jan. 1 of the fifth following calendar year, and thereafter mandatory. It is further intended that the adoption of such tables would apply to all business issued since the adoption of this *Valuation Manual*. The details of how to implement any unlocking of mortality tables will need to be addressed in the future.

- Anticipated experience vs. CSO table

Modeling mortality for the DR/SR

1) Nested modeling



2) Distinct model runs

3) ‘One vector’ approach

4) All inner-loop

Mortality improvement

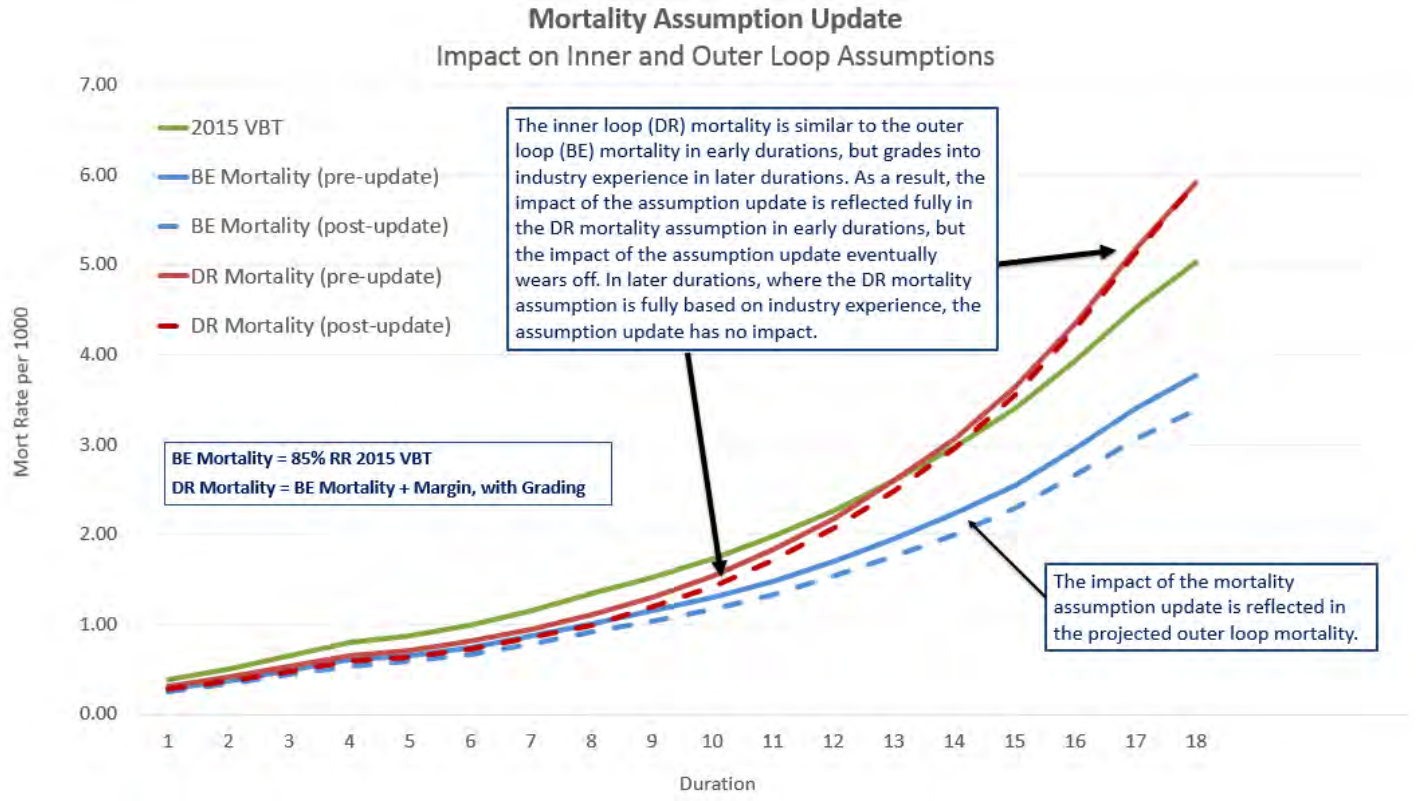
- Industry tables

> g. Mortality improvement shall not be incorporated beyond the valuation date. However, historical mortality improvement from the date of the industry basic table (e.g., Jan. 1, 2008, for the 2008 VBT and July 1, 2015, for the 2015 VBT) to the valuation date may be incorporated using the improvement factors for the applicable industry basic table as determined by the SOA and published on the SOA website, https://www.soa.org/research/topics/indiv-val-exp-study-list/ (Mortality Improvement Rates for AG-38 for Year-End YYYY).

- Company specific tables

- Beyond the valuation date

Mortality Improvement example



Credibility/Sufficiency data period

- Improvements to mortality ‘parameters’ with each year of new data
  - Credibility
  - Sufficient data period

Projection Year	Credibility	"D"
1	58%	34
2	60%	35
…	…	…
10	85%	50
11	90%	50

- Projections inside vs. outside the system

Aggregation

- New business
- Accelerated underwriting and/or simplified issue

Putting it all together

- Mortality is both complex, and the most influential assumption on the liabilities
- The rigor used to determine the assumption should be driven by its purpose – complexity is not always better

PBA Asset Projections and case study

Dylan Strother, FSA, MAAA

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Asset related nested modeling topics

There are additional challenges and complexities for asset modeling when performing a nested projection of reserves

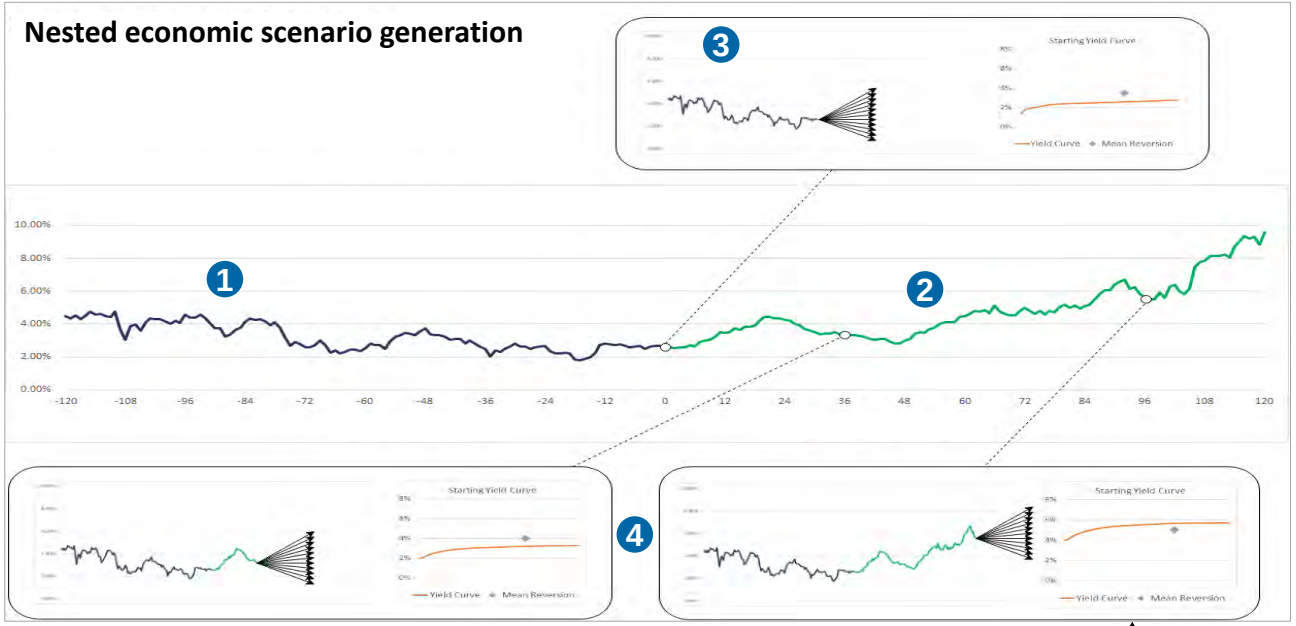
- Economic scenarios
- Existing assets
- Reinvestments
- Other considerations

Economic scenarios

Commentary

1. Historical rates used to calculate mean reversion parameter
2. Outer-loop scenario for a key maturity
3. Inner-loop valuation scenarios as projection start date
4. Inner-loop scenarios at future valuation nodes

Nested economic scenario generation

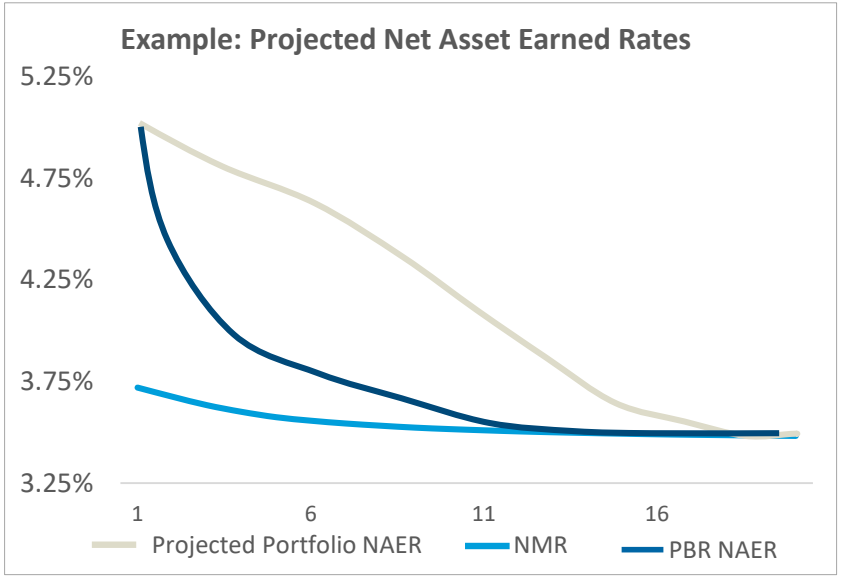


Key inputs for generating interest rates for inner loop economic scenarios are mean reversion parameter and a starting yield curve

Existing assets

Challenges

- Starting assets
- Externally projected existing asset cash flows
- Asset collar requirement
- Negative assets



Reinvestment

- Prescribed spreads and default factors
- Reinvestment strategy and guardrail requirements
- Disinvestment

Other considerations

- Hedging
- Common simplifications
- Model efficiency / run time reduction

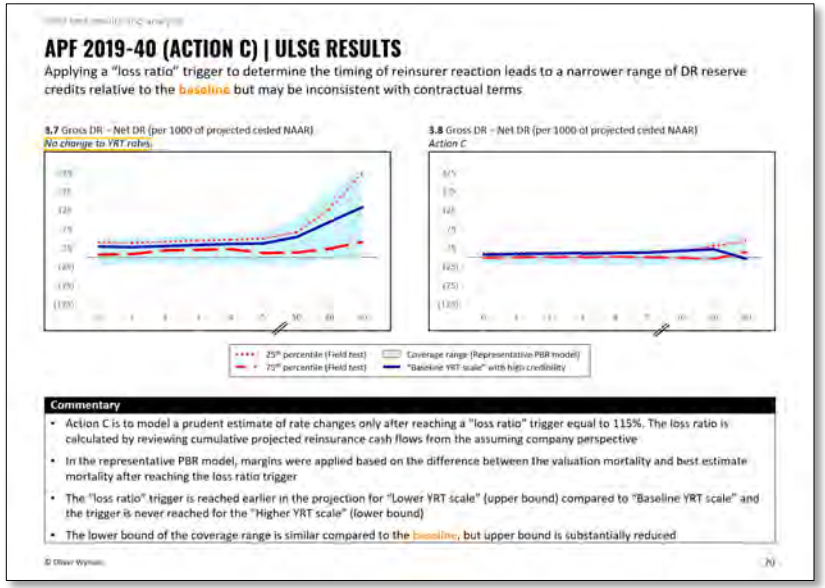
Asset PBR projection key takeaways

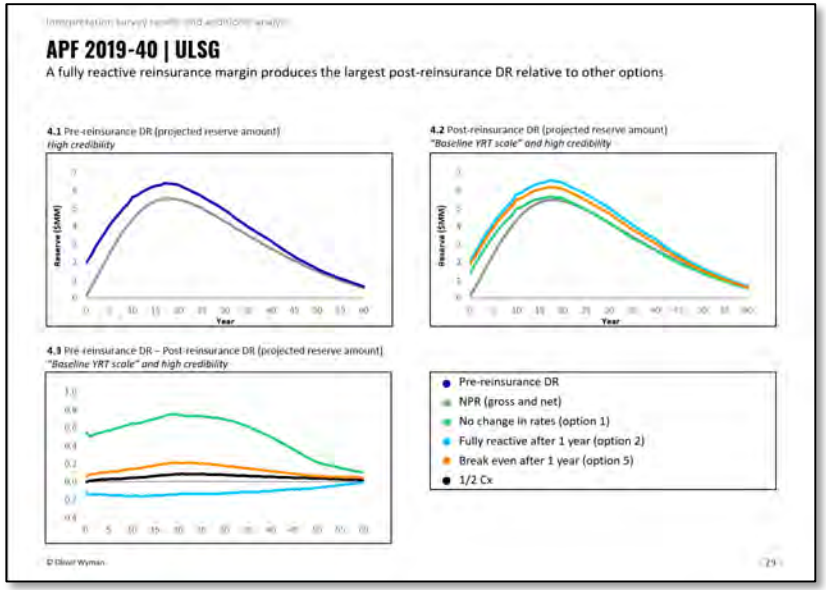
1. **Changes to the asset modeling approach may be required to support projections of reserves**

2. **Simplifications are common, driven by runtime concerns and model system limitations**

3. **Asset projections and overall PBR projections should be fit for purpose**

Projecting PBR case study (1/2)



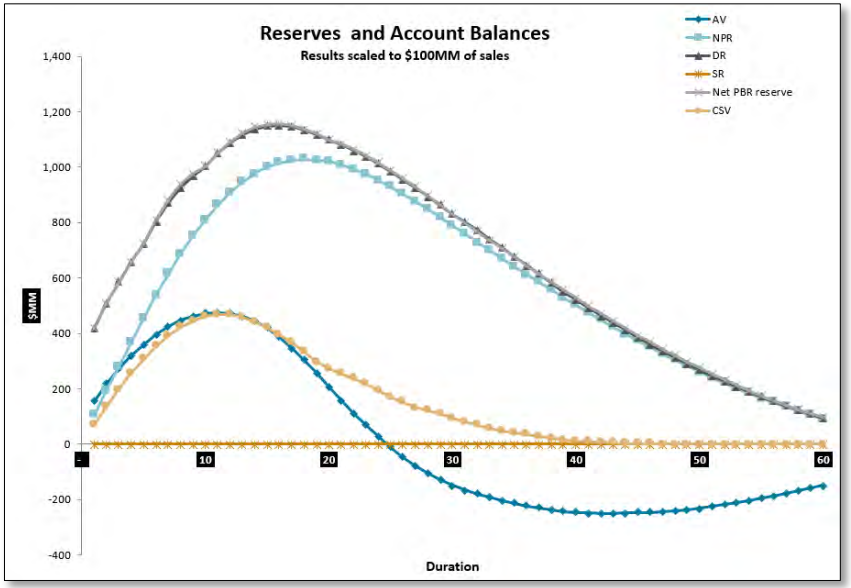


Analysis performed in support of the industry field test required projecting PBR reserves using a representative PBR model

Projecting PBR case study (2/2)

NAIC YRT Field Test
Model Analysis File
Inner Loop PBR
As of: 2019 11 18

	Block Pivot Indicator	12/31/2019				12/31/2023	
	Calendar Year	2019	2020	2021	2022	2023	2024
Gross Premium	Outer Loop	-	96.7	93.3	89.8	86.4	83.0
	Loop 12.31.19	101.0	98.7	96.2	93.6	90.9	88.2
	Loop 12.31.23	-	-	-	-	-	87.3
	12.31.19 Inner/Outer		102%	103%	104%	105%	106%
	12.31.23 Inner/Outer						105%
Coverages EOY	Outer	58.1	56.3	54.4	52.6	50.8	49.0
	Loop 12.31.19	58.7	57.4	56.1	54.8	53.4	52.1
	Loop 12.31.23	-	-	-	-	52.6	51.3
CSV Per Policy	Outer	70.4	135	198	256	307	352
	Loop 12.31.19	69.9	135	201	261	317	366
	Loop 12.31.23	-	-	-	-	256	308
Net Earned Rate (Outer vs. 1.31.19)	Outer	4.34%	4.69%	4.65%	4.63%	4.58%	4.51%
	Loop 12.31.19	2.92%	4.32%	4.29%	4.24%	4.15%	4.08%
	Inner Less Outer		-0.4%	-0.4%	-0.4%	-0.4%	-0.4%
Net Earned Rate (Outer vs. 12.31.23)	Outer	4.34%	4.69%	4.65%	4.63%	4.58%	4.51%
	Loop 12.31.23	0.00%	0.00%	0.00%	0.00%	0.00%	3.95%
	Inner Less Outer					-4.6%	-0.6%
Net Earned Rate (1.31.19 vs. 12.31.23)	Loop 12.31.19	2.92%	4.32%	4.29%	4.24%	4.15%	4.08%
	Loop 12.31.23	0.00%	0.00%	0.00%	0.00%	0.00%	3.95%
	Innner Less Inner					-4.2%	-0.1%



Analysis tools that perform high level sensibility checks can be useful for confirming modeled results at future valuation points at a glance

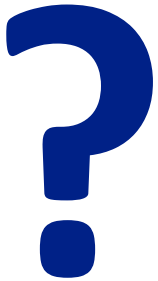
Projecting PBR case study takeaways

- Organization is key to obtaining accurate results
- Visualization and analytics can be useful to understand and confirm the integrity of model results at a high level
- The best way to gain intuition is performing analysis

Conclusion

- Projections are only as good as the models - and more complicated is not necessarily better
- Assumptions/models should be set/calibrated for a specific purpose
- Model output should be structured to give flexibility for ad-hoc analysis

Questions



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Presenter bios

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Biographies – Kevin Piotrowski

Kevin Piotrowski, FSA, CERA, MAAA
Insurance and Actuarial Advisory Services, Ernst & Young LLP

Kevin works in the Insurance and Actuarial Advisory Services practice of Ernst & Young LLP's Financial Services Office. He is based in New York and has 9+ years of consulting experience. He serves as an advisor to large insurance companies and is focused on Financial Reporting.

Kevin focuses his time on various aspects of insurance including assumption setting, valuation, reinsurance reporting and capital management. Additionally he has been involved in large scale model validation projects as well as assisting companies to transform their actuarial systems and processes (Actuarial Transformation). Recently, Kevin has focused his efforts on Principle-Based Reserves - managing review of both AG-48 and VM-20 implementations at several companies. He has written articles around PBR implementation and is involved in the SOA's effort to provide more depth/breadth around Principle-Based Reserves.

Kevin is a Fellow of the Society of Actuaries (FSA), a Chartered Enterprise Risk Analyst (CERA) and a Member of the American Academy of Actuaries (MAAA)

Biographies – Dylan Strother

Dylan Strother, FSA, MAAA
Oliver Wyman Actuarial Consulting

Dylan is a Senior Consultant with the Actuarial Practice of Oliver Wyman and is based in New York. He is an expert in statutory and GAAP valuation and financial reporting across a variety of products and has assisted clients extensively with emerging financial regulations such as PBR and LDTI, in addition to working extensively with modeling, model validation and M&A.

Especially active with Life PBR projects, Dylan was one of the team leads supporting the analysis and development of insights for the VM-20 YRT field test. He routinely volunteers for PBR related initiatives, such as the PBA Projections Practice Note Work Group. He also frequently speaks and writes articles on the subject.

Dylan is a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries

Biographies – Ben Slutsker

Ben Slutsker, FSA, MAAA
New York Life Insurance Company

Ben Slutsker is a Corporate Vice President & Actuary for New York Life Insurance Company, where he works in the Office of the Chief Actuary and is responsible for actuarial regulatory oversight. In past roles, Ben has worked in Individual Life Financial Reporting, New York Life International, BOLI/COLI Pricing, and previously led the implementation of Principles-Based Reserving.

Ben currently chairs the American Academy of Actuaries Annuity Reserves Work Group and the Society of Actuaries Life Financial Modeling Exam Curriculum Committee. In addition, he is a member of the Academy Life Practice Council, Life Valuation Committee, and PBR Implementation Work Group.

Ben is a Fellow of the Society of Actuaries (FSA) and a Member of the American Academy of Actuaries (MAAA).