

**Southeastern Actuaries Conference  
2010 Spring Meeting  
June 16, 2010**

**PBA Reserve Workshop  
What Will PBA Mean to You  
and Your Software?**



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**Agenda**

- Overview to PBA project
  - Should I be worrying about PBA?
- Summary and exploration of current VM20 requirements
- What are the implications?
- What should be your action plan?

## You may be asking...

- Should I be worrying about PBA?
- What will PBA require me to do?
- How will PBA demands impact systems?
- How will PBA impact actuarial departments?
- How to find a solution that I can afford?

## Is it time to take PBR seriously?

- PBA project ongoing for 10 years?
- Revised Standard Valuation Law “conditionally passed” by NAIC in 2009
  - Valuation Manual needed to be approved
  - Needs sufficient states to pass legislation
  - 5 year phase in
  - New business only
  - ACLI proposed “net premium method” floor

## Is it time to take PBR seriously?

- In 2010 many technical issues and changes
  - Level of aggregation/reporting
  - Actuary's judgment vs. NAIC prescription
  - Use of own scenario generator vs. AAA predefined
  - Credit spreads/default rates
  - Concern over small company cost vs. benefit
  - Product exclusion by definition or by test?

## Is it time to take PBR seriously?

- Oliver Wyman report on 2009 AG43 results
  - Standard scenario driving results
  - Unintuitive results need explaining
- Towers Watson Survey
  - Analyze costs of implementing principle-based framework for reserves and capital
  - Key findings:
    - Uncertainty
    - Costs
    - Models

## Is it time to take PBR seriously?

- May 2010 letters from ACLI, ALIA, AAA
  - Fundamental point of “Principles-based” defeated by excessive rules, conservatism?
  - Costly to implement and difficult to predict cumulative impact of changes
  - Requested:
    1. Pilot testing of final VM20
    2. Consider adjustments as required
    3. Limit scope of initial roll out to Term and UL with secondary guarantees

## Is it time to take PBR seriously?

- NAIC is considering research project to evaluate impact of proposed VM20
  - focus on all products not just UL and Term
- Study would likely get more participating companies, more resources, yield more meaningful results than previous studies
- Likely result is another delay for PBR

## What about PBA for Capital?

- PBA for C3 in RBC is already here
  - C3 Phase II for VA's (2005)
- NAIC appeared committed to C3 Ph III
  - Consistent methodology to stochastic PBR
  - All in force Life business with exclusion test
  - No phase-in period
- 1 year delay announced March 2010
  - C3 Phase III target was 2010 (life) or 2011 (annuities) until March NAIC meeting

## What are Prospects for PBA?

- PBA is not going away
  - Original reasons for PBA remain
  - Despite debate and delays, strong support, significant commitment within NAIC, industry, profession
  - Core principles of risk based analysis, prospective approach are consistent with global trends (IFRS)

## Summary of Proposed PBR (latest VM20 draft)

- Three layers (in worst case):
  1. Net Premium Reserve (absolute minimum, used for Tax reporting?)
  2. Or Deterministic Reserves (if greater in aggregate, and Deterministic or Stochastic Exclusion Tests failed)
  3. Or Stochastic Reserves (if greater in aggregate and Stochastic Exclusion Test failed)

## ACLI Net Premium Reserve (Term Insurance)

- Minimum reserve per policy using modified net premium method (ACLI):
  1. Adjusted gross premiums using
    - reductions of 100% yr 1, 10% yrs 2-5
    - year 1 expense of \$2.50 per mil
  2. Reduction of net premiums after level period to max 135% of pv of benefits, with offsetting increase in prior years net premiums

## ACLI Net Premium Reserve (Term Insurance)

3. Prescribed assumptions:
  - Mortality – 2001 CSO (as adopted 2002), supplemented by the 2001 CSO Preferred Class Structure Mortality Table (as adopted 2006)
  - Interest – level interest rate formula based on historic Corporate Bond yields (locked by issue year)
  - Lapses – 6% in level premium period, 10% thereafter, plus shock lapse

## Deterministic Reserves

- Deterministic Reserve:
  - Seriatim(?) first principles gross premium reserve with CSV floor
  - Cash flows reflect all risks and benefits
  - "Anticipated experience" with explicit "prudent" margins reset annually
  - Discount at earned rate from A/L model

## Deterministic Reserves

- Deterministic Reserve exclusion test (new)
- A test of Gross premium adequacy:
  - Sum of Net Premiums for minimum reserves must be less than sum of Gross premiums
  - For term insurance, test both over level premium period and whole policy using guaranteed premiums

## Stochastic Reserves

- Stochastic reserve calculation (unless Stochastic Exclusion tests passed)
  - 1000+ scenarios for yield curve and equity growth (Academy scenarios)
  - Calculate CTE(70) using GPV of AD method (similar to C3 PII for VA's) discounted using 105% of 90 day rates



## Stochastic Exclusion Tests

- Stochastic Exclusion Ratio Test
  - Calculate scenario reserves on baseline plus 15 prescribed test scenarios
  - Show ratio =  $(b - c) / a < 4\%$   
where,
    - b = worst scenario reserve
    - c = baseline scenario reserve
    - a = PV of baseline benefits and expenses

## Stochastic Exclusion Tests

- Or, demonstrate that Stochastic Reserve less than either
  - Modified Deterministic Reserve, or
  - Net Premium Reserve
- Modified Deterministic Reserve is greater of Deterministic Reserve or GPVAD on deterministic assumptions

## Principles-Based Capital

- C3 Phase III proposal:
  - C3 component = TAR – Reserve
  - TAR = Total Asset Requirement
  - Aggregate stochastic calculation (GPVAD) consistent with PBR except using CTE(90) and after taxes

## Implications of Principles-Based Approach

- Annual review of anticipated experience and required margins
  - Access to experience studies
  - Ease of definition and control of assumptions by block of business
  - Tools to investigate and quantify impact of margins

## Implications of Principles-Based Approach

- Updating of assumptions and reliance on actuary means increased scrutiny by
  - independent reviewer
  - Regulators (Model Audit Rule)
  - senior management and board
  - the profession
- Need time for more analysis and review

## Implications of Principles-Based Approach

- ... BUT models will be more complex:
  - More sophisticated modeling of risks and benefits
  - 1000+ scenarios on life insurance policies
  - Less model compression
- Less time for review and analysis unless better model performance

## High performance models

- Model Performance must be greatly improved
- Possible strategies
  - Through Hardware upgrades?
  - Through Software improvement?
  - Using Model Efficiency techniques?

## Current Technology Trends

- Technology will likely continue trend of exponential performance improvements and cost reduction
  - Multi-core chips vs. faster CPU's
  - Increased parallelism in software
  - Software must be highly scalable to multi-core machines or grids

## The Evolution of Grids

- Trend now to greater use of dedicated server farms and/or computer clusters
  - Tightly coupled for efficiency
  - Easy software installation
  - More cost effective O/S (Microsoft HPC Server 2008) and less IT support
    - enables sharing grid and scheduling multiple jobs
  - Robust, secure and audit friendly
  - Single box cluster; scalable up to large farms

## Technology Response to Challenges of PBA

- Software enhancements needed?
  - For Performance
    - Well designed code for efficiency
    - Compiled code vs. interpreted
    - Supporting evolving technology including grid techniques
    - Manage complex assumption sets
  - Probably signals trend to vendor-coded systems vs. user coded going forward

## Model Efficiency Techniques

- Recognition of budget constraints especially of smaller companies
- Scepticism regarding value of full stochastic
- Uncertainty regarding number of scenarios

## Model Efficiency Work Group

- Formed by the Academy's SVLII Committee in view of onerous modeling demands of PBA for statutory reserves and capital
- Mandate "to examine ways to make these calculations more manageable"

## Model Efficiency Work Group

- Browse the MEWG web page [www.actuary.org/life/model.asp](http://www.actuary.org/life/model.asp) :
  - Survey of Model Efficiency Practices
  - Bibliography of research papers and presentations
  - New research initiative to promote and assist company investigation of new techniques using real models

## Model Efficiency Work Group

- Scenario reduction techniques
  - Run fewer scenarios than “full set”?
  - How many and how to choose?
  - How to assess impact?
  - Regulators seek safe harbour, advice

## Model Efficiency Work Group

- Scenario reduction techniques
  - Stratification (Scenario Picking Tool?)
  - Importance Sampling
  - Clustering
  - Correcting for bias using Control Variates
  - Mean estimation vs. Tail measures

## Model Efficiency Work Group

- Model Compression Techniques
  - Traditional grouping under PBA
  - Cluster compression techniques
  - Using good importance functions
  - Choosing and validating compression ratios
  - Condensed models for testing, research, scenario reduction



## Challenge of Designing Best PBA Solution

- How to achieve an optimum balance?
  - System Performance
    - Seriatim, scenarios, multiple test runs
  - Ease of use/flexibility/reporting
    - Investigate changes in assumptions/margins by plan/cohort
    - Responsive to ongoing changes
  - Control
    - Auditable, transparent, self-documenting
    - End-to-end automation

## Challenge of Designing Best PBA Solution

- But most importantly, how to optimize actuarial performance?
  - Total solution not just system speed
  - Actuaries cost more than technology
  - PBA work will be like an iceberg: only 10% at final reporting

## Application specific software?

- Most companies use multiple actuarial systems that are application specific...

### Valuation

- Seriatim files
- Liabilities only
- Production run orientation
- Compiled
- Inflexible

### Modeling

- Compressed data
- ALM capable
- Investigation run orientation
- User programmed
- More flexible

## Convergent Software and Actuarial Performance

- Plan for multiple purpose, multiple basis valuation and projection system
  - Handle both deterministic and stochastic (both today and at projected dates)
  - Seriatim, where possible, & controlled compression for stochastic only
  - Avoid reconciling and validating multiple models on different platforms
  - Staff productivity with one platform to learn, maintain, document, audit

## Summary

- Yes, its time to plan for PBA
  - Technology will help but it should support actuarial performance gains and not just runtimes
  - Model control issues will increase
  - System architecture may need to change from valuation/modeling silos to convergent designs
- PBA will keep changing and so will the demands on your software

## Summary

- Don't just react to PBA, create a long term systems vision that handles PBA and more and work toward it!
- The sooner you start the better

Thank you!