Developments in Actuarial Systems

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Developments in Actuarial Systems
Principles Based Reserves

Southeastern Actuarial Conference
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What is the Status of PBA?

- After 8+ years of discussion, NAIC has adopted
  - PBR model legislation and
  - the Valuation Manual referred to by the model law
- Arizona is the first state to adopt the legislation.
  - Approx 9 others will consider legislation in 2013
- PBR takes effect on Jan 1st following adoption by at least 42 jurisdictions representing 75% of 2008 written premium
  - California, New York, Texas are potential road blocks
  - Earliest likely effective date January 1, 2016
  - New business only; optional 3 year phase in

Overview of VM-20 (PBA for Life Insurance)

Minimum reserves based on three distinct reserve calculations

1. **Net premium reserve** – Formulaic, seriatim net premium calculation, prescribed assumptions, CSV floor
   - Expected to be used for Tax reserves
2. **Deterministic reserve** – Gross premium reserve, prudent estimate assumptions, deterministic interest rate scenario based on ALM model
   - Unless Deterministic/Stochastic Exclusion Tests passed
3. **Stochastic reserve** – ALM model, reserve set to CTE(70) of PV of greatest accumulated deficiency over stochastic scenarios (1000+ ?)
   - Unless Stochastic Exclusion Test passed
Overview of VM-20 (PBA for Life Insurance)

- AAA is working on updated Life PBR Practice note
  - First draft expected mid-2013?
- New research initiated by SOA Financial Reporting Section to identify key considerations for PBA implementation (Nov. 2013?)
- VM-20 is still being debated, revised, refined;
  - Evolution will continue as experience emerges

The Major Challenges of PBA (1)

- Methodology: A blend of traditional valuation and stochastic ALM modeling
  - Management of scenarios and asset models
  - Run-time vs. IT resource concerns both in development and testing and in production runs
  - Iterative solutions for certain requirements e.g. starting assets
  - Reporting challenges: combining deterministic and stochastic runs; large volumes of potential results; validation vs. production runs
The Major Challenges of PBA (2)

• Assumptions: Prospective, unlocked, all material risks
  o Development, management, validation of expected experience assumptions
  o Development, management, justification of margins
  o Compliance with regulatory rules (note mortality especially)
  o Experience Study requirements

The Major Challenges of PBA (3)

• Processes are more complicated
  o Research and development of models & assumptions
  o Updating models every year
  o Initial and ongoing validation
  o Automated processes for production runs
  o Flexible yet reliable reporting
  o Governance/audit support

• Software must facilitate
  o Flexibility yet control
  o Handle more complicated processes while keeping IT and HR expenses down
The Challenges of PBA

- Managing a complex, model-based system with a control environment sufficient for critical financial reporting purposes
  - Assumptions and margins continuously reset
  - Multiple deterministic and stochastic runs
  - New unfamiliar processes likely to be evolving over time
  - Reliance on traditional model-based systems with open code and spreadsheet components

SOA Research Report on Modeling Controls

- Financial Reporting Section commissioned a survey and report published by Deloitte in December, 2012
  - Documenting the current state of actuarial modeling controls in US and Canadian life insurers
  - Evaluating the current state vs. the anticipated leading practices
  - Discussing the considerations in narrowing the gaps

- The full SOA Report can be found at

  www.soa.org/Research/Research-Projects/Life-Insurance/Actuarial-Modeling-Control.aspx
SOA Research Report on Modeling Controls

• Key findings based on survey results included:

• There is a wide variety of actuarial model governance and controls currently in place in the industry
• Companies that had experienced an adverse event caused by actuarial modeling errors or companies that are subject to Canadian or European reporting requirements were generally further along in implementing leading practice actuarial model controls
• The current robustness of controls over desktop applications and spreadsheet applications exhibited at companies will need to be significantly enhanced

14 Action Steps were suggested to move toward Industry leading practices, including:

1. Establish a formal and documented governance policy for actuarial modeling processes.
4. Consolidate models to a single platform or a single modeling system where feasible
6. Implement a formal change management process for governing model code changes and model updates.
8. Automate the input of assumptions into the models.
10. Analyze and document the impact of each significant assumption change.

Each action step may well have software design implications, although often these are matters of policy and/or individual discipline.
Control Facilitated by a Centralized Environment

Conclusions

- Actuarial models will significantly increase in complexity, hardware demands, and importance within company financial reporting, risk management processes.
- Actuarial Software systems will need to be specifically designed not just to perform the calculations required but to facilitate the work of the actuaries in:
  - developing
  - updating
  - understanding and
  - exploiting these complex models within a robust control environment.
SEAC Seminar: PBA – Calculation Considerations

Presenter: Chris Peek, Principal
Actuarial Resources Corporation
June 21, 2013

Agenda

- PBA Calculations
- Technology
- Stochastics
- Nested Stochastics
- Reduction Techniques
PBA Calculations

PBA Challenges

1,000+ Scenario Dynamic and Stochastic Processing

Distributed Processing

BIG Data

Projection of PBA Reserves and Capital
Advancing Hardware

- Hardware improvements
  - Multi-core processors
    - Quad-Cores available today
    - 32+ Cores coming soon!
  - Fast hard drives (Solid State!)
  - Fast network connectivity
  - Expanded RAM memory capacity
    - More RAM slots per machine
    - Bigger RAM chips
Advancing Software

- Multi-threaded applications
  - Ability to run a single scenario across multiple cores
- 64-Bit processing
  - Increases amount of available RAM memory for model
  - In-memory dynamic runs far more efficient when remaining outside of virtual memory (disk memory)

Technology

- Distributed Processing – What is the difference?
- GRID Solutions
- Cloud Computing
- Software as a Service
- GPUs
Stochastic Calculations

Dynamic and Stochastic ALM

- 1,000 scenarios
- Dynamic assumptions
- Potential Model Size Limitations
- Availability of Asset Information
- Need ability to project PBA stochastics
- Runtimes!

Stochastic Challenges

Need timely production of results

- Assumption data, particularly asset information, is not always readily available
- Dynamic and Stochastic models are resource intensive
- Potential Model Size Limitations
- Large volume of data created
- Need ability to effectively audit stochastic results to proceed with financial reporting cycle
- Sensitivity analysis takes time and resources
Experience Analysis

Experience Studies in Production

- VM 50 and VM 51
- Perform studies in conjunction with valuation
- This is a process not a project
- Reconciliation to other financial measures
- Increase the scope of studies beyond mortality and lapse

Using the Results

- Develop Prudent Estimate Assumptions
- Credibility of Results
- Sensitivity Tests
- More frequent updating of “current” assumptions for pricing and GAAP
**Reporting**

**Key Reporting Requirements**

- **Standard Scenario/Deterministic Reserves on Seriatim Basis (with Audit Support)**
- **Stochastic results available in total (summarized) as well as by individual scenario (detailed)**
- **Allocation of stochastic reserves net/gross of reinsurance**

**Nested Stochastics**

**Properties of SoS**

- Inner/Outer Scenarios
- Deterministic on Stochastic
- SoSo….S?
- Lots of data generated
- Various uses
  - Pricing
  - Capital Modeling
  - Challenging to Audit
Nested Stochastic Challenges

- Exponentially larger than stochastic runs
- HUGE increase in data
- Requires efficient distributed processing and control of frequency of calculations
- Difficult to audit results due to volume of information

Model Efficiencies

- Inforce Compression
- Proxy Modeling
- Scenario Reduction
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Presented by
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MG-ALFA Global Sales Director

June 21, 2013

Agenda

- Modeling Efficiency Techniques
  - Model Compression
  - Proxy Modeling
  - Scenario Reduction
- Automation of Production Modeling
  - Model Refresh
    - Assumption Management
    - Input Data
  - Calculations
  - Validation & Sign Off
  - Reporting
Modeling Efficiency Techniques

- Model Compression
  - Seriatim Model Necessary for NPR & Deterministic Reserves
  - Compressed Model Optional for Stochastic Reserve
  - Compressed Model Likely for Nested Stochastic Projections
  - Compression Methods
    - Traditional Actuarial Mapping
    - Intelligent Mapping (i.e. Cluster Modeling)
  - Model Fit Must Improve Dramatically
  - Predict Compression Methods to Expand

- Proxy Modeling
  - Useful for Frequent Capital Analysis
  - Replicating Portfolios Common
  - Least Squares Monte Carlo
  - Numerous Adjustment Methods
  - Unlikely for PBR

- Scenario Reduction
  - Numerous Methods
  - Clustering
  - Stratified Sampling
  - Regulatory Acceptance Unknown
Automation of Production Modeling

- Practical Challenges
  - Input File Management
    - Inforce Files (Assets & Liabilities)
    - Scenario Files
  - Model Management
    - Assumptions
    - Model Updates
  - Calculation Capacity & Control
  - Validation & Signoff
  - Reporting Timeline
  - Multiple Model Purposes (PBR, GAAP, IFRS)

Manual Processes Must Migrate to Automated Processes

- Automated Inforce File Feeds
- Automated Compression (If Desired)
- Managed Asset & Liability Assumption Updates
- Automated Economic Scenario Feeds
- Automated Change Control Process
- Automated Audit Trail

Expanded IT Involvement for Automation

Data Warehouses (Input & Output) More Prevalent
Automation Solutions

- Most Vendors Offering Solutions for PBR & Beyond
  - Client/Server Designs
  - Automation of Refresh and Reporting Tasks
  - Automated Processing via Grid & Cloud Options
  - Significant Expansion in Controls
- Supporting the Migration to Production Modeling
- Few Early Adopters
- Predict Rapid Expansion
- Significant IT Involvement!!!