Session 3A – Model Governance for Actuarial Models

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The SOA Asia-Pacific Annual Symposium

Model Governance for Actuarial Models

July 7, 2017

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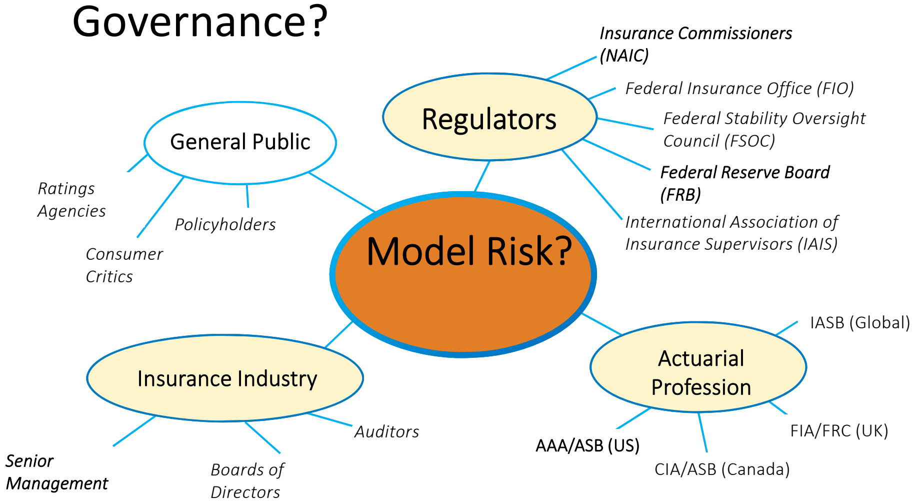
Agenda

- Model risk guidance from the Actuarial profession
  - IAA Riskbook
  - ASOP on Modeling
- Model risk in Financial Models of Life Insurance
- Model validation and governance of Life Insurance models

Who has lead the drive to address Model Risk through improved Model Governance?



Global Progress on Actuarial Modeling SOPs

- ASOP on "Modeling" 3rd Exposure Draft released July, 2016
  - comment period ended 10/31/2016

"Revisions to General Standards to Reflect the Use of Models"
- released January 2017 (effective January 2018)

ISAP 1A – Model Governance and
ISAP 5 – Insurer Enterprise Risk Models
- adopted November, 2016

Technical Actuarial Standard M – Modelling
- effective April, 2010

IAA Risk Book

Governance, Management and Regulation of Insurance Operations

» A collection of papers produced by the Insurance Regulation Committee of the International Actuarial Association (IAA) "to help ensure both the sustainability of insurance programs and the protection of their policyholders"

» Chapter 15 - Governance of Models - by Trevor Howes, Godfrey Perrott, Sheldon Selby, David Sherwood (approved on 9 September 2016)

- Target Audience is Regulators and other stakeholders
- Goal is to explore Models and Model Risk specifically from an actuarial insurance enterprise perspective, and describe the importance and nature of Model Governance
- Reviewed and extracted key points from wealth of materials available on the subject as in references listed
- Not a comprehensive textbook; not professional guidance

What is Model Governance?

- Definition: Model governance is a comprehensive set of principles, roles, responsibilities and processes that provide comfort to the intended users of the model results that model risk is understood and being effectively managed.
  - Model Governance is not model management.
    - Model governance provides a **framework** through which an insurer can effectively **oversee** the development, implementation, maintenance, enhancement, use and retirement of models, understand model risk throughout this model lifecycle and provide those who use the results of the model with the confirmation of fitness and quality needed.
    - Model management is the day to day operational activities of creating, implementing, adapting and using models throughout their lifetime.
  - Important components of model governance and model risk management:
    - Model Inventory: a record of all models that are relied on by the company, showing model type and significance, risk rating, the status of validation, and outstanding deficiencies.
    - Model Validation: the process of reviewing and examining all aspects of a model in order to confirm that the model is fit for its purpose;
  - Model governance does not define the approach to model validation. It is vitally concerned with the ongoing assessment of its effectiveness.

Key Messages on Model Governance

1. Models are critical to the financial and risk management of insurance enterprises. This requires a governance structure to manage their limitations and weaknesses so that the results of the model can be relied upon by its users.
2. Model governance is an ongoing process, not an end point.
3. The nature of insurance risks and their level of complexity must be specifically considered both in the design and application of the model risk management policy, and in designing appropriate model governance.
4. Actuaries and other modeling professionals serve a vital role in governance of insurer financial models

Scope of Proposed Modeling ASOP for US Actuaries

- Scope – The ASOP applies to actuaries in all practice areas who select, design, build, modify, develop, use, review or evaluate **models** when performing actuarial services.
  - whether or not actuary is part of the modeling team or the model is developed by others outside the organization
  - all models (with appropriate judgement re the extent of reliance by the intended user and the materiality of the financial effect)
  - Professional standards apply whether you are the signing actuary in a formal role or not

Key Principles of Modeling ASOP

- The actuary should select, design, build, modify, develop, or use a **model** that **meets the intended purpose**.
- The actuary should examine the potential for **model risk** and undertake reasonable and appropriate steps to mitigate it

– **Model risk** - the risk of adverse consequences (e.g. loss) from reliance on a model which is flawed or misused.
  - Loss can arise from model flaws i.e. errors
    - Undetected initial development error
    - Errors introduced through model update and change
    - Errors in development or application of assumptions
  - Loss can also arise from misuse (model not suited to purpose)
    - Misunderstanding or negligence or lack of alternatives
    - Overfitting or miscalibration or poor choice of model

Model Validation Techniques

- Mitigation of model risk
  - The actuary should examine the potential for **model risk** and undertake reasonable and appropriate steps to mitigate it using **validation, governance and controls** as appropriate
  - Perform model validation to confirm reasonableness and integrity using reconciliation, output analysis, peer review
  - Implement appropriate model governance and controls
- Model Governance is the oversight framework; controls are the tools which either prevent or detect the possibility of model failure
- Model Validation should be concerned with all types of model risk according to the relative contribution to the model's risk rating
  - Flaws and errors – is the model doing what it was designed to do?
  - Use and misuse – is the appropriate model being used, and used correctly as designed?

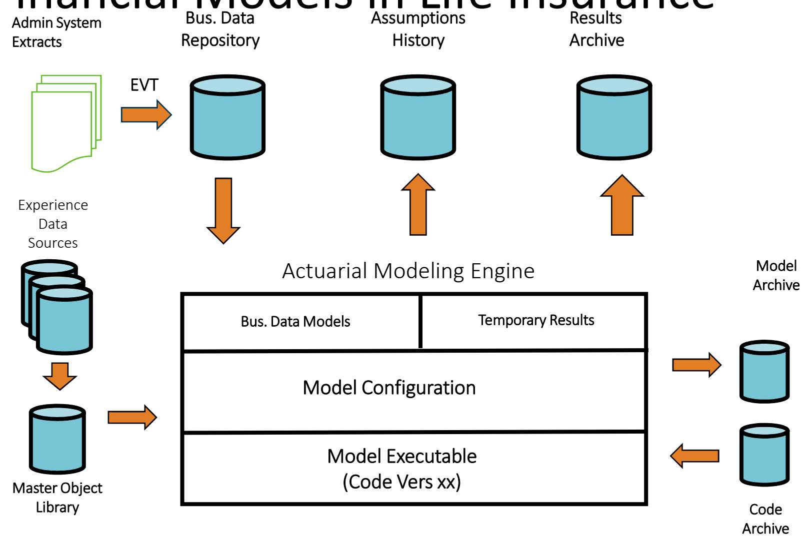
What Types of Models do Actuaries Use?

- What is a Model? Models are *simulations of entities, processes or risks* used "to help explain a system, to study the effects of different components, and to derive estimates and guide decisions." A model is a tool used to perform analysis.
  - Cash Flow & Financial Models
    - Used for Pricing, Valuation, Financial Projection and Planning, ALM and Risk Analysis
    - Models and submodels
  - Risk Models
  - Deterministic/Stochastic Models
  - Business Data Models (Clustering and Compression)
  - Dynamic Policyholder Behaviour Models
  - Predictive Models
  - Other types?

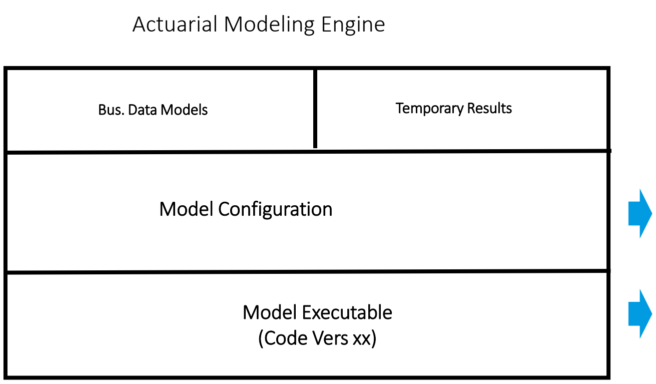
Financial Models in Life Insurance

- Many submodels within a large financial model
  - Risk models (ESG, Lapse/mortality, policyholder behaviour)
  - Financial simulation models (e.g. simplification of cash flow timing)
  - Business data models (full seriatim vs. grouped/represented data)
- Full production model includes all data input and output processes including assumption development and model structure that links assumptions with business data
- New financial reporting frameworks (PBA, IFRS, etc.) require detailed assumptions to be reset according to current estimates/current environment regularly
- Model code may need frequent update to reflect new products, new regulations, new demands on the model
- Large complex models with many moving parts increases the risk of model flaws from implementation, operation and maintenance and complicates model validation

Financial Models in Life Insurance



Financial Models in Life Insurance



- Model structure
- Definition and linkage of assumptions
- Parameters

- System code
  - Vendor supplied
  - User approved

Validation of Life Insurance Financial Models

- Each model and component submodel is different and requires a appropriate selection of possible controls, validation tests, and other risk management tools
  - Insurance models are not necessarily comparable to models in banks and other financial institutions and may require different approaches
  - Actuaries should work with data management and IT specialists as a collaborative team in system development, in model risk assessment and in model controls and validation
- Model validation using fully independent replication may be very challenging both to develop and to maintain over time
  - Can the critical actuarial resources with business expertise be replicated and maintained?
  - Can a fully separate and independent modeling tool replicate the entire process?
  - The alternative is likely a combination of sample component replication and independent peer review of the model documentation including validation tests performed in-house
- Model validation techniques should be planned and developed while the model is being developed, tested and implemented, and retained for repeated revalidation use
- Modeling platforms should support component calculation reporting and other model validation and control tools (e.g. version control, movement attribution analysis, etc.)
- Use of a single modeling platform will facilitate a consistent governance approach and reduce model validation effort

Q / A