13th Global Conference of Actuaries 2011

Emerging Risks… Daring Solutions

Note on Internal Models

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February 20 – 22, 2011

Agenda

- IAA Papers
- Note on Internal Models
- Own Risk and Solvency Assessment
- Conclusion

IAA Papers

- IAA has developed papers on solvency and related issues as follows:
  - Global Framework for Insurer Solvency Assessment, 2004
  - Note on Enterprise Risk Management for Capital and Solvency Purposes in the Insurance Industry, March 2009
  - Measurement of Liabilities for Insurance Contracts: Current Estimates and Risk Margins, April 2009
  - Comprehensive Actuarial Risk Evaluation (CARE), May 2010
  - Stochastic Modeling – Theory and Reality from an Actuarial Perspective, 2010

Internal Model

- Note on the use of Internal Models for Risk and Capital Management Purposes by Insurers; IAA, November 2010. Developed by the Solvency Subcommittee of the Insurance Regulation Committee
  - Provides educational material for those responsible for constructing, using and approving the use of models to assess and manage risk and capital within insurers.
  - Not Standards for Practitioners
- Internal model is a mathematical representation of the insurer's business

Internal Model ; Introduction

- The use of internal models for insurer risk assessment and capital management is increasing due to the:
  - emergence of comprehensive insurer risk management practices
  - widespread use of economic capital, etc
- It may also be useful and advisable to employ the same model in stress/scenario testing

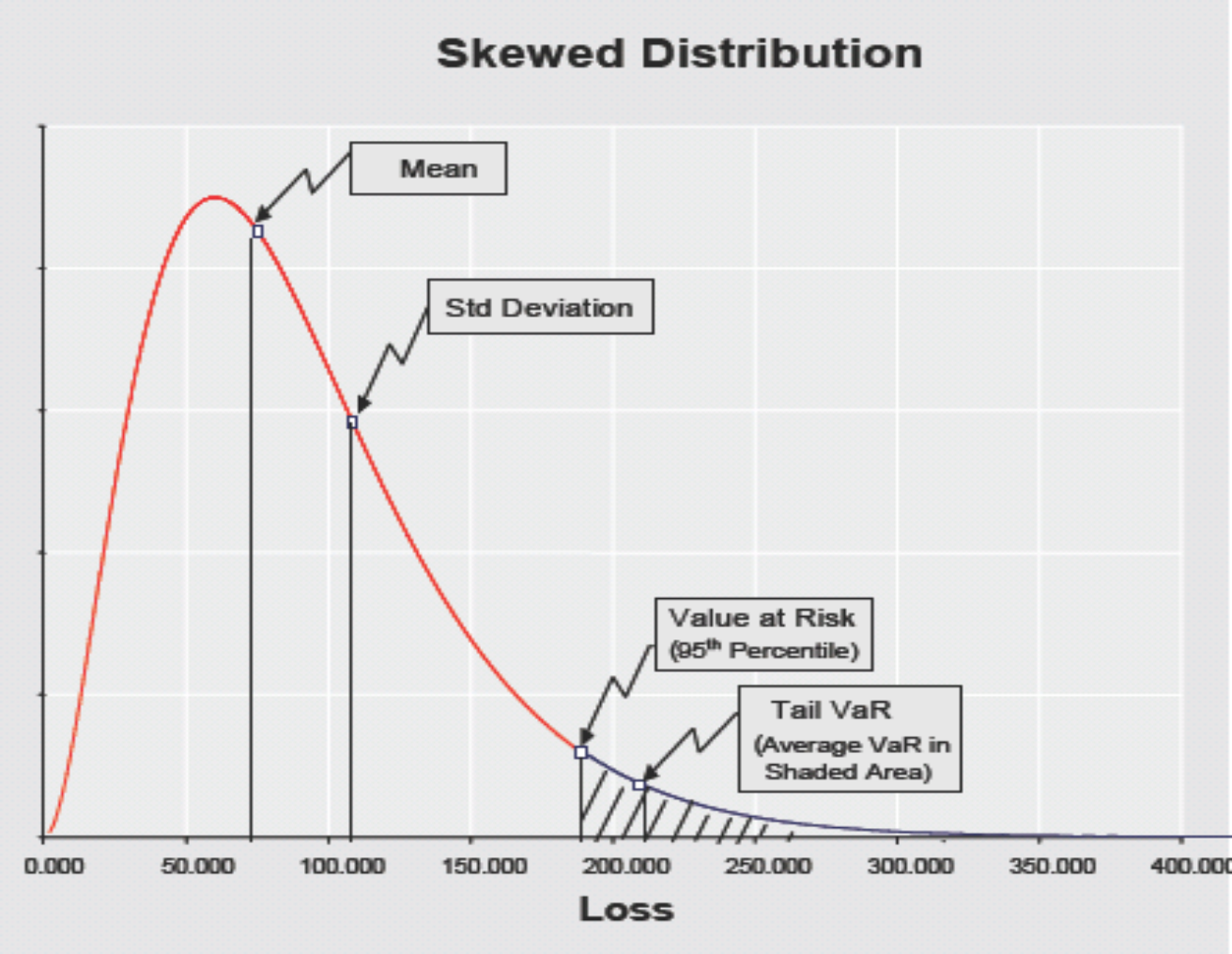
Internal Model ; Fundamentals

- Internal model is used to estimate a range of possible future financial states an insurer may find itself in as a result of
  - the variety of risks to which it is exposed
  - the methods used to manage those risks
- An insurer's financial position is affected by many variables
- Financial effects of some of the variables (ex. operational events) may be difficult to quantify except through stress/scenario testing

Internal Models ; Fundamentals

- Proportionality
  - The structure of the model should reflect the nature, size and complexity of an insurer's risk
- Risk assessment framework
  - Internal model can only a tool within the risk assessment framework, include the following;
    - Time horizon
    - Risk measure
    - Confidence level
    - Terminal provision

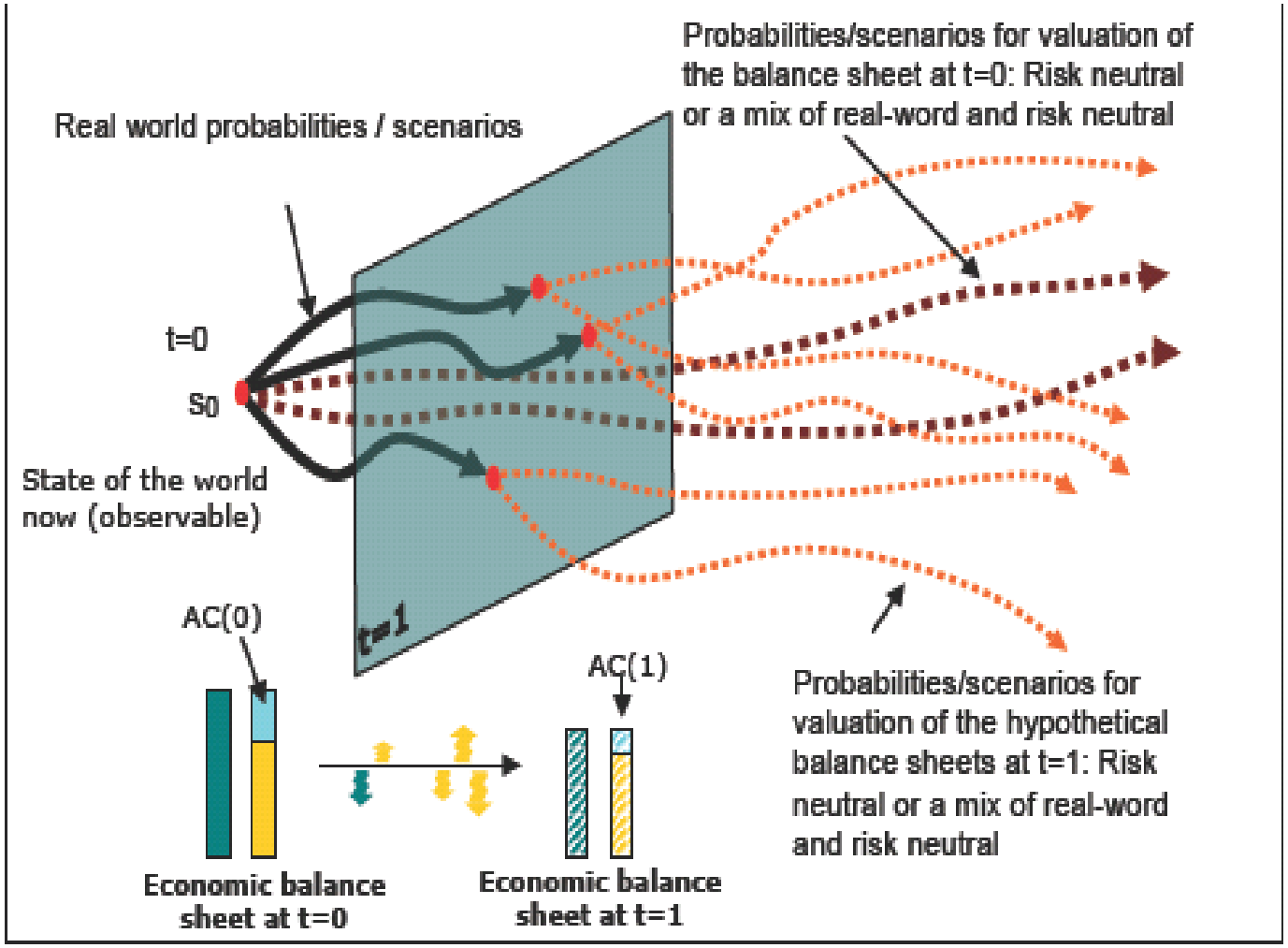
Internal Models ; Fundamentals



Internal Models ; Fundamentals

- Real World versus Risk Neutral Probabilities
  - Real world probability measures project economic scenarios based on historical experience and actuarial techniques
  - Real world probabilities have to be used to arrive at a future, observable state of the world
  - Risk neutral valuation is a mathematical tool to arrive at a market consistent valuation that reflects the markets view and expectation of risk

Internal Models ; Fundamentals



Internal Models ; Design Considerations

- Results
  - The model can be constructed to produce the desired results. There should be a way of reproducing all results for audit purposes and for checking and correcting errors
- Order of calculation
  - It can significantly affect the model's ability to reflect specific interactions between modeled components
- Control over Assumptions
  - Centralized coordination and/or control over common assumptions is essential because any changes in assumptions need to be properly reflected

Internal Models ; Design Considerations

- Reproducibility
  - Run a model several times with the same data and assumptions and verify that the same results are obtained each time
- Flexibility
  - Models should be constructed to be flexible and facilitate the reflection of future changes such as new products and changes in internal policies

Internal Models ; Construction of Model

- Time granularity
  - In choosing an appropriate granularity the modeler should balance accuracy against materiality, computing power and run time
- Product descriptions
  - Products should be modeled so as to generate projected cash flows that are sufficiently close to the actual products
  - In choosing grouping, the group of products should exhibit similar financial results under all possible future scenarios

Internal Models ; Construction of Model

- In-force data
  - Greatest accuracy in life product modeling would be obtained from use of seriatim data, but appropriate to use “model points”
  - The determination of the segment structure is a important step for non-life business. Segmentation criteria are of statistical nature, like homogeneity and statistical mass
- Assets
  - Mapping of assets to proxy asset classes or indices should be plausible, intuitive and conceptually sound

Internal Models ; Construction of Model

- Insurance experience assumptions
  - Assumptions about future experience for insurance risks are among the most difficult issues in constructing an internal model
  - If the experience is insufficient to yield sufficiently credible information, make use of industry data
  - If there are sufficiently strong doubts concerning the applicability of past experience to the future, it may be appropriate to use new assumptions
  - The insurer may have new products under which experience is expected to differ from that of its older products

Internal Models ;
Construction of Model

- Insurance assumptions for projections
  - Most mortality or morbidity studies focus on the derivation of expected rates and long-term improvements
  - The current models of general insurance usually use stochastic simulation techniques
  - Less is known about probability distributions with respect to surrender or lapse rates which are significantly driven be policyholder behaviour

Internal Models ; Construction of Model

- Calibration
  - The process of validating estimated parameters and assumptions used in the model to their real life values
  - In the case of a model employing stochastic projections of economic scenarios, the parameters which govern the Economic Scenario Generator should be calibrated so that the specific implementation of the economic model produces results consistent with historical experience or current market data
- Assumptions concerning the firm
  - Need to incorporate assumptions about the insurer's future policies and practices in its on-going operations

Internal Models ; Construction of Model

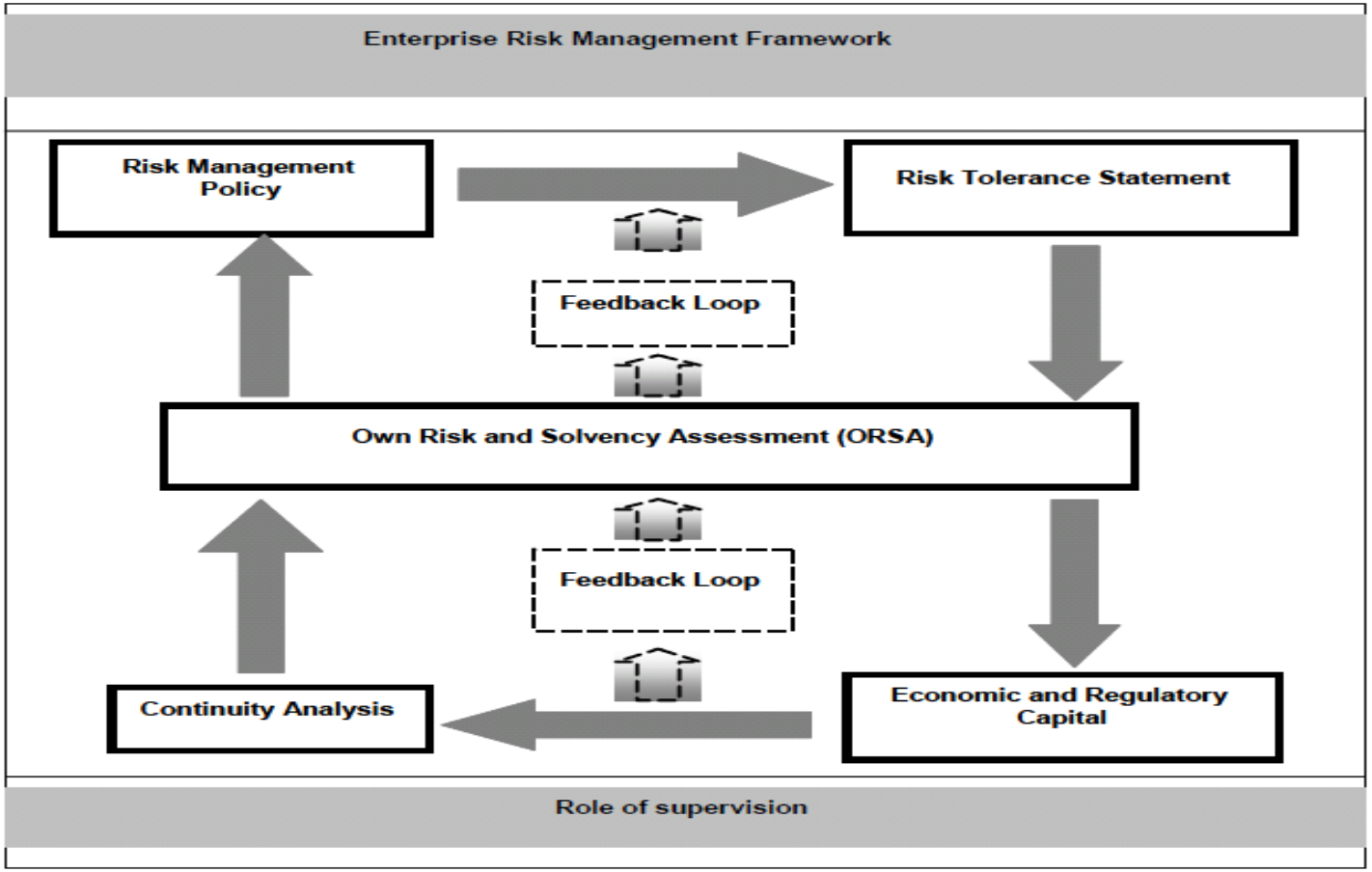
- On the use of random numbers
  - Random number generators are algorithms and produce pseudo-random numbers. The generator's periodicity should exceed the number of random numbers that will be needed in any simulation
- Number of simulations in a stochastic models
  - Insurer's models are usually large and complex. The determination of how many simulations are sufficient is difficult. In many cases through empirical testing
- Extreme values
  - Advisable to supplement stochastic modeling by testing of deterministically selected extreme scenario

Own Risk and Solvency Assessment

- IAIS Insurance Core Principle 16 ERM
  - 16.11 The solvency regime requires the insurer regularly to perform its own risk and solvency assessment (ORSA) to assess the adequacy of its risk management and current, and likely future, solvency position
  - 16.13 The solvency regime requires the insurer's ORSA to encompass all reasonably foreseeable and relevant material risks including, as a minimum, underwriting, credit, market, operational and liquidity risks and additional risks arising due to membership of a group

Own Risk and Solvency Assessment

- IAIS standard ERM framework



Own Risk and Solvency Assessment

- 16.13.1 In its ORSA an insurer should consider all material risks that may have an impact on its ability to meet its obligations to policy holders, including in that assessment a consideration of the impact of future changes in economic conditions or other external factors...
- 16.13.3 An insurance group should perform its ORSA to assess the adequacy of the group's risk management and current , and likely future, solvency position...

Conclusion

- When properly embedded in an insurer's risk and capital management processes, internal models are a rich and vital source on information about the insurer's inherent and residual risks
- Internal models are useful tool in the ORSA, especially for insurance groups
- IAA Insurance Regulation Committee and Solvency Subcommittee are developing the papers on Systemic Risk Regulation and Stress/Scenario Testing respectively for the next steps