A Framework For Estimating Uncertainty in Insurance Claims Cost

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Agenda

- Why do we need a framework?
- Proposed Framework
  - Individual product group
  - Inter-product group dependencies
- Insights & Lessons Learned

Why a Framework?

Current Approaches have Limitations:	Implied Need
Separate approaches to mean, variance, covariance	• Consistent approach based on the underlying distributional form
Bottom up approach – little work done on risk aggregation (diversification benefit)	• Portfolio approach based on estimating key uncertainties
Quantitative techniques for CoVs are costly, inconclusive and "backward-looking"	• An approach that looks at all sources of variability in estimates
No acknowledgement of subjective elements of the valuation basis – Business information provided *to* the actuary – Assumptions made *by* the actuary	• A means of controlling and bringing accountability to – Qualitative information provided to the actuary – the use of subjective judgement by the actuary

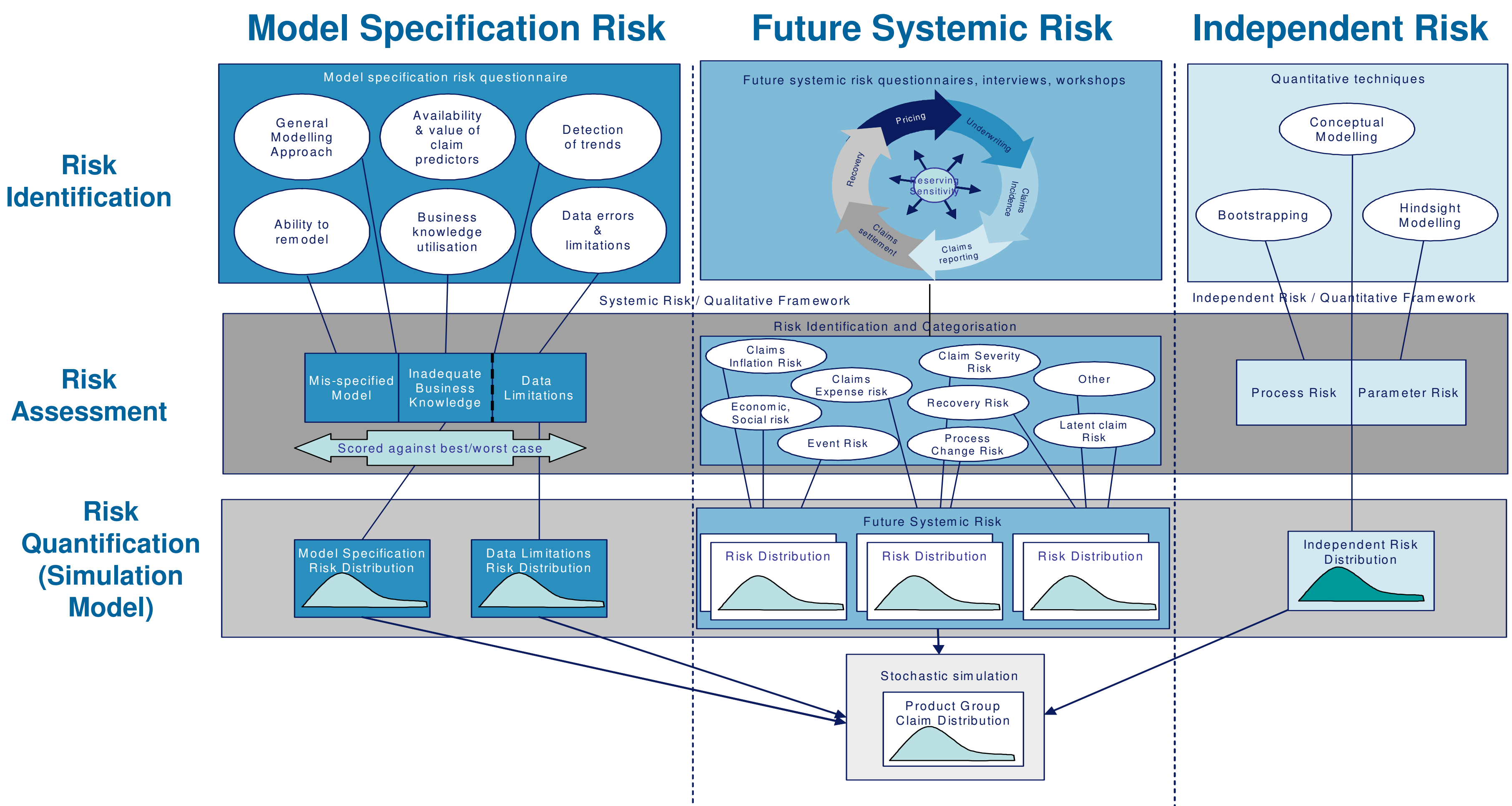
The Framework in General

- Top-down approach to identifying key risks
  - Identification
  - Assessment
  - Quantification
- Goal is to make sure all sources of risk are identified and key risks quantified
- To this end, hierarchical risk categories are used (this also enables identification of dependence relationships between risks)
- Has broad similarities with approaches being developed for operational risk quantification (eg. Basel II AMA)

Components of Risk

Source of Risk	Description	Example
Independent Risk		
Independent Parameter Error	Process error in past data results in volatility in calibrating the model	Volatility in past results even if the process does not change
Process Error	Future insurance process has volatile outcomes relative to expected	Tossing of an unbiased coin 100 times will not always give 50 tails
Systemic Risk		
Model Specification Risk	Model is an imperfect representation of complex real-life processes - includes "systemic parameter error"	Actuarial model assumes payments related to simplistic predictor (finalised claims) while process is more complex
Future Systemic Risk	Trends move systemically away from current realistic outcomes	Trends in inflation

Product Group Framework



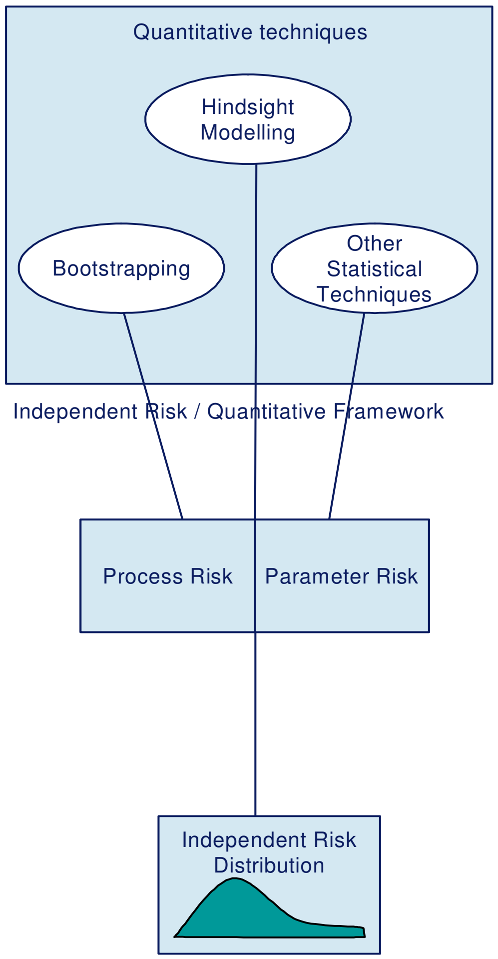
Independent Risk

<u>Risk Identification</u>

- Quantitative techniques
- Formal modelling (eg. Bootstrapping), informal modelling (eg. Sensitivity analysis) and historic reserving variance

<u>Risk Assessment</u>

- Adjust results for major known systemic episodes



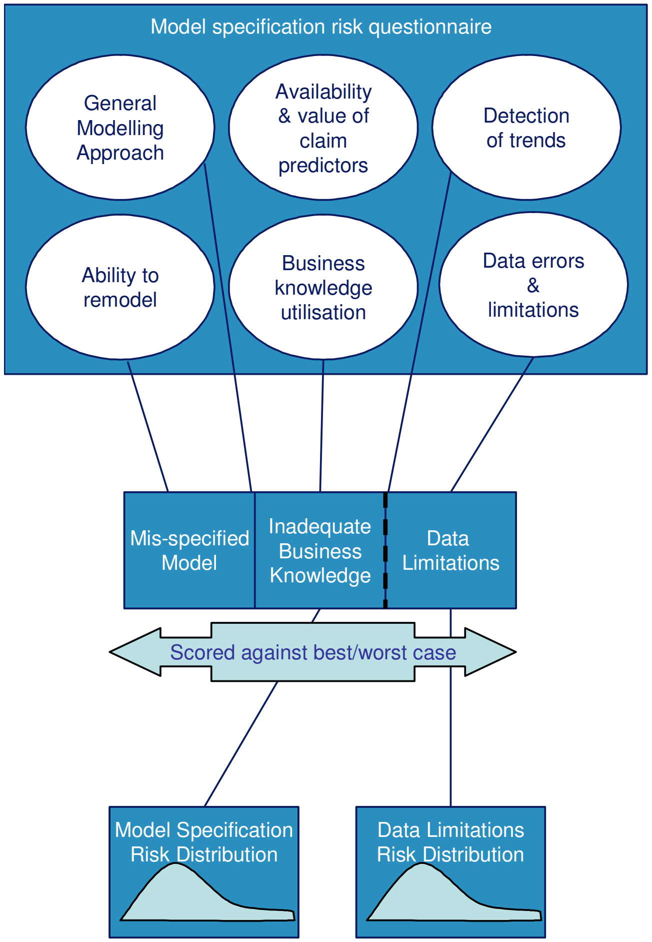
Model Specification Risk

Risk Identification

- Mainly qualitative techniques used to compare valuation methods
- Consistency of approach across product groups

Risk Assessment

- Balanced scorecard approach and use of risk indicators
- Calibration of model based on:
  - Actuarial model differences
  - Black box model outputs
  - Actuarial judgement!!!



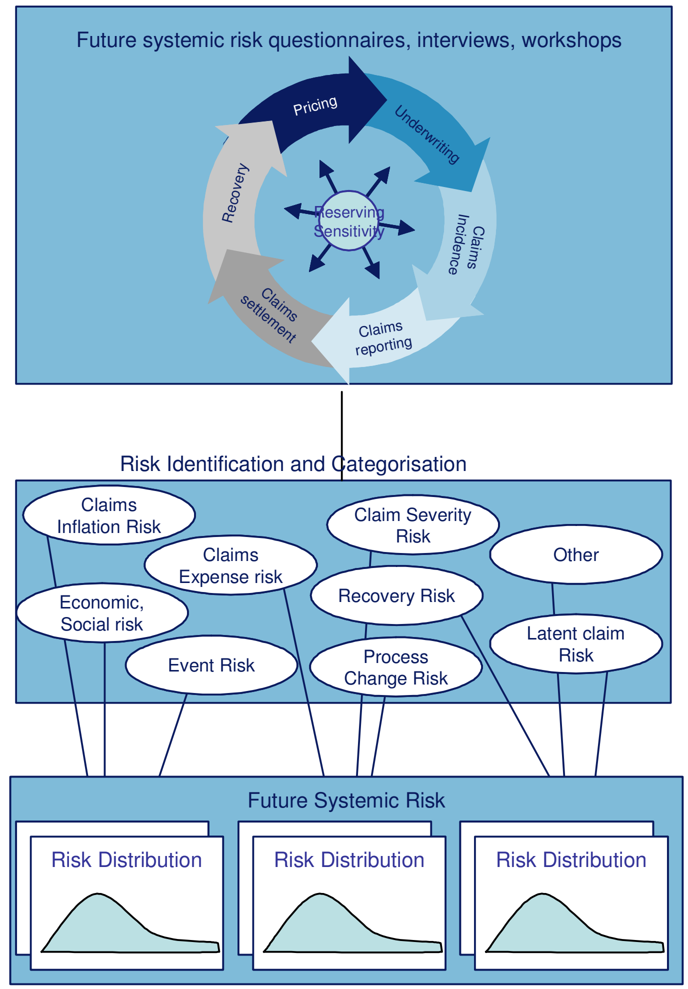
Future Systemic Risk

Risk Identification

- Forward looking method
- Identify key risks by mapping business processes and interviews with business experts

Risk Assessment

- Key risks categorised into independent “risk buckets”
- Quantification using mix of qualitative and quantitative techniques



Inter-product Group Dependencies

- Risk categories identified gives power to measuring dependencies across different product groups
- Explicitly model root cause of dependencies
  - For example event risk, inflation risk, data risk
  - Explicit tail correlations can be separately identified and modelled
  - If you can't identify dependencies then they probably don't exist
- Stochastic simulation techniques can be used to model resulting dependencies

Practical Application of Framework

- Asbestos portfolio:
  - Qualitative investigations
    - Interviews with business experts (medical, legal, actuarial etc)
  - Sensitivity / scenario analysis under a probabilistic framework
- LMI portfolio:
  - Mainly quantitative methods used
  - Stochastic economic modelling
  - E Kelly, K Smith (2005)

Practical Application of Framework

- Insurer with multiple lines of business:
  - Mixture of quantitative and qualitative methods:
    - Quantitative approach to independent risk and event risk
    - Qualitative approach for model specification risk and other components of future systemic risk
  - Consistency of assumptions across product groups:
    - Economic risk effects related to the mean term of liabilities
    - Model specification risk consistent method / quantification across product groups
  - Root cause of dependencies identified and explicitly modelled

Insights & Lessons Learned

- Top few risks in a class often comprise over 90% of uncertainty
- Difficult to justify high correlations unless key risks or processes are shared
- “Multiplier” approach to premium liabilities is inherently flawed
- Some risks do not fall easily under commonly used distributions (eg events)
- Model specification risk is still a significant challenge requiring further work

Advantages of Proposed Framework

- A robust and forward looking framework
- Auditable, replicable and transparent process
- Consistency in:
  - approach to moment estimation
  - methods used between product groups and over time
- Premium liabilities treated appropriately
- No distributional limitations on risks or results
- Identification of key risks and control of subjectivity
- Dependencies explicitly identified and quantified