CNSF – XXIV International Seminar on Insurance and Surety

Internal models

20 November 2014

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Internal models

Agenda

(1) SST overview

(2) Current market practice

(3) Learnings from validation of internal models
SST overview
• Aims to protect policyholders

• In-force since 2011

• “Largely equivalent” with Solvency II
• SST very strong in Pillar I
• FINMA may increase Pillar II (e.g. ORSA) and Pillar III (reporting) requirements
The risk measure is the 99% Tail Value at Risk (aka Expected Shortfall)

Requirement to model each legal entity explicitly

Standard model consists of separate modules for market risk, life insurance risk, non-life insurance risk, credit risk, scenarios (insurance and financial scenarios, prescribed and company-specific), aggregation and the Market Value Margin (risk margin)
Internal model requirements are principle based
- Documentation requirements covering methodology, parameterisation, data quality, limitations and weaknesses

Validation by FINMA is not a one-off exercise
- 69 companies (just over half of total number of SST participants) in Switzerland have applied for internal models. 6 were accepted, 34 conditionally accepted and 29 declined
Current market practice
All reinsurers are required to use internal models

Most P&C insurers use internal models at least for insurance risk, most life insurers use internal models for valuation, market and credit risk

Modular approach
- Market risk
- Insurance risk (separate models for life and non-life)
  - Sub-modules: reserve risk, premium risk, nat cat risk for non-life for example
- Scenarios
- Credit risk
- Outward reinsurance (including intra-group transactions)
- Aggregation
- MVM
- Expected result (technical plus financial)
• Most material risk is insurance risk for P&C insurers and reinsurers, and market risk for life and health insurers

Source: FINMA website, SST 2014 results
• Definition: Risk relating to business from prior accident years
• Different lines of business modelled separately
• Approaches vary in terms of:
  • Analytical (e.g. Mack) or Stochastic (e.g. bootstrap)
  • Modelling ultimate risk and transforming it to one-year risk, or modelling one-year risk directly
  • Modelling claims together or separate modelling of large claims
• All approaches involve significant assumptions, increasing the importance of validation
Internal Models

Current market practice – Example: Natural Catastrophes

Scenario 1, e.g. WS Europe
- Portfolio information
- Hazard model
- Vulnerability model
- Event loss table

Scenario 2, e.g. EQ California
- Portfolio information
- Hazard model
- Vulnerability model
- Event loss table

Scenario 3, e.g. TC North America
- Portfolio information
- Hazard model
- Vulnerability model
- Event loss table

Scenario 4, Scenario 5, .................

Adjustments,
Aggregation
with Other Risks
in a Monte Carlo
Simulation,
Modelling of Outward
Reinsurance Conditions
Internal Models

Current market practice – Example: Natural Catastrophes (Hazard Model)

- List of probabilistic events, frequency and intensity footprint of each
- Historic events are insufficient to capture all possibilities, so probabilistic events are created using scientific models, with sub-models for:
  - Generating the origin of the event (e.g. epicentre for earthquakes, or the tracks for windstorms)
  - Attenuation functions to estimate the intensity (e.g. ground shake, wind speed, water depth) at all locations affected by the event
  - Allowance for soil characteristics, topographic factors, climatology, etc
  - etc
- Sub-perils, e.g. storm surge, may be modelled as an extension of the hazard model for the primary peril, e.g. wind, or separately

Global Tropical Cyclone Tracks, Wikipedia
Sample output from the SLOSH storm surge model, US National Hurricane Center
Earthquake zoning map for Turkey
Image from website of Kandilli Observatory and Earthquake Research Institute
Given the intensity of an event at each location, and characteristics of the insured item(s), what will the insured loss be?

Characteristics of the insured item:
- Location
- Policy conditions (e.g. deductibles, limits)
- Coverage (buildings, contents, business interruption, etc)
- Occupancy types (residential, commercial, industrial, etc)
- Construction type (brick, timber, etc)
- etc

Vulnerability curves are often based on:
- Historical data
- Post-disaster surveys
- Engineering analyses, building code information

PPA (Probability of Property to be Affected) and MDD (Mean Damage Degree) may be modelled separately, or MDR (Mean Damage Ratio, PPA*MDD) modelled directly

It is common for secondary uncertainty to be allowed for in the model
Internal Models

Current market practice – Example: Natural Catastrophes

- Modelling NatCats is a complex task, parameter uncertainty and model uncertainty can be significant
  - There is no perfect model

- Significant differences between the results from different vendors

- FINMA expects that the companies are able to explain and justify their selection between vendor models and own models, and the adjustments to these by considering:
  - Assumptions and limitations of the different models
  - Their own risk profile

- The effort needed to build up this understanding, if not already there, is a big task
Learnings from validation Internal Models
Internal Models

Learnings from validation of internal models

1) Interviews & workshops in addition to reading documentation is often essential
   • Good documentation is essential but it often comes with gaps and ambiguity and can be aspirational

2) Some insurers criticise the speed of the regulatory reviews but in my opinion proper and valuable reviews need time,
   • A lot of terms in requirements are ambiguous, e.g. “appropriate”, “reasonable”
   • Quick checklist approach may lead to misleading conclusions
     • IMs contains many parameters, takes time to understand them
     • And changes in economic environment and modelling literature and market practice may lead to new request/questions from the regulator

3) Benchmarking requires care

4) Assigning materiality to findings can be challenging
5) Some commonly not well-understood model elements, e.g.
   • One-year risk
   • Risk margin
   • Model risk, parameter risk
   • Intra-group guarantees (consolidated models do not give policyholder view)

6) Two types of validation
   1. Checking whether the model works as documented
   2. Checking whether the methodology makes sense and fit for the company using it
      • Both are important, both require different types of skill set. FINMA sometimes
        makes use of consultants. Specialist expertise and creativity required for the
        second type.

7) Despite challenges in making conclusions on materiality, appropriateness,
   etc, in most cases the discussions involved in design and validation of
   internal models improve the company’s and the regulators understanding of
   risk profile and lead to better decisions