Session 2-1: Introduction to risk analytics principles and approaches

Stuart Fraser
Technical Lead, Risk Modelling Steering Group (RMSG), Insurance Development Forum
Introduction to climate and disaster risk analytics principles and approaches
Risk information for supervisors

Supervisors should increase understanding of climate risk and capabilities to evaluate activities toward climate resilience

IAIS, 2018, Issues paper of climate change risks to the insurance sector

• Solvency, business model viability: e.g., higher claims burden
• Access, affordability: availability, capacity, uninsurable assets
• System-level stability: e.g., stress tests / scenarios (current and future)
Catastrophe model framework

Historical event information is not always complete.
On its own it is not a reliable guide to the future.

Models give a more complete picture of risk by simulating other plausible events that could occur in the future.

- **1960s** Initial research
- **1980s** First commercial models
- **1990s** Growing demand for models
- **2000s** More regulation, more providers
- **2010, 2020s** More integration, new technologies, wider application
Catastrophe model framework

Source: Oasis
Data quality – hazard

Hazard inputs
• Observations – past events, weather data, climate projection
• Environment features
• Protection standards

Influences
• Event set frequency, correlation
• Event footprint: intensity, extent
Data quality – exposure

- Location (address, postcode, district, state…)
- Replacement cost / insured value
- Usage (occupancy)
- Construction materials
- Structure type and features
- Number of people, demographics
- Up to date?
Data quality – vulnerability

- Relationship between hazard intensity and impact
- Cost of damage, fatality or injury rates
- Analytical, empirical, judgement based
- Local information or based on global assumptions?

EEFIT, 2012
Commonly used risk metrics

- Scenario Loss
- Event Loss Table (ELT) or Year Loss Table (YLT)
  - Annual Average Loss / Annual Expected Loss
  - Exceedance frequency
  - Occurrence Exceedance Probability
  - Aggregate Exceedance Probability
  - Return Period Loss / Probable Maximum Loss
  - Value at Risk

<table>
<thead>
<tr>
<th>Event</th>
<th>Annual rate</th>
<th>Mean Loss</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.01</td>
<td>605,000</td>
<td>1,200,000</td>
</tr>
<tr>
<td>2</td>
<td>0.05</td>
<td>252,000</td>
<td>900,000</td>
</tr>
<tr>
<td>3</td>
<td>0.02</td>
<td>456,000</td>
<td>1,750,000</td>
</tr>
<tr>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
</tbody>
</table>

Source: Verisk
Projecting future risk

• Climate change
  • Scenarios / emission pathways
  • Frequency / severity of events adjusted
  • Non-linear change in loss estimates

• Socio-economic change
  • Location, types of future development, population, value

• Compare current loss vs. 2040, 2060…
  • Large uncertainty – projections are indicative
  • Several projections and climate models

Sung et al., 2021
Challenges in modelling

• Quality of information to validate and improve models
• Understanding and communicating uncertainty
• Understanding what is not included in models
• Access to models
• Open modelling and collaboration can address some of these
Further open resources

insdevforum.org/rmsg-tools

**Oasis Risk Explorer** – self-guided tutorial on parametric analysis

**CatRiskTools** – find available catastrophe models for your country
Further open resources

*Resilient Planet Data Hub*
resilient-planet-data.org/

*Global Risk Viewer*
global.infrastructureresilience.org
Further open resources

World Bank (DRF) Analytics Tools
financialprotectionforum.org/disaster-risk-financing-drf-analytics-tools