Moving beyond history: A loss driver approach to projecting and quantifying casualty exposure
Agenda

• The Casualty Context
• An Existing Exposure Approach
• Towards Liability Risk Drivers
• Modelling Liability Risk Drivers
• Indicator Retrieval
• Data Analysis
• Application of LRD (Examples)
• Potential Collaborations on Data Analysis
• Q & A
The Casualty Context

1. Causation
2. Occurrence
3. Manifestation
4. Claims Made
5. Pay-out
Liability Valuation – Need for a forward-looking approach

• Market failures lead to Liability Crises
  → inadequate premiums & rise in claims/indemnity awards
  → insurers withdraw from public liability or even default
  → no cover available for many or only at prohibitive prices
  → businesses have to close
    Examples: USA mid '80s, Australia 2000

• Current approaches are
  - somehow backward looking and therefore inadequate for liability, which is long tail
  - weak in dynamic environments (emerging markets, tort reforms, etc.)
  - for RI treaties relatively unspecific with respect to industry segment and neglect other risk drivers (such as turnover size) altogether (at least on the treaty reinsurance side)
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What is Increased Limit Factors (ILF)?

An approach to redistribute the cedent's premium to layers

- Premium redistribution based on a loss ratio estimation and a constant double limit surcharge (Increased Limit Factor) assumption
- All internal and external factors on losses are combined into two factors
ILF Model Overview

• The ILF approach is based on the cedent premium $P$, the sum insured $SI$, the loss ratio $LR$ and the ILF Factor $f$ (portion of the premium that needs to be charged additionally, if the sum insured is doubled $f \in [0,1]$).

• It is used to calculate the expected loss $EL$ in the layer. In the example the layer is $(SI - SI/4)$ excess $SI/4$.

• The excess frequency is set implicitly by the loss ratio assumption.
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Short vs. Long Tail: Risk Factors

Example Earthquake

Table: Hazard + Vulnerability + Values + Conditions

Example Liability Event

Diagram: Understanding what drives risk in Liability is key to improve UW quality
NatCat Modelling – The 4 Box Principle

- **Hazard**: Where, how often, with what intensity do events occur?
- **Vulnerability**: What is the extent of damage at a given event intensity?
- **Value distribution**: Where are the insured objects located and what is their value?
- **Insurance conditions**: What proportion of the loss is insured?

**Computer Model**

**Expected Annual Loss**
What are the Risk Drivers in Liability?

Liability Risk Drivers Model

Expected Annual Loss

→ Understanding what drives risk in Liability is key to improve UW quality
### Main advantages:
1. LRDs are periodically assessed.
2. Perceived changes in risk landscape can immediately be factored in.
3. External and group-wide data are combined to calibrate the model.

### Example: Product Liability Risk

Breakdown of the cause-effect chain into "LRDs":

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<tr>
<td>New products, emerging risks?</td>
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<td>Propensity to sue, …?</td>
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<td>Likelihood of mass litigation?</td>
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<td>Product Liability Loss</td>
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Casualty vs. Nat Cat: Risk R&D and Tool Dev. History

**Nat Cat**

**till 1970**
no quantitative methods, loss surprises

**1980**
first attempts for quantified risk assessment, CRESTA info plans

**1990**
tools for main areas and perils, data standards and exchange

**2000**
world-wide cat risk assessment, sophisticated software, hazard/vulnerab. data bases, systematic/organized data flow

**2013**
tools: DONE secondary and multiline effects? assessability limits?

- + new LoBs/ToBs
- + costing/UW/steering
- + systematic data exchange

...\n
**Liability**

until recently: status of most Casualty models and tools

LRD (2007-2013)
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What is Swiss Re Liability Risk Drivers™?

**A forward-looking costing tool and loss model for Liability business**

- Exposure assessment based on a set of loss scenarios
- Assesses effect of internal and external factors on losses
- Incorporates validated underwriter insights
- Calibrated and validated against reliable in-house and external exposure and loss data
Liability Risk Drivers (LRD): Model Approach

• Calculates the expected loss costs of the (re)insurance layer starting from a set of loss scenarios

• Assesses the impact of (changes in) key factors (e.g. legal environment) on the expected loss

• Evaluates effect of (re)insurance terms and conditions on the expected loss (e.g. sub-limit per victim, Spain)

• Past experience is used as testing environment to calibrate/verify the model’s outcome

• Due to its modular approach it can be extended (e.g. new drivers, new scenarios) only by adapting the corresponding module
Model Context
LRD Model
Model Overview

Exposure information

Model

- How much it costs
- What else does also influence the loss
- Where
  - What can go wrong
    - Consequence
- What is covered and how
- Aggregation engine

Expected Loss
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Indicator Retrieval: Make the LRD Model work!

- Regular and sudden retrieval and processing of indicators/drivers on a broad geographic scale
- Implementation of an indicator retrieval tool to automate model feed (where sensible)
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Model Calibration

• *Reality check* for model output with loss data
• Calibrate the “raw” model to reproduce the loss data for one country
• The calibrated model output is then verified for other countries by changing only *known* parameters
  - from risk driver indicator retrieval
• Results are continuously tracked
LRD Prediction for Country A and B verified

- **oil blue**: country A data fit
- **red**: country A, LRD
- **grey**: country B data fit
- **green**: country B, LRD

**Calibration:**
- **brown**: country C data fit
- **blue**: country C, LRD
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## Application of LRD

<table>
<thead>
<tr>
<th>1. Portfolio Risk Analysis</th>
<th>Decomposition of an insurance portfolio into key risk drivers</th>
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<tbody>
<tr>
<td>2. Tariff Indicator for Emerging Markets</td>
<td>Calculation of expected loss and identification of major risk drivers in different high growth countries</td>
</tr>
<tr>
<td>3. Scenario Analysis</td>
<td>Portfolio impact analysis based on legal and societal developments</td>
</tr>
<tr>
<td>4. Casualty Cat Modeling</td>
<td>Calculate impact of various casualty cat scenarios on client portfolio (work in progress)</td>
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</table>
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Data Analysis Collaboration

- What are the liability risk drivers in your portfolio?
- We are always motivated to investigate the risk drivers in collaboration with clients willing to share their data.
- We can offer a wide range of data analysis services (based on your data, enriched with SR data) according to your needs and interests:
  - Loss frequency vs. company size
  - Loss severity vs. company size
  - Loss severity vs. purchased limit
  - Granularity and number of losses permitting: Differentiation by industry
  - ...

...
Q & A

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