Swiss Re

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

Eric Huang, FCAS
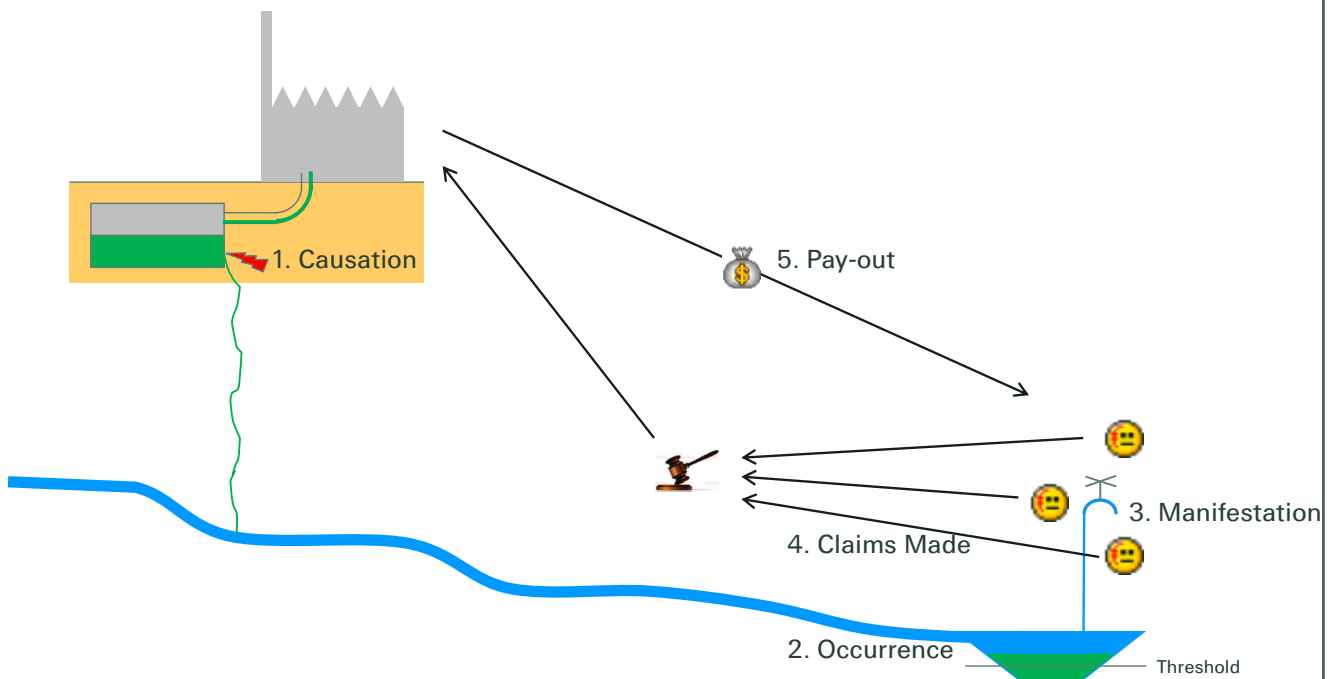**Swiss Re**

CAS Reinsurance Seminar, May 21, 2014
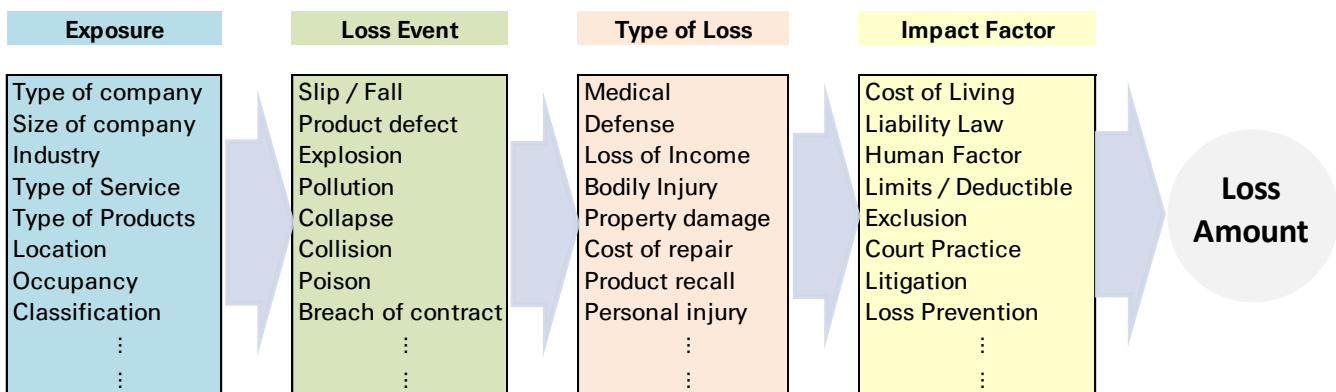
SWISS RE
150
YEARS

Agenda

- **The Casualty Context**
- Towards Liability Risk Drivers
- Modelling Liability Risk Drivers
- Data Analysis
- Application of LRD (Examples)
- Potential Collaborations on Data Analysis
- Q & A

The Casualty Context

1. Causation

5. Pay-out

3. Manifestation

4. Claims Made

2. Occurrence

Threshold

Challenges in Casualty Modelling

| Liability Loss Producing Process			
Exposure	**Loss Event**	**Type of Loss**	**Impact Factor**
Type of company Size of company Industry Type of Service Type of Products Location Occupancy Classification ⋮ ⋮	Slip / Fall Product defect Explosion Pollution Collapse Collision Poison Breach of contract ⋮	Medical Defense Loss of Income Bodily Injury Property damage Cost of repair Product recall Personal injury ⋮	Cost of Living Liability Law Human Factor Limits / Deductible Exclusion Court Practice Litigation Loss Prevention ⋮

Loss Amount

- Heterogeneous risk exposures and complex loss events/scenarios.

- Dynamic environments – new types of claims, emerging markets, tort reforms etc.

- Long tail – Information lag, property makes past experience less predictable.

- Not all information is available in modeling data sets.

- The predictive modeling approach:

  - somehow backward looking and therefore inadequate for liability, which is long tail

  - can only incorporate information which is available in the modeling data sets.

Agenda

- The Casualty Context
- **Towards Liability Risk Drivers**
- Modelling Liability Risk Drivers
- Data Analysis
- Application of LRD (Examples)
- Potential Collaborations on Data Analysis
- Q & A

Casualty vs. Nat Cat: Risk Factors

Example Earthquake   >> Accurate "hard" risk factors based on science, statistics, observations

Hazard + Vulnerability + Values + Conditions

Cat Event

Loss — EARTH-QUAKE — Frequency
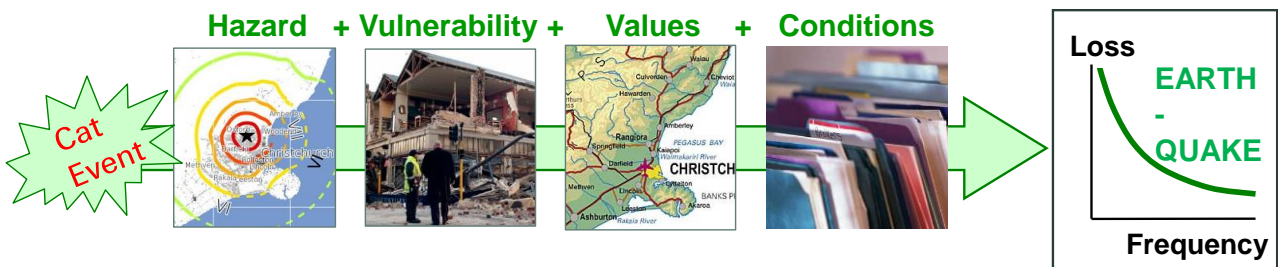
Example Liability Event   >> Some "soft" experience and statistics, but what exactly "drives" the risk?

Liability "Event"

Loss — Liability ? ? ? — Frequency

➔ Understanding what drives risk in Liability is key to improve UW quality

What are the Risk Drivers in Liability?

Type of Products	Size of Company	Exports	Cultural background	Legal system	Cost of living	...	Insurance conditions
Activities? What is produced?	How big is the company?	Geographic spread of products?	Likelihood that people sue?	Mass litigation?	What do courts award for bodily injuries?	...	What proportion of the loss is insured?

Liability Risk Drivers Model

Expected Annual Loss

➜ **Understanding what drives risk in Liability is key to improve UW quality**

Ⓜ **Swiss Re**

Eric Huang, FCAS | Seminar on Reinsurance | 21. May. 2014   7

Casualty vs. Nat Cat: Risk R&D and Tool Dev. History

Nat Cat

till 1970	**1980**	**1990**	**2000**	**2013**
no quantitative methods, loss surprises	first attempts for quantified risk assessment, CRESTA info plans	tools for main areas and perils, data standards and exchange	world-wide cat risk assessment sophisticated software hazard/vulnerab. data bases systematic/organized data flow	tools: DONE secondary and multiline effects? assessability limits?

until recently: status of most Casualty models and tools

LRD (2007-2013)
...

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

Liability

Ⓜ **Swiss Re**   Eric Huang, FCAS | Seminar on Reinsurance | 21. May. 2014   8

Agenda

- The Casualty Context
- Towards Liability Risk Drivers
- **Modelling Liability Risk Drivers**
- Data Analysis
- Application of LRD (Examples)
- Potential Collaborations on Data Analysis
- Q & A

## 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
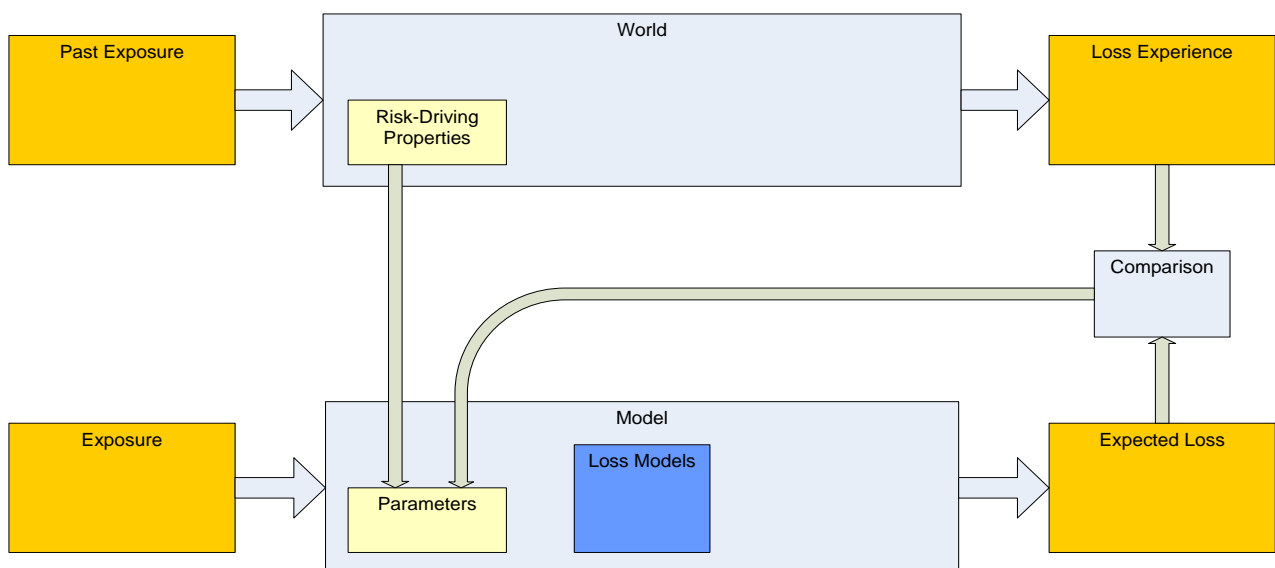
Model Overview
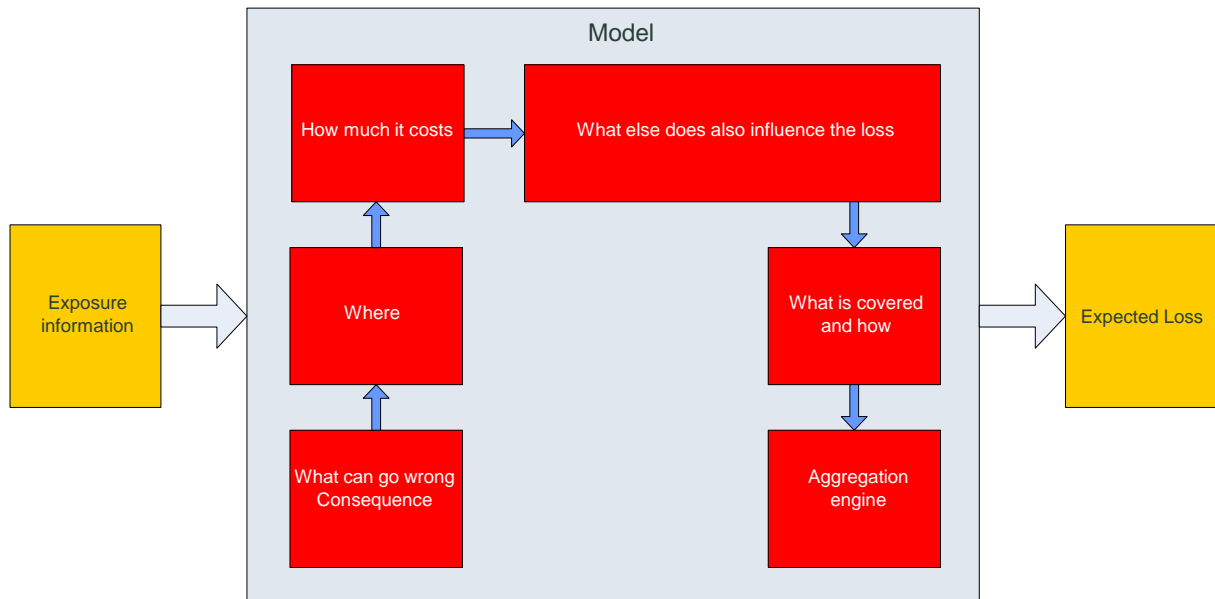
Agenda

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

Model Calibration

Here enters
loss experience! →

- *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
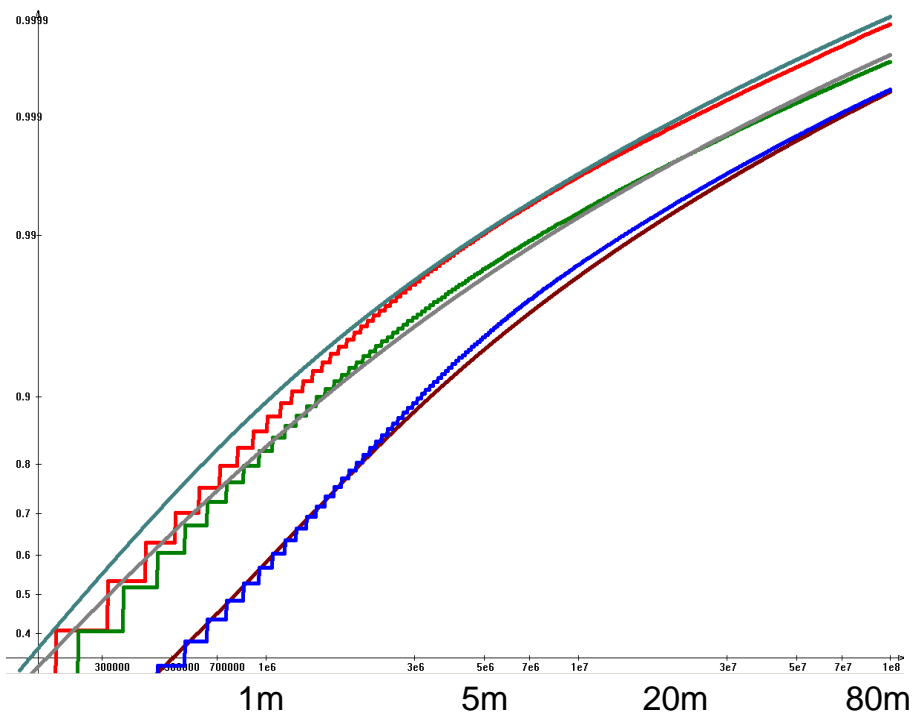
Agenda

- 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

Application of LRD

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

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

Swiss Re

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
  - ...

Swiss Re

Q & A

Thank you

Q & A

Legal notice