GIRO Conference and Exhibition 2012
Juggling uncertainty the actuary’s part to play
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Individual Claim Development
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Agenda

• Context / Objectives / basic idea

• Methodology

• Simulation process

• Results
• Innovative method for evaluating severity for long tail business

• Goal: To improve upon the default approach which consists of applying Loss Development Factors calculated on aggregated triangles to individual (large) losses

• Aim is therefore to estimate the ultimate value of each and every individual claim.

• Basic idea: reproduce what we observe on “Closed” claims to “Open” ones
Methodology – Initial step

- Trend data for inflation and hyper inflation (if necessary)
- Select claims which are “closed”. The definition of “closed” is defined as:
  - Case reserves less than X% of the incurred claims (ex paid=96, incurred=100)
- For each “closed” claim calculate the ratio $R$ which is its ultimate value to its incurred value after $n$ years of development.
  \[ R_{i,n} = \frac{S_{i,\infty}}{S_{i,n}} \]
  Where $S$ is the incurred value
- $R$ is considered to be a random variable.
Methodology – Ratios to Ultimate

\[ R_{2,1} = \frac{S_{2,5}}{S_{2,1}} \]
Methodology – Definition of thresholds

Dependency of R on amount of claim

For all development years
Methodology – Definition of clustering

Clustering observed around R=0 and R=1

For all development years
Definition of R ratios

Use R ratios observed on **Closed** claims and apply them to **Open** ones

Consideration of **claim size**, **development year** and **clustering** for ratios close to 0 and 1

For each open claim, conditional simulation of its **status**
Status of open claims

**Status**
- Stable: R around 1
- ‘sans-suite’: R around 0
- Other: R<>0,1

**Claim size**
- Definition of 3 bands of capital
- Maximum ratio

**Development year**
- Position of the claim also considered
Conditionally to:
- claim size
- DY

For each Open claim we simulate conditionally its status
Case where $R$ is different from 0 and 1

- In this case, the goal is to find theoretical distributions which fit observed ratios:

- Tests have been performed on French and Italian companies: Regardless of the company and of the development year:

The distribution which best fits $R$ is repeatedly the same: **Split Simple Pareto**
Case where \( R \) is different from 0 and 1

- The fact that Split Simple Pareto came out is worth noting:
  - Splice of 2 different distribution: Power and Simple Pareto
  - Corresponds to claims developing up or down

- This distribution has 3 parameters to be estimated using conditional MLE with following elements:
  - Studied interval: \([\text{min}; \text{lower band around } 1] \cup [\text{upper band around } 1; \text{max}]\)

- Density: \( \text{density}(x, \alpha, \beta, \theta) = \begin{cases} \frac{\alpha \beta}{\theta(\alpha + \beta)} \left( \frac{x}{\theta} \right)^{\beta - 1} & \text{if } 0 \leq x \leq \theta \\ \frac{\alpha \beta}{\theta(\alpha + \beta)} \left( \frac{\theta}{x} \right)^{\alpha + 1} & \text{if } \theta \leq x \leq \infty \end{cases} \)

- Negative likelihood:

\[
\text{NLL} = -\sum_{i=1}^{n} \ln \left[ \frac{\alpha \beta}{\theta(\alpha + \beta)} \left( \frac{x_i}{\theta} \right)^{\beta - 1} \right] \cdot 1_{0 \leq x_i \leq \theta} + \frac{\alpha \beta}{\theta(\alpha + \beta)} \left( \frac{\theta}{x_i} \right)^{\alpha + 1} \cdot 1_{\theta \leq x_i \leq \infty} + n \ln \left( \frac{1}{\text{Cond.const}} \right)
\]
Case where R is different from 0 and 1

• If insufficient data, another way must be adopted to find parameters:
  – Market parameters

  Possibility to apply this methodology on a market database
  – If \( \text{Pr}(R \neq 0,1 / \text{condition}) \) is very low, possibility to force it to 0

  it is generally true for the right part of the triangle
Simulating Ultimate Claims - Example
Scheme with 100 simulations

Closed Claims

Open Claims

Pr(R=0 | ...) = 0.1
Pr(R=1 | ...) = 0.2
Pr(R<> 0,1 | ...) = 0.7

10 simulations
20 simulations
70 simulations

100 simulations

100 simulations = value when closed

10 simulations = 0

20 simulations = latest evaluation

70 simulations ~ Split Simple Pareto
Comparison with other approaches

Individual projection can turn out to be lighter in some cases than aggregated methodologies
Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.

The views expressed in this presentation are those of the presenter.