The Actuarial Profession
making financial sense of the future

GIRO Conference and Exhibition 2012
Juggling uncertainty the actuary’s part to play

20/09/2012

The Actuarial Profession
making financial sense of the future

GIRO Conference and Exhibition 2012

Individual Claim Development

Julien Saunier

Agenda

- Context / Objectives / basic idea
- Methodology
- Simulation process
- Results

Context / Objectives / basic idea

- 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

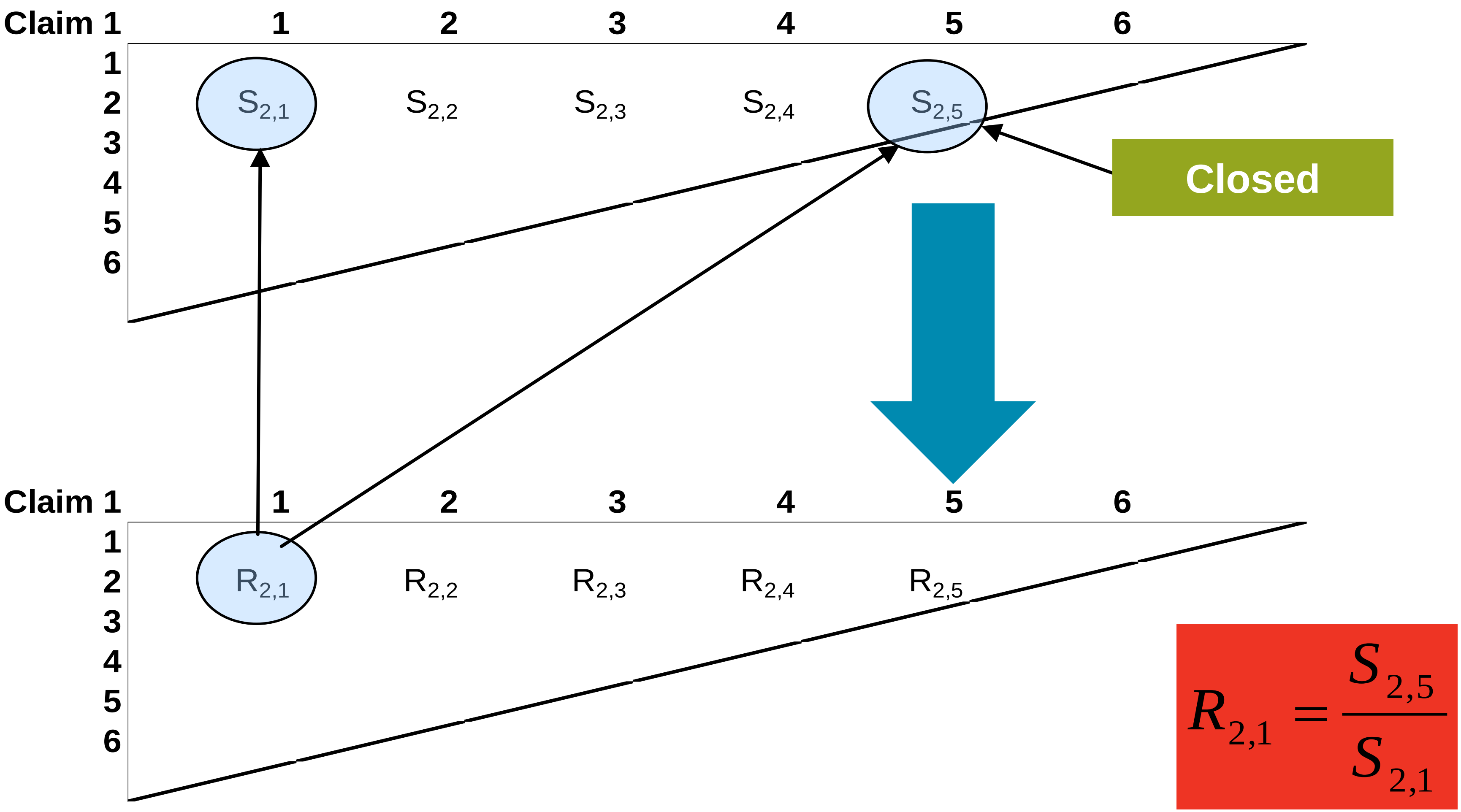
- Trend data for inflation and hyper inflation (if necessary)
- Select claims which are “closed”. The definition of “closed” is defined as :
  - Case reserves less than X% of the incurred claims (ex paid=96, incurred=100)
- For **each “closed” claim** calculate the ratio **R** which is its ultimate value 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

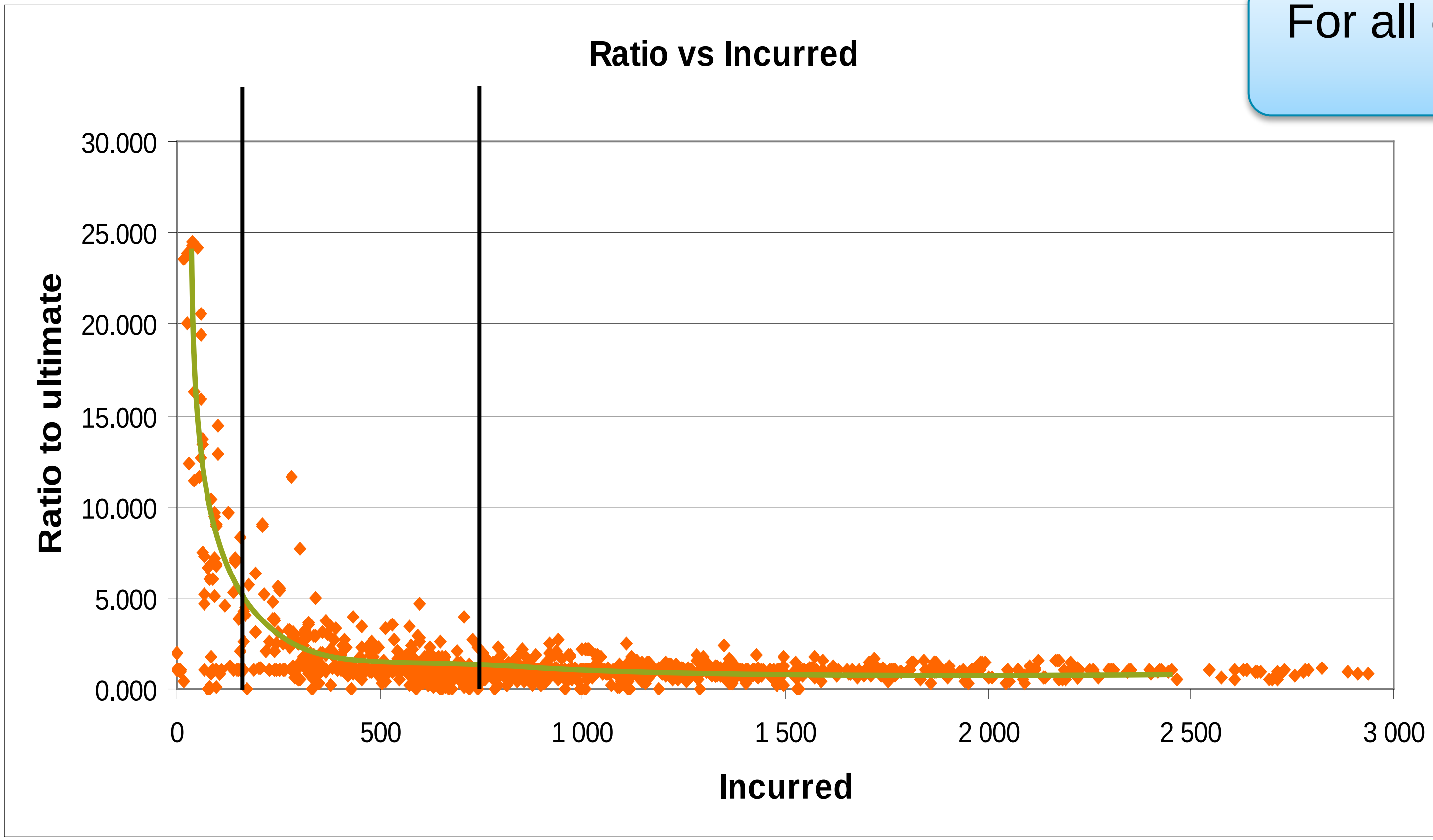
- **R** is considered to be a **random variable**.

Methodology – Ratios to Ultimate



Methodology – Definition of thresholds

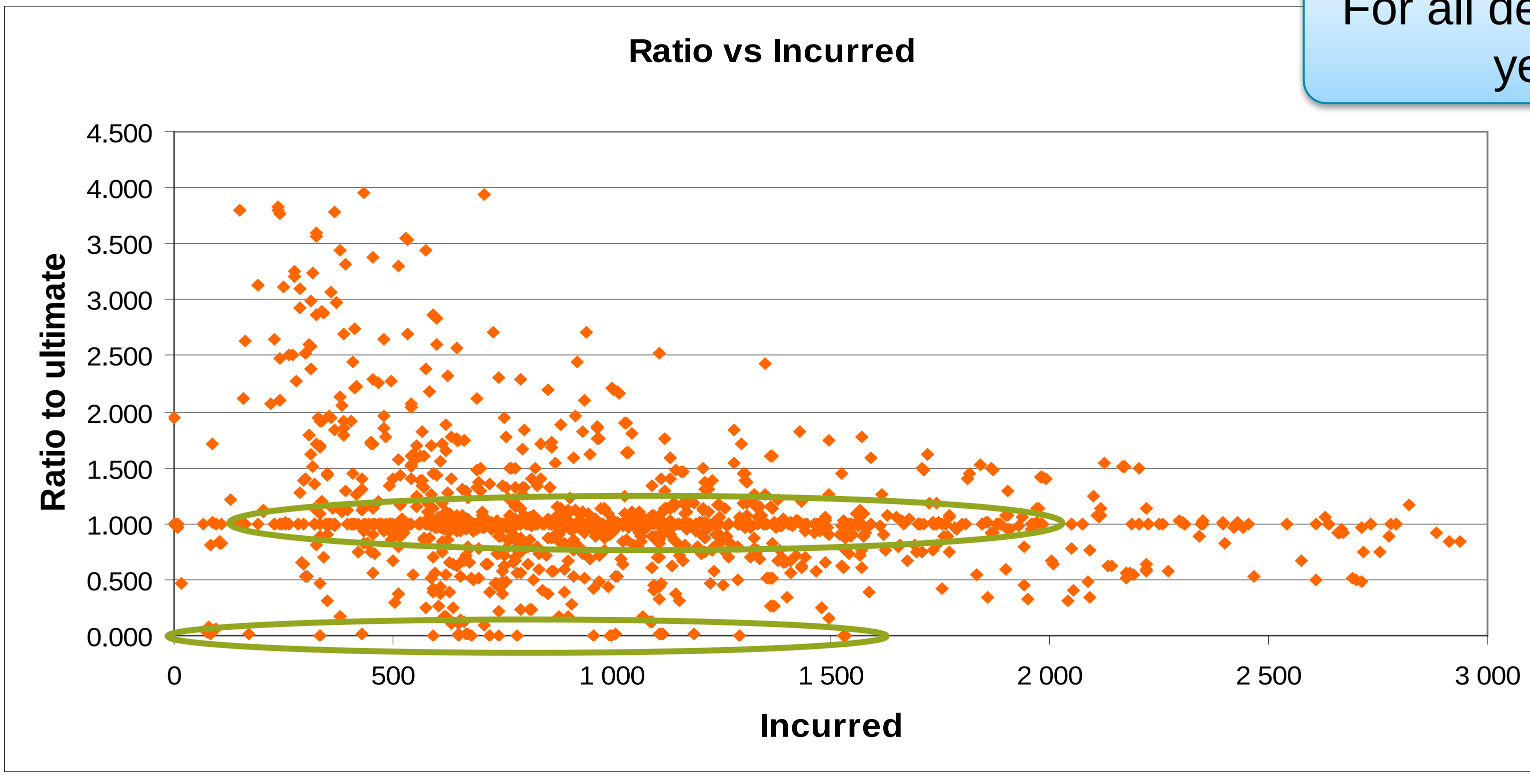
For all development years



Dependency of R on amount of claim

Methodology – Definition of clustering

For all development years



Clustering observed around R=0 and R=1

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

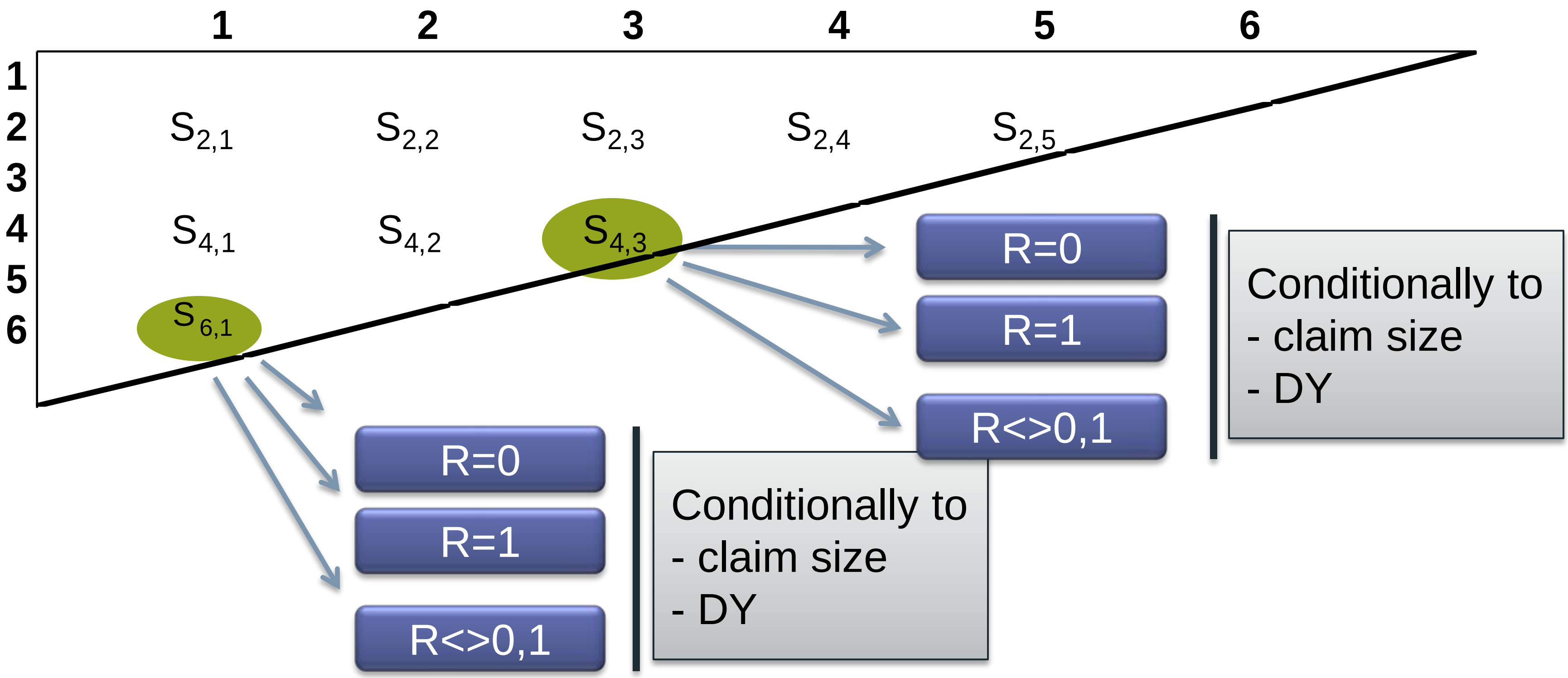
Claim size

- Definition of 3 bands of capital
- Maximum ratio

Development year

- Position of the claim also considered

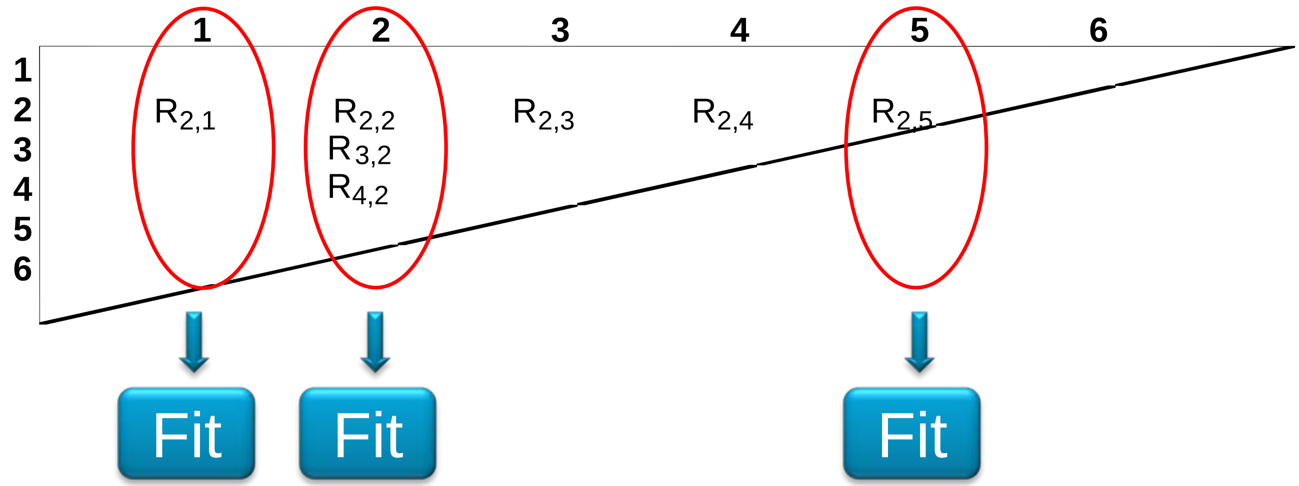
Status of Open claims



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: $\left[\text{min; lower band around 1}\right] \cup \left[\text{upper band around 1; max}\right]$
  - Density: $$density(x,\alpha,\beta,\theta) = \begin{cases} \dfrac{\alpha\beta}{\theta(\alpha+\beta)} * \left(\dfrac{x}{\theta}\right)^{\beta-1} & if\ 0 \le x \le \theta \\ \dfrac{\alpha\beta}{\theta(\alpha+\beta)} * \left(\dfrac{\theta}{x}\right)^{\alpha+1} & if\ \theta \le x \le \infty \end{cases}$$
  - Negative likelihood:

$$\text{NLL} = -\sum_{i=1}^{n} \ln\left[\frac{\alpha\beta}{\theta(\alpha+\beta)} * \left(\frac{x_i}{\theta}\right)^{\beta-1} * 1_{0 \le x_i \le \theta} + \frac{\alpha\beta}{\theta(\alpha+\beta)} * \left(\frac{\theta}{x_i}\right)^{\alpha+1} * 1_{\theta \le x_i \le \infty}\right] + n * \ln\left(\frac{1}{\text{Cond.const}}\right)$$

Case where R is different from 0 and 1

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

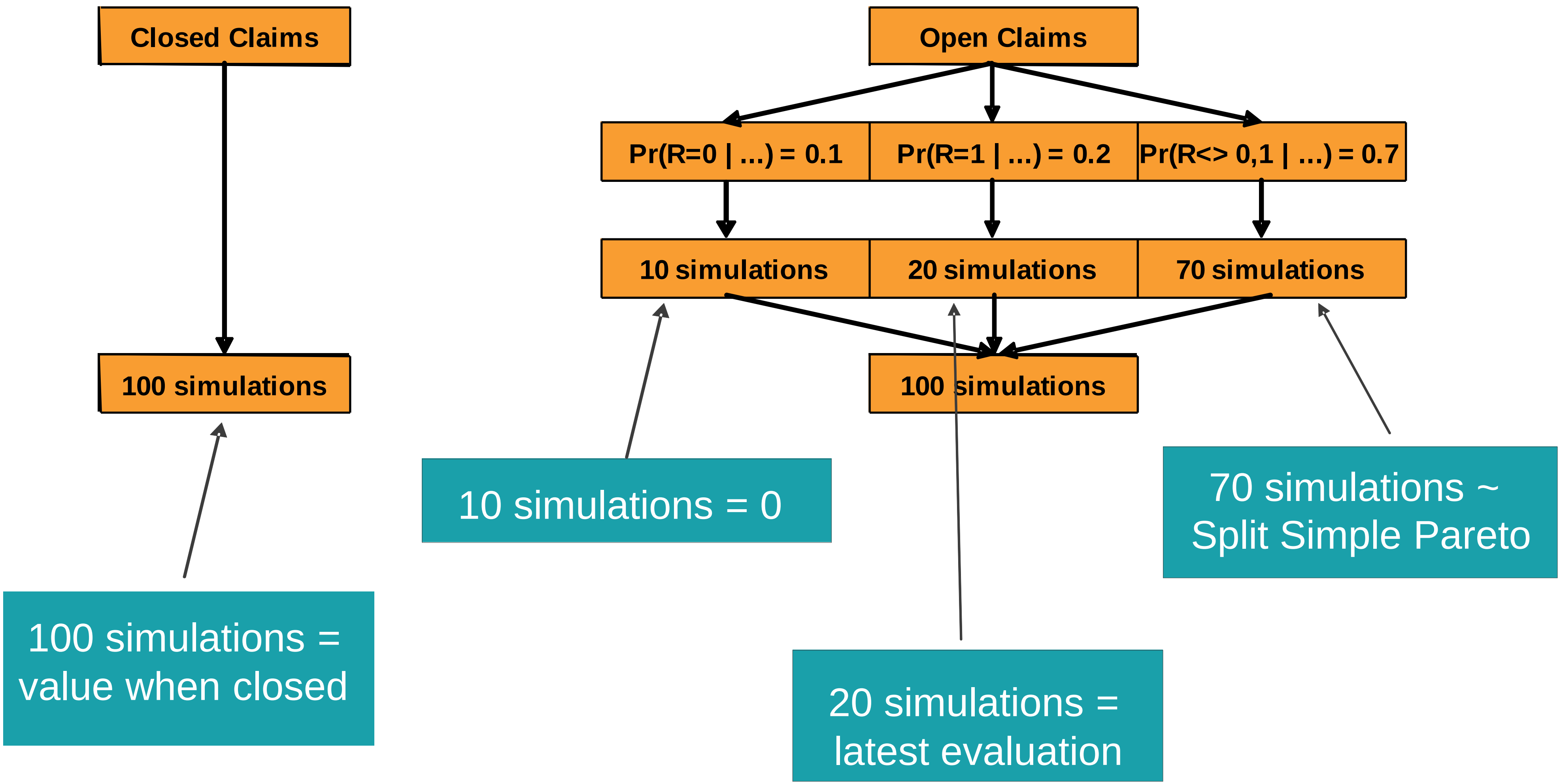
➡ Possibility to apply this methodology on a market database

  - If Pr(R≠0,1 / condition) is very low, possibility to force it to 0

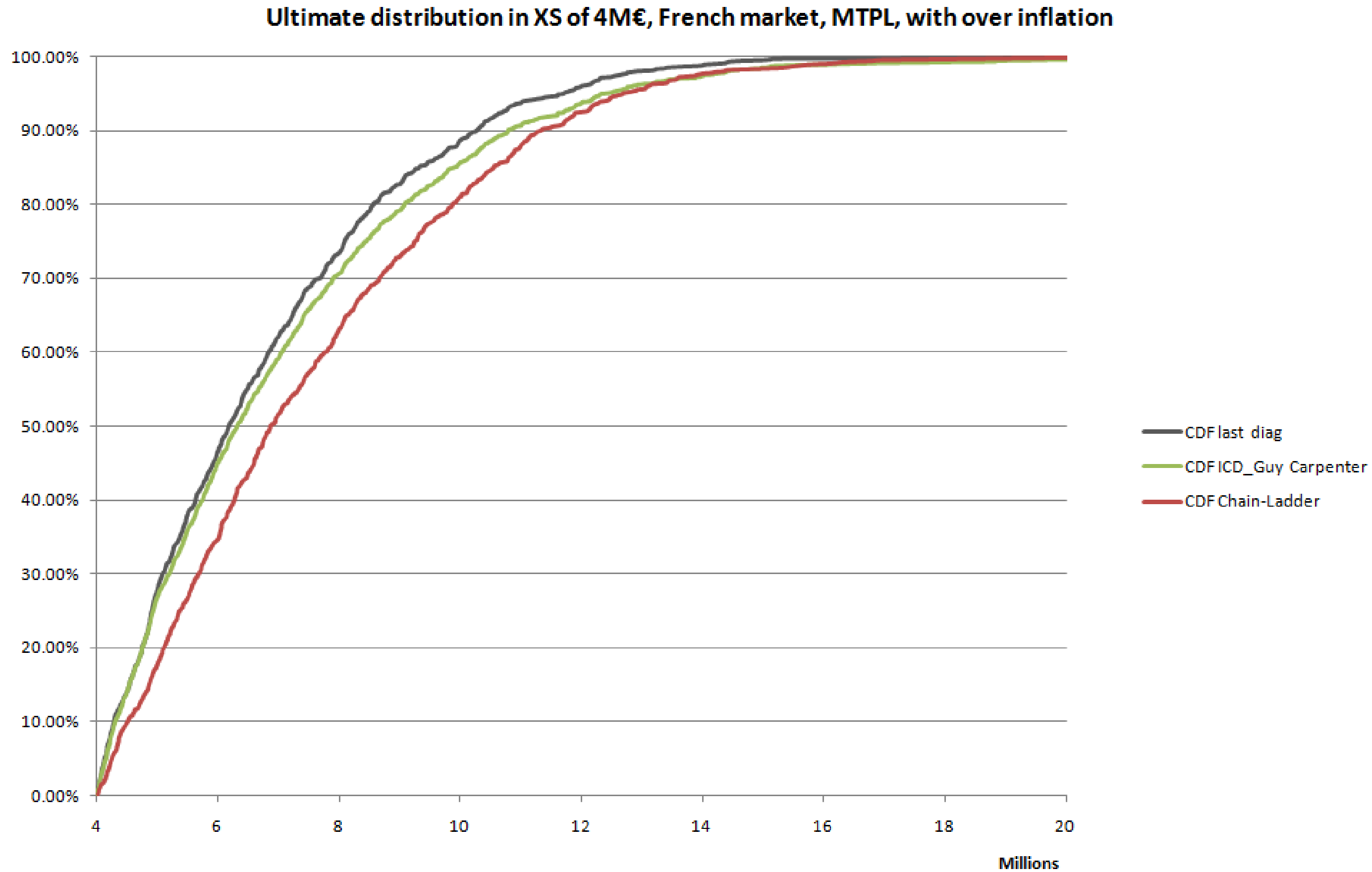
➡ it is generally true for the right part of the triangle

Simulating Ultimate Claims - Example

Scheme with 100 simulations



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.