



# ISFA – Results

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# Pricing steps

Pricing steps:

- ✓ Analysis of the reinsured portfolio
- ✓ Statistical data set revalorisation
- ✓ Selection of claims
- ✓ Estimation of the claims amount distribution
- ✓ Estimation of Frequency distributions
- ✓ Computation of the pure premium
- ✓ Calculation of special clauses



# Pricing steps

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- ✓ *Analysis of the reinsured portfolio*
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- ✓ *Estimation of Frequency distributions*
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# From our estimations...

$$S = \sum_{i=1}^N X_i$$

Where  $N$  is the Frequency distribution with a frequency  $\lambda_{>T}$

- We have those distributions!



# Application to XL treaty

XL treaty C xs. D

- *We have can go from the Collective Risk model*
  - *We can also use the exposure curves + LRs*
- In some cases, we also need the distribution of  $S_R$



# Aggregate cover?

- AAD & AAL

$$P_R = E[\min(AAL, \max(0, S_R - AAD))]$$

- Need for distribution of  $S_R$



# Reinstatement

- It is said that the reinsurer offers  $k$  reinstatements if he limits his yearly liability to  $k + 1$  times the cover C.
- Sometimes the reinstatements are free.
- Often they are paid. This means that when a claim affects the layer, the ceding company is obliged to pay a reinstatement premium in order to reinstate the layer.

# Reinstatement

- This reinstatement premium is calculated pro rata capita, i.e. it considers the fraction of the layer used by the potential claims leading to the  $j^{th}$  reinstatement premium:

$$\frac{1}{C} \min(C, \max(0, S_R - (j - 1)C)) .$$

- This fraction is multiplied by a certain price, or percentage  $c_j$  of the initial premium  $P_R$ :

$$\frac{P_R c_j}{C} \min(C, \max(0, S_R - (j - 1)C)) .$$

# Reinstatement pricing

An initial premium  $P_R$  is paid.

Reinstatement premiums, functions of  $P_R$ , might be paid. This random part of the premium income is

$$P_R \sum_{j=1}^k \frac{c_j}{C} \min(C, \max(0, S_R - (j - 1)C)).$$

# Reinstatement pricing

The reinsurer covers  $(k + 1)$  times the cover:

$$\min(S_R, (k + 1)C)$$

The premium  $P_R$  is the solution to the problem of equating the expected premium and the expected aggregate claims:

$$\begin{aligned} E \left[ P_R \left( 1 + \sum_{i=1}^k \frac{c_j}{C} \min(C, \max(0, S_R - (j - 1)C)) \right) \right] \\ = E[\min(S_R, (k + 1)C)] \end{aligned}$$

# Reinstatement pricing

This immediately gives

$$P_R = \frac{E[\min(S_R, (k+1)C)]}{1 + \sum_{i=1}^k \frac{c_j}{C} E[\min(C, \max(0, S_R - (j-1)C))]}.$$

- Can be calculated knowing the distribution of  $S_R$

# Simulations



KEEP CALM  
AND

TRUST THE

MONTE CARLO  
SIMULATION



# Conclusion

- Once you have the distributions, you can quote any reinsurance structure
- You have 3 XL alternatives (each with a given number of layers) to quote
- You also have some SL structures, and QS structures with specific clauses
- Don't forget to complete the Excel spreadsheet

# Questions ?

