

Worst-Case-Optimal Dynamic Reinsurance for Large Claims

Olaf Menkens, Dublin City University (DCU), Ireland

We control the surplus process of a non-life insurance company by dynamic proportional reinsurance. The objective is to maximize expected (utility of the) surplus under the worst-case claim development. In the large claim case with a worst-case upper limit on claim numbers and claim sizes, we find the optimal reinsurance strategy in a differential game setting where the insurance company plays against mother nature. We analyze the resulting strategy and illustrate its characteristics numerically. A crucial feature of our result is that the optimal strategy is robust to claim number and size modeling and robust to the choice of utility function. This robustness makes a strong case for our approach. Numerical examples illustrate the characteristics of the new approach. We analyze the optimal strategy, e.g. in terms of the more conventional, in the insurance context, objective of minimizing the probability of ruin. Finally, we calculate the intrinsic risk-free return of the model and we show that the principle of Markowitz – don't put all your eggs in one basket – does not hold in this setting.

This is joint research with Ralf Korn (TU Kaiserslautern) and Mogens Steffensen (University of Copenhagen).

Keywords: dynamic proportional reinsurance, reserve process, worst-case scenario approach, Cramér–Lundberg model, differential game, robust optimization.

References

- [1] Ralf Korn, Olaf Menkens, and Mogens Steffensen. Worst-Case-Optimal Dynamic Reinsurance for Large Claims. *European Actuarial Journal*: 2(1), 2012.