Micro-level stochastic loss reserving models for time-discrete data

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Abstract: In the advent of the Solvency II regulation, the insurance industry has regained interest in using more elaborate methodology to meet regulators' increasing requirements. A very popular topic in this sense is the internal model, i.e. an actuarial/statistical model that predicts future cash flows of outstanding claims or the future cost of outstanding liabilities of an insurance company. In contrast to traditional techniques such as deterministic models using aggregated data, other loss reserving models focus on the development of individual claims. This paper puts focus on the development of future cash flows on a claim-by-claim basis, leading to construction of so-called micro-level stochastic loss reserving models.

Up until recently, the literature of the micro-level loss reserving was dominated mainly by theoretical papers. The paper by Antonio and Plat (2014) is one of the first to transform this large body of existing methodology into a comprehensive model, able to meet modern day regulators' requirements. Their proposed internal model, however, assumes the availability of time-continuous data for the claim development process, a level of granularity which is not necessarily present within many insurance companies. Therefore, the work by Antonio and Plat (2014) was extended to also deal with time-discrete data. To this end, a multiple state framework is proposed, such that the claim development process can be reconstructed as a series of transitions between a given set of states. The transition probabilities between the latter states are modeled by means of a proportional odds model, hereby allowing the transition probabilities to depend on, if necessary, time-varying covariates.

A second extension of the work by Antonio and Plat (2014) is proposed regarding the modelization of the claim size distribution. For each subsequent payment of the claim development process, its claim size distribution is modeled. In Antonio and Plat (2014), a standard parametric distribution was chosen to model the complete support of the claim size distribution. Here we use an approach based on splicing: the respective claim size distribution is divided in different slices and by means of a multinomial distribution the probability is determined that the claim size of a certain claim pertains to the slice of interest. The different slices themselves are modeled by means of truncated gamlss models (Rigby and Stasinopoulos, 2005) and the best fitting truncated distribution is determined from the large library of the gamlss error distributions by means the Akaike Information Criterion (AIC). The multinomial distribution and the truncated gamlss distributions of all slices are all allowed to depend on time-varying covariates.

References

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