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Measuring the impact of a bonus-malus system in finite and continuous time ruin probabilities for large portfolios in motor insurance

Motor insurance is a very competitive business where insurers operate with quite large portfolios, often decisions must be taken under short horizons and therefore ruin probabilities should be calculated in finite time. The probability of ruin, in continuous and finite time, is numerically evaluated under the classical Cramér–Lundberg risk process framework for a large motor insurance portfolio, where we allow for a posteriori premium adjustments, according to the claim record of each individual policyholder. Focusing on the classical model for bonus-malus systems, we propose that the probability of ruin can be interpreted as a measure to decide between different bonus-malus scales or even between different bonus-malus rules. In our work, the required initial surplus can also be evaluated. We consider an application of a bonus-malus system for motor insurance to study the impact of experience rating in ruin probabilities. For that, we used a real commercial scale of an insurer operating in the Portuguese market, and we also work on various well-known optimal bonus-malus scales estimated with real data from that insurer. Results involving these scales are discussed.

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