A three dimensional stochastic Model for Claim Reserving

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Abstract

Within the Solvency II framework the insurance industry requires a realistic modelling of the risk processes relevant for its business. Every insurance company should be capable of running a holistic risk management process to meet this challenge. For property and casualty (P&C) insurance companies the risk adequate modelling of the claim reserves is a very important topic as this liabilities determine up to 70% percent of the balance sum.

We propose a three dimensional (3D) stochastic model for claim reserving. It meets the necessary number of degrees of freedom to model a realistic claim process that consists of occurrence, reporting and run-off. The model delivers consistently the reserve's distribution function as well as the distributions of all parts of it that are needed for accounting and controlling. The calibration methods for the model are well known from data analysis and they are applicable in an practitioner environment. We evaluate the model numerically by the help of Monte Carlo (MC) simulation.

Classical actuarial reserve models are two dimensional (2D). They lead to an estimation algorithm that is applied on a 2D matrix, the run off triangle. Those methods (for instance the Chain – Ladder or the Bornhuetter – Ferguson method) are widely used in practice nowadays and give rise to several problems: They estimate the reserves' expectation and some of them - under very restriction assumptions - the variance. They provide no information about the tail of the reserve's distribution, what would be most important for risk calculation, for assessing the insurance company's financial stability and economic situation. Additionally, due to the projection of the claim process into a two dimensional space the results are very often distorted and dependent on the kind of projection.
Therefore we extend the classical 2D models to a 3D space because we find inconsistencies generated by inadequate projections into the 2D spaces.

Keywords:
Claim reserving, IBNR reserve, collective model of risk theory, Monte Carlo simulation, stochastic model.