

# Stochastic re-reserving in multi-year internal models – An approach based on simulations

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## Abstract

Only high-quality internal models optimally reflecting the risk situation facing the company allow insurers to assess the level of risk capital required. This importantly involves measuring and evaluating reserve risk as a part of insurance risks. In literature there is a wide variety of methods for stochastic reserving such as the Mack method, Bootstrap method, regression approaches, Bayesian methods, etc. All these approaches are based on an *ultimo view*, so that the uncertainty of full run-off of the liabilities is quantified. In contrast Solvency II requires the quantification of the one-year reserve risk. In addition the investment results, which have to be added to insurance results, are also based on a one-year view, which means that actually many internal models show an *ultimo view* for insurance results and the one-year view for investment results. So at the moment there is a discussion in academic literature and in insurance practice, how this one-year reserve risk can be quantified. This paper presents the idea of *re-reserving* which can to be applied in modelling reserve risk and premium risk. Based on this approach we can quantify one-year risk capital and multi-year risk capital. We compare the results of the re-reserving method with the results of the analytic approach recently shown in *Merz / Wüthrich (2008)*.

The second part of this paper deals with the use of multi-year internal models in *value and risk-based management*. A sample model (based on the re-reserving approach) was applied to test the effectiveness of management strategies on corporate performance indicators such as EVA (economic value added) and RoRAC (return on risk-adjusted capital).

**Keywords:** Reserve risk, stochastic reserving, re-reserving, Solvency II, internal models, value and risk-based management