

Evaluation of Model Assisted Survey Sampling for Life Insurance Technical Provision Calculations

Mattias Lundahl*

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Abstract

This thesis aims to evaluate the feasibility of using model assisted survey sampling to estimate the technical provisions of a traditional life insurance portfolio, for IFRS purposes as well as Solvency II best estimate purposes. The goal is to achieve an estimate of technical provisions of certain subsets of the portfolio that falls within a certain tolerance margin of the true provisions calculated using the entire portfolio, while using only a limited subset of policies to significantly shorten the calculation's running time. The evaluation compares two separate survey sampling techniques, estimating the aggregate technical provisions in the subsets of the portfolio firstly by scaling individual policies' calculated technical provisions based on their respective selection probabilities and secondly by fitting a multiple linear regression to the selected policies (where the surrender value and second order reserve predict the technical provisions) and use this model to explicitly predict the technical provisions of each individual policy not included in the sample. In particular the regression based estimator is found to be accurate to within less than 0.5% of the true aggregate technical provisions of each subset on average, even for sample sizes as low as 3% of the total portfolio in terms of number of policies. Since the calculation time for technical provisions is approximately linear in the number of policies used by the provision model, the suggested sampling method can save significant amounts of time. The regression model variables and selection probability parameter values are found to be robust when tested on other time periods, indicating that frequent recalibration would not be required. Using unequal selection probabilities based on each policy's surrender value provides an added benefit to the trade off between accuracy and calculation time compared to using a fixed probability for each policy.

*Postal address: Mathematical Statistics, Stockholm University, SE-106 91, Sweden.
E-mail: mattias.lundahl@gmail.com. Supervisor: Filip Lindskog.