Paid-Incurred Chain Reserving Method with Dependence Modeling

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The paid-incurred chain (PIC) reserving method is a claims reserving method that allows to combine claims payments and incurred losses information in a mathematical consistent way. The main criticism on the original Bayesian log-normal PIC model presented in Merz-Wüthrich is that it does not respect dependence properties within the observed data. In the present paper, we extend the original Bayesian log-normal PIC model so that dependence is modeled in an appropriate way. We derive closed form results for the expected ultimate claim and the prediction uncertainty in terms of the conditional mean square error of prediction (MSEP). The PIC reserving method with dependence modeling works in a Bayesian framework and thus it allows for the derivation of the full predictive distribution of the ultimate claim and any other risk measure like Value-at-Risk or conditional tail expectation can be calculated using Monte-Carlo Methods. Finally, we present in the example section for three suitable correlation choices the ultimate claim predictions and the corresponding MSEPs and compare them to the classical results in Merz-Wüthrich. We find that not taking into account dependencies between paid and incurred ratios leads to an underestimation of the ultimate claim prediction uncertainty.

Keywords: Claims Reserving, Outstanding Loss Liabilities, Ultimate Loss Prediction, Claims Payments, Claims Incurred, Incurred Losses, Prediction Uncertainty, Paid-Incurred Chain Model, PIC Reserving Method.