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Original article

On the independence between risk profiles in the compound collective risk actuarial model

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Abstract

This paper examines a compound collective risk model in which the primary distribution comprised the Poisson–Lindley distribution with a λ parameter, and where the secondary distribution is an exponential one with a θ parameter. We consider the case of dependence between risk profiles (i.e., the parameters λ and θ), where the dependence is modelled by a Farlie–Gumbel–Morgenstern family. We analyze the consequences of the dependence on the Bayes premium. We conclude that the consequences of the dependence on the Bayes premium may vary considerably.

MSC: 62P05; 62F15; 60E05

Keywords: Bayesian analysis; Bayes premium; Farlie–Gumbel–Morgenstern distributions; Poisson–Lindley distribution; Risk profile dependence

1. Introduction

In actuarial risk theory, the collective risk model is described by a frequency distribution for the number of claims N and a sequence of independent and identically distributed random variables representing the size of the single claims X_i. Frequency N and Severity X_i are assumed to be independent, conditional on distribution parameters. There is an extensive body of literature on the risk modelling process, see e.g. McNeil et al. [28].

For each likelihood assessment and for each probabilistic modelling of the prior information, a different model is derived. The most commonly used models are

1. N has a Poisson distribution [16], Negative Binomial ([17,47]; among others).
2. The claim severity distribution is Exponential [35], Gamma [44], Lognormal [23,3], Pareto and Weibull [9], among others.

Our interest is focussed on $S = X_1 + \cdots + X_N$ which denotes the aggregate losses or the total cost over a period.

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