Information criteria for bivariate compound Poisson risk models with dependent claims

Ryota SAITO* and Yasutaka SHIMIZU
Department of Applied Mathematics, Waseda University, Japan

Abstract

When we construct multivariate insurance risk models, it is important to consider the dependence structure between those components. *Lévy copula*, introduced in Cont and Tankov (2004), is one of the useful tools to put a dependency in two risk processes driven by Lévy processes. However, the choice of Lévy copula is critical in practice since it completely determines the dependence structure. In such a context, values of maximum likelihoods are often used as a criterion to choose a better model; e.g., Avanzi *et al.* (2011, *ASTIN Bulletin*), where the model with higher values of the likelihood is preferred to the lower. However, as is well-known, such a "maximum likelihood criterion" sometimes chooses an unsuitable model in the sense of future's prediction. In this paper, we will give some AIC-type *information criteria* for statistical model selection of not only Lévy copulas but also Lévy measures in bivariate compound Poisson risk processes.

Our information criterion is based on the *extended* Kullback-Leibler divergence; see, e.g., Shimizu (2009, *J. Statist. Plan. Infer.*), since Lévy measures in compound Poisson processes are not necessarily probability measures, but finite measures in general. We shall construct an information criterion as an asymptotically unbiased estimator of the extended Kullback-Leibler divergence by suitable bias correction. We also show some numerical examples, where our criterion works well although the maximum likelihood criterion can select unsuitable models.

Key Words. Lévy copula; bivariate risk processes; model selection; information criteria; the extended Kullback-Leibler divergence.