An efficient importance sampling algorithm for copula models in insurance

Mathieu Cambou

A simple importance sampling algorithm for copula models is introduced. The method improves Monte Carlo estimators in the case where the functional of interest depends mainly on the behaviour of the random vector when at least one of the components is large. Such problems often arise in financial and insurance dependence models. The importance sampling framework we propose is general and can be implemented for all classes of copula models from which sampling is feasible. In particular, our method does not require the existence of a copula density. We show how the proposal distribution can be optimized in order to minimize the sampling error. In practice this method can be implemented for multidimensional insurance applications such as the calculation of Value-at-Risk and Expected Shortfall for a portfolio of dependent losses or capital allocation. Through a case study inspired by these examples and performed in 2, 5 and 25 dimensions, we obtain variance reduction factors between 10 and 20.