

Efficient calculation of risk measures by importance sampling -- the heavy tailed case

Computation of extreme quantiles and tail-based risk measures using standard Monte Carlo simulation can be inefficient.

A method to speed up computations is provided by importance sampling. We show that importance sampling algorithms, designed for efficient tail probability estimation, can significantly improve Monte Carlo estimators of tail-based risk measures.

In the heavy-tailed setting, when the random variable of interest has a regularly varying distribution, we provide sufficient conditions for the asymptotic relative error of importance sampling estimators of risk measures, such as Value-at-Risk and expected shortfall, to be small. The results are illustrated by some numerical examples.