
Rare event simulation related to financial risks: efficient estimation and sensitivity analysis

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Abstract

We propose an adaptive rare event simulation method based on reversible shaking transformations on path space to estimate the rare event statistics arising in different financial risk settings which are embedded within a unified framework of isonormal Gaussian process. We prove the convergence of the adaptive algorithm and provide key theoretical results on the accompanying Markov chain sampler. We tackle the important problem of calculating sensitivities of rare event statistics with respect to the model parameters by providing general analytical formulas. We demonstrate the strength of our method and application of our results in various numerical examples which cover usual semi-martingale stochastic models (not necessarily Markovian) driven by Brownian motion and, also, models driven by fractional Brownian motion (non semi-martingale) to address various financial risks.

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