Non-parametric regression related to rare-event, using MCMC design, and application to nested risk computations

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Abstract

We consider the problem of estimating the mean of a function of a conditional expectation in a rare-event regime, using Monte Carlo simulations. This is a problem of nested Monte Carlo computations with a special emphasis on the distribution tails. A major application is the risk management of portfolios written with derivative options; these computations are also an essential concern for Solvency Capital Requirement in insurance. In our approach, the outer expectation is evaluated using a Metropolis-hastings type algorithm able to suitably sample the rare-event scenarii. The inner expectation is computed using non-parametric regression tools, in a context of non i.i.d. design. We provide some non-asymptotic quadratic error bounds and we experiment the final algorithm on financial examples.

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