

Multilevel Monte Carlo Methods for Discontinuous Payoffs in the Heston Model

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The Heston Model is a popular stochastic volatility model in mathematical finance using (in its classical form) the CIR process as volatility process. While there exist several numerical methods to compute functionals of the Heston price, the convergence order is typically low for discontinuous functionals.

In this talk, we will study an approach based on the integration by parts formula from Malliavin calculus to overcome this problem: The original function is replaced by a function involving its antiderivative and by a Malliavin weight. Using a suitable discretization scheme for the square root of the volatility, we will construct an estimator for which we can prove that it has L^2 convergence order one half and weak convergence order one even for discontinuous functionals. This leads to an efficient multilevel algorithm, also in the multidimensional case.