Discrete-time Simulation of Stochastic Volterra Equations

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In this talk, I will present a couple of discrete-time simulation schemes for stochastic Volterra equations (namely Euler and Milstein schemes), and the corresponding Multilevel Monte-Carlo method. Stochastic Volterra equations form a particular class of path-dependent SDEs involving a deterministic kernel which is allowed to be singular. For equations with smooth enough coefficients, we obtain the convergence rates for these schemes towards the original equation, under the supremum norm. I will then apply these schemes to approximate the expectation of functionals of such Volterra equations by the (Multilevel) Monte-Carlo method, and compute their complexity. Then for equations with non-Lipschitz coefficients (typically CIR-type Volterra processes with square-root coefficient in the stochastic integral), we also obtain the convergence of the Euler scheme. These models have been used a lot recently in the modeling of so-called rough volatilities in mathematical finance.

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