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Stochastic Black-Scholes Equation under Rough Volatility

Rough volatility is a new paradigm in finance. We shall talk about the option pricing problems for rough volatility models. As the framework is non-Markovian, the value function for a European option is not deterministic; rather, it is random and satisfies a backward stochastic partial differential equation (BSPDE) or so-called stochastic Black-Scholes equation. The wellposedness of such kind of BSPDEs and associated Feynman-Kac representations will be discussed. These BSPDEs are also used to approximate American option prices. Moreover, a deep learning-based method will be investigated for the numerical approximations to such BSPDEs and associated non-Markovian pricing problems. Examples will be presented for both European and American options.

This talk is based on joint work with Christian Bayer and Yao Yao.