Numerical Methods for Derivative Pricing in Non-BS Markets

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ABSTRACT

We report on our development of deterministic computational methods for a class of Markovian market models of jump-diffusion and pure jump type.

Single and multivariate models with parametric dependence in the marginals' jump structure and with possibly infinite jump intensity and non-stationary characteristic triples are allowed.

The approach is based on stabilized multilevel Galerkin discretization of the process' infinitesimal generator resp. its Dirichlet form in a multiscale basis.

Our computational methods allow to analyze single period and multiperiod contracts of European, American or exotic style, in single or multiple periods and on single underlyings or on baskets in which case rather general, parametric copula models of dependence in diffusion and in the processes' jump structure are admitted.

We outline fast, deterministic pricing methods for various pricing and martingale measure selection principles, the superconvergent extraction of Greeks and model calibration, validation and verification. Multilevel numerical analysis in the domains of Dirichlet forms of the price processes is briefly addressed.

We give case studies for Levy copula dependence models, single or multiscale stochastic volatility models of BNS and of coGARCH type. Our unified numerical treatment for pricing, hedging and model sensitivity quantification under general market models opens the perspective for goal-oriented, hierarchic modeling in quantitative finance which will also be outlined if time permits.

References

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