Springer Proceedings in Mathematics & Statistics

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Editors

Topics in Numerical Methods for Finance

Springer

2012, XII, 204 p.

Printed book

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Topics in Numerical Methods for Finance

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- Provides valuable, practical and cutting-edge developments in a variety of quantitative finance areas, including option pricing, arbitrage-free surface construction, moving boundary problems, arbitrage-free parity theory and fear measurement
- Presents a variety of novel mathematical methods involving weak discrete time approximations, moving least squares construction, simulation-regression methods, Fourier transform techniques, Wiener-Hopf factorisation, multinomial lattices and cross recurrence
- Offers topics of appeal to both academics and practitioners working in the field of quantitative finance

Presenting state-of-the-art methods in the area, the book begins with a presentation of weak discrete time approximations of jump-diffusion stochastic differential equations for derivatives pricing and risk measurement. Using a moving least squares reconstruction, a numerical approach is then developed that allows for the construction of arbitrage-free surfaces. Free boundary problems are considered next, with particular focus on stochastic impulse control problems that arise when the cost of control includes a fixed cost, common in financial applications. The text proceeds with the development of a fear index based on equity option surfaces, allowing for the measurement of overall fear levels in the market. The problem of American option pricing is considered next, applying simulation methods combined with regression techniques and discussing convergence properties. Changing focus to integral transform methods, a variety of option pricing problems are considered. The COS method is practically applied for the pricing of options under uncertain volatility, a method developed by the authors that relies on the dynamic programming principle and Fourier cosine series expansions. Efficient approximation methods are next developed for the application of the fast Fourier transform for option pricing under multifactor affine models with stochastic volatility and jumps.