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Sinopsis

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A demonstrably consistent use of infinitesimals permits a radically simplified approach to stochastic calculus
Chapters on asset pricing, Lévy processes and the Feynman path integral introduce readers to applications
Appendixes explore the relationship with Internal Set Theory and Robinsonian nonstandard analysis
Stochastic analysis is not only a thriving area of pure mathematics with intriguing connections to partial differential equations and differential geometry. It also has numerous applications in the natural and social sciences (for instance in financial mathematics or theoretical quantum mechanics) and therefore appears in physics and economics curricula as well. However, existing approaches to stochastic analysis either presuppose various concepts from measure theory and functional analysis or lack full mathematical rigour. This short book proposes to solve the dilemma: By adopting E. Nelson's "radically elementary" theory of continuous-time stochastic processes, it is based on a demonstrably consistent use of infinitesimals and thus permits a radically simplified, yet perfectly rigorous approach to stochastic calculus and its fascinating applications, some of which (notably the Black-Scholes theory of option pricing and the Feynman path integral) are also discussed in the book.
Content Level » Research

Keywords » 03H05; 60G05; 91B25; 81Q30; 60G51; 60H05; 60H10 - Feynman path integral - Internal Set Theory - asset pricing - infinitesimals

Related subjects » Applications - Mathematics - Probability Theory and Stochastic Processes