



Stochastic Analysis in Discrete and Continuous Settings: With Normal Martingales (Lecture Notes in Mathematics)

By Nicolas Privault

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This monograph is an introduction to some aspects of stochastic analysis in the framework of normal martingales, in both discrete and continuous time. The text is mostly self-contained, except for Section 5.7 that requires some background in geometry, and should be accessible to graduate students and researchers having already received a basic training in probability. Prerequisites are mostly limited to a knowledge of measure theory and probability, namely \mathbb{R} -algebras, expectations, and conditional expectations. A short introduction to stochastic calculus for continuous and jump processes is given in Chapter 2 using normal martingales, whose predictable quadratic variation is the Lebesgue measure. There already exists several books devoted to stochastic analysis for continuous diffusion processes on Gaussian and Wiener spaces, cf. e.g. [51], [63], [65], [72], [83], [84], [92], [128], [134], [143], [146], [147]. The particular feature of this text is to simultaneously consider continuous processes and jump processes in the unified framework of normal martingales.

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Review

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“The author presents several aspects of stochastic analysis for discrete and continuous-time normal martingales. ... variety of operators on the Poisson space is an highlight of this book. ... It is finally worth mentioning that this volume of the Lecture Notes in Mathematics includes many interesting applications and that the various notions, properties and proofs are clear and detailed.” (A. Réveillac, Zentralblatt MATH, Vol. 1185, 2010)

“The book under review has the original feature of giving a unified treatment to all normal martingales. ... The book is quite accessible to beginners. ... its main goal is providing advanced researchers with a study of stochastic analysis in both discrete and continuous time and with a simultaneous treatment of both continuous and jump processes.” (Dominique Lépingle, Mathematical Reviews, Issue 2011 j)

From the Back Cover

This volume gives a unified presentation of stochastic analysis for continuous and discontinuous stochastic processes, in both discrete and continuous time. It is mostly self-contained and accessible to graduate students and researchers having already received a basic training in probability. The simultaneous treatment of continuous and jump processes is done in the framework of normal martingales; that includes the Brownian motion and compensated Poisson processes as specific cases. In particular, the basic tools of stochastic analysis (chaos representation, gradient, divergence, integration by parts) are presented in this general setting. Applications are given to functional and deviation inequalities and mathematical finance.

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