

Kwantitatieve Methoden

Book Review Section

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Book review 72B32

PROTTER, PHILIP E. (2004).

Stochastic Integration and Differential Equations.

Applications of Mathematics. Springer-Verlag, Berlin.

ISBN 3-540-00313-4, XIII, 415 p., Hardcover, EUR 64,95.

The book under review allows a fast and nice introduction to semimartingales and stochastic integration by bypassing highly technical “general theory of processes”, and by giving a new type of insight. The approach taken by the author is to define a semimartingale as a stochastic process which is a “good integrator” and with respect to which the stochastic integral can be defined. He starts by defining the stochastic integral as a limit of sums, which requires some path smoothness of the integrands, this being however sufficient to prove many theorems such as Itô’s formula, Girsanov-Meyer theorem, and to treat applications like stochastic differential equations.

The advantage of this approach is that it gives the reader an intuitive grasp of the stochastic calculus without requiring a knowledge of highly technical general theory of processes, and as such, the book meets its purpose excellently. An extension to the general construction for stochastic integrals is presented later in the book. In this sense, the author’s approach is roughly analogous to that of going from the Riemann integral to the Lebesgue integral. The book ends with a number of topics in the theory of stochastic differential equations.

The second edition of the book has a number of changes and new topics, such as, for instance, a new proof of the Doob-Meyer decomposition theorem, the treatment of sigma martingales, which is particularly welcomed from the viewpoint of arbitrage theory in mathematical finance, and a whole new chapter on the expansion of filtrations. Another great feature compared to its previous edition is the addition of exercises at the end of the each chapter, which is very useful for students as well as for teachers.

The book is highly recommendable for graduate students and experts alike. It is a pleasure to read, with many examples, and all arguments are presented clearly and with care. Although, the text is not fully self-containing and assumes a fair amount of knowledge in the theory of stochastic processes. However, the author has provided plenty of references for the reader.

This book can equally well serve as a course on stochastic calculus as well as an

excellent reference material.

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