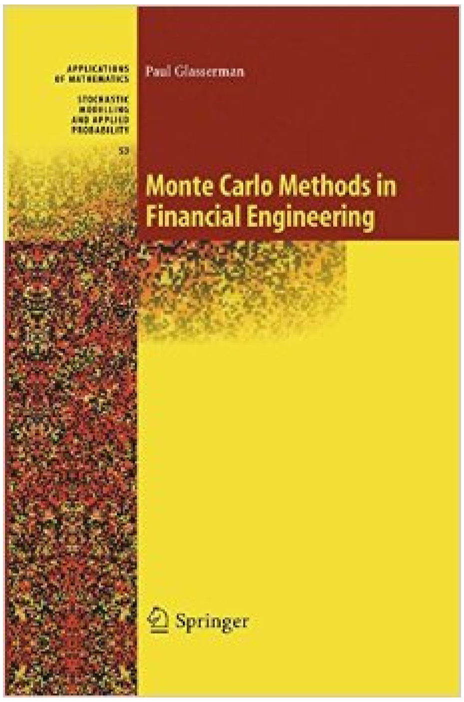
Monte Carlo Methods In Financial Engineering (Stochastic Modelling And Applied Probability) (v. 53)



Synopsis

From the reviews: "Paul Glasserman has written an astonishingly good book that bridges financial engineering and the Monte Carlo method. The book will appeal to graduate students, researchers, and most of all, practicing financial engineers [...] So often, financial engineering texts are very theoretical. This book is not." --Glyn Holton, Contingency Analysis

Book Information

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Customer Reviews

This new book, written by an active contributor to the field of Monte Carlo methods in finance, summarizes the ongoing interaction between theory and practice in a way that is readily accessible to graduate students and practitioners in quantitative finance.The book is as self-contained as possible: basic notions on Monte Carlo simulation and option pricing are recalled in the first chapter and the second chapter explains how random number generators are designed. Chapter 3 explains how to generate sample paths for some commonly used stochastic models: multifactor Gaussian models, square root diffusions, diffusions with Poisson jumps, some examples of LÃ©vy processes and the LIBOR market model. Instead of giving a general result and leaving the reader on his own, the author treats each example with a fair amount of detail.Chapter 4, which is the longest and probably the best chapter in the book, discusses variance reduction techniques. Variance reduction is what makes all the difference between a basic Monte Carlo simulation and a state-of-the-art algorithm incorporating the tricks of the trade. Apart from classical topics such as control variates, stratified sampling and importance sampling, the author (briefly) discusses more advanced topics such as the Weighted Monte Carlo method of Avellaneda et al., viewing it as a variance reduction method.While computation of prices as expectations are standard applications of the Monte Carlo methods, two other issues in finance have turned out to be more challenging to solve using Monte Carlo simulation: the computation of sensitivities ("Greeks") and the pricing of American options, which involves the maximization of conditional expectations.

Monte Carlo simulations are extensively used not only in finance but also in network modeling, bioinformatics, radiation therapy planning, physics, and meteorology, to name a few. This book gives a good overview of how they are used in financial engineering, with particular emphasis on pricing American options and risk management. Aspiring financial engineers will find much that is helpful in the book, and after reading it should be able to apply the methodologies in the book in whatever financial institution they find themselves employed. The mathematics may be too formidable for a practical trader, but the book is targeted to readers who intend to work as financial engineers in a high-powered financial institution. Due to constraints of space, only the last two chapters will be reviewed here.The next-to-last chapter discusses the difficult problem of pricing American options, which the author introduces as an `embedded optimization problem': the value of an American option is found by finding the optimal expected discounted payoff, in order to find the best time to exercise the option. When applying Monte Carlo simulation, the author restricts himself to options that can only be exercised at a finite, fixed set of opportunities, with a discrete Markov chain used to model the underlying process representing the discounted payoff from the exercise of the option at a particular time. This allows the use of dynamic programming, which the author does throughout the chapter, with the further simplification that the discounting is omitted. The author also shows how to find the optimal value by finding the best value within a parametric class, giving in the process a more tractable problem. This approach considers a parametric class of exercise regions or stopping rules.

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