Simulation and Monte Carlo: With Applications in Finance and MCMC.

J. S. DAGPUNAR. Hoboken, NJ: Wiley, 2007. ISBN 978-0-470-85494-5. xiv + 333 pp. $130.00 (H). ISBN 978-0-470-85495-2. $60.00 (P).

Because part of my research focuses on the interface between simulation and mathematical finance, I was excited to have the opportunity to review this book. It is not intended for experienced practitioners or novices seeking to break into these areas; rather, it seems better suited as a course text for advanced undergraduates and beginning graduate students. As such, it presumes little knowledge of simulation and finance, but readers should have a solid background in mathematical statistics, probability and random processes, and object-oriented computer programming.

The book does a nice job of discussing, developing, and presenting the mathematical aspects of random processes, random number generation, and Markov chain Monte Carlo (MCMC) methods. I particularly like the notation used and the depth of proofs offered; they are technically correct, well organized, and nicely presented. A potential drawback is the book's reliance on Maple; however, the author does do a good job including and discussing the detailed code in each chapter for the methods included.

The book's core part consists of eight chapters that I perceive as being divided into four disjoint sections. The first chapter contains a general introduction to the material. Rather than motivating the reader by providing insightful finance examples, which could foreshadow the simulation material, the exposition begins with a discussion of how to numerically evaluate an integral and then segues to an example of a random process and its simulation using Maple.

The book's second section, comprising Chapters 2–5, focuses on simulation. Chapter 2 contains a very detailed description of how to generate uniform random numbers. Although this is interesting from a mathematical perspective, I question its utility for practitioners, in light of the fact that uniform random number generators are available in many software packages. Chapter 3 discusses general methods for simulating random variables, including the inverse cumulative distribution function technique and acceptance/rejection methodology. Chapter 4 builds on the two previous chapters in discussing simulation for standard distributions. Although software packages also incorporate methods for doing this, I still believe that this material will be helpful to students. The best chapter in this section is Chapter 5, in which the author gives a nice treatment of variance reduction techniques through sampling, stratified sampling, and importance sampling.

The book's third part consists of Chapter 6, in which material related to finance is introduced, including derivatives, various types of options, and the standard stochastic volatility model. The exposition is quite mathematical, and the linkage to simulation and the use of Maple is, unfortunately, sketchy. The last core segment, Chapters 7 and 8, covers random processes and then MCMC methods. Although I enjoyed the presentation of this material, I think that those trying to learn the subject would be frustrated by the tenuous connections to finance and the limited number of examples, the main one being the estimation of pump failure rates. One additional bonus chapter provides detailed computer solutions to the problems in earlier chapters, which I am sure will be greatly appreciated by readers.

In summary, this book has some appealing features, but in my mind the failure to bridge the gap between finance applications and the simulation-random process material is a significant deficiency. It would take a masterful classroom instructor to overcome this problem; without such an effort, the untrained reader would be left with the impression that for finance and the probabilistic material, the twain have not yet met.

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