



# Lectures on BSDEs, Stochastic Control, and Stochastic Differential Games with Financial Applications (Financial Mathematics)

By René Carmona

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## Lectures on BSDEs, Stochastic Control, and Stochastic Differential Games with Financial Applications (Financial Mathematics) By René Carmona

The goal of this textbook is to introduce students to the stochastic analysis tools that play an increasing role in the probabilistic approach to optimization problems, including stochastic control and stochastic differential games. While optimal control is taught in many graduate programs in applied mathematics and operations research, the author was intrigued by the lack of coverage of the theory of stochastic differential games.

This is the first title in SIAM's Financial Mathematics book series and is based on the author's lecture notes. It will be helpful to students who are interested in stochastic differential equations (forward, backward, forward-backward); the probabilistic approach to stochastic control (dynamic programming and the stochastic maximum principle); and mean field games and control of McKean-Vlasov dynamics.

The theory is illustrated by applications to models of systemic risk, macroeconomic growth, flocking/schooling, crowd behavior, and predatory trading, among others.

**Audience:** This book is written for young researchers and newcomers to stochastic control and stochastic differential games.

**Contents:** Preface; List of Notation; Part I: Stochastic Calculus; Chapter 1: Stochastic Differential Equations; Chapter 2: Backward Stochastic Differential Equations; Part II: Stochastic Control; Chapter 3: Continuous Time Stochastic Optimization and Control; Chapter 4: Probabilistic Approaches to Stochastic Control; Part III: Stochastic Differential Games; Chapter 5: Stochastic Differential Games; Chapter 6: Mean Field Games; Bibliography; Author Index; Subject Index

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### Editorial Review

#### About the Author

**René Carmona** is the Paul M. Wythes 55 Professor of Engineering and Finance at Princeton University, where he chairs the Department of Operations Research and Financial Engineering. He is an associate member of the Department of Mathematics, a member of the Program in Applied and Computational Mathematics, and a member of the Bendheim Center for Finance, where he oversaw the Master in Finance program for thirteen years. Dr. Carmona's publications include over 100 articles and seven books in probability, statistics, and financial mathematics. He was elected Fellow of the Institute of Mathematical Statistics in 1984 and of SIAM in 2009. He is the founding chair of the SIAM Activity Group on Financial Mathematics and Engineering and a founding co-editor of *Electronic Journal of Probability*, *Electronic Communications in Probability*, and *SIAM Journal on Financial Mathematics*.

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