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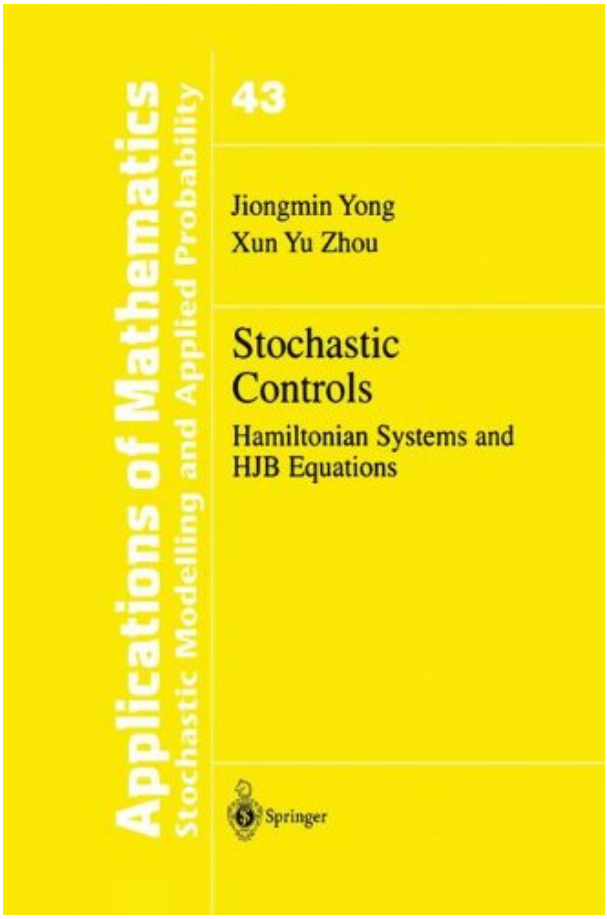

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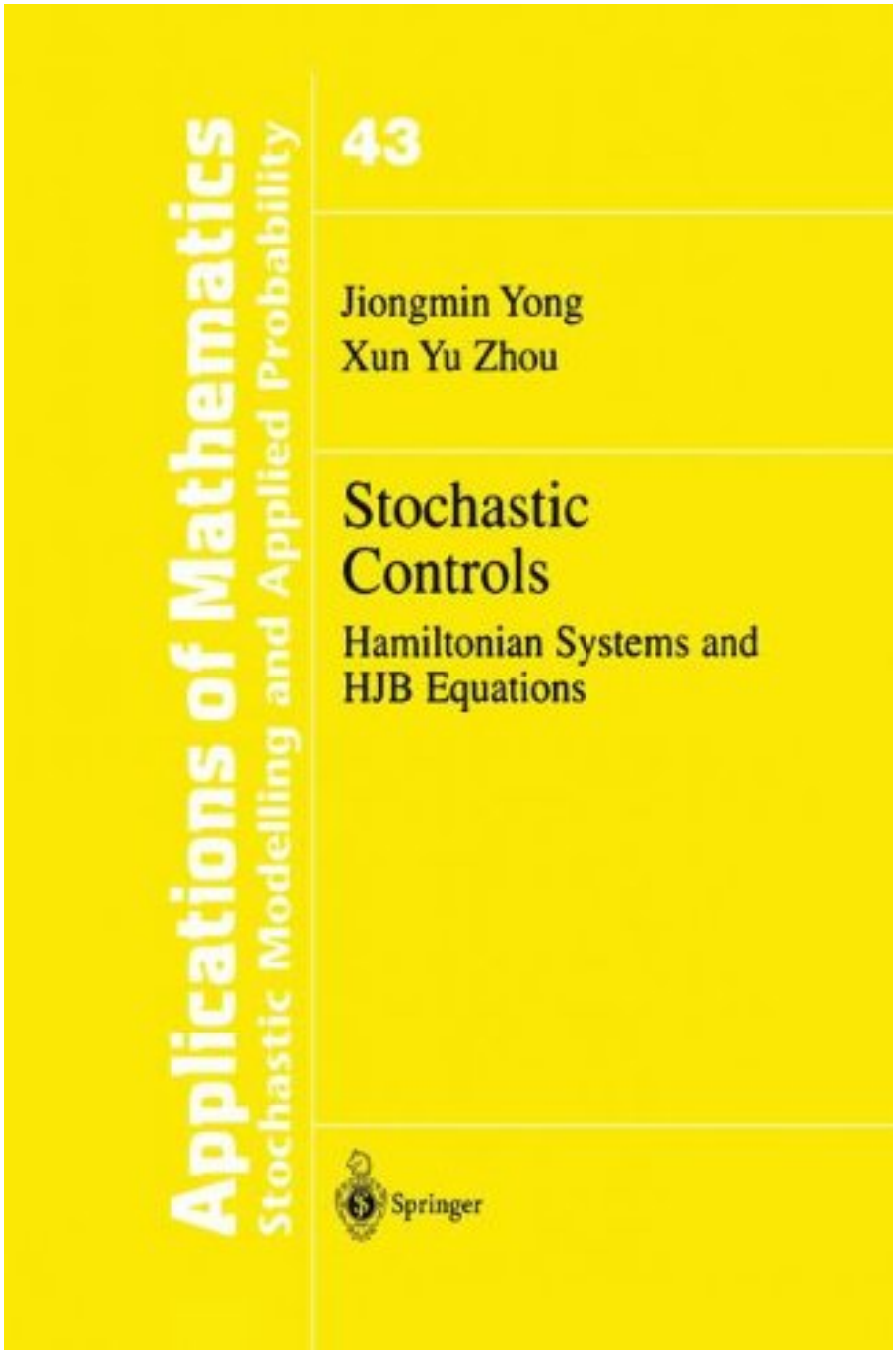

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SIAM REVIEW

"The presentation of this book is systematic and self-contained…Summing up, this book is a very good addition to the control literature, with original features not found in other reference books. Certain parts could be used as basic material for a graduate (or postgraduate) course…This book is highly recommended to anyone who wishes to study the relationship between Pontryagin’s maximum principle and Bellman’s dynamic programming principle applied to diffusion processes."

MATHEMATICS REVIEW

This is an authoratative book which should be of interest to researchers in stochastic control, mathematical finance, probability theory, and applied mathematics. Material out of this book could also be used in graduate courses on stochastic control and dynamic optimization in mathematics, engineering, and finance curricula. Tamer Basar, Math. Review

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As is well known, Pontryagin's maximum principle and Bellman's dynamic programming are the two principal and most commonly used approaches in solving stochastic optimal control problems. * An interesting phenomenon one can observe from the literature is that these two approaches have been developed separately and independently. Since both methods are used to investigate the same problems, a natural question one will ask is the fol lowing: (Q) What is the relationship betwccn the maximum principlc and dy namic programming in stochastic optimal controls? There did exist some researches (prior to the 1980s) on the relationship between these two. Nevertheless, the results usually werestated in heuristic terms and proved under rather restrictive assumptions, which were not satisfied in most cases. In the statement of a Pontryagin-type maximum principle there is an adjoint equation, which is an ordinary differential equation (ODE) in the (finite-dimensional) deterministic case and a stochastic differential equation (SDE) in the stochastic case. The system consisting of the adjoint equa tion, the original state equation, and the maximum condition is referred to as an (extended) Hamiltonian system. On the other hand, in Bellman's dynamic programming, there is a partial differential equation (PDE), of first order in the (finite-dimensional) deterministic case and of second or der in the stochastic case. This is known as a Hamilton-Jacobi-Bellman (HJB) equation.

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17 of 17 people found the following review helpful.
Wow: a general solution to stochastic control problems!
By A Customer
This book covers general stochastic control more thoroughly than any other book I could find.
This is *not* a book on numerical methods. It is also not on the cases which yield closed-form solutions: there is a chapter on LQG problems, but for the most part, this book focuses on the general theory of stochastic controls -- which are not the easiest things to solve in general, as you may know. The book handles only diffusion processes with perfect knowledge of the past and present (natural filtration). If these sound like what you want, I doubt there's a more thorough treatment.
It starts with a chapter on preliminaries of prob. spaces and stoch. processes and the Ito integral. After that, the book briefly addresses deterministic problems in order to compare solution methods to the stoch. approaches. It approaches the problems using a stochastic maximum principle and a stochastic Hamiltonian system, and also from a dynamic programming point of view using HJB equations. The authors attempt to show the relationship between the two approaches.
This book is technically rigorous. Though it claims to be self-contained, the reader should certainly be familiar with functional analysis and stochastic processes.
The authors try to keep the solutions as general as possible, handling non-smooth cases as well as smooth ones. This is fine, except that they don't emphasize well enough (I thought), for instance, that the solutions are much simpler when functions are well behaved on convex bodies (it's mentioned as a note on p. 120), or when diffusions are not dependent on controls, and such.
Because of this tendency to present one solution which will handle any case, it could sometimes be difficult to figure out what all the terms are. In the end, it all works out. Each chapter ends with a few pages of "historical background": who did what piece of the theory when, with an excellent list of references. (I found the originals useful to help explain things, on occasion, especially to see simpler ways to do simpler cases)
Altogether, a very thorough piece on general solutions to stochastic control! I was quite impressed.

0 of 0 people found the following review helpful.
Five Stars
By xzq
Very nice book!

6 of 6 people found the following review helpful.
A very readable book
By PST
From every page of the book, it is clear, that the two authors know the subject, they are writing about!

It is assumed, that the reader knows something about stochstic calculus and stochastic differential equations, and also about measure theoretic probability theory. My only exposure to these subjects was the book "Brownian Motion and Stochastic Calculus" by I. Karatzas and S. Shreve, and this was enough.

The pace of the book was just right for me (I am an engineer with a lot of interest in mathematics), not too slow, and not too fast.

It might be advisable to read chapter 7 right after chapter 2 unless you have had previous exposure to BFSDE (Backward-Forward-Stochastic-Differential-Equations), which are extremely well explained there.

The book is not free of typos (I found about 30), but given the complexity of the sub/super scripts, it does not seem bad at all.

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