Stochastic Differential Equations And Applications Second Edition

This book is based on

research that, to a large extent, started around 1990, when a research project on fluid flow in stochastic reservoirs was initiated by a group including some of us with the support of VISTA, a

research coopera tion between the Norwegian Academy of Science and Letters and Den norske stats oljeselskap A.S. (Statoil). The purpose of the project was to use stochastic partial

differential equations (SPDEs) to describe the flow of fluid in a medium where some of the parameters, e.g., the permeability, were stochastic or "noisy". We soon realized that the theory

of SPDEs at the time was insufficient to handle such equations. Therefore it became our aim to develop a new mathematically rigorous theory that satisfied the following conditions. 1) The

theory should be physically meaningful and realistic, and the corre sponding solutions should make sense physically and should be useful in applications. 2) The theory should be

general enough to handle many of the interesting SPDEs that occur in reservoir theory and related areas. 3) The theory should be strong and efficient enough to allow us to solve

th,~se SPDEs explicitly, or at least provide algorithms or approximations for the solutions.

Stochastic Differential Equations and Applications, Volume 1 covers the

development of the basic theory of stochastic differential equation systems. This volume is divided into nine chapters. Chapters 1 to 5 deal with the basic theory of stochastic

differential equations, including discussions of the Markov processes, Brownian motion, and the stochastic integral. Chapter 6 examines the connections between solutions of partial

differential equations and stochastic differential equations, while Chapter 7 describes the Girsanov's formula that is useful in the stochastic control theory. Chapters 8 and 9 evaluate

the behavior of sample paths of the solution of a stochastic differential system, as time increases to infinity. This book is intended primarily for undergraduate and graduate

mathematics students. This text develops the theory of systems of stochastic differential equations and presents applications in probability, partial differential equations, and

stochastic control problems. Originally published in 2 volumes, it combines a book of basic theory with a book of applications. Familiarity with elementary probability is the sole prerequisite. 1975

edition.

This volume is a survey/monograph on the recently developed theory of forward-backward stochastic differential equations (FBSDEs). Basic techniques

such as the method of optimal control, the 'Four Step Scheme', and the method of continuation are presented in full. Related topics such as backward stochastic PDEs and many

applications of FBSDEs are also discussed in detail. The volume is suitable for readers with basic knowledge of stochastic differential equations, and some exposure to the

stochastic control theory and PDEs. It can be used for researchers and/or senior graduate students in the areas of probability, control theory, mathematical finance, and other related

fields.

Singular Stochastic Differential Equations

Stability of Infinite Dimensional Stochastic Differential Equations with Applications

Stochastic Differential Inclusions and Applications Mathematical and Analytical Techniques with Applications to Engineering Backward Stochastic Differential Equations with

Jumps and Their Actuarial and Financial Applications

The systematic study of existence, uniqueness, and properties of solutions to stochastic differential equations in infinite

dimensions arising from practical problems characterizes this volume that is intended for graduate students and for pure and applied mathematicians, physicists, engineers, professionals

working with mathematical models of finance. Major methods include compactness, coercivity, monotonicity, in a variety of set-ups. The authors emphasize the fundamental work of Gikhman and Skorokhod on the

existence and uniqueness of solutions to stochastic differential equations and present its extension to infinite dimension. They also generalize the work of Khasminskii on stability and stationary distributions of

solutions. New results, applications, and examples of stochastic partial differential equations are included. This clear and detailed presentation gives the basics of the infinite dimensional version of the

classic books of Gikhman and Skorokhod and of Khasminskii in one concise volume that covers the main topics in infinite dimensional stochastic PDE's. By appropriate selection of material, the volume can be

adapted for a 1- or 2-semester course, and can prepare the reader for research in this rapidly expanding area.

A beginner's guide to stochastic growth modeling

The chief advantage of

stochastic growth models over deterministic models is that they combine both deterministic and stochastic elements of dynamic behaviors, such as weather, natural disasters, market fluctuations, and epidemics.

This makes stochastic modeling a powerful tool in the hands of practitioners in fields for which population growth is a critical determinant of outcomes. However, the background requirements for

studying SDEs can be daunting for those who lack the rigorous course of study received by math majors. Designed to be accessible to readers who have had only a few courses in calculus and statistics, this book offers

a comprehensive review of the mathematical essentials needed to understand and apply stochastic growth models. In addition, the book describes deterministic and stochastic applications of population growth models

including logistic, generalized logistic, Gompertz, negative exponential, and linear. Ideal for students and professionals in an array of fields including economics, population studies,

environmental sciences, epidemiology, engineering, finance, and the biological sciences, Stochastic Differential Equations: An Introduction with Applications in Population Dynamics Modeling: •

Provides precise definitions of many important terms and concepts and provides many solved example problems • Highlights the interpretation of results and does not rely on a theorem-proof approach •

Features comprehensive chapters addressing any background deficiencies readers may have and offers a comprehensive review for those who need a mathematics refresher • Emphasizes solution techniques for SDEs

and their practical application to the development of stochastic population models An indispensable resource for students and practitioners with limited exposure to mathematics and statistics,

Stochastic Differential Equations: An Introduction with Applications in Population Dynamics Modeling is an excellent fit for advanced undergraduates and beginning graduate students, as well as practitioners who

need a gentle introduction to SDEs. Michael J. Panik, PhD, is Professor in the Department of Economics, Barney School of Business and Public Administration at the University of Hartford in Connecticut. He received

his PhD in Economics from Boston College and is a member of the American Mathematical Society, The American Statistical Association, and The Econometric Society.

The main new feature of the

fifth edition is the addition of a new chapter, Chapter 12, on applications to mathematical finance. I found it natural to include this material as another major application of stochastic analysis, in view

of the amazing development in this field during the last 10-20 years. Moreover, the close contact between the theoretical achievements and the applications in this area is striking. For example, today very few

firms (if any) trade with options without consulting the Black & Scholes formula! The first 11 chapters of the book are not much changed from the previous edition, but I have continued my efforts to improve the

presentation through out and correct errors and misprints. Some new exercises have been added. Moreover, to facilitate the use of the book each chapter has been divided into subsections. If one doesn't

want (or doesn't have time) to cover all the chapters, then one can compose a course by choosing subsections from the chapters. The chart below indicates what material depends on which sections.

Chapter 6 Chapter IO Chapter 12 For example, to cover the first two sections of the new chapter 12 it is recom mended that one (at least) covers Chapters 1-5, Chapter 7 and Section 8.6. VIII Chapter 10, and hence

Section 9.1, are necessary additional background for Section 12.3, in particular for the subsection on American options.

This book presents the texts of seminars presented during the years 1995 and 1996 at

the Université Paris VI and is the first attempt to present a survey on this subject. Starting from the classical conditions for existence and unicity of a solution in the most simple case-which requires more

than basic stochartic calculus-several refinements on the hypotheses are introduced to obtain more general results.

On Stochastic Differential Equations and Applications

Introduction to Stochastic

Differential Equations with Applications to Modelling in Biology and Finance

Numerical Solution of Stochastic Differential Equations

A Modeling, White Noise

Functional Approach

This book studies the existence and uniqueness of solutions to parabolic-type equations with irregular coefficients and/or initial conditions. It elaborates on the DiPerna-Lions theory of renormalized solutions to linear

transport equations and related equations, and also examines the connection between the results on the partial differential equation and the well-posedness of the underlying stochastic/ordinary differential equation.

Stochastic Differential Equations and ApplicationsAcademic Press

Stochastic differential equations (SDEs) are a powerful tool in science, mathematics, economics and finance. This book will help the reader to master the basic theory and learn some

applications of SDEs. In particular, the reader will be provided with the backward SDE technique for use in research when considering financial problems in the market, and with the reflecting SDE technique to enable study of optimal stochastic population

control problems. These two techniques are powerful and efficient, and can also be applied to research in many other problems in nature, science and elsewhere.

This book gives an introduction to the basic theory of stochastic calculus and

its applications. Examples are given throughout the text, in order to motivate and illustrate the theory and show its importance for many applications in e.g. economics, biology and physics. The basic idea of the presentation is to start from some basic

results (without proofs) of the easier cases and develop the theory from there, and to concentrate on the proofs of the easier case (which nevertheless are often sufficiently general for many purposes) in order to be able to reach quickly the parts of the theory which is

most important for the applications. For the 6th edition the author has added further exercises and, for the first time, solutions to many of the exercises are provided. This corrected 6th printing of the 6th edition contains additional corrections and useful improvements,

based in part on helpful comments from the readers.

An Analytical Approach

Backward Stochastic Differential Equations

With Applications to Physics and Engineering

Applied Stochastic Differential Equations

Diffusion Processes, the Fokker-Planck and Langevin Equations

From the reviews: "The author, a lucid mind with a fine pedagogical instinct, has written a splendid

text. He starts out by stating six problems in the introduction in which stochastic differential equations play an essential role in the solution. Then, while developing stochastic calculus, he frequently returns to these problems and variants thereof and

to many other problems to show how the theory works and to motivate the next step in the theoretical development. Needless to say, he restricts himself to stochastic integration with respect to Brownian motion. He is not hesitant to give some basic results

without proof in order to leave room for "some more basic applications... The book can be an ideal text for a graduate course, but it is also recommended to analysts (in particular, those working in differential equations and deterministic dynamical

systems and control) who wish to learn quickly what stochastic differential equations are all about." Acta Scientiarum Mathematicarum, Tom 50, 3-4, 1986#1 "The book is well written, gives a lot of nice applications of stochastic differential equation

theory, and presents theory and applications of stochastic differential equations in a way which makes the book useful for mathematical seminars at a low level. (...) The book (will) really motivate scientists from non-mathematical fields to try to

understand the usefulness of stochastic differential equations in their fields." Metrica#2

This book presents various results and techniques from the theory of stochastic processes that are useful in the study of stochastic problems in the natural sciences.

The main focus is analytical methods, although numerical methods and statistical inference methodologies for studying diffusion processes are also presented. The goal is the development of techniques that are applicable to a wide variety of

stochastic models that appear in physics, chemistry and other natural sciences. Applications such as stochastic resonance, Brownian motion in periodic potentials and Brownian motors are studied and the connection between diffusion processes and time-dependent

statistical mechanics is elucidated. The book contains a large number of illustrations, examples, and exercises. It will be useful for graduate-level courses on stochastic processes for students in applied mathematics, physics and engineering. Many of the

topics covered in this book (reversible diffusions, convergence to equilibrium for diffusion processes, inference methods for stochastic differential equations, derivation of the generalized Langevin equation, exit time problems) cannot be

easily found in textbook form and will be useful to both researchers and students interested in the applications of stochastic processes.
Completely revised and greatly expanded, the new edition of this text takes readers who have been

exposed to only basic courses in analysis through the modern general theory of random processes and stochastic integrals as used by systems theorists, electronic engineers and, more recently, those working in quantitative and mathematical

finance. Building upon the original release of this title, this text will be of great interest to research mathematicians and graduate students working in those fields, as well as quants in the finance industry. New features of this edition include: End of chapter

exercises; New chapters on basic measure theory and Backward SDEs; Reworked proofs, examples and explanatory material; Increased focus on motivating the mathematics; Extensive topical index. "Such a self-contained and complete exposition of stochastic

calculus and applications fills an existing gap in the literature. The book can be recommended for first-year graduate studies. It will be useful for all who intend to work with stochastic calculus as well as with its applications." – Zentralblatt (from review of the First Edition)

This advanced undergraduate and graduate text has now been revised and updated to cover the basic principles and applications of various types of stochastic systems, with much on theory and applications not previously available in book form. The text is

also useful as a reference source for pure and applied mathematicians, statisticians and probabilists, engineers in control and communications, and information scientists, physicists and economists. Has been revised and updated to cover the basic

principles and applications of various types of stochastic systems Useful as a reference source for pure and applied mathematicians, statisticians and probabilists, engineers in control and communications, and information scientists, physicists

and economists
Parabolic Equations with Irregular Data and Related Issues
Stochastic Differential Equations
Stochastic Partial Differential Equations and Applications
Forward-Backward Stochastic Differential Equations and their

Applications

Proceedings of a Conference held in Trento, Italy, September 30 - October 5, 1985

Stochastic processes and diffusion theory are the mathematical underpinnings of

many scientific disciplines, including statistical physics, physical chemistry, molecular biophysics, communications theory and many more. Many books, reviews and research articles have been published

on this topic, from the purely mathematical to the most practical. This book offers an analytical approach to stochastic processes that are most common in the physical and life sciences, as well as in

optimal control and in the theory of filltering of signals from noisy measurements. Its aim is to make probability theory in function space readily accessible to scientists trained in the traditional methods of

applied mathematics, such as integral, ordinary, and partial differential equations and asymptotic methods, rather than in probability and measure theory.

Stochastic differential

equations in infinite dimensional spaces are motivated by the theory and analysis of stochastic processes and by applications such as stochastic control, population biology, and

turbulence, where the analysis and control of such systems involves investigating their stability. While the theory of such equations is well establ This book aims to further develop the theory of

stochastic functional inclusions and their applications for describing the solutions of the initial and boundary value problems for partial differential inclusions. The self-contained volume is designed to

introduce the reader in a systematic fashion, to new methods of the stochastic optimal control theory from the very beginning. The exposition contains detailed proofs and uses new and original methods

to characterize the properties of stochastic functional inclusions that, up to the present time, have only been published recently by the author. The work is divided into seven chapters, with the first

two acting as an introduction, containing selected material dealing with point- and set-valued stochastic processes, and the final two devoted to applications and optimal control problems. The book

presents recent and pressing issues in stochastic processes, control, differential games, optimization and their application in finance, manufacturing, queueing networks, and climate control.

Written by an award-winning author in the field of stochastic differential inclusions and their application to control theory, This book is intended for students and researchers in mathematics and applications;

particularly those studying optimal control theory. It is also highly relevant for students of economics and engineering. The book can also be used as a reference on stochastic differential

inclusions. Knowledge of select topics in analysis and probability theory are required. This book explains a procedure for constructing realistic stochastic differential equation models for randomly varying

systems in biology, chemistry, physics, engineering, and finance. Introductory chapters present the fundamental concepts of random variables, stochastic processes, stochastic integration, and

stochastic differential equations. These concepts are explained in a Hilbert space setting which unifies and simplifies the presentation. An Introduction to Stochastic Differential Equations

Stochastic Calculus and Applications

STOCHASTIC DIFFERENTIAL EQUATIONS AND APPLICATIONS. VOLUME 2

From Linear to Fully Nonlinear Theory

Modeling with Itô Stochastic Differential Equations

Stochastic Methods & their Applications to Communications presents a valuable approach to the modelling, synthesis and

numerical simulation of random processes with applications in communications and related fields. The authors provide a detailed account of random processes from

an engineering point of view and illustrate the concepts with examples taken from the communications area. The discussions mainly focus on the analysis and

synthesis of Markov models of random processes as applied to modelling such phenomena as interference and fading in communications. Encompassing both theory

and practice, this original text provides a unified approach to the analysis and generation of continuous, impulsive and mixed random processes based on the Fokker-Planck

equation for Markov processes. Presents the cumulated analysis of Markov processes Offers a SDE (Stochastic Differential Equations) approach to the generation

of random processes with specified characteristics Includes the modelling of communication channels and interfer ences using SDE Features new results and techniques for the of

solution of the generalized Fokker-Planck equation Essential reading for researchers, engineers, and graduate and upper year undergraduate students in

the field of communications, signal processing, control, physics and other areas of science, this reference will have wide ranging appeal.

Explore Theory and Techniques to Solve Physical, Biological, and Financial Problems Since the first edition was published, there has been a surge of interest in

stochastic partial differential equations (PDEs) driven by the Lévy type of noise. Stochastic Partial Differential Equations, Second Edition incorporates these recent

developments and improves the presentation of material. New to the Second Edition Two sections on the Lévy type of stochastic integrals and the related stochastic

differential equations in finite dimensions Discussions of Poisson random fields and related stochastic integrals, the solution of a stochastic heat equation with Poisson

noise, and mild solutions to linear and nonlinear parabolic equations with Poisson noises Two sections on linear and semilinear wave equations driven by the Poisson type

of noises Treatment of the Poisson stochastic integral in a Hilbert space and mild solutions of stochastic evolutions with Poisson noises Revised proofs and new

theorems, such as explosive solutions of stochastic reaction diffusion equations Additional applications of stochastic PDEs to population biology and

finance Updated section on parabolic equations and related elliptic problems in Gauss–Sobolev spaces The book covers basic theory as well as computational and

analytical techniques to solve physical, biological, and financial problems. It first presents classical concrete problems before proceeding to a unified

theory of stochastic evolution equations and describing applications, such as turbulence in fluid dynamics, a spatial population growth model in a random environment, and

a stochastic model in bond market theory. The author also explores the connection of stochastic PDEs to infinite-dimensional stochastic analysis.

Presents theory, sources, and applications of stochastic differential equations of Ito's type; those containing white noise. Closely studies first passage problems by

modern singular perturbation methods and their role in various fields of science. Introduces analytical methods to obtain information on

probabilistic quantities. Demonstrates the role of partial differential equations in this context. Clarifies the relationship between the complex mathematical theories

involved and sources of the problem for physicists, chemists, engineers, and other non-mathematical specialists. These notes provide a concise introduction to

stochastic differential equations and their application to the study of financial markets and as a basis for modeling diverse physical phenomena. They are

accessible to non-specialists and make a valuable addition to the collection of texts on the topic. --Srinivasa Varadhan, New York University This is a handy

and very useful text for studying stochastic differential equations. There is enough mathematical detail so that the reader can benefit from this

introduction with only a basic background in mathematical analysis and probability. --George Papanicolaou, Stanford University This book covers the most important

elementary facts regarding stochastic differential equations; it also describes some of the applications to partial differential equations, optimal stopping, and

options pricing. The book's style is intuitive rather than formal, and emphasis is made on clarity. This book will be very helpful to starting graduate students and

strong undergraduates as well as to others who want to gain knowledge of stochastic differential equations. I recommend this book enthusiastically.

--Alexander Lipton, Mathematical Finance Executive, Bank of America Merrill Lynch This short book provides a quick, but very readable introduction to stochastic differential

equations, that is, to differential equations subject to additive ``white noise'' and related random disturbances. The exposition is concise and

strongly focused upon the interplay between probabilistic intuition and mathematical rigor. Topics include a quick survey of measure theoretic probability

theory, followed by an introduction to Brownian motion and the Ito stochastic calculus, and finally the theory of stochastic differential equations. The text also

includes applications to partial differential equations, optimal stopping problems and options pricing. This book can be used as a text for senior undergraduates or

beginning graduate students in mathematics, applied mathematics, physics, financial mathematics, etc., who want to learn the basics of stochastic differential

equations. The reader is assumed to be fairly familiar with measure theoretic mathematical analysis, but is not assumed to have any particular knowledge of

probability theory (which is rapidly developed in Chapter 2 of the book). Stochastic Partial Differential Equations, Second Edition Stochastic Differential

Equations and Applications
Reflecting Stochastic Differential Equations with Jumps and Applications
Theory and Applications
Stochastic Differential

Equations Approach

The numerical analysis of stochastic differential equations (SDEs) differs significantly from that of ordinary differential equations. This book provides an easily accessible introduction to SDEs, their applications and the

numerical methods to solve such equations. From the reviews: "The authors draw upon their own research and experiences in obviously many disciplines... considerable time has obviously been spent writing this in the simplest language possible." --ZAMP

'Et moi, ..~ si lavait su CO.llUlJalt en revc:nir, One acMcc matbcmatica bu JaIdcred the human rac:c. It bu put COIDIDOD _ beet je n'y serais point aBe.' Jules Verne wbac it bdoup, 0Jl!be~ IbcII _t to!be dusty cauialcr Iabc & d 'diMardod__ The series is divergent;

thc:reforc we may be -'. I!.ticT. Bc:I1 able to do something with it. O. Hcavisidc Mathematics is a tool for thought. A highly necessary tool in a world when: both feedback and non linearities abound. Similarly. all kinds of parts of mathematics serve as tools for other parts

and for other sciences. Applying a simple rewriting rule to the quote on the right above one finds such statcmalts as: 'One service topology has rendered mathematical physics ...-; 'One service logic has rendered c0m puter science ... '; 'One service category theory has

rendered mathematics ... ". All arguably true. And all statements obtainable this way form part of the raison d'etre of this series. This series, Mathematics and Its Applications. started in 19n. Now that over one hundred volumes have appeared it seems opportune to

reexamine its scope. At the time I wrote "Growing specialization and diversification have brought a host of monographs and textbooks on increasingly specialized topics. However. the 'tree' of knowledge of mathematics and related fields does not grow only by

putting forth new branc:hes. It also happens, quite often in fact, that branches which were thought to be completely.

Fundamentals of probability theory; Markov processes and diffusion processes; Wiener process and white

noise; Stochastic integrals; The stochastic integral as a stochastic process, stochastic differentials; Stochastic differential equations, existence and uniqueness of solutions; Properties of the solutions of stochastic differential equations; Linear stochastic differentials equations; The

solutions of stochastic differentail equations as Markov and diffusion processes; Questions of modeling and approximation; Stability of stochastic dynamic systems; Optimal filtering of a disturbed signal; Optimal control of stochastic dynamic systems.

A comprehensive introduction to the core issues of stochastic differential equations and their effective application Introduction to Stochastic Differential Equations with Applications to Modelling in Biology and Finance offers a comprehensive examination to the

most important issues of stochastic differential equations and their applications. The author — a noted expert in the field — includes myriad illustrative examples in modelling dynamical phenomena subject to randomness, mainly in biology,

bioeconomics and finance, that clearly demonstrate the usefulness of stochastic differential equations in these and many other areas of science and technology. The text also features real-life situations with experimental data, thus covering topics such as Monte Carlo simulation

and statistical issues of estimation, model choice and prediction. The book includes the basic theory of option pricing and its effective application using real-life. The important issue of which stochastic calculus, It ô or Stratonovich, should be used in applications is dealt

with and the associated controversy resolved. Written to be accessible for both mathematically advanced readers and those with a basic understanding, the text offers a wealth of exercises and examples of application. This important volume: Contains a complete

introduction to the basic issues of stochastic differential equations and their effective application Includes many examples in modelling, mainly from the biology and finance fields Shows how to: Translate the physical dynamical phenomenon to mathematical models

and back, apply with real data, use the models to study different scenarios and understand the effect of human interventions Conveys the intuition behind the theoretical concepts Presents exercises that are designed to enhance understanding Offers a supporting

website that features solutions to exercises and R code for algorithm implementation Written for use by graduate students, from the areas of application or from mathematics and statistics, as well as academics and professionals wishing to study or to

apply these models, Introduction to Stochastic Differential Equations with Applications to Modelling in Biology and Finance is the authoritative guide to understanding the issues of stochastic differential equations and their application.

Stochastic Partial Differential Equations
Stochastic Processes and Applications
BSDEs with Jumps
An Introduction with Applications
Proceedings

Many important physical variables satisfy certain dynamic evolution

systems and can take only non-negative values. Therefore, one can study such variables by studying these dynamic systems. One can put some conditions on the coefficients to ensure non-negative values in deterministic cases. However, as a random process disturbs the system, the components of

solutions to stochastic differential equations (SDE) can keep changing between arbitrary large positive and negative values-even in the simplest case. To overcome this difficulty, the author examines the reflecting stochastic differential equation (RSDE) with the coordinate planes as its

boundary-or with a more general boundary. Reflecting Stochastic Differential Equations with Jumps and Applications systematically studies the general theory and applications of these equations. In particular, the author examines the existence, uniqueness, comparison, convergence,

and stability of strong solutions to cases where the RSDE has discontinuous coefficients-with greater than linear growth-that may include jump reflection. He derives the nonlinear filtering and Zakai equations, the Maximum Principle for stochastic optimal control, and the necessary and

sufficient conditions for the existence of optimal control. Most of the material presented in this book is new, including much new work by the author concerning SDEs both with and without reflection. Much of it appears here for the first time. With the application of RSDEs to various real-life problems,

such as the stochastic population and neurophysiological control problems- both addressed in the text-scientists dealing with stochastic dynamic systems will find this an interesting and useful work.

Stochastic differential equations are differential equations whose solutions

are stochastic processes. They exhibit appealing mathematical properties that are useful in modeling uncertainties and noisy phenomena in many disciplines. This book is motivated by applications of stochastic differential equations in target tracking and medical technology and, in particular,

their use in methodologies such as filtering, smoothing, parameter estimation, and machine learning. It builds an intuitive hands-on understanding of what stochastic differential equations are all about, but also covers the essentials of Ito calculus, the central theorems in the

field, and such approximation schemes as stochastic Runge-Kutta. Greater emphasis is given to solution methods than to analysis of theoretical properties of the equations. The book's practical approach assumes only prior understanding of ordinary differential equations. The numerous worked

examples and end-of-chapter exercises include application-driven derivations and computational assignments. MATLAB/Octave source code is available for download, promoting hands-on work with the methods.

Backward stochastic differential

equations with jumps can be used to solve problems in both finance and insurance. Part I of this book presents the theory of BSDEs with Lipschitz generators driven by a Brownian motion and a compensated random measure, with an emphasis on those generated by step processes and Lévy

processes. It discusses key results and techniques (including numerical algorithms) for BSDEs with jumps and studies filtration-consistent nonlinear expectations and g-expectations. Part I also focuses on the mathematical tools and proofs which are crucial for understanding the theory. Part II

investigates actuarial and financial applications of BSDEs with jumps. It considers a general financial and insurance model and deals with pricing and hedging of insurance equity-linked claims and asset-liability management problems. It additionally investigates perfect hedging, superhedging,

quadratic optimization, utility maximization, indifference pricing, ambiguity risk minimization, no-good-deal pricing and dynamic risk measures. Part III presents some other useful classes of BSDEs and their applications. This book will make BSDEs more accessible to those who

are interested in applying these equations to actuarial and financial problems. It will be beneficial to students and researchers in mathematical finance, risk measures, portfolio optimization as well as actuarial practitioners.

This book provides a systematic and

accessible approach to stochastic differential equations, backward stochastic differential equations, and their connection with partial differential equations, as well as the recent development of the fully nonlinear theory, including nonlinear expectation, second order backward stochastic

differential equations, and path dependent partial differential equations. Their main applications and numerical algorithms, as well as many exercises, are included. The book focuses on ideas and clarity, with most results having been solved from scratch and most theories being

motivated from applications. It can be considered a starting point for junior researchers in the field, and can serve as a textbook for a two-semester graduate course in probability theory and stochastic analysis. It is also accessible for graduate students majoring in financial engineering.

Theory of Stochastic Differential Equations with Jumps and Applications
An Introduction with Applications in Population Dynamics Modeling
Stochastic Methods and their Applications to Communications
Theory and Applications of Stochastic Processes

Stochastic Differential Equations in Infinite Dimensions

The first paper in the volume, Stochastic Evolution Equations by N V Krylov and B L Rozovskii, was originally published

in Russian in 1979. After more than a quarter-century, this paper remains a standard reference in the field of stochastic partial differential equations

(SPDEs) and continues to attract attention of mathematicians of all generations, because, together with a short but thorough introduction to SPDEs, it presents a

number of optimal and essentially non-improvable results about solvability for a large class of both linear and non-linear equations.

Stochastic Differential

Equations and Their Applications
Theory and Applications of Stochastic Differential Equations
Applications to Stochastic Differential Equations

Stochastic Differential Equations and Applications. Vol. 1 with Applications to Stochastic Partial Differential Equations