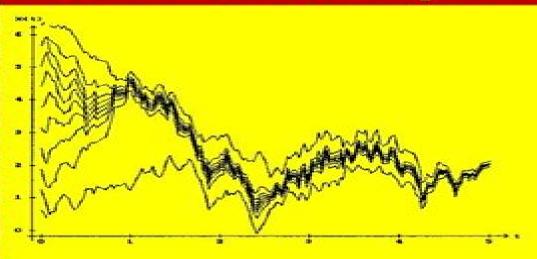
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Peter E. Kloeden Eckhard Platen

Numerical Solution of Stochastic Differential Equations





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Numerical Solution of Stochastic Differential Equations Peter E. Kloeden, Eckhard Platen, 2013-04-17 The aim of this book is to provide an accessible introduction to stochastic differ ential equations and their applications together with a systematic presentation of methods available for their numerical solution During the past decade there has been an accelerating interest in the de velopment of numerical methods for stochastic differential equations SDEs This activity has been as strong in the engineering and physical sciences as it has in mathematics resulting inevitably in some duplication of effort due to an unfamiliarity with the developments in other disciplines Much of the reported work has been motivated by the need to solve particular types of problems for which even more so than in the deterministic context specific methods are required The treatment has often been heuristic and ad hoc in character Nevertheless there are underlying principles present in many of the papers an understanding of which will enable one to develop or apply appropriate numerical schemes for particular problems or classes of problems Numerical Solution of SDE Through Computer Experiments Peter Eris Kloeden, Eckhard Platen, Henri Schurz, 2012-12-06 The numerical solution of stochastic differential equations is becoming an in dispensible worktool in a multitude of disciplines bridging a long standing gap between the well advanced theory of stochastic differential equations and its application to specific examples This has been made possible by the much greater accessibility to high powered computers at low cost combined with the availability of new effective higher order numerical schemes for stochastic differential equations Many hitherto intractable problems can now be tackled successfully and more realistic modelling with stochastic differential equations undertaken The aim of this book is to provide a computationally oriented introduction to the numerical solution of stochastic differential equations using computer experiments to develop in the readers an ability to undertake numerical studies of stochastic differential equations that arise in their own disciplines and an understanding intuitive at least of the necessary theoretical background It is related to but can also be used independently of the monograph P E Kloeden and E Platen Numerical Solution of Stochastic Differential Equations Applications of Mathematics Series Vol 23 Springer Verlag Hei delberg 1992 which is more theoretical presenting a systematic treatment of time discretized numerical schemes for stochastic differential equations along with background material on probability and stochastic calculus To facilitate the parallel use of both books the presentation of material in this book follows that in the monograph closely Random Ordinary Differential Equations and Their Numerical Solution Xiaoying Han, Peter E. Kloeden, 2017-10-25 This book is intended to make recent results on the derivation of higher order numerical schemes for random ordinary differential equations RODEs available to a broader readership and to familiarize readers with RODEs themselves as well as the closely associated theory of random dynamical systems In addition it demonstrates how RODEs are being used in the biological sciences where non Gaussian and bounded noise are often more realistic than the Gaussian white noise in stochastic differential equations SODEs RODEs are used in many important

applications and play a fundamental role in the theory of random dynamical systems. They can be analyzed pathwise with deterministic calculus but require further treatment beyond that of classical ODE theory due to the lack of smoothness in their time variable Although classical numerical schemes for ODEs can be used pathwise for RODEs they rarely attain their traditional order since the solutions of RODEs do not have sufficient smoothness to have Taylor expansions in the usual sense However Taylor like expansions can be derived for RODEs using an iterated application of the appropriate chain rule in integral form and represent the starting point for the systematic derivation of consistent higher order numerical schemes for RODEs The book is directed at a wide range of readers in applied and computational mathematics and related areas as well as readers who are interested in the applications of mathematical models involving random effects in particular in the biological sciences. The level of this book is suitable for graduate students in applied mathematics and related areas computational sciences and systems biology A basic knowledge of ordinary differential equations and numerical analysis is Numerical Solution of Stochastic Differential Equations with Jumps in Finance Eckhard Platen, Nicola Bruti-Liberati, 2010-07-23 In financial and actuarial modeling and other areas of application stochastic differential equations with jumps have been employed to describe the dynamics of various state variables. The numerical solution of such equations is more complex than that of those only driven by Wiener processes described in Kloeden Platen Numerical Solution of Stochastic Differential Equations 1992 The present monograph builds on the above mentioned work and provides an introduction to stochastic differential equations with jumps in both theory and application emphasizing the numerical methods needed to solve such equations It presents many new results on higher order methods for scenario and Monte Carlo simulation including implicit predictor corrector extrapolation Markov chain and variance reduction methods stressing the importance of their numerical stability Furthermore it includes chapters on exact simulation estimation and filtering Besides serving as a basic text on quantitative methods it offers ready access to a large number of potential research problems in an area that is widely applicable and rapidly expanding Finance is chosen as the area of application because much of the recent research on stochastic numerical methods has been driven by challenges in quantitative finance Moreover the volume introduces readers to the modern benchmark approach that provides a general framework for modeling in finance and insurance beyond the standard risk neutral approach It requires undergraduate background in mathematical or quantitative methods is accessible to a broad readership including those who are only seeking numerical recipes and includes exercises that help the reader develop a deeper understanding of the underlying mathematics Numerical Analysis of Systems of Ordinary and Stochastic Differential Equations S. S. Artemiev, T. A. Averina, 2011-02-11 No detailed description available for Numerical Analysis of Systems of Ordinary and Stochastic Differential Equations Numerical Solution of SDE Through Computer Experiments Peter Eris Kloeden, Eckhard Platen, Henri Schurz, 2002-12-12 This book provides an easily accessible computationally oriented introduction into the numerical solution of stochastic differential equations using computer

experiments It develops in the reader an ability to apply numerical methods solving stochastic differential equations It also creates an intuitive understanding of the necessary theoretical background Software containing programs for over 100 problems is available online Mathematical Tools for Physicists Michael Grinfeld, 2015-01-12 The new edition is significantly updated and expanded This unique collection of review articles ranging from fundamental concepts up to latest applications contains individual contributions written by renowned experts in the relevant fields Much attention is paid to ensuring fast access to the information with each carefully reviewed article featuring cross referencing references to the most relevant publications in the field and suggestions for further reading both introductory as well as more specialized While the chapters on group theory integral transforms Monte Carlo methods numerical analysis perturbation theory and special functions are thoroughly rewritten completely new content includes sections on commutative algebra computational algebraic topology differential geometry dynamical systems functional analysis graph and network theory PDEs of mathematical physics probability theory stochastic differential equations and variational methods Lectures on Mathematical Finance 2013 Fred Espen Benth, Dan Crisan, Paolo Guasoni, Konstantinos Manolarakis, Johannes Muhle-Karbe, Colm Nee, Philip Protter, 2013-07-11 The current volume presents four chapters touching on some of the most important and modern areas of research in Mathematical Finance asset price bubbles by Philip Protter energy markets by Fred Espen Benth investment under transaction costs by Paolo Guasoni and Johannes Muhle Karbe and numerical methods for solving stochastic equations by Dan Crisan K Manolarakis and C Nee The Paris Princeton Lecture Notes on Mathematical Finance of which this is the fifth volume publish cutting edge research in self contained expository articles from renowned specialists The aim is to produce a series of articles that can serve as an introductory reference source for research in the field Numerical Analysis Of Ordinary Differential Equations And Its Applications Taketomo Mitsui, Y Shinohara, 1995-10-12 The book collects original articles on numerical analysis of ordinary differential equations and its applications Some of the topics covered in this volume are discrete variable methods Runge Kutta methods linear multistep methods stability analysis parallel implementation self validating numerical methods analysis of nonlinear oscillation by numerical means differential algebraic and delay differential equations and stochastic initial value problems Stochastic Differential Equations and Processes Mounir Zili, Darya V. Filatova, 2011-09-24 Selected papers submitted by participants of the international Conference Stochastic Analysis and Applied Probability 2010 www saap2010 org make up the basis of this volume The SAAP 2010 was held in Tunisia from 7 9 October 2010 and was organized by the Applied Mathematics Mathematical Physics research unit of the preparatory institute to the military academies of Sousse Tunisia chaired by Mounir Zili The papers cover theoretical numerical and applied aspects of stochastic processes and stochastic differential equations The study of such topic is motivated in part by the need to model understand forecast and control the behavior of many natural phenomena that evolve in time in a random way Such phenomena appear in the fields of finance

telecommunications economics biology geology demography physics chemistry signal processing and modern control theory to mention just a few As this book emphasizes the importance of numerical and theoretical studies of the stochastic differential equations and stochastic processes it will be useful for a wide spectrum of researchers in applied probability stochastic numerical and theoretical analysis and statistics as well as for graduate students To make it more complete and accessible for graduate students practitioners and researchers the editors Mounir Zili and Daria Filatova have included a survey dedicated to the basic concepts of numerical analysis of the stochastic differential equations written by Henri Schurz

Theory of Stochastic Differential Equations with Jumps and Applications Rong SITU, 2005-04-20 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 Recent Developments in Computational Finance Thomas Gerstner, 2013 Computational finance is an interdisciplinary field which joins financial mathematics stochastics numerics and scientific computing Its task is to estimate as accurately and efficiently as possible the risks that financial instruments generate This volume consists of a series of cutting edge surveys of recent developments in the field written by leading international experts These make the subject accessible to a wide readership in academia and financial businesses The book consists of 13 chapters divided into 3 parts foundations algorithms and applications Besides surveys of existing results the book contains many new previously unpublished results Finite Difference Methods. Theory and Applications Ivan Dimov, István Faragó, Lubin Vulkov, 2019-01-28 This book constitutes the refereed conference proceedings of the 7th International Conference on Finite Difference Methods FDM 2018 held in Lozenetz Bulgaria in June 2018 The 69 revised full papers presented together with 11 invited papers were carefully reviewed and selected from 94 submissions They deal with many modern and new numerical techniques like splitting techniques Green's function method multigrid methods and immersed interface method Stochastic Differential Equations K. Sobczyk, 2001-11-30 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 what it be be IbcII to be dusty causaler labe the refore we may be I ticT Be 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 detre 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

Seminarbericht - Sektion Mathematik der Humboldt-Universitäet zu Berlin Berlin. Universität. Sektion Splitting Methods in Communication, Imaging, Science, and Engineering Roland Glowinski, Stanley J. Osher, Wotao Yin, 2017-01-05 This book is about computational methods based on operator splitting It consists of twenty three chapters written by recognized splitting method contributors and practitioners and covers a vast spectrum of topics and application areas including computational mechanics computational physics image processing wireless communication nonlinear optics and finance Therefore the book presents very versatile aspects of splitting methods and their applications motivating the cross fertilization of ideas Monte Carlo and Quasi-Monte Carlo Methods Ronald Cools, Dirk Nuyens, 2016-06-13 This book presents the refereed proceedings of the Eleventh International Conference on Monte Carlo and Quasi Monte Carlo Methods in Scientific Computing that was held at the University of Leuven Belgium in April 2014 These biennial conferences are major events for Monte Carlo and quasi Monte Carlo researchers The proceedings include articles based on invited lectures as well as carefully selected contributed papers on all theoretical aspects and applications of Monte Carlo and guasi Monte Carlo methods Offering information on the latest developments in these very active areas this book is an excellent reference resource for theoreticians and practitioners interested in solving high dimensional computational problems arising in particular in finance statistics and computer graphics Understanding the Discrete Element Method Hans-Georg Matuttis, Jian Chen, 2014-05-12 Gives readers a more thorough understanding of DEM and equips researchers for independent work and an ability to judge methods related to simulation of polygonal particles Introduces DEM from the fundamental concepts theoretical mechanics and solidstate physics with 2D and 3D simulation methods for polygonal particles Provides the fundamentals of coding discrete element method DEM requiring little advance knowledge of granular matter or numerical simulation Highlights the numerical tricks and pitfalls that are usually only realized after years of experience with relevant simple experiments as applications Presents a logical approach starting with the mechanical and physical bases followed by a description of the techniques and finally their applications Written by a key author presenting ideas on how to model the dynamics of angular particles using polygons and polyhedral Accompanying website includes MATLAB Programs providing the simulation code for two dimensional polygons Recommended for researchers and graduate students who deal with particle models in areas such as fluid dynamics multi body engineering <u>Library of Congress Subject Headings Library of</u> finite element methods the geosciences and multi scale physics Congress, 2004 Library of Congress Subject Headings Library of Congress. Cataloging Policy and Support Office, 2009

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