Computational Methods For Option Pricing Frontiers In Applied Mathematics

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AGUIRRE KENNY

Topics in Numerical Methods for Finance Springer
Numerical methods in finance have emerged as a vital field at the crossroads of probability theory, finance and numerical analysis. Based on presentations given at the workshop Numerical Methods in Finance held at the INRIA Bordeaux (France) on June 1-2, 2010, this book provides an overview of the major new advances in the numerical treatment of instruments with American exercises. Naturally it covers the most recent research on the mathematical theory and the practical applications of optimal stopping problems as they relate to financial applications. By extension, it also provides an original treatment of Monte Carlo methods for the recursive computation of conditional expectations and solutions of BSDEs and generalized multiple optimal stopping problems and their applications to the valuation of energy derivatives and assets. The articles were carefully written in a pedagogical style and a reasonably self-contained manner. The book is geared toward quantitative analysts, probabilists, and applied mathematicians interested in financial applications.
Option Pricing Using MATLAB. Addison-Wesley Professional
Accompanying CD-ROM contains ... "working computer code, demonstration applications, and also PDF versions of several research articles that are referred to in the book." -- d.j.
Pricing Derivative Securities CRC Press
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 Besides surveys of existing results, the book contains many new previously unpublished results.
Numerical Methods in Computational Finance Cambridge University Press
While the valuation of standard American option contracts has now achieved a fair degree of maturity, much work remains to be done regarding the new contractual forms that are constantly emerging in response to evolving economic conditions and regulations. Focusing on recent developments in the field, American-Style Derivatives provides an extensive treatment of option pricing with an emphasis on the valuation of American options on dividend-paying assets. The book begins with a review of valuation principles for European contingent

claims in a financial market in which the underlying asset price follows an Ito process and the interest rate is stochastic and then extends the analysis to American contingent claims. In this context the author lays out the basic valuation principles for American claims and describes instructive representation formulas for their prices. The results are applied to standard American options in the Black-Scholes market setting as well as to a variety of exotic contracts such as barrier, capped, and multi-asset options. He also reviews numerical methods for option pricing and compares their relative performance. The author explains all the concepts using standard financial terms and intuitions and relegates proofs to appendices that can be found at the end of each chapter. The book is written so that the material is easily accessible not only to those with a background in stochastic processes and/or derivative securities, but also to those with a more limited exposure to those areas.

Option Pricing Using Monte Carlo Methods Springer Science & Business Media

Although there are several publications on similar subjects, this book mainly focuses on pricing of options and bridges the gap between Mathematical Finance and Numerical Methodologies. The author collects the key contributions of several monographs and selected literature, values and displays their importance, and composes them here to create a work which has its own characteristics in content and style.This invaluable book provides working Matlab codes not only to implement the algorithms presented in the text, but also to help readers code their own pricing algorithms in their preferred programming languages. Availability of the codes under an Internet site is also offered by the author.Not only does this book serve as a textbook in related undergraduate or graduate courses, but it can also be used by those who wish to implement or learn pricing algorithms by themselves. The basic methods of option pricing are presented in a self-contained and unified manner, and will hopefully help readers improve their mathematical and computational backgrounds for more advanced topics.Errata(s)Errata

Numerical Analysis and Multi-precision Computational Methods Applied to the Extant Problems of Asian Option Pricing and Simulating Stable Distributions and Unit Root Densities Academic Press

This book contains mostly the author’s up-to-date research results in the area. Option pricing has attracted much attention in the past decade from applied mathematicians, statisticians, practitioners and educators. Many partial differential equation-based theoretical models have been developed for valuing various options. These models do not have any practical use unless their solutions can be found. However, most of these models are far too complex to solve analytically and numerical approximations have to be sought in practice. The contents of the book consist of three parts: (i) basic theory of stochastic control and formulation of various option pricing models, (ii) design of finite volume, finite difference and penalty-based algorithms for solving the models and (iii) stability and convergence analysis of the algorithms. It also contains extensive numerical experiments demonstrating how these algorithms perform for practical problems. The theoretical and numerical results demonstrate these algorithms provide efficient, accurate and easy-to-implement numerical tools for financial

engineers to price options. This book is appealing to researchers in financial engineering, optimal control and operations research. Financial engineers and practitioners will also find the book helpful in practice.

Quantitative Methods in Derivatives Pricing Springer Science & Business Media

Abstract: This paper aims to practice the use of Monte Carlo methods to simulate stock prices in order to price European call options using control variates. American put options are priced using the binomial model separately. Finally, we use the information to form a portfolio position using an Interactive Brokers paper trading account.

First International Conference, CSMCS 2020, Kozhikode, Kerala, India, September 10-12, 2020, Revised Selected Papers Springer Science & Business Media

Computationally-intensive tools play an increasingly important role in financial decisions. Many financial problems-ranging from asset allocation to risk management and from option pricing to model calibration-can be efficiently handled using modern computational techniques. Numerical Methods and Optimization in Finance presents such computational techniques, with an emphasis on simulation and optimization, particularly so-called heuristics. This book treats quantitative analysis as an essentially computational discipline in which applications are put into software form and tested empirically. This revised edition includes two new chapters, a self-contained tutorial on implementing and using heuristics, and an explanation of software used for testing portfolio-selection models. Postgraduate students, researchers in programs on quantitative and computational finance, and practitioners in banks and other financial companies can benefit from this second edition of Numerical Methods and Optimization in Finance. Introduces numerical methods to readers with economics backgrounds Emphasizes core simulation and optimization problems Includes MATLAB and R code for all applications, with sample code in the text and freely available for download

Foundations, Algorithms and Applications John Wiley & Sons

Implementing Models of Financial Derivatives is a comprehensive treatment of advanced implementation techniques in VBA for models of financial derivatives. Aimed at readers who are already familiar with the basics of VBA it emphasizes a fully object oriented approach to valuation applications, chiefly in the context of Monte Carlo simulation but also more broadly for lattice and PDE methods. Its unique approach to valuation, emphasizing effective implementation from both the numerical and the computational perspectives makes it an invaluable resource. The book comes with a library of almost a hundred Excel spreadsheets containing implementations of all the methods and models it investigates, including a large number of useful utility procedures. Exercises structured around four application streams supplement the exposition in each chapter, taking the reader from basic procedural level programming up to high level object oriented implementations. Written in eight parts, parts 1-4 emphasize application design in VBA, focused around the development of a plain Monte Carlo application. Part 5 assesses the performance of VBA for this application, and the final 3 emphasize

the implementation of a fast and accurate Monte Carlo method for option valuation. Key topics include: ?Fully polymorphic factories in VBA; ?Polymorphic input and output using the TextStream and FileSystemObject objects; ?Valuing a book of options; ?Detailed assessment of the performance of VBA data structures; ?Theory, implementation, and comparison of the main Monte Carlo variance reduction methods; ?Assessment of discretization methods and their application to option valuation in models like CIR and Heston; ?Fast valuation of Bermudan options by Monte Carlo. Fundamental theory and implementations of lattice and PDE methods are presented in appendices and developed through the book in the exercise streams. Spanning the two worlds of academic theory and industrial practice, this book is not only suitable as a classroom text in VBA, in simulation methods, and as an introduction to object oriented design, it is also a reference for model implementers and quants working alongside derivatives groups. Its implementations are a valuable resource for students, teachers and developers alike. Note: CD-ROM/DVD and other supplementary materials are not included as part of eBook file.

Handbook of Computational and Numerical Methods in Finance

Springer

The early exercise opportunity of an American option makes it challenging to price and an array of approaches have been proposed in the vast literature on this topic. In The Numerical Solution of the American Option Pricing Problem, Carl Chiarella, Boda Kang and Gunter Meyer focus on two numerical approaches that have proved useful for finding all prices, hedge ratios and early exercise boundaries of an American option. One is a finite difference approach which is based on the numerical solution of the partial differential equations with the free boundary problem arising in American option pricing, including the method of lines, the component wise splitting and the finite difference with PSOR. The other approach is the integral transform approach which includes Fourier or Fourier Cosine transforms. Written in a concise and systematic manner, Chiarella, Kang and Meyer explain and demonstrate the advantages and limitations of each of them based on their and their co-workers' experiences with these approaches over the years. Contents:IntroductionThe Merton and Heston Model for a CallAmerican Call Options under Jump-Diffusion ProcessesAmerican Option Prices under Stochastic Volatility and Jump-Diffusion Dynamics — The Transform ApproachRepresentation and Numerical Approximation of American Option Prices under HestonFourier Cosine Expansion ApproachA Numerical Approach to Pricing American Call Options under SVJDConclusionBibliographyIndexAbout the Authors Readership: Post-graduates/ Researchers in finance and applied mathematics with interest in numerical methods for American option pricing; mathematicians/physicists doing applied research in option pricing Keywords:American Option;Early Exercise;Method of Lines;Finite Difference Approach;Integral Transform Approach;Numerical MethodsKey Features:Complete discussion of different numerical methods for American optionsAble to handle stochastic volatility and/or jump diffusion dynamicsAble to produce hedge ratios

efficiently and accurately
Computational Methods for Quantitative Finance World Scientific
More useful techniques, tips, and tricks for harnessing the power of the new generation of powerful GPUs.
Tools for Computational Finance Springer Science & Business Media
New Tools to Solve Your Option Pricing Problems For nonlinear PDEs encountered in quantitative finance, advanced probabilistic methods are needed to address dimensionality issues. Written by two leaders in quantitative research—including Risk magazine's 2013 Quant of the Year—Nonlinear Option Pricing compares various numerical methods for solving high-dimensional nonlinear problems arising in option pricing. Designed for practitioners, it is the first authored book to discuss nonlinear Black-Scholes PDEs and compare the efficiency of many different methods. Real-World Solutions for Quantitative Analysts The book helps quants develop both their analytical and numerical expertise. It focuses on general mathematical tools rather than specific financial questions so that readers can easily use the tools to solve their own nonlinear problems. The authors build intuition through numerous real-world examples of numerical implementation. Although the focus is on ideas and numerical examples, the authors introduce relevant mathematical notions and important results and proofs. The book also covers several original approaches, including regression methods and dual methods for pricing chooser options, Monte Carlo approaches for pricing in the uncertain volatility model and the uncertain lapse and mortality model, the Markovian projection method and the particle method for calibrating local stochastic volatility models to market prices of vanilla options with/without stochastic interest rates, the a + bλ technique for building local correlation models that calibrate to market prices of vanilla options on a basket, and a new stochastic representation of nonlinear PDE solutions based on marked branching diffusions.
Computational Finance Elsevier
Any financial asset that is openly traded has a market price. Except for extreme market conditions, market price may be more or less than a "fair" value. Fair value is likely to be some complicated function of the current intrinsic value of tangible or intangible assets underlying the claim and our assessment of the characteristics of the underlying assets with respect to the expected rate of growth, future dividends, volatility, and other relevant market factors. Some of these factors that affect the price can be measured at the time of a transaction with reasonably high accuracy. Most factors, however, relate to expectations about the future and to subjective issues, such as current management, corporate policies and market environment, that could affect the future financial performance of the underlying assets. Models are thus needed to describe the stochastic factors and environment, and their implementations inevitably require computational finance tools.
Essays in Honour of Manfred Gilli World Scientific
As today's financial products have become more complex, quantitative analysts, financial engineers, and others in the financial industry now require robust techniques for numerical analysis. Covering advanced quantitative techniques, Computational Methods in Finance explains how to solve complex

functional equations through numerical methods. The first part of the book describes pricing methods for numerous derivatives under a variety of models. The book reviews common processes for modeling assets in different markets. It then examines many computational approaches for pricing derivatives. These include transform techniques, such as the fast Fourier transform, the fractional fast Fourier transform, the Fourier-cosine method, and saddlepoint method; the finite difference method for solving PDEs in the diffusion framework and PIDEs in the pure jump framework; and Monte Carlo simulation. The next part focuses on essential steps in real-world derivative pricing. The author discusses how to calibrate model parameters so that model prices are compatible with market prices. He also covers various filtering techniques and their implementations and gives examples of filtering and parameter estimation. Developed from the author’s courses at Columbia University and the Courant Institute of New York University, this self-contained text is designed for graduate students in financial engineering and mathematical finance as well as practitioners in the financial industry. It will help readers accurately price a vast array of derivatives.

Novel Methods in Computational Finance Butterworth-Heinemann

Abstract: This paper describes methods for pricing European and American options. Monte Carlo simulation and control variates methods are employed to price call options. The binomial model is employed to price American put options. Using daily stock data I am able to compare the model price and market price and speculate as to the cause of difference. Lastly, I build a portfolio in an Interactive Brokers paper trading [1] account using the prices I calculate. This project was done a part of the masters capstone course Math 573: Computational Methods of Financial Mathematics.

Tools for Computational Finance LAP Lambert Academic Publishing

Abstract: This paper aims to use Monte Carlo methods to price American call options on equities using the variance reduction technique of control variates and to price American put options using the binomial model. We use this information to form option positions. This project was done a part of the masters capstone course Math 573: Computational Methods of Financial Mathematics.

Monte Carlo Methods for American Option Pricing Springer Nature

From the unique perspective of partial differential equations (PDE), this self-contained book presents a systematic, advanced introduction to the Black-Scholes-Merton's option pricing theory.A unified approach is used to model various types of option pricing as PDE problems, to derive pricing formulas as their solutions, and to design efficient algorithms from the numerical calculation of PDEs. In particular, the qualitative and quantitative analysis of American option pricing is treated based on free boundary problems, and the implied volatility as an inverse problem is solved in the optimal control framework of parabolic equations.

Computational Methods for Option Pricing John Wiley & Sons

Abstract: This project is devoted primarily to the use of Monte Carlo methods to simulate stock prices in order to price European call options using control variates, and to the use of the binominal model to price American put options. At the end, we can use the

information to form a portfolio position using an Interactive Brokers paper trading account. This project was done as a part of the masters capstone course Math 573: Computational Methods of Financial Mathematics.

Tools for Computational Finance World Scientific Publishing Company

Computational Methods for Option PricingSIAM

An Introduction to Computational Finance Springer Science & Business Media

The purpose of this paper is to show the practical application of computational methods to price options. Emphasis is especially given to the use of the Longstaff-Schwartz method for pricing American and exotic options. An implementation of these pricing methods in a computer program are demonstrated. The advantages of using object-oriented programming design patterns to make pricing programs more flexible and useful is also discussed.

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