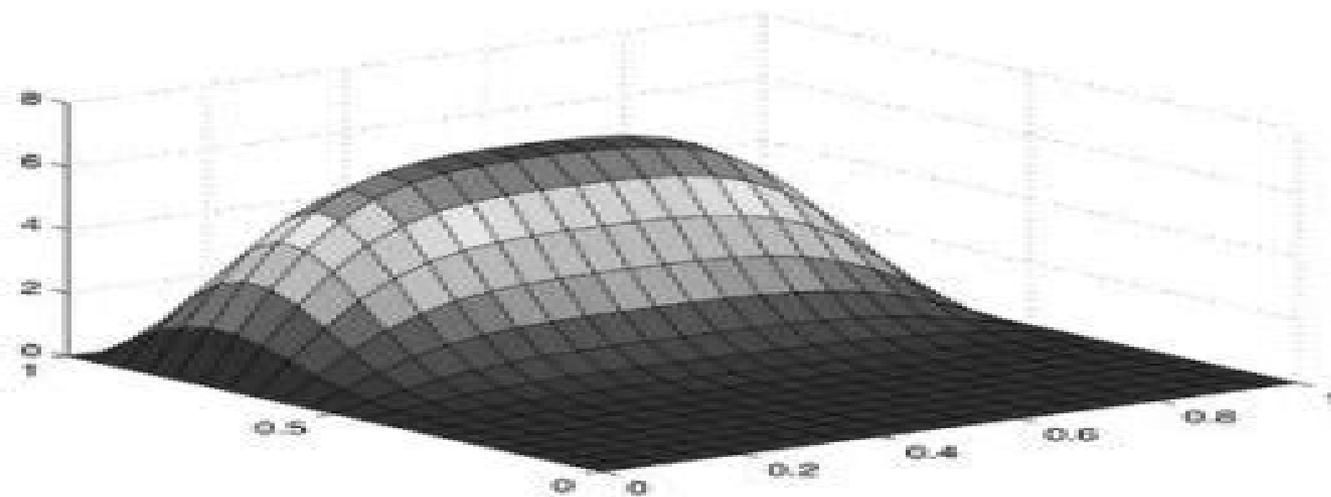


PAOLO BRANDIMARTE

# Numerical Methods in Finance and Economics

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**Numerical Methods in Finance** Paolo Brandimarte, 2003-09-29 Balanced coverage of the methodology and theory of numerical methods in finance Numerical Methods in Finance bridges the gap between financial theory and computational practice while helping students and practitioners exploit MATLAB for financial applications Paolo Brandimarte covers the basics of finance and numerical analysis and provides background material that suits the needs of students from both financial engineering and economics perspectives Classical numerical analysis methods optimization including less familiar topics such as stochastic and integer programming simulation including low discrepancy sequences and partial differential equations are covered in detail Extensive illustrative examples of the application of all of these methodologies are also provided The text is primarily focused on MATLAB based application but also includes descriptions of other readily available toolboxes that are relevant to finance Helpful appendices on the basics of MATLAB and probability theory round out this balanced coverage Accessible for students yet still a useful reference for practitioners Numerical Methods in Finance offers an expert introduction to powerful tools in finance

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*Mathematical Modelling and Numerical Methods in Finance* Alain Bensoussan, Qiang Zhang, 2009-06-16 Mathematical finance is a prolific scientific domain in which there exists a particular characteristic of developing both advanced theories and practical techniques simultaneously Mathematical Modelling and Numerical Methods in Finance addresses the three most important aspects in the field mathematical models computational methods and applications and provides a solid

overview of major new ideas and results in the three domains Coverage of all aspects of quantitative finance including models computational methods and applications Provides an overview of new ideas and results Contributors are leaders of the field

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**Topics in Numerical Methods for Finance** Mark Cummins, Finbarr Murphy, John J.H. Miller, 2012-07-15 Presenting state of the art methods in the area the book begins with a presentation of weak discrete time approximations of jump diffusion stochastic differential equations for derivatives pricing and risk measurement Using a moving least squares reconstruction a numerical approach is then developed that allows for the construction of arbitrage free surfaces Free boundary problems are considered next with particular focus on stochastic impulse control problems that arise when the cost of control includes a fixed cost common in financial applications The text proceeds with the development of a fear index based on equity option surfaces allowing for the measurement of overall fear levels in the market The problem of American option pricing is considered next applying simulation methods combined with regression techniques and discussing convergence properties Changing focus to integral transform methods a variety of option pricing problems are considered The COS method is practically applied for the pricing of options under uncertain volatility a method developed by the authors that relies on the dynamic programming principle and Fourier cosine series expansions Efficient approximation methods are next developed for the application of the fast Fourier transform for option pricing under multifactor affine models with stochastic volatility and jumps Following this fast and accurate pricing techniques are showcased for the pricing of credit derivative contracts

with discrete monitoring based on the Wiener Hopf factorisation With an energy theme a recombining pentanomial lattice is developed for the pricing of gas swing contracts under regime switching dynamics The book concludes with a linear and nonlinear review of the arbitrage free parity theory for the CDS and bond markets *Numerical Methods in Computational Finance* Daniel J. Duffy, 2022-03-14 This book is a detailed and step by step introduction to the mathematical foundations of ordinary and partial differential equations their approximation by the finite difference method and applications to computational finance The book is structured so that it can be read by beginners novices and expert users Part A Mathematical Foundation for One Factor Problems Chapters 1 to 7 introduce the mathematical and numerical analysis concepts that are needed to understand the finite difference method and its application to computational finance Part B Mathematical Foundation for Two Factor Problems Chapters 8 to 13 discuss a number of rigorous mathematical techniques relating to elliptic and parabolic partial differential equations in two space variables In particular we develop strategies to preprocess and modify a PDE before we approximate it by the finite difference method thus avoiding ad hoc and heuristic tricks Part C The Foundations of the Finite Difference Method FDM Chapters 14 to 17 introduce the mathematical background to the finite difference method for initial boundary value problems for parabolic PDEs It encapsulates all the background information to construct stable and accurate finite difference schemes Part D Advanced Finite Difference Schemes for Two Factor Problems Chapters 18 to 22 introduce a number of modern finite difference methods to approximate the solution of two factor partial differential equations This is the only book we know of that discusses these methods in any detail Part E Test Cases in Computational Finance Chapters 23 to 26 are concerned with applications based on previous chapters We discuss finite difference schemes for a wide range of one factor and two factor problems This book is suitable as an entry level introduction as well as a detailed treatment of modern methods as used by industry quants and MSc MFE students in finance The topics have applications to numerical analysis science and engineering More on computational finance and the author's online courses see [www.datasim.nl](http://www.datasim.nl) [Topics in Numerical Methods for Finance](#) Mark Cummins, Finbarr Murphy, John J.H. Miller, 2014-08-08 Presenting state of the art methods in the area the book begins with a presentation of weak discrete time approximations of jump diffusion stochastic differential equations for derivatives pricing and risk measurement Using a moving least squares reconstruction a numerical approach is then developed that allows for the construction of arbitrage free surfaces Free boundary problems are considered next with particular focus on stochastic impulse control problems that arise when the cost of control includes a fixed cost common in financial applications The text proceeds with the development of a fear index based on equity option surfaces allowing for the measurement of overall fear levels in the market The problem of American option pricing is considered next applying simulation methods combined with regression techniques and discussing convergence properties Changing focus to integral transform methods a variety of option pricing problems are considered The COS method is practically applied for the pricing of options under uncertain

volatility a method developed by the authors that relies on the dynamic programming principle and Fourier cosine series expansions Efficient approximation methods are next developed for the application of the fast Fourier transform for option pricing under multifactor affine models with stochastic volatility and jumps Following this fast and accurate pricing techniques are showcased for the pricing of credit derivative contracts with discrete monitoring based on the Wiener Hopf factorisation With an energy theme a recombining pentanomial lattice is developed for the pricing of gas swing contracts under regime switching dynamics The book concludes with a linear and nonlinear review of the arbitrage free parity theory for the CDS and bond markets

*Quantitative Methods for Finance with Simulations II* Geon Ho Choe, 2026-02-16 This self contained book is the second of a two volume set providing a thorough introduction to quantitative finance covering both theoretical and computational methods This volume covers numerical methods including numerical solutions of ordinary and partial differential equations such as the Black Scholes Merton equation as well as stochastic differential equations Monte Carlo methods estimation of implied volatility stochastic volatility models and Fourier transform methods for option pricing The numerical methods are implemented in both Matlab and Python Background in mathematics is included in the appendices and the level of familiarity with computer programming is kept to a minimum

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*Market Risk Analysis, Quantitative Methods in Finance* Carol Alexander, 2008-04-30 Written by leading market risk academic Professor Carol Alexander Quantitative Methods in Finance forms part one of the Market Risk Analysis four volume set Starting from the basics this book helps readers to take the first step towards becoming a properly qualified financial risk manager and asset manager roles that are currently in huge demand Accessible to intelligent readers with a moderate understanding of mathematics at high school level or to anyone with a university degree in mathematics physics or engineering no prior knowledge of finance is necessary Instead the emphasis is on understanding ideas rather than on mathematical rigour meaning that this book offers a fast track introduction to financial analysis for readers with some quantitative background highlighting those areas of mathematics that are particularly relevant to solving problems in financial risk management and asset management Unique to this book is a focus on both continuous and discrete time finance so that Quantitative Methods in Finance is not only about the application of mathematics to finance it also explains in very pedagogical terms how the continuous time and discrete time finance disciplines meet providing a comprehensive highly accessible guide which will provide readers with the tools to start applying their knowledge immediately All together the Market Risk Analysis four volume set illustrates virtually every concept or formula with a practical numerical example or a longer empirical case study Across all four volumes there are approximately 300 numerical and empirical examples 400 graphs and figures and 30 case studies many of which are contained in interactive Excel spreadsheets available from the

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**Numerical Partial Differential Equations in Finance Explained** Karel in 't Hout,2017-09-02 This book provides a first basic introduction into the valuation of financial options via the numerical solution of partial differential equations PDEs It provides readers with an easily accessible text explaining main concepts models methods and results that arise in this approach In keeping with the series style emphasis is placed on intuition as opposed to full rigor and a relatively basic understanding of mathematics is sufficient The book provides a wealth of examples and ample numerical experiments are given to illustrate the theory The main focus is on one dimensional financial PDEs notably the Black Scholes equation The book concludes with a detailed discussion of the important step towards two dimensional PDEs in finance

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