

Springer Finance

Antoon Pelsser

# Efficient Methods for Valuing Interest Rate Derivatives



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# Efficient Methods For Valuing Interest Rate Derivatives

**SJ Ball**



## **Efficient Methods For Valuing Interest Rate Derivatives:**

**Efficient Methods for Valuing Interest Rate Derivatives** Antoon Pelsser, 2013-03-09 Efficient Methods for Valuing Interest Rate Derivatives provides an overview of the models that can be used for valuing and managing interest rate derivatives Split into two parts the first discusses and compares the traditional models such as spot and forward rate models while the second concentrates on the more recently developed Market models Unlike most of his competitors the author's focus is not only on the mathematics Antoon Pelsser draws on his experience in industry to explore the practical issues such as the implementation of models and model selection Aimed at people with a solid quantitative background this book will be of particular interest to risk managers interest rate derivative traders quantitative researchers portfolio and fund managers and students of mathematics and economics but it will also prove invaluable to anyone looking for a good overview of interest rate derivative modelling

**Efficient Methods for Valuing Interest Rate Derivatives** Antoon Pelsser, 2000-07-31 This book provides an overview of the models that can be used for valuing and managing interest rate derivatives Split into two parts the first discusses and compares the traditional models such as spot and forward rate models while the second concentrates on the more recently developed Market models Unlike most of his competitors the author's focus is not only on the mathematics Antoon Pelsser draws on his experience in industry to explore a host of practical issues

Interest Rate Derivatives Ingo Beyna, 2013-02-20 The class of interest rate models introduced by O Cheyette in 1994 is a subclass of the general HJM framework with a time dependent volatility parameterization This book addresses the above mentioned class of interest rate models and concentrates on the calibration valuation and sensitivity analysis in multifactor models It derives analytical pricing formulas for bonds and caplets and applies several numerical valuation techniques in the class of Cheyette model i e Monte Carlo simulation characteristic functions and PDE valuation based on sparse grids Finally it focuses on the sensitivity analysis of Cheyette models and derives Model and Market Greeks To the best of our knowledge this sensitivity analysis of interest rate derivatives in the class of Cheyette models is unique in the literature Up to now the valuation of interest rate derivatives using PDEs has been restricted to 3 dimensions only since the computational effort was too great The author picks up the sparse grid technique adjusts it slightly and can solve high dimensional PDEs four dimensions plus time accurately in reasonable time Many topics investigated in this book are new areas of research and make a significant contribution to the scientific community of financial engineers They also represent a valuable development for practitioners

*Markets with Transaction Costs* Yuri Kabanov, Mher Safarian, 2009-12-04 The book is the first monograph on this highly important subject

*Mathematical Methods for Financial Markets* Monique Jeanblanc, Marc Yor, Marc Chesney, 2009-10-13 Mathematical finance has grown into a huge area of research which requires a large number of sophisticated mathematical tools This book simultaneously introduces the financial methodology and the relevant mathematical tools in a style that is mathematically rigorous and yet accessible to practitioners and mathematicians alike It interlaces financial concepts such as

arbitrage opportunities admissible strategies contingent claims option pricing and default risk with the mathematical theory of Brownian motion diffusion processes and Levy processes The first half of the book is devoted to continuous path processes whereas the second half deals with discontinuous processes The extensive bibliography comprises a wealth of important references and the author index enables readers quickly to locate where the reference is cited within the book making this volume an invaluable tool both for students and for those at the forefront of research and practice

The Concepts and Practice of Mathematical Finance Mark S. Joshi, 2003-12-24 For those starting out as practitioners of mathematical finance this is an ideal introduction It provides the reader with a clear understanding of the intuition behind derivatives pricing how models are implemented and how they are used and adapted in practice Strengths and weaknesses of different models e.g Black Scholes stochastic volatility jump diffusion and variance gamma are examined Both the theory and the implementation of the industry standard LIBOR market model are considered in detail Uniquely the book includes extensive discussion of the ideas behind the models and is even handed in examining various approaches to the subject Thus each pricing problem is solved using several methods Worked examples and exercises with answers are provided in plenty and computer projects are given for many problems The author brings to this book a blend of practical experience and rigorous mathematical background and supplies here the working knowledge needed to become a good quantitative analyst

*The LIBOR Market Model in Practice* Dariusz Gatarek, Przemyslaw Bachert, Robert Maksymiuk, 2007-01-30 The LIBOR Market Model LMM is the first model of interest rates dynamics consistent with the market practice of pricing interest rate derivatives and therefore it is widely used by financial institution for valuation of interest rate derivatives This book provides a full practitioner's approach to the LIBOR Market Model It adopts the specific language of a quantitative analyst to the largest possible level and is one of first books on the subject written entirely by quants The book is divided into three parts theory calibration and simulation New and important issues are covered such as various drift approximations various parametric and nonparametric calibrations and the uncertain volatility approach to smile modelling a version of the HJM model based on market observables and the duality between BGM and HJM models Co authored by Dariusz Gatarek the G in the BGM model who is internationally known for his work on LIBOR market models this book offers an essential perspective on the global benchmark for short term interest rates

Computational Finance Using C and C# George Levy, 2016-07-21 Computational Finance Using C and C# Derivatives and Valuation Second Edition provides derivatives pricing information for equity derivatives interest rate derivatives foreign exchange derivatives and credit derivatives By providing free access to code from a variety of computer languages such as Visual Basic Excel C++ and C it gives readers stand alone examples that they can explore before delving into creating their own applications It is written for readers with backgrounds in basic calculus linear algebra and probability Strong on mathematical theory this second edition helps empower readers to solve their own problems Features new programming problems examples and exercises for each chapter Includes freely accessible source

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*Modeling Derivatives in C++* Justin London, 2005-01-21 This book is the definitive and most comprehensive guide to modeling derivatives in C today Providing readers with not only the theory and math behind the models as well as the fundamental concepts of financial engineering but also actual robust object oriented C code this is a practical introduction to the most important derivative models used in practice today including equity standard and exotics including barrier lookback and Asian and fixed income bonds caps swaptions swaps credit derivatives The book provides complete C implementations for many of the most important derivatives and interest rate pricing models used on Wall Street including Hull White BDT CIR HJM and LIBOR Market Model London illustrates the practical and efficient implementations of these models in real world situations and discusses the mathematical underpinnings and derivation of the models in a detailed yet accessible manner illustrated by many examples with numerical data as well as real market data A companion CD contains quantitative libraries tools applications and resources that will be of value to those doing quantitative programming and analysis in C Filled with practical advice and helpful tools *Modeling Derivatives in C* will help readers succeed in understanding and implementing C when modeling all types of derivatives

**Interest Rate Models Theory and Practice** Damiano Brigo, Fabio Mercurio, 2013-04-17 The 2nd edition of this successful book has several new features The calibration discussion of the basic LIBOR market model has been enriched considerably with an analysis of the impact of the swaptions interpolation technique and of the exogenous instantaneous correlation on the calibration outputs A discussion of historical estimation of the instantaneous correlation matrix and of rank reduction has been added and a LIBOR model consistent swaption volatility interpolation technique has been introduced The old sections devoted to the smile issue in the LIBOR market model have been enlarged into several new chapters New sections on local volatility dynamics and on stochastic volatility models have been added with a thorough treatment of the recently developed uncertain volatility approach Examples of calibrations to real market data are now considered The fast growing interest for hybrid products has led to new chapters A special focus here is devoted to the pricing of inflation linked derivatives The three final new chapters of this second edition are devoted to credit Since Credit Derivatives are increasingly fundamental and since in the reduced form modeling framework much of the technique involved is analogous to interest rate modeling Credit Derivatives mostly Credit Default Swaps CDS CDS Options and Constant Maturity CDS are discussed building on the basic short rate models and market models introduced earlier for the default free market Counterparty risk in interest rate payoff valuation is also considered motivated by the recent Basel II framework developments

**Financial Markets in Continuous Time**

Rose-Anne Dana, Monique Jeanblanc-Picqué, Monique Jeanblanc, 2007-07-12 This book explains key financial concepts mathematical tools and theories of mathematical finance It is organized in four parts The first brings together a number of results from discrete time models The second develops stochastic continuous time models for the valuation of financial assets the Black Scholes formula and its extensions for optimal portfolio and consumption choice and for obtaining the yield curve and pricing interest rate products The third part recalls some concepts and results of equilibrium theory and applies this in financial markets The last part tackles market incompleteness and the valuation of exotic options **Financial Modeling**

**Under Non-Gaussian Distributions** Eric Jondeau, Ser-Huang Poon, Michael Rockinger, 2007-04-05 This book examines non Gaussian distributions It addresses the causes and consequences of non normality and time dependency in both asset returns and option prices The book is written for non mathematicians who want to model financial market prices so the emphasis throughout is on practice There are abundant empirical illustrations of the models and techniques described many of which could be equally applied to other financial time series **Risk and Asset Allocation** Attilio Meucci, 2009-05-22 Discusses in

the practical and theoretical aspects of one period asset allocation i e market Modeling invariants estimation portfolio evaluation and portfolio optimization in the presence of estimation risk The book is software based many of the exercises simulate in Matlab the solution to practical problems and can be downloaded from the book's web site *Demystifying Exotic Products* Chia Tan, 2010-01-05 In recent times derivatives have been inaccurately labelled the financial weapons of mass destruction responsible for the worst financial crisis in recent history Inherently complex and perilous for the ill informed investment professional they can however also be gainfully harnessed This book is a practical guide to the complexities of exotic products written in simple terms based on the premise that derivatives are not homogenous and not necessarily dangerous By exploring common themes behind the construction of various structured products in interest rates equities and foreign exchange and investigating the economic environment that promoted the explosive growth of these products this book will help readers make sense of their relevance in this period of economic uncertainty Subsequently by explaining exotic products with simple mathematics it will aid readers in understanding their potential use in certain investment strategies whilst having a firm control over risk Exotic products need not be inaccessible By understanding the products available investors can make informed decisions ensuring features are consistent with their investment objectives and risk preferences Author Chia Chiang Tan takes readers through the risks and rewards of each product illustrating when products can damage investment strategies and how to avoid them leading to suitable profitable investments Ultimately this book will provide practitioners with an understanding of derivatives enabling them to determine for themselves which products will fit their investment strategy and how to use them based on the economic environment and inherent risks

**Risk-Neutral Valuation** Nicholas H. Bingham, Rüdiger Kiesel, 2013-06-29 Since its introduction in the early 1980s the risk neutral valuation principle has proved to be an important tool in the pricing and hedging of financial derivatives

Following the success of the first edition of Risk Neutral Valuation the authors have thoroughly revised the entire book taking into account recent developments in the field and changes in their own thinking and teaching In particular the chapters on Incomplete Markets and Interest Rate Theory have been updated and extended there is a new chapter on the important and growing area of Credit Risk and in recognition of the increasing popularity of Lvy finance there is considerable new material on Infinite divisibility and Lvy processes Lvy based models in incomplete markets Further material such as exercises solutions to exercises and lecture slides are also available via the web to provide additional support for lecturers

Mathematical Models of Financial Derivatives Yue-Kuen Kwok,2008-07-10 Objectives and Audience In the past three decades we have witnessed the phenomenal growth in the trading of financial derivatives and structured products in the financial markets around the globe and the surge in research on derivative pricing theory Leading financial institutions are hiring graduates with a science background who can use advanced analytical and numerical techniques to price financial derivatives and manage portfolio risks a phenomenon coined as Rocket Science on Wall Street There are now more than a hundred Master level degree programs in Financial Engineering Quantitative Finance Computational Finance on different continents This book is written as an introductory textbook on derivative pricing theory for students enrolled in these degree programs Another audience of the book may include practitioners in quantitative teams in financial institutions who would like to acquire the knowledge of option pricing techniques and explore the new development in pricing models of exotic structured derivatives The level of mathematics in this book is tailored to readers with preparation at the advanced undergraduate level of science and engineering majors in particular basic proficiencies in probability and statistics differential equations numerical methods and mathematical analysis Advance knowledge in stochastic processes that are relevant to the martingale pricing theory like stochastic differential calculus and theory of martingale are introduced in this book The cornerstones of derivative pricing theory are the Black Scholes Merton pricing model and the martingale pricing theory of financial derivatives

**Arbitrage Theory in Continuous Time** Tomas Bjork,2020-01-16 The fourth edition of this widely used textbook on pricing and hedging of financial derivatives now also includes dynamic equilibrium theory and continues to combine sound mathematical principles with economic applications Concentrating on the probabilistic theory of continuous time arbitrage pricing of financial derivatives including stochastic optimal control theory and optimal stopping theory Arbitrage Theory in Continuous Time is designed for graduate students in economics and mathematics and combines the necessary mathematical background with a solid economic focus It includes a solved example for every new technique presented contains numerous exercises and suggests further reading in each chapter All concepts and ideas are discussed not only from a mathematics point of view but with lots of intuitive economic arguments In the substantially extended fourth edition Tomas Bjork has added completely new chapters on incomplete markets treating such topics as the Esscher transform the minimal martingale measure f divergences optimal investment theory for incomplete markets and good deal

bounds This edition includes an entirely new section presenting dynamic equilibrium theory covering unit net supply endowments models and the Cox Ingersoll Ross equilibrium factor model Providing two full treatments of arbitrage theory the classical delta hedging approach and the modern martingale approach this book is written so that these approaches can be studied independently of each other thus providing the less mathematically oriented reader with a self contained introduction to arbitrage theory and equilibrium theory while at the same time allowing the more advanced student to see the full theory in action This textbook is a natural choice for graduate students and advanced undergraduates studying finance and an invaluable introduction to mathematical finance for mathematicians and professionals in the market

**Semiparametric Modeling of Implied Volatility** Matthias R. Fengler, 2005-12-19 Yet that weakness is also its greatest strength People like the model because they can easily understand its assumptions The model is often good as a first approximation and if you can see the holes in the assumptions you can use the model in more sophisticated ways Black 1992 Expected volatility as a measure of risk involved in economic decision making is a key ingredient in modern financial theory A rational risk averse investor will seek to balance the tradeoff between the risk he bears and the return he expects The more volatile the asset is i.e. the more it is prone to excessive price fluctuations the higher will be the expected premium he demands Markowitz 1959 followed by Sharpe 1964 and Lintner 1965 were among the first to quantify the idea of the simple equation more risk means higher return in terms of equilibrium models Since then the analysis of volatility and price fluctuations has sparked a vast literature in theoretical and quantitative finance that refines and extends these early models As the most recent climax of this story one may see the Nobel prize in Economics granted to Robert Engle in 2003 for his path breaking work on modeling time dependent volatility

*Interest-Rate Management* Rudi Zagst, 2013-04-17 Who gains all his ends did set the level too low Although the history of trading on financial markets started a long and possibly not exactly definable time ago most financial analysts agree that the core of mathematical finance dates back to the year 1973 Not only did the world's first option exchange open its doors in Chicago in that year but Black and Scholes published their pioneering paper BS73 on the pricing and hedging of contingent claims Since then their explicit pricing formula has become the market standard for pricing European stock options and related financial derivatives In contrast to the equity market no comparable model is accepted as standard for the interest rate market as a whole One of the reasons is that interest rate derivatives usually depend on the change of a complete yield curve rather than only one single interest rate This complicates the pricing of these products as well as the process of managing their market risk in an essential way Consequently a large number of interest rate models have appeared in the literature using one or more factors to explain the potential changes of the yield curve Beside the Black 1976 and the Heath Jarrow Morton model HJM92 which are widely used in practice the LIBOR and swap market models introduced by Brace Gatarek and Musiela BGM97 Miltersen Sandmann and Sondermann MSS97J and Jamshidian Jam98 are among the most promising ones

Binomial Models in Finance John van der Hoek, Robert J.



Elliott, 2006 This book deals with many topics in modern financial mathematics in a way that does not use advanced mathematical tools and shows how these models can be numerically implemented in a practical way The book is aimed at undergraduate students MBA students and executives who wish to understand and apply financial models in the spreadsheet computing environment The basic building block is the one step binomial model where a known price today can take one of two possible values at the next time In this simple situation risk neutral pricing can be defined and the model can be applied to price forward contracts exchange rate contracts and interest rate derivatives The simple one period framework can then be extended to multi period models The authors show how binomial tree models can be constructed for several applications to bring about valuations consistent with market prices The book closes with a novel discussion of real options John van der Hoek is Senior Lecturer in Applied Mathematics at the University of Adelaide He has developed courses in finance for a number of years at various levels and is a regular plenary speaker at major conferences on Quantitative Finance Robert J Elliott is RBC Financial Group Professor of Finance at the Haskayne School of Business at the University of Calgary He is the author of over 300 research papers and several books including Mathematics of Financial Markets Second Edition with P Ekkehard Kopp Stochastic Calculus and Applications Hidden Markov Models with Lahkdar Aggoun and John Moore and Measure Theory and Filtering Theory and Applications with Lakhdar Aggoun He is an Associate Editor of Mathematical Finance Stochastics and Stochastics Reports Stochastic Analysis and Applications and the Canadian Applied Mathematics Quarterly

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