Markov Functional Interest Rate Models Springer

Packed with insights, Lorenzo Bergomi's Stochastic Volatility Modeling explains how stochastic volatility is used to address issues arising in the modeling of derivatives, including:Which trading issues do we tackle with stochastic volatility? How do we design models and assess their relevance? How do we tell which models are usable and when does c

This book addresses the applications of Fourier transform to smile modeling. Smile effect is used generically by ?nancial engineers and risk managers to refer to the inconsistences of quoted implied volatilities in ?nancial markets, or more mat- matically, to the leptokurtic distributions of ?nancial assets and indices. Therefore, a sound modeling of smile effect is the central challenge in quantitative ?nance. Since more than one decade, Fourier transform has triggered a technical revolution in option pricing theory. Almost all new developed option pricing models, es- cially in connection with stochastic volatility and random jump, have extensively applied Fourier transform and the corresponding inverse transform to express - tion pricing formulas. The large accommodation of the Fourier transform allows for a very convenient modeling with a general class of stochastic processes and d- tributions. This book is then intended to present a comprehensive treatment of the Fourier transform in the option valuation, covering the most stochastic factors such as stochastic volatilities and interest rates, Poisson and Levy´ jumps, including some asset classes such as equity, FX and interest rates, and providing numerical ex- ples and prototype programming codes. I hope that readers will bene?t from this book not only by gaining an overview of the advanced theory and the vast large l- erature on these topics, but also by gaining a ?rst-hand feedback from the practice on the applications and implementations of the theory.

The credit and sovereign debt crises have fundamentally changed the way participants in the global financial markets perceive credit risk. The effects of this change have been studied by many leading experts in Mathematical Finance, but to date there is no single volume that combines the results of this research and presents them at a level suited for practitioners and students alike. In market practice this fundamental market change is most directly visible from significant bases throughout the interest rate world, especially tenor bases, cross-currency bases, and bond-cds bases. This means that the curve used for discounting is no longer the curve used for Libor (aka Fixing Curve or Forwarding Curve). In the last two years a consensus has

emerged that this multi-curve pricing is now standard.The crises have also altered the perception of banks and governments - they are no longer regarded as zero-risk counterparties. Now both sides of an uncollateralized trade need to consider, and price in, the risk that the other defaults: my CVA is your DVA. Even collateralization does not remove pricing problems: when you post collateral how much do you have to pay for it? This FVA is not symmetric in many ways: whatever it costs you to source it, your counterparty will only pay you OIS. Even worse is that your funding costs are unlikely to be the same as those of all your counterparties.Discounting, Libor, CVA and Funding: Interest Rate and Credit Pricing is the first book to illustrate new ways of pricing interest rate and credit products in the post-crisis markets. Written by two seasoned practitioners, it will enable the readers to understand the many different versions of credit and basis spreads, and to build the appropriate discount curves that take the these spreads into account so that collateralized derivatives will be priced correctly. The authors guide the reader through the complexity added by OIS discounting and multi-curve pricing as well as CVA, DVA and FVA. Derivatives do not exist in a vacuum. Regulators world-wide have reacted strongly to the crises with the introduction of Basel III. Hitherto quants could ignore capital costs and charges, but as of January 2013 this world is gone. Discounting, Libor, CVA and Funding explains details of Basel III that are important for pricing, especially around the CVA VaR and default exposure capital charges.This book will be required reading for quantitative practitioners who need to keep up-to-date with the latest developments in derivatives pricing, and will also be of interest to academic researchers and students interested in how instruments are priced in practice.

This is the second volume in a two-volume sequence on Stochastic calculus models in finance. This second volume, which does not require the first volume as a prerequisite, covers infinite state models and continuous time stochastic calculus. The book is suitable for beginning masters-level students in mathematical finance and financial engineering.

Stochastic Calculus for Finance II

Interest Rates, Equities and Foreign Exchange

Advanced Methods in Option Pricing

Demystifying Exotic Products

Markov Functional Modeling of Equity, Commodity and Other Assets

One-Dimensional Markov-Functional Models Driven by Non-Gaussian Markov Processes

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.

This outstanding collection of articles includes papers presented at the Fields Institute, Toronto, as part of the Thematic Program in Quantitative Finance that took place in the first six months of the year 2010. The scope of the volume is very broad, with papers on foundational issues in mathematical finance, papers on computational finance, and papers on derivatives and risk management. Many of the articles contain path-breaking insights that are relevant to the developing new order of post-crisis financial risk management.

In recent years, interest-rate modeling has developed rapidly in terms of both practice and theory. The academic and practitioners' communities, however, have not always communicated as productively as would have been desirable. As a result, their research programs have often developed with little constructive interference. In this book, Riccardo Rebonato draws on his academic and professional experience, straddling both sides of the divide to bring together and build on what theory and trading have to offer. Rebonato begins by presenting the conceptual foundations for the application of the LIBOR market model to the pricing of interest-rate derivatives. Next he treats in great detail the calibration of this model to market prices, asking how possible and advisable it is to enforce a simultaneous fitting to several market observables. He does so with an eye not only to mathematical feasibility but also to financial justification, while devoting special scrutiny to the implications of market incompleteness. Much of the book concerns an original extension of the LIBOR market model, devised to account for implied volatility smiles. This is done by introducing a stochastic-volatility, displaced-diffusion version of the model. The emphasis again is on the financial justification and on the computational feasibility of the proposed solution to the smile problem. This book is must reading for quantitative researchers in financial houses, sophisticated practitioners in the derivatives area, and students of finance.

"The three volumes of Interest rate modeling are aimed primarily at practitioners working in the area of interest rate derivatives, but much of the material is quite general and, we believe, will also hold significant appeal to researchers working in other asset classes. Students and academics interested in financial engineering and applied work will find the material particularly useful for its description of real-life model usage and for its expansive discussion of model calibration, approximation theory, and numerical methods."--Preface.

XVA
Modern Pricing of Interest-Rate Derivatives
Implementation of a One-Factor Markov-Functional Interest Rate Model
Global Derivatives: Products, Theory And Practice
Financial Derivatives in Theory and Practice
An Introduction

The field of financial mathematics has developed tremendously over the past thirty years, and the underlying models that have taken shape in interest rate markets and bond markets, being much richer in structure than equity-derivative models, are particularly fascinating and complex. This book introduces the tools required for the arbitrage-free modelling of the dynamics of these markets. Andrew Cairns addresses not only seminal works but also modern developments. Refreshingly broad in scope, covering numerical methods, credit risk, and descriptive models, and with an approachable sequence of opening chapters, Interest Rate Models will make readers--be they graduate students, academics, or practitioners--confident enough to develop their own interest rate models or to price nonstandard derivatives using existing models. The mathematical chapters begin with the simple binomial model that introduces many core ideas. But the main chapters work their way systematically through all of the main developments in continuous-time interest rate modelling. The book describes fully the broad range of approaches to interest rate modelling: short-rate models, no-arbitrage models, the Heath-Jarrow-Morton framework, multifactor models, forward measures, positive-interest models, and market models. Later chapters cover some related topics, including numerical methods, credit risk, and model calibration. Significantly, the book develops the martingale approach to bond pricing in detail, concentrating on risk-neutral pricing, before later exploring recent advances in interest rate modelling where different pricing measures are important.

Filling a gap in the literature caused by the recent financial crisis, this book provides a treatment of the techniques needed to model and evaluate interest rate derivatives according to the new paradigm for fixed income markets. Concerning this new development,

there presently exist only research articles and two books, one of them an edited volume, both being written by researchers working mainly in practice. The aim of this book is to concentrate primarily on the methodological side, thereby providing an overview of the state-of-the-art and also clarifying the link between the new models and the classical literature. The book is intended to serve as a guide for graduate students and researchers as well as practitioners interested in the paradigm change for fixed income markets. A basic knowledge of fixed income markets and related stochastic methodology is assumed as a prerequisite.

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.

An insightful collection of 35+ articles encapsulating advances in financial derivatives, selected by two well-respected academics.

Market Practice in Financial Modelling

Subprime Crisis, Pricing and Hedging, CVA, MBS, Ratings, and Liquidity

Credit, Funding and Capital Valuation Adjustments

Discounting, LIBOR, CVA and Funding

Stochastic Volatility Modeling

Manufacturing and Managing Customer-Driven Derivatives

"This book deals with some of the key derivatives products including equity derivatives, mainly used for creating investment products for retail and private investors, interest rates derivatives, used for creating investment and treasury products, real estate derivatives and hybrid derivatives products"--

In this short note we show how to setup a one dimensional single asset model, e.g. equity model, which calibrates to a full (two dimensional) implied volatility surface. We show that the efficient calibration procedure used in LIBOR Markov functional models may be applied here too. In a addition to the calibration to a full volatility surface the model allows the calibration of the joint asset-interest rate movement (i.e. local interest rates) and forward volatility. The latter allows the calibration of compound or Bermudan options.The Markov functional modeling approach consists of a Markovian driver process x and a mapping functional representing the asset states S(t) as a function of x(t). It was originally developed in the context of interest rate models, see [Hunt Kennedy Pelsser 2000]. Our approach however is similar to the setup of the hybrid Markov functional model in spot measure, as considered in [Fries Rott 2004].For equity models it is common to use a deterministic Numeacute;raire, e.g. the bank account with deterministic interest rates. In our approach we will choose the asset itself as Numeacute;raire. This is a subtle, but crucial difference to other approaches considering Markov functional modeling. Choosing the asset itself as Numeacute;raire will allow for a very efficient numerically calibration procedure. As a consequence interest rates have to be allowed to be stochastic, namely as a functional of x too. The Black-Scholes model with deterministic interest rates is a special case of such a Markov functional model.The most general form of this modeling approach will allow for a simultaneous calibration to a full two dimensional volatility smile, a prescribed joint movement of interest rates and a given forward volatility structure.

The 2008 financial crisis shook the financial derivatives market to its core, revealing a failure to fully price the cost of doing business then. As a response to this, and to cope with regulatory demands for massively increased capital and other measures with funding cost, the pre-2008 concept of Credit Valuation Adjustment (CVA) has evolved into the far more complex hybrid Cross Valuation Adjustment (XVA).This book presents a clear and concise framework and provides key considerations for the computation of myriad adjustments to the price of financial derivatives, to fully reflect costs. XVA has been of great interest recently due to heavy funding costs (FVA), initial margin (MVA) and capital requirements (KVA) required to sustain a derivatives business since 2008, in addition to the traditional concepts of cost from counterparty default or credit deterioration (CVA), and its mirror image — the cost of one own's default (DVA).The book takes a practitioner's perspective on the above concepts, and then provides a framework to implement such adjustments in practice. Models are presented too, taking note of what is

computationally feasible in light of portfolios typical of investment banks, and the different instruments associated with these portfolios.

The class of Markov-functional models provide a framework that can be used to define interest-rate models of finite dimension calibrated to any arbitrage-free formula for caplet or swaption prices. Because of their computational efficiency one-factor Markov-functional models are of particular interest. So far the literature has been focused on models driven by a Gaussian process. The aim of this paper is to move away from this Gaussian assumption and to provide new algorithms that can be used to implement a Markov-functional model driven by a more general class of one-dimensional diffusion processes. We provide additional insight into the role of the driving process by presenting a simple copula-based criterion that can be used to distinguish between models. Finally we offer further insight into the dynamics of one-dimensional Markov-functional models by relating them to separable local-volatility LIBOR market models and demonstrate this with a practical example.

Efficient pricing algorithms for exotic derivatives

Interest Rate Modeling: Post-Crisis Challenges and Approaches

Interest Rate Modelling

Credit Risk Frontiers

Hedging with Trees

Nonlinear Option Pricing

Thorough, accessible coverage of the key issues inXVA XVA – Credit, Funding and Capital ValuationAdjustments provides specialists and non-specialists alikewith an up-to-date and comprehensive treatment of Credit, Debit,Funding, Capital and Margin Valuation Adjustment (CVA, DVA, FVA,KVA and MVA), including modelling frameworks as well as broader ITengineering challenges. Written by an industry expert, this booknavigates you through the complexities of XVA, discussing in detailthe very latest developments in valuation adjustments including theimpact of regulatory capital and margin requirements arising fromCCPs and bilateral initial margin. The book presents a unified approach to modelling valuationadjustments including credit risk, funding and regulatory effects.The practical implementation of XVA models using Monte Carlotechniques is also central to the book. You'll also find thoroughcoverage of how XVA sensitivities can be accurately measured, thetechnological challenges presented by XVA, the use of gridcomputing on CPU and GPU platforms, the management of data, and howthe regulatory framework introduced under Basel III presentsmassive implications for the finance industry. Explores how XVA models have developed in the aftermath of thecredit crisis The only text to focus on the XVA adjustments rather than thebroader topic of counterparty risk. Covers regulatory change since the credit crisis includingBasel III and the impact regulation has had on the pricing ofderivatives. Covers the very latest valuation adjustments, KVA and MVA. The author is a regular speaker and trainer at industry events,including WBS

training, Marcus Evans, ICBI, Infoline and RISK If you're a quantitative analyst, trader, banking manager, riskmanager, finance and audit professional, academic or studentlooking to expand your knowledge of XVA, this book has youcovered.

We introduce a general class of interest rate models in which the value of pure discount bonds can be expressed as a functional of some (low-dimensional) Markov process. At the abstract level this class includes all current models of practical importance. By specifying these models in Markov-functional form, we obtain a specification which is efficient to implement. An additional advantage of Markov-functional models is the fact that the specification of the model can be such that the forward rate distribution implied by market option prices can be fitted exactly, which makes these models particularly suited for derivatives pricing. We give examples of Markov-functional models that are fitted to market prices of caps/floors and swaptions.

This paper uses an extensive set of market data of forward swap rates and swaptions covering 3 July 2002 to 21 May 2009 to identify a two-dimensional stochastic volatility process for the level of rates. The process is identified step by step by increasing the requirement of the model and introduce appropriate adjustments.The first part of the paper investigates the smile dynamics of forward swap rates at their setting dates. Comparing the SABR (with different $ beta$s) and Heston stochastic volatility models informs about what different specifications of the driving SDEs has to offer in terms of reflecting the dynamics of the smile across dates. The outcome of the analysis is that a normal SABR model ($ beta=0$) satisfactorily passes all tests and seems to provide a good match to the market. In contrast we find the Heston model does not.The next step is to seek a model of the forward swap rates (in their own swaption measure) based on only two factors that enables a specification with common parameters. It turns out that this can be done by extending the SABR model with a time-dependent volatility function and a mean reverting volatility process. The performance of the extended (SABR with mean-reversion) model is analysed over several historical dates and is shown to be a stable and flexible choice that allows for good calibration across expiries and strikes. Finally a time-homogeneous candidate stochastic volatility process that can be used as a driver for all swap rates is identified and used to construct a simple terminal Markov-functional type model under a single measure. This candidate process may in future work be used as a building block for a separable stochastic volatility LIBOR market model or a stochastic volatility Markov-functional model.

Analysis, Geometry, and Modeling in Finance: Advanced Methods in Option Pricing is the first book that applies advanced analytical and geometrical methods used in physics and mathematics to the financial field. It even obtains new results when only approximate and partial solutions were previously available. Through the problem of option pricing, the author introduces powerful tools and methods, including differential geometry, spectral decomposition, and supersymmetry, and applies these methods to practical problems in finance. He mainly focuses on the calibration and dynamics of implied volatility, which is commonly called smile. The book covers the Black–Scholes, local volatility, and stochastic volatility models, along with the Kolmogorov, Schrödinger, and Bellman–Hamilton–Jacobi equations. Providing both theoretical and numerical results throughout, this book offers new ways of solving financial problems using techniques found in physics and mathematics.

With Smile, Inflation and Credit

Efficient Methods for Valuing Interest Rate Derivatives
Martingale Methods in Financial Modelling
Interest Rate Models - Theory and Practice
Stochastic Volatility for Interest Rate Derivatives
Risk

This book gives a comprehensive introduction to the modeling of financial derivatives, covering all major asset classes (equities, commodities, interest rates and foreign exchange) and stretching from Black and Scholes' lognormal modeling to current-day research on skew and smile models. The intended reader has a solid mathematical background and is a graduate/final-year undergraduate student specializing in Mathematical Finance, or works at a financial institution such as an investment bank or a hedge fund.

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.

New Tools to Solve Your Option Pricing ProblemsFor 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 hi

The interest rate market has been expanding immensely for thirty years, both in term of volumes and diversity of traded contracts. The growing complexity of derivatives has implied a need for sophisticated models in order to price and hedge these products. Three main approaches can be distinguished in interest rates modeling. Short-rate models model the dynamics of the term structure of interest rates by specifying the dynamics of a single rate (the spot rate or the instantaneous spot rate) from which the whole term structure at any point in time can be calculated. The prices of derivatives in these models are quite involved functions of the underlying process which is being modeled. This fact makes these models difficult to calibrate. However the short rate process is easy to follow and hence implementation is straightforward.Unlike short rate models the class of Market Models is formulated in terms of market rates which are directly related to tradable assets. Thus they exhibit better calibration properties than short rate models. However they are high dimensional by construction and tedious to implement.In 1999, Hunt, Kennedy and Pelsser introduced the class of Markov-Functional Models (MFM) aiming at

developing models which could match as many market prices as Market Models while maintaining the efficiency of short rate models in calculating derivative prices.After a general overview of the two dominant paradigms in section III, this report will focus on the class of Markov-functional models. Section IV presents the general framework. Then several issues related to the implementation of a one-factor MFM model are analyzed in section V. Finally we will display in section VI some numerical results of the simulations of this one-factor model.

Practical Approach To Xva, A: The Evolution Of Derivatives Valuation After The Financial Crisis

Advances in Pricing and Risk Managing Derivatives

Theory, Modeling, Implementation

Financial Derivatives Modeling

Applications of Fourier Transform to Smile Modeling

Continuous-Time Models

A new edition of a successful, well-established book that provides the reader with a text focused on practical rather than theoretical aspects of financial modelling Includes a new chapter devoted to volatility risk The theme of stochastic volatility reappears systematically and has been revised fundamentally, presenting a much more detailed analyses of interest-rate models

Back Cover (this section should include endorsements also) As interest rate markets continue to innovate and expand it is becoming increasingly important to remain up-to-date with the latest practical and theoretical developments. This book covers the latest developments in full, with descriptions and implementation techniques for all the major classes of interest rate models - both those actively used in practice as well as theoretical models still 'waiting in the wings'. Interest rate models, implementation methods and estimation issues are discussed at length by the authors as are important new developments such as kernel estimation techniques, economic based models, implied pricing methods and models on manifolds. Providing balanced coverage of both the practical use of models and the theory that underlies them, Interest Rate Modelling adopts an implementation orientation throughout making it an ideal resource for both practitioners and researchers. Back Flap Jessica James Jessica James is Head of Research for Bank One's Strategic Risk Management group, based in the UK. Jessica started life as a physicist at Manchester University and completed her D Phil in Theoretical Atomic and Nuclear Physics at Christ Church, Oxford, under Professor Sandars. After a year as

a college lecturer at Trinity, Oxford, she began work at the First National Bank of Chicago, now Bank One, where she still works. She is well known as a speaker on the conference circuit, lecturing on a variety of topics such as VaR, capital allocation, credit derivatives and interest rate modelling, and has published articles on various aspects of financial modelling. Nick Webber Nick Webber is a lecturer in Finance at Warwick Business School. Prior to his academic career, Nick had extensive experience in the industrial and commercial world in operational research and computing. After obtaining a PhD in Theoretical Physics from Imperial College he began research into financial options. His main area of research centres on interest rate modelling and computational finance. He has taught practitioner and academic courses for many years, chiefly on options and interest rates. Front Flap Interest Rate Modelling provides a comprehensive resource on all the main aspects of valuing and hedging interest rate products. A series of introductory chapters reviews the theoretical background, pointing out the problems in using naïve valuation and implementation techniques. There follows a full analysis of interest rate models including major categories, such as Affine, HJM and Market models, and in addition, lesser well known types that include Consol, Random field and Jump-augmented Models. Implementation methods are discussed in depth including the latest developments in the use of finite difference, Lattice and Monte Carlo methods and their particular application to the valuation of interest rate derivatives. Containing previously unpublished material, Interest Rate Modelling is a key reference work both for practitioners developing and implementing models for real and for academics teaching and researching in the field.

The term Financial Derivative is a very broad term which has come to mean any financial transaction whose value depends on the underlying value of the asset concerned. Sophisticated statistical modelling of derivatives enables practitioners in the banking industry to reduce financial risk and ultimately increase profits made from these transactions. The book originally published in March 2000 to widespread acclaim. This revised edition has been updated with minor corrections and new references, and now includes a chapter of exercises and solutions, enabling use as a course text. Comprehensive introduction to the theory and practice of financial derivatives. Discusses and elaborates on the theory of

interest rate derivatives, an area of increasing interest. Divided into two self-contained parts ? the first concentrating on the theory of stochastic calculus, and the second describes in detail the pricing of a number of different derivatives in practice. Written by well respected academics with experience in the banking industry. A valuable text for practitioners in research departments of all banking and finance sectors. Academic researchers and graduate students working in mathematical finance.

A timely guide to understanding and implementing credit derivatives Credit derivatives are here to stay and will continue to play a role in finance in the future. But what will that role be? What issues and challenges should be addressed? And what lessons can be learned from the credit mess? Credit Risk Frontiers offers answers to these and other questions by presenting the latest research in this field and addressing important issues exposed by the financial crisis. It covers this subject from a real world perspective, tackling issues such as liquidity, poor data, and credit spreads, as well as the latest innovations in portfolio products and hedging and risk management techniques. Provides a coherent presentation of recent advances in the theory and practice of credit derivatives Takes into account the new products and risk requirements of a post financial crisis world Contains information regarding various aspects of the credit derivative market as well as cutting edge research regarding those aspects If you want to gain a better understanding of how credit derivatives can help your trading or investing endeavors, then Credit Risk Frontiers is a book you need to read.

Finance at Fields

The LIBOR Market Model and Beyond

Credit Correlation

Markov-Functional Interest Rate Models

Mathematical Finance

Interest Rate and Credit Pricing

This book provides a broad description of the financial derivatives business from a practitioner's point of view, with a particular emphasis on fixed income derivatives, a specific development on fixed income derivatives and a practical approach to the field. With particular emphasis on the concrete usage of mathematical models, numerical methods and the pricing methodology, this book is an essential reading for anyone considering a career in derivatives either as a trader, a quant or a structurer.

A balanced introduction to the theoretical foundations and real-world applications of mathematical finance The ever-growing use of derivative products makes it essential for financial industry practitioners to have a solid understanding of derivative pricing. To cope with the growing complexity, narrowing margins, and shortening life-cycle of the individual derivative product, an efficient, yet modular, implementation of the pricing algorithms is necessary. Mathematical Finance is the first book to harmonize the theory, modeling, and implementation of today's most prevalent pricing models under one convenient cover. Building a bridge from academia to practice, this self-contained text applies theoretical concepts to real-world examples and introduces state-of-the-art, object-oriented programming techniques that equip the reader with the conceptual and illustrative tools needed to understand and develop successful derivative pricing models. Utilizing almost twenty years of academic and industry experience, the author discusses the mathematical concepts that are the foundation of commonly used derivative pricing models, and insightful Motivation and Interpretation sections for each concept are presented to further illustrate the relationship between theory and practice. In-depth coverage of the common characteristics found amongst successful pricing models are provided in addition to key techniques and tips for the construction of these models. The opportunity to interactively explore the book's principal ideas and methodologies is made possible via a related Web site that features interactive Java experiments and exercises. While a high standard of mathematical precision is retained, Mathematical Finance emphasizes practical motivations, interpretations, and results and is an excellent textbook for students in mathematical finance, computational finance, and derivative pricing courses at the upper undergraduate or beginning graduate level. It also serves as a valuable reference for professionals in the banking, insurance, and asset management industries.

The popularity of the so-called Market Models has led researchers and practitioners to ask two important questions about modelling interest-rate derivatives. The first (and highly contentious) question is, how many stochastic drivers are needed to value accurately any given derivative? The second, which arises because of the high dimensionality of Market Models, even those with a small number of stochastic drivers, is how can callable products be valued using Monte Carlo simulation?In this paper we consider the Longstaff-Schwartz algorithm, an effective algorithm developed to answer the second of these questions, and in so doing we shed light on the first of these questions. We show that the success of the Longstaff-Schwartz algorithm for high-dimensional models demonstrates that, in a way we make precise, low-dimensional models are sufficient, but that in another sense the higher dimensionality still plays a part.Using the insight gained from this analysis we go on to develop models which have these desirable properties - high dimensionality and accurate calibration properties on the one hand, but the ability to collapse the models onto lower-dimensional 'core' models for the purposes of valuing callable derivatives. The core models that we develop are Markovian and can thus be implemented efficiently using lattice methods, avoiding the need for more costly Monte Carlo simulation.

This book provides an advanced guide to correlation modelling for credit portfolios, providing both theoretical underpinnings and practical implementation guidance. The book picks up where pre-crisis credit books left off, offering guidance for quants on the latest tools and techniques for credit portfolio modelling in the presence of CVA (Credit Value Adjustments). Written at an advanced level, it assumes that readers are familiar with the fundamentals of credit modelling covered, for example, in the market leading books by Schonbucher (2003) and O’Kane (2008). Coverage will include the latest default correlation approaches; correlation modelling in the ‘Marshall-Olkin’ contagion framework, in the context of CVA; numerical implementation; and pricing,

calibration and risk challenges. The explosive growth of credit derivatives markets in the early-to-mid 000's was bought to a close by the 2007 financial crisis, where these instruments were held largely to blame for the economic downturn. However, in the wake of increased regulation across all financial instruments and the challenge of buying and selling bonds in large amounts, credit derivatives have once again been found to be the answer and the market has grown significantly. Written by a practitioner for practitioners, this book will also interest researchers in mathematical finance who want to understand how things happen and work 'on the floor'. Building the reader's knowledge from the ground up, and with numerous real life examples used throughout, this book will prove a popular reference for anyone with a mathematical mind interested credit markets.

The LIBOR Market Model in Practice

Analysis, Geometry, and Modeling in Finance

Theory and Practice

The Journal of Derivatives

The Journal of Computational Finance

Theory and Implementation

The motivation for the mathematical modeling studied in this text on developments in credit risk research is the bridging of the gap between mathematical theory of credit risk and the financial practice. Mathematical developments are covered thoroughly and give the structural and reduced-form approaches to credit risk modeling. Included is a detailed study of various arbitrage-free models of default term structures with several rating grades.

The 2nd edition of this successful book has several new features. The calibration discussion of the basic LIBOR market model ha 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 a new chapter. 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 a new chapter. 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.

Written to bridge the gap between foundational quantitative finance and market practice, this book goes beyond the basics covere

in most textbooks by presenting content concerning actual industry norms, thus resulting in a clearer picture of the field for the readers. These include, for instance, the practitioner's perspective of how local versus stochastic volatility affects forward smile, c the implications of mean reversion on forward volatility. Key considerations for modelling in rates, equities and foreign exchange are presented from the perspective of common themes across various assets, as well as their individual characteristics. The discussion on models emphasizes the key aspects that are relevant to the pricing of different types of financial derivatives, so tha the reader can observe how an appropriate choice of models is essential in reflecting the risk profile and hedging considerations for different products. With the knowledge gleaned from this book, readers will attain a more comprehensive understanding of market practice in derivatives modelling. Foreword Foreword (246 KB)

Longstaff-Schwartz, Effective Model Dimensionality and Reducible Markov-Functional Models

Interest Rate Modeling

Interest Rate Models

Credit Risk: Modeling, Valuation and Hedging

Markov-functional Interest Rate Models