

Pricing Bermudan Swaptions In The Libor Market Model

Recognizing the artifice ways to get this book **Pricing Bermudan Swaptions In The Libor Market Model** is additionally useful. You have remained in right site to start getting this info. acquire the Pricing Bermudan Swaptions In The Libor Market Model belong to that we have enough money here and check out the link.

You could purchase guide Pricing Bermudan Swaptions In The Libor Market Model or acquire it as soon as feasible. You could quickly download this Pricing Bermudan Swaptions In The Libor Market Model after getting deal. So, in the same way as you require the ebook swiftly, you can straight get it. Its so entirely easy and so fats, isnt it? You have to favor to in this look

Pricing Bermudan Swaptions in the LIBOR Market Model -
Karl Mannion 2003

Swaps and Other Derivatives - Richard R. Flavell
2012-03-30

"Richard Flavell has a strong theoretical perspective on swaps with considerable practical experience in the actual trading of these instruments. This rare combination makes this welcome updated second edition a useful reference work for market practitioners."

—Satyajit Das, author of Swaps and Financial Derivatives Library and Traders and Guns & Money: Knowns and Unknowns in the Dazzling World of Derivatives Fully revised and updated from the first edition, Swaps and Other Derivatives, Second Edition, provides a practical explanation of the pricing and evaluation of swaps and interest rate derivatives. Based on the author's extensive experience in derivatives and risk management, working as a financial engineer, consultant and trainer for a wide range of institutions across the world this

book discusses in detail how many of the wide range of swaps and other derivatives, such as yield curve, index amortisers, inflation-linked, cross-market, volatility, diff and quanto diffs, are priced and hedged. It also describes the modelling of interest rate curves, and the derivation of implied discount factors from both interest rate swap curves, and cross-currency adjusted curves. There are detailed sections on the risk management of swap and option portfolios using both traditional approaches and also Value-at-Risk. Techniques are provided for the construction of dynamic and robust hedges, using ideas drawn from mathematical programming. This second edition has expanded sections on the credit derivatives market – its mechanics, how credit default swaps may be priced and hedged, and how default probabilities may be derived from a market strip. It also prices complex swaps with embedded options, such as range accruals, Bermudan swaptions and target accrual redemption notes, by constructing detailed numerical models such as interest rate trees

and LIBOR-based simulation. There is also increased discussion around the modelling of volatility smiles and surfaces. The book is accompanied by a CD-ROM where all the models are replicated, enabling readers to implement the models in practice with the minimum of effort.

Dependence of Bermudan Swaptions on Volatility Structure-computational Comparisons in the Lognormal Forward LIBOR Market Model - Florian Huehne 2002

The LIBOR Market Model in Practice - Dariusz Gatarek 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.

Interest Rate Modeling - Lixin Wu 2019-03-04
Containing many results that are new, or which exist only in recent research articles, Interest Rate

Modeling: Theory and Practice, 2nd Edition portrays the theory of interest rate modeling as a three-dimensional object of finance, mathematics, and computation. It introduces all models with financial-economical justifications, develops options along the martingale approach, and handles option evaluations with precise numerical methods. Features Presents a complete cycle of model construction and applications, showing readers how to build and use models Provides a systematic treatment of intriguing industrial issues, such as volatility and correlation adjustments Contains exercise sets and a number of examples, with many based on real market data Includes comments on cutting-edge research, such as volatility-smile, positive interest-rate models, and convexity adjustment New to the 2nd edition: volatility smile modeling; a new paradigm for inflation derivatives modeling; an extended market model for credit derivatives; a dual-curved model for the post-crisis interest-rate derivatives markets; and an elegant framework for the xVA.

Robust Libor Modelling and Pricing of Derivative Products - John Schoenmakers 2005-03-29

One of Riskbook.com's Best of 2005 - Top Ten Finance Books The Libor market model remains one of the most popular and advanced tools for modelling interest rates and interest rate derivatives, but finding a useful procedure for calibrating the model has been a perennial problem. Also the respective pricing of exotic derivative products such as Bermudan callable structures is considered highly non-trivial. In recent studies, author John Schoenmakers and his colleagues developed a fast and robust implied method for calibrating the Libor model and a new generic procedure for the pricing of callable derivative instruments in this model. Within a

compact, self-contained review of the requisite mathematical theory on interest rate modelling, Robust Libor Modelling and Pricing of Derivative Products introduces the author's new approaches and their impact on Libor modelling and derivative pricing. Discussions include economically sensible parametrisations of the Libor market model, stability issues connected to direct least-squares calibration methods, European and Bermudan style exotics pricing, and lognormal approximations suitable for the Libor market model. A look at the available literature on Libor modelling shows that the issues surrounding instability of calibration and its consequences have not been well documented, and an effective general approach for treating Bermudan callable Libor products has been missing. This book fills these gaps and with clear illustrations, examples, and explanations, offers new methods that surmount some of the Libor model's thornier obstacles.

Quantitative Finance with Python - Chris Kelliher
2022-05-20

Quantitative Finance with Python: A Practical Guide to Investment Management, Trading and Financial Engineering bridges the gap between the theory of mathematical finance and the practical applications of these concepts for derivative pricing and portfolio management. The book provides students with a very hands-on, rigorous introduction to foundational topics in quant finance, such as options pricing, portfolio optimization and machine learning. Simultaneously, the reader benefits from a strong emphasis on the practical applications of these concepts for institutional investors. Features Useful as both a teaching resource and as a practical tool for professional investors. Ideal textbook for first year graduate students in quantitative finance

programs, such as those in master's programs in Mathematical Finance, Quant Finance or Financial Engineering. Includes a perspective on the future of quant finance techniques, and in particular covers some introductory concepts of Machine Learning. Free-to-access repository with Python codes available at www.routledge.com/9781032014432.

Financial Derivatives in Theory and Practice - Philip Hunt
2004-07-02

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.

Market Practice in Financial Modelling - Chia Chiang Tan
2012-07-11

Written to bridge the gap between foundational quantitative finance and market practice, this book goes beyond the basics covered 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, or 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 that 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)

An Exact and Efficient Method for Computing Cross-Gammas of Bermudan Swaptions and Cancellable Swaps Under the Libor Market Model - Mark S. Joshi 2014

We introduce a new simulation algorithm for computing the Hessians of Bermudan swaptions and cancellable swaps, the resulting pathwise estimates are unbiased and accurate. Given the exercise strategy, the pathwise angularities are removed by a sequence of measure changes. The change of measure at each exercise time is chosen to be optimal in terms of minimizing the variance of the likelihood ratio terms. Numerical results are presented for computing the Hessian of cancellable swaps, to demonstrate the time and efficacy of the

method.

Martingale Methods in Financial Modelling - Marek Musiela 2006-01-21

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

Interest Rate Swaps and Their Derivatives - Amir Sadr 2009-08-07

An up-to-date look at the evolution of interest rate swaps and derivatives Interest Rate Swaps and Derivatives bridges the gap between the theory of these instruments and their actual use in day-to-day life. This comprehensive guide covers the main "rates" products, including swaps, options (cap/floors, swaptions), CMS products, and Bermudan callables. It also covers the main valuation techniques for the exotics/structured-notes area, which remains one of the most challenging parts of the market. Provides a balance of relevant theory and real-world trading instruments for rate swaps and swap derivatives Uses simple settings and illustrations to reveal key results Written by an experienced trader who has worked with swaps, options, and exotics With this book, author Amir Sadr shares his valuable insights with practitioners in the field of interest rate derivatives-from traders and marketers to those in operations.

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 Derivatives Explained: Volume 2 - Jörg Kienitz 2017-11-08

This book on Interest Rate Derivatives has three parts. The first part is on financial products and extends the range of products considered in Interest Rate Derivatives Explained I. In particular we consider callable products such as Bermudan swaptions or exotic derivatives. The second part is on volatility modelling. The Heston and the SABR model are reviewed and analyzed in detail. Both models are widely applied in practice.

Such models are necessary to account for the volatility skew/smile and form the fundament for pricing and risk management of complex interest rate structures such as Constant Maturity Swap options. Term structure models are introduced in the third part. We consider three main classes namely short rate models, instantaneous forward rate models and market models. For each class we review one representative which is heavily used in practice. We have chosen the Hull-White, the Cheyette and the Libor Market model. For all the models we consider the extensions by a stochastic basis and stochastic volatility component. Finally, we round up the exposition by giving an overview of the numerical methods that are relevant for successfully implementing the models considered in the book.

Fast and Accurate Exercise Policies for Bermudan Swaptions in Libor Market Model - Patrik Karlsson 2015

This paper describes an American Monte Carlo approach for obtaining fast and accurate exercise policies for pricing of callable LIBOR Exotics (e.g., Bermudan swaptions) in the LIBOR market model using the Stochastic Grid Bundling Method (SGBM). SGBM is a bundling and regression based Monte Carlo method where the continuation value is projected onto a space where the distribution is known. We also demonstrate an algorithm to obtain accurate and tight lower-upper bound values without the need for nested Monte Carlo simulations.

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.

Generic Market Models - Raoul Pietersz 2005

Factor Dependence of Bermudan Swaption Prices - Leif B. G. Andersen 2000

This paper investigates the effect of interest rate correlation in the pricing of Bermudan swaptions. Investigating both Gaussian Markov models and Libor

Market models, we find that Bermudan swaption prices depend only weakly on the number of factors in the underlying interest rate model. Moreover, we find that prices of standard Bermudan swaptions typically decrease slightly in the number of factors, primarily a consequence of effects on the time evolution of volatility induced by calibration of the model dynamics. Our findings are markedly different from those of Longstaff, Schwarz, and Santa-Clara (1999) who conclude that single-factor interest rate models significantly undervalue Bermudan swaptions. We argue that the conclusions of Longstaff, Schwarz, and Santa-Clara are due to non-standard choices of model dynamics and calibration methodology. Our study highlights the importance of using a reasonable set of calibration instruments when applying and comparing interest rate models.

Network and Parallel Computing - James J. Park
2012-12-09

This book constitutes the refereed post-proceedings of the 9th IFIP International Conference on Network and Parallel Computing, NPC 2012, held in Gwangju, Korea, in September 2012. The 38 papers presented were carefully reviewed and selected from 136 submissions. The papers are organized in the following topical sections: algorithms, scheduling, analysis, and data mining; network architecture and protocol design; network security; parallel, distributed, and virtualization techniques; performance modeling, prediction, and tuning; resource management; ubiquitous communications and networks; and web, communication, and cloud computing. In addition, a total of 37 papers selected from five satellite workshops (ATIMCN, ATSME, Cloud&Grid, DATICS, and UMAS 2012) are included.

Market-Conform Valuation of Options - Tobias Herwig
2006-03-12

1. 1 The Area of Research In this thesis, we will investigate the 'market-conform' pricing of newly issued contingent claims. A contingent claim is a derivative whose value at any settlement date is determined by the value of one or more other underlying assets, e. g. , forwards, futures, plain-vanilla or exotic options with European or American-style exercise features. Market-conform pricing means that prices of existing actively traded securities are taken as given, and then the set of equivalent martingale measures that are consistent with the initial prices of the traded securities is derived using no-arbitrage arguments. Sometimes in the literature other expressions are used for 'market-conform' valuation - 'smile-consistent' valuation or 'fair-market' valuation - that describe the same basic idea. The seminal work by Black and Scholes (1973) (BS) and Merton (1973) mark a breakthrough in the problem of hedging and pricing contingent claims based on no-arbitrage arguments. Harrison and Kreps (1979) provide a firm mathematical foundation for the Black-Scholes-Merton analysis. They show that the absence of arbitrage is equivalent to the existence of an equivalent martingale measure. Under this measure the normalized security price process forms a martingale and so securities can be valued by taking expectations. If the securities market is complete, then the equivalent martingale measure and hence the price of any security are unique.

Quantitative Analysis in Financial Markets - Marco Avellaneda 2001-01-10

This book contains lectures delivered at the celebrated Seminar in Mathematical Finance at the Courant

Institute. The lecturers and presenters of papers are prominent researchers and practitioners in the field of quantitative financial modeling. Most are faculty members at leading universities or Wall Street practitioners. The lectures deal with the emerging science of pricing and hedging derivative securities and, more generally, managing financial risk. Specific articles concern topics such as option theory, dynamic hedging, interest-rate modeling, portfolio theory, price forecasting using statistical methods, etc.

Contents: Estimation and Data-Driven Models: Transition Densities for Interest Rate and Other Nonlinear Diffusions (Y Ait-Sahalia) Hidden Markov Experts (A Weigend & S-M Shi) When is Time Continuous? (A Lo et al.) Asset Prices are Brownian Motion: Only in Business Time (H Geman et al.) Hedging Under Stochastic Volatility (K Ronnie Sircar) Model Calibration and Volatility Smile: Determining Volatility Surfaces and Option Values from an Implied Volatility Smile (P Carr & D Madan) Reconstructing the Unknown Local Volatility Function (T Coleman et al.) Building a Consistent Pricing Model from Observed Option Prices (J-P Laurent & D Leisen) Weighted Monte Carlo: A New Technique for Calibrating Asset-Pricing Models (M Avellaneda et al.) Pricing and Risk Management: One- and Multi-Factor Valuation of Mortgages: Computational Problems and Shortcuts (A Levin) Simulating Bermudan Interest-Rate Derivatives (P Carr & G Yang) How to Use Self-Similarities to Discover Similarities of Path-Dependent Options (A Lipton) Monte Carlo Within a Day (J Cárdenas et al.) Decomposition and Search Techniques in Disjunctive Programs for Portfolio Selection (K Wyatt)
Readership: Students and researchers in economics, finance and applied mathematics. Keywords:

The Oxford Guide to Financial Modeling - Thomas S. Y. Ho
2004-01-15

The essential premise of this book is that theory and practice are equally important in describing financial modeling. In it the authors try to strike a balance in their discussions between theories that provide foundations for financial models and the institutional details that provide the context for applications of the models. The book presents the financial models of stock and bond options, exotic options, investment grade and high-yield bonds, convertible bonds, mortgage-backed securities, liabilities of financial institutions--the business model and the corporate model. It also describes the applications of the models to corporate finance. Furthermore, it relates the models to financial statements, risk management for an enterprise, and asset/liability management with illiquid instruments. The financial models are progressively presented from option pricing in the securities markets to firm valuation in corporate finance, following a format to emphasize the three aspects of a model: the set of assumptions, the model specification, and the model applications. Generally, financial modeling books segment the world of finance as "investments," "financial institutions," "corporate finance," and "securities analysis," and in so doing they rarely emphasize the relationships between the subjects. This unique book successfully ties the thought processes and applications of the financial models together and describes them as one process that provides business solutions. Created as a companion website to the book readers can visit www.thomasho.com to gain deeper understanding of the book's financial models. Interested readers can build and test the models described in the

book using Excel, and they can submit their models to the site. Readers can also use the site's forum to discuss the models and can browse server based models to gain insights into the applications of the models. For those using the book in meetings or class settings the site provides Power Point descriptions of the chapters. Students can use available question banks on the chapters for studying.

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.

Pricing of Bermudan Swaptions Using Calibrated LIBOR Market Models - Martin Juhl 2010

Pricing Models for Bermudan-style Interest Rate

Derivatives - Raoul Pietersz 2005

Efficient Control Variates and Strategies for Bermudan Swaptions in a Libor Market Model - Malene Shin Jensen 2002

Fixed Income Modelling - Claus Munk 2011-06-30

A large number of securities related to various interest rates are traded in financial markets. Traders and analysts in the financial industry apply models based on economics, mathematics and probability theory to compute reasonable prices and risk measures for these securities. This book offers a unified presentation of such models and securities.

Engineering BGM - Alan Brace 2007-11-01

Also known as the Libor market model, the Brace-Gatarek-Musiela (BGM) model is becoming an industry standard for pricing interest rate derivatives. Written by one of its developers, *Engineering BGM* builds progressively from simple to more sophisticated versions of the BGM model, offering a range of methods that can be programmed into production code to suit readers' requirements. After introducing the standard lognormal flat BGM model, the book focuses on the shifted/displaced diffusion version. Using this version, the author develops basic ideas about construction, change of measure, correlation, calibration, simulation, timeslicing, pricing, delta hedging, barriers, callable exotics (Bermudans), and vega hedging. Subsequent chapters address cross-economy BGM, the adaptation of the BGM model to inflation, a simple tractable stochastic volatility version of BGM, and Brazilian options suitable for BGM analysis. An appendix provides notation and an extensive array of formulae. The straightforward presentation of various

BGM models in this handy book will help promote a robust, safe, and stable environment for calibrating, simulating, pricing, and hedging interest rate instruments.

Swaps and Other Derivatives - Richard R. Flavell 2010-01-19

"Richard Flavell has a strong theoretical perspective on swaps with considerable practical experience in the actual trading of these instruments. This rare combination makes this welcome updated second edition a useful reference work for market practitioners."

—Satyajit Das, author of *Swaps and Financial Derivatives Library and Traders and Guns & Money: Knowns and Unknowns in the Dazzling World of Derivatives Fully revised and updated from the first edition, Swaps and Other Derivatives, Second Edition, provides a practical explanation of the pricing and evaluation of swaps and interest rate derivatives. Based on the author's extensive experience in derivatives and risk management, working as a financial engineer, consultant and trainer for a wide range of institutions across the world this book discusses in detail how many of the wide range of swaps and other derivatives, such as yield curve, index amortisers, inflation-linked, cross-market, volatility, diff and quanto diffs, are priced and hedged. It also describes the modelling of interest rate curves, and the derivation of implied discount factors from both interest rate swap curves, and cross-currency adjusted curves. There are detailed sections on the risk management of swap and option portfolios using both traditional approaches and also Value-at-Risk. Techniques are provided for the construction of dynamic and robust hedges, using ideas drawn from mathematical programming. This second edition has expanded sections*

on the credit derivatives market – its mechanics, how credit default swaps may be priced and hedged, and how default probabilities may be derived from a market strip. It also prices complex swaps with embedded options, such as range accruals, Bermudan swaptions and target accrual redemption notes, by constructing detailed numerical models such as interest rate trees and LIBOR-based simulation. There is also increased discussion around the modelling of volatility smiles and surfaces. The book is accompanied by a CD-ROM where all the models are replicated, enabling readers to implement the models in practice with the minimum of effort.

The Valuation of Caps, Floors and Swaptions in a Multi-Factor Spot-Rate Model - Sandra Peterson 2008

We build a multi-factor, no-arbitrage model of the term structure of spot interest rates. The stochastic factors are the short-term interest rate and the premia of the futures rates over the short-term interest rates. In the three-factor version of the model, for example, the first factor is the three-month LIBOR, the second factor is the premium of the first futures LIBOR over spot LIBOR, and the third factor is the incremental premium of the second futures over the first. The model provides an extension of the lognormal interest rate model of Black and Karasinski (1991) to multiple factors, each of which can exhibit mean-reversion. This method is computationally efficient for several reasons. First, we suggest calibrating the model to LIBOR futures prices, which enables us to satisfy the no-arbitrage condition without resorting to iterative methods. Second, we modify and implement the binomial approximation methodology of Nelson and Ramaswamy (1990) and Ho, Stapleton and Subrahmanyam (1995) to compute a multi-period tree of rates with the no-arbitrage property. The

method uses a recombining two or three-dimensional binomial lattice of interest rates that minimizes the number of states and term structures over time. In addition to these computational advantages, a key feature of the model is that it is consistent with the observed term structure of futures rates as well as the term structure of volatilities implied by the prices of interest rate caps and floors. We use the model to price European-style and Bermuda-style swaptions and yield-spread options. To implement the methodology, we first calibrate the model to the caplet implied-volatility curve on a given day, and then use the model to price European-style swaptions. We find that the two-factor model, where the LIBOR mean reverts rapidly to a slowly mean-reverting second factor, overprices the swaptions relative to market quotations. However, introducing a third factor significantly reduces the overpricing. The calibrated model is used to price Bermudan-style swaptions and yield-spread options. Then, we re-calibrated the two-factor model simultaneously to caplet and swaption prices and use the model output to price Bermudan-style swaptions.

Non-Exploding Bushy Tree Technique and its Applications to the Multi-Factor Interest Rate Market Model - Yi Tang 2001

In this paper, we present a novel multi-factor non-exploding bushy tree technique capable of efficiently solving non-Markovian diffusion processes with multiple state variables, such as the general full yield curve interest rate models. A non-exploding bushy tree essentially is a sub-sampling of a conventional bushy tree with significantly reduced number of tree nodes, but with no state bundling and stratification. As such, unlike the case of a conventional bushy tree, the number

of nodes in a non-exploding bushy tree does not explode exponentially as a function of the number of tree steps. Brace-Gatarek-Musiela (BGM/J) LIBOR market models with 1 to 3 factors have been implemented with the non-exploding bushy tree technique. Results for caps/floors, European and Bermudan swaptions comparable with those of other techniques have been obtained. The computation time is normally in seconds and over 100 tree steps are allowed. The effects of the number of factors (up to 5 factors) on the Bermudan swaption prices have been obtained through preliminary analyses. Sufficient conditions of convergence are also provided. As an extension to the current research, the interest rate volatility skews, such as caplet volatility skews and European swaption volatility skews, have also been successfully modeled by the non-exploding bushy tree technique.

Explicit European Swaption Formula in a Separable One-Factor Libor Market Model; Extension to Bond Futures and 2-Bermudan Swaptions - Marc P. A. Henrard 2008

In the framework of the Libor Market Model (LMM) an explicit pricing formula is obtained for European swaptions. The LMM used is a displaced diffusion also called Bond Market Model (BMM). The results are similar to the one obtained for the Gaussian HJM. The extension to bond futures and 2-Bermuda swaptions is also provided.

Analytical Finance: Volume II - Jan R. M. Röman
2017-11-30

Analytical Finance is a comprehensive introduction to the financial engineering of equity and interest rate instruments for financial markets. Developed from notes from the author's many years in quantitative risk management and modeling roles, and then for the

Financial Engineering course at Mälardalen University, it provides exhaustive coverage of vanilla and exotic mathematical finance applications for trading and risk management, combining rigorous theory with real market application. Coverage includes: • Date arithmetic's, quote types of interest rate instruments • The interbank market and reference rates, including negative rates • Valuation and modeling of IR instruments; bonds, FRN, FRA, forwards, futures, swaps, CDS, caps/floors and others • Bootstrapping and how to create interest rate curves from prices of traded instruments • Risk measures of IR instruments • Option Adjusted Spread and embedded options • The term structure equation, martingale measures and stochastic processes of interest rates; Vasicek, Ho-Lee, Hull-White, CIR • Numerical models; Black-Derman-Toy and forward induction using Arrow-Debreu prices and Newton-Raphson in 2 dimension • The Heath-Jarrow-Morton framework • Forward measures and general option pricing models • Black log-normal and, normal model for derivatives, market models and managing exotics instruments • Pricing before and after the financial crisis, collateral discounting, multiple curve framework, cheapest-to-deliver curves, CVA, DVA and FVA

Bermudan Swaptions in the Libor Market Model - Morten Bjerregaard Pedersen 1999

Bermudan swaptions have until recently been valued using only one-factor models such as the Black-Derman-Toy (BDT) or Black-Karasinski (BK) models. The LIBOR Market (LM) model which is a more general multi-factor model is becoming increasingly popular as a benchmark model. Whereas the BDT and BK models can be approximated using a lattice facilitating easy valuation of Bermudan swaption, the LM model doesn't conform to the lattice framework and as such the valuation seems very

difficult. Monte-Carlo simulation is a popular alternative to the lattice framework for derivatives valuation. In order to facilitate valuation of Bermudan swaptions the Monte-Carlo simulation technique must be extended. A few methods doing this are presently available, eg [And98]. A common feature of these methods is that the estimated option premia are only lower bounds on the true premia. The Stochastic Mesh method proposed by [BG97b] for valuation of Bermudan (equity) options with applications to equity options provides a lower and an upper bound. We have applied this method to the LM model and use this to verify the premia found by Andersen. We will also apply the approach suggested in [LS98] to the LM model and verify the premia found using that approach. As it turns out this approach is a special case of the [And98] approach. Furthermore we also examine the impact on the Bermudan swaption premia when moving from a LM model with only one factor to a LM model with multiple factors and do indeed find a significant--but not dramatic--impact. We find the [And98] and [LS98] approaches to be mutually consistent and in line with results obtained from low-biased Stochastic Mesh estimates.

Modeling and Simulation in Engineering, Economics and Management - Raúl León 2016-06-25

This book contains the refereed proceedings of the International Conference on Modeling and Simulation in Engineering, Economics and Management, MS 2016, held in Teruel, Spain, in July 2016. The event was co-organized by the AMSE Association and the University of Zaragoza through the GESES Research Group, with the support of the SoGREs-MF Research Group from University Jaume I. This edition of the conference paid special attention to modeling and simulation in diverse fields of business

management. The 20 papers in this book were carefully reviewed and selected from 52 submissions. They are organized in topical sections on modeling and simulation in finance and accounting; modeling and simulation in business management and economy; and engineering and other general applications. /div

A Simple Approach to the Pricing of Bermudan Swaptions in the Multi-Factor Libor Market Model - Leif B. G. Andersen 1999

This paper considers the pricing of Bermuda-style swaptions in the Libor market model (Brace et al (1997), Jamshidian (1997), Miltersen et al (1997)) and its extensions (Andersen and Andreasen (1998)). Due to its large number of state variables, application of lattice methods to this model class is generally not feasible, and we instead focus on a simple technique to incorporate early exercise features into the Monte Carlo method. Our approach involves a direct search for an early exercise boundary parametrized in intrinsic value and the values of still-alive swaptions. We compare results of the proposed algorithm against prices obtained from Markov Chain approximations and finite difference methods. The proposed algorithm is fast and robust, and produces a lower bound on Bermuda swaption prices that appears to be very tight for many realistic structures. The paper contains several numerical results against which other methods can be tested.

Modern Pricing of Interest-Rate Derivatives - Riccardo Rebonato 2012-01-16

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.

Deep Learning-Based BSDE Solver for Libor Market Model with Applications to Bermudan Swaption Pricing and Hedging - Haojie Wang 2018

The Libor market model, also known as the BGM Model, is a term structure model of interest rates. It is widely used for pricing interest rate derivatives, especially Bermudan swaptions, and other exotic Libor callable derivatives. For numerical implementation the pricing of derivatives with Libor market models is mainly carried

out with Monte Carlo simulation. The PDE grid approach is not particularly feasible due to the "Curse of Dimensionality". The standard Monte Carlo method for American swaption pricing more or less uses regression to estimate the expected value as a linear combination of basis functions as demonstrated in the classical paper by Longstaff and Schwartz [Longstaff01]. However, [Longstaff01] only provides the lower bound for American option price. Another complexity arises from applying Monte Carlo simulation is the computation of the sensitivities of the option, the so-called "Greeks", which are fundamental for a trader's hedging activity. Recently, an alternative numerical method based on deep learning and backward stochastic differential equations (BSDEs) appeared in quite a few researches [Weinan17, Jiequn17]. For European style options the feedforward deep neural networks (DNN) show not only feasibility but also efficiency to obtain both prices and numerical Greeks. The standard LMM implementation requires dimension five or higher in factor space even after PCA, which cannot be solved by traditional PDE solvers, such as finite differences or finite elements methods. In this paper, a new backward DNN solver is proposed for Bermudan swaptions. Our approach is representing financial pricing problems in the form of high dimensional stochastic optimal control problems, FBSDEs, or equivalent PDEs. We demonstrate that using backward DNN the high-dimension Bermudan swaption pricing and hedging can be solved effectively and efficiently. A comparison between Monte Carlo simulation and the new method for pricing vanilla interest rate options manifests the superior performance of the new method. We then use this method to calculate prices and Greeks of Bermudan swaptions as a prelude for other Libor callable

derivatives.

Bermudan Swaptions and the Libor Market Model - 2007

Financial Modelling - Joerg Kienitz 2013-02-18

Financial modelling Theory, Implementation and Practice with MATLAB Source Jörg Kienitz and Daniel Wetterau
Financial Modelling - Theory, Implementation and Practice with MATLAB Source is a unique combination of quantitative techniques, the application to financial problems and programming using Matlab. The book enables the reader to model, design and implement a wide range of financial models for derivatives pricing and asset allocation, providing practitioners with complete financial modelling workflow, from model choice, deriving prices and Greeks using (semi-) analytic and simulation techniques, and calibration even for exotic options. The book is split into three parts. The first part considers financial markets in general and looks at the complex models needed to handle observed structures, reviewing models based on diffusions including stochastic-local volatility models and (pure) jump processes. It shows the possible risk-neutral densities, implied volatility surfaces, option pricing and typical paths for a variety of models including SABR, Heston, Bates, Bates-Hull-White, Displaced-Heston, or stochastic volatility versions of Variance Gamma, respectively Normal Inverse Gaussian models and finally, multi-dimensional models. The stochastic-local-volatility Libor market model with time-dependent parameters is

considered and as an application how to price and risk-manage CMS spread products is demonstrated. The second part of the book deals with numerical methods which enables the reader to use the models of the first part for pricing and risk management, covering methods based on direct integration and Fourier transforms, and detailing the implementation of the COS, CONV, Carr-Madan method or Fourier-Space-Time Stepping. This is applied to pricing of European, Bermudan and exotic options as well as the calculation of the Greeks. The Monte Carlo simulation technique is outlined and bridge sampling is discussed in a Gaussian setting and for Lévy processes. Computation of Greeks is covered using likelihood ratio methods and adjoint techniques. A chapter on state-of-the-art optimization algorithms rounds up the toolkit for applying advanced mathematical models to financial problems and the last chapter in this section of the book also serves as an introduction to model risk. The third part is devoted to the usage of Matlab, introducing the software package by describing the basic functions applied for financial engineering. The programming is approached from an object-oriented perspective with examples to propose a framework for calibration, hedging and the adjoint method for calculating Greeks in a Libor market model. Source code used for producing the results and analysing the models is provided on the author's dedicated website, <http://www.mathworks.de/matlabcentral/fileexchange/authors/246981>.