

June 2 – 4, 2010

***The Institute of Physics, 76 Portland Place, London, UK***

Mark Joshi presents

# Pricing Exotic Interest Rate Derivatives - The LIBOR Market Model in QuantLib

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This three-day course will be led by an international expert who played a large role in the coding of the LIBOR market model in the QuantLib C++ open-source project. He will examine the practical problems that arise when implementing the LIBOR market model to price exotic interest rate derivatives. Each issue will be discussed at theoretical, practical and coding levels. The solution of these using QuantLib classes will be the focus of the course.

We will see how QuantLib provides a free easily-extendible implementation that achieves rapid pricing and sensitivity computation, and stable calibration to the market; whilst being able to cope with path-dependence, discontinuous pay-offs and early exercise features.

## About the speaker

Mark Joshi obtained a B.A. in mathematics (top of year) from the University of Oxford in 1990, and a Ph.D. in pure mathematics from the Massachusetts Institute of Technology in 1994. He was an Assistant Lecturer in the department of pure mathematics and mathematical statistics at Cambridge University from 1994 to 1999. Following which he worked for the Royal Bank of Scotland from 1999 to 2005 as a quantitative analyst at a variety of levels, finishing as the Head of Quantitative Research for Group Risk Management. He joined Melbourne University in November 2005 as an Associate Professor.

Mark's book "The Concepts and Practice of Mathematical Finance," CUP 2003 has become a standard introductory text in the area, and his other book "C++ Design Patterns and Derivatives Pricing," CUP 2004, has also proved popular. He has published twenty pure mathematics papers, as well as writing over thirty papers on financial mathematics, many of which deal with the practical aspects of implementing market models.

## Course Highlights

- Drift approximations
- Calibration
- Early exercise
- Greek computation
- QuantLib Classes

## Course Methodology

- Intensive but interactive and fun program
- Relevant case studies updated from recent market events
- Course highly customised depending on feedback from pre-course questionnaires
- Pre-course and post-course reading provided

## What have previous delegates said?

**"Great Interactivity"**

**"Relevant and timely coverage of recent developments"**

**"Very Practical"**

**"Relaxed, Broad coverage"**

## Prerequisites

- Basic knowledge of fixed income and derivative products
- Basic maths skills
- Basic knowledge of C++ and derivatives pricing

## Who should attend?

- Derivative Structurers
- Derivative Trading
- Financial Engineers
- Risk managers
- Back Office and IT staff supporting the structured products group

## Course Contents

### Day 1 - Basics and Calibration

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- Why market models and theoretical underpinnings.
- Achieving a speedy Monte Carlo implementation: drift computation, drift approximation, accelerating convergence, latest implementations of Sobol, randomized QMC, delta hedging as an accelerator
- Markov functional control variates

**QuantLib classes:** *MarketModelEvolver, LogNormalFwdRatePc, LogNormalFwdRateIpc, LogNormalCotSwapRatePc, LMMDriftCalculator, NormalFwdRatePc, BrownianGenerator, SobolRsg*

- Calibration: time homogeneity, correlation structures, the pseudo-square root as a fundamental building block, stable simultaneous calibration to caplets and swaptions, period mismatches,

**QuantLib classes:** *MarketModel, SwapForwardMappings, FwdToCotSwapAdapter, CotSwapToFwdAdapter, PiecewiseConstantAbcdVariance, CTSMMCapletCalibration, CTSMMCapletMaxHomogeneityCalibration, capletSwaptionPeriodicCalibration*

### Day 2 - Early Exercise and Greeks

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- Pricing products with early exercise features, obtaining lower bounds. Working with cancellables, least-squares method. Anderson's method. Orthogonalization, adaptive basis functions, double regression, sub-optimal points, practical policy iteration,

**QuantLib classes:** *NodeData, collectNodeData, MarketModelExerciseValue, LongstaffSchwartzExerciseStrategy, MarketModelBasisSystem, MarketModelParametricExercise, genericLongstaffSchwartzRegression*

- Upper bounds for callable products.

**QuantLib classes:** *UpperBoundEngine*

- Greek computation: partial proxy simulation, the conditional analytic method, and adjoint methods.
- Market Greeks as opposed to model Greeks

**QuantLib classes:** *ConstrainedEvolver, LogNormalFwdRateEulerConstrained, PathwiseAccountingEngine, PathwiseVegasAccountingEngine, MarketModelPathwiseMultiProduct*

### Day 3 – CRAs, Skew and Smiles

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- Fitting callable range accruals into the LMM
- Interpolation methodologies
- Using displaced diffusion to achieve skew

**QuantLib classes:** *how existing classes already include Displaced Diffusion*

- Using Heston stochastic volatility to obtain smile: Monte Carlo implementation

**QuantLib classes:** *SVDDFwdRatePc, MarketModelVolProcess, SquareRootAndersen*

- Analytic approximations of the stochastic vol LMM, calibration, SABR and the LMM

**QuantLib classes:** *possible ways to extend to encompass these cases*

### Further Information

**Dates:** June 2 -4, 2010

**Venue:** The Institute of Physics, London, UK

**Cost:** £2500 exc. VAT

### Enquiries

**Jacob Bettany**

**Tel:** +44 (0) 117 923 8851

**Email:** jacob@moneyscience.com

### Registration

Please Return Application form to:

Financial Training  
MoneyScience Ltd,  
4 St Pauls Road,  
Bristol,  
BS8 1LT, UK

Or sign, scan and send to  
jacob@moneyscience.com



Registration Form

Pricing Exotic Interest Rate Derivatives - The LIBOR Market Model in QuantLib

Discount Code:

Title (Mr/Mrs/Ms/Dr/Other)

First Name

Last Name

Email Address

Participant's First Name (If different from above)

Participant's Last Name (If different from above)

Participant's Email Address (If different from above)

Company Name

Job Title

Department

Telephone Number

Tax Registration No.

VAT Registration No.

Address for Invoice

Postal Code

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SIGNED.....

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DATE.....

or Sign, scan return to jacob@moneyscience.com

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