



Three separately bookable one day training courses in four different locations

London 15–17 February 2012

Singapore 26–28 September 2012

New York 25–27 April 2012

Sydney 5–7 December 2012

Marcello Minenna on Derivative Pricing and Model Calibration: Tools and Techniques

*Build robust financial models to
price and hedge in a volatile world*



About the course

Basic, intermediate and cutting edge one-day training courses for financial professionals

In the last years, a lot of very sophisticated and realistic models for pricing derivatives have been developed in the financial literature. However, in many cases it's not clear for the financial practitioners the rationale behind these increased complexities that require specialized training and skills that are not so widespread in the industry; moreover, having considered that technical difficulties and implementation issues for advanced models are far to be completely overcome, it's not surprising to see that the fundamental analytics have not so much changed despite the continuous growing of new structures and products. Nevertheless, the recent markets turmoil has proved without doubt that an adequate and effective modeling of complex phenomenon like abrupt movements of prices, rates and volatilities is necessary in order to avoid a complete model's failure.

Risk has developed this newly researched world-wide training programme designed to cover all the main aspects related to derivative pricing, starting from the very beginning and exploring the advanced solutions developed in literature to overcome problems that arises in the utilization of models in the real world, up to the frontier of the financial research.

This course is the first of its kind since it is structured as in the best Master programs in Mathematical Finance all around the world with theoretical and practical sessions supported by computer programming examples. Delegates will be brought through the complex world of quantitative finance by Professor Marcello Minenna and by his teaching assistant Dr. Paolo Verzella and will reach the goal of mastering derivative pricing and model calibration in just three days.

This world-wide training course is composed by three modules, independent and not overlapping, with an increased level of complexity. Each module can be signed separately, but it's strongly suggested that the delegate that goes directly to the advanced ones can handle all the arguments faced in the lower layers, as they are prerequisites to follow the module in a proper way.

Who should attend?

Specific functions which our program may appeal to include:

- Risk managers
- Quantitative/Insurance/Credit Risk/Operational Risk Analysts
- FOREX /Commodity/Fixed Income/Derivative Traders
- Models Developers
- Structured Products Engineers
- Financial Software - Developers
- Financial Advisors
- Portfolio Managers
- Compliance Officers
- Internal Auditors
- Professors
- Reaserchers
- Undergraduate/PhD/Master students

Complimentary Books

Produced in consultation with the course tutor, every delegate will receive a complimentary book to support the level of course they attend. Copies of the bestselling Risk Books “*A Guide to Quantitative Finance*” by Marcello Minenna and of the advanced technical report “*Option Pricing via Quadrature*” by Marcello Minenna and Paolo Verzella will be distributed to each delegate at the course.

Pre-course e-Learning content

Upon booking onto the Marcello Minenna on Derivative Pricing and Model Calibration: Tools and Techniques, delegates will receive the below e-learning module on derivatives as preparation for the course.

Derivatives: An Overview

The aim of this module is to provide an overview of derivative instruments and the markets in which they are traded. The module reviews the key risks involved in international trading and investing, and highlights those that can be hedged through the use of derivatives (such as market or credit risk) and those that cannot (e.g. political or regulatory risks). The rationale behind the use of derivatives as both hedging and trading instruments is thus explained. In addition, the module provides an overview of how the market operates the role of the different players.

To register today – Call us:

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Beginner Course

London 15 February 2012

New York 25 April 2012

Singapore 26 September 2012

Sydney 5 December 2012

About the course

This one day crash training course will introduce the absolute beginner to the technicalities needed to dominate the paradigm presently used in the financial world. The standard derivative models of Black-Scholes-Merton and Cox-Ross-Rubinstein will be explained and derived in a rigorous fashion, with a specific focus on implementation issues via spreadsheets and numerical software like MATLAB. The step-by-step analysis will help the delegates to approach sophisticated tools like Stochastic Calculus only by using elementary mathematical skills and the knowledge of the basics of finance. The well-known weaknesses of the Black-Scholes-Merton will be investigated in details, giving insights on the most natural extensions feasible to fix the major problems. In detail, the local volatility class of models will be introduced and derived in the original form of Dupire, in order to complete the knowledge of the standard tools necessary to price and hedge, used in the vast majority of the financial industry.

Delegates will learn how to:

- Price and hedge in discrete and continuous time using the most widespread models in the financial industry
- Be aware of the practical limits of the standard paradigm, and control the simplest, most effective ways to handle and overcome them
- Use and implement common formulas in spreadsheets and popular numerical software
- Apply mathematical techniques to price more complex instruments (exotics) in the Black-Scholes-Merton framework

Course Highlights:

- Exploring the Basics: The No Arbitrage Hypothesis and Market Completeness
- Building step by step a simple option pricing model in discrete time
- The continuous time hypothesis and the need of Stochastic Calculus
- The Risk-Neutrality and the Black-Scholes-Merton model
- Detailed Derivation and control of the pricing formulas
- The Hedging problem;
- Limit of the standard paradigm: local volatility extensions

Day 1:

Beginner Programme

0830 Registration and coffee

0900 **Setting up the black scholes paradigm: A tutorial overview**

- The No Arbitrage Hypothesis and the Pricing Fundamentals
- The Mathematical Bases of Black-Scholes-Merton world
- Pricing and Hedging in the Black-Scholes-Merton framework
- Black-Scholes world vs the real world: the hard facts –Examples of a systematic underestimation of tail events

1030 Morning break

1100 **Managing derivatives in discrete times**

- The Discrete Nature of financial variables
- The analytical connections between continuous and discrete times
- Discrete Models for Pricing and Hedging Derivatives
- Step by step Excel and MATLAB implementation

1230 Lunch

1330 **Uncovering the analytics of asset pricing**

- The Martingale Property for stochastic processes
 - The Fundamental Theorem of Asset Pricing and the Probabilistic Pricing at Expiry Time
 - The Change of Measure technique: intuition and practice
 - Homogeneous Functions and Basics of Analytical Hedging
-

1500 Afternoon break

1530 **Beyond the black scholes paradigm: The rationale**

- Managing the limits of Black-Scholes Model: volatility smiles, local volatility and other tricks
 - The stochastic nature of interest rates
 - The stochastic nature of volatility
 - Modelling prices and rates discontinuities with jumps
 - Correlations and risks integration between state variables in a complete model: a risk-based view via quantitative indicators
-

1700 **Q/A SESSION**

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Intermediate Course

London 16 February 2012

New York 26 April 2012

Singapore 27 September 2012

Sydney 6 December 2012

About the course

This module is addressed to intermediate users that are familiar with the analytical standard tools used in finance but want to explore the rationale and the basics of the most popular models extensions, with an extensive focus on models implementation and calibration; this approach will allow the delegate to walk away with in-depth understanding of useful techniques and will give him the confidence to effectively use this new knowledge to control and manipulate models. The hypothesis of stochastic volatility will be investigated, starting from the need of a more realistic modelling of the behaviour of a financial asset to the analytical challenges it involves and the practical difficulties a conscious user has to dominate, like the calibration problem. Other possible extensions that try to model observed price discontinuities (i.e jumps) are explored with a reasoned analysis of their pros and cons.

Delegates will learn how to:

- Price and hedge in discrete and continuous time using different and sophisticated techniques
- Control all the fundamental analytics actually in use in the financial world
- Valuing the adequacy of models assumptions and when and how to increase complexity
- Explore and Control advanced models in derivatives pricing and hedging
- Calibrate in a robust and effective way complex models

Course Highlights:

- Pros and Cons of the actual paradigm in the financial industry
- The complete analytical toolkit to manage risk and pricing derivatives
- Analyse models beyond the Black-Scholes-Merton paradigm and deterministic volatility: Stochastic Volatility Models
- Modelling discontinuities in asset prices and volatilities: Jump Diffusion Models
- High-end mathematical techniques in derivative pricing
- Models Calibration techniques, robust procedures and error control

Day 2: Intermediate Programme

0830 Registration and coffee

- 0900 **Stylized facts on the real world as guidelines to build robust models**
- The “anormality” of the returns normality assumption
 - Real Probability Distributions for Asset Prices: Asimmetry, Kurtosis and Fat Tails
 - An extended framework for pricing and hedging in the real world
 - Stochastic Volatility Models and Jump Diffusion: an Overview
-

1030 Morning break

- 1100 **Advanced mathematical tools for the real world**
- Stochastic Volatility calculus
 - Levy Processes
 - The Fourier and Laplace Transforms
 - The mathematics of the complex plane
-

1230 Lunch

1330 **Extending the black-scholes framework: stochastic volatility models**

- Stochastic volatility models: PDE derivation via Fourier Transform
 - Solving the Pricing Problem via numerical algorithms in Excel and MATLAB
 - Calibrating Stochastic Volatility Models: procedures and solutions in Excel and MATLAB, with extensive evaluation tests
 - Moving from Vanilla Derivatives to Exotics in a stochastic volatility setting: Monte Carlo solutions
-

1500 Afternoon break

- 1530 **Extending the black-scholes framework: jump diffusion models**
- Jump Diffusion Models: Replicating and quasi-replicating portfolios
 - Solving the Pricing Problem via numerical algorithms in Excel and MATLAB
 - Calibrating Jump Models: procedures and solutions in Excel and MATLAB with extensive evaluation tests
 - Moving from Vanilla Derivatives to Exotics in jump setting: Monte Carlo solutions
-

1700 **Q/A SESSION**

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Advanced Course

London 17 February 2012

New York 27 April 2012

Singapore 28 September 2012

Sydney 7 December 2012

About the course

This advanced training course is specifically designed for traders and financial engineers that are very familiar with the most popular Black-Scholes-Merton models extensions, like stochastic and local volatility models and are able to use sophisticated analytic techniques to manipulate models for their own needs. Starting with the known weaknesses of the more widespread advanced models used in the industry, like Heston and Dupire, the program will investigate the cutting edge approaches to derivative pricing and hedging like Pure Jump Models and the Stochastic Time hypothesis, stochastic interest rate extensions, SABR-like models and useful implementations of uncommon models like the Constant Elasticity of Variance and Displaced Diffusion Models, in a standard unified framework. The aim is to offer a complete spectrum of the available alternatives to Black-Scholes-Merton for the user in a uniform and usable setting, in order to choose and tailor each model to solve specific problems.

Delegates will learn how to:

- Represent each model in a unified, standardised framework to exploit similarities;
- Manipulate models in order to build customized variants for specific needs
- Control the vast majority of models alternatives to the actual paradigm in the financial industry

Course Highlights:

- Pros and Cons of popular extensions to the BSM paradigm
- A step beyond: Pure Jump models and the Stochastic Time Hypothesis
- A general unified framework to price and hedge derivatives
- Classical Models revisited and made simple in a standardised fashion: CEV and DD
- Different representations for the SABR models family
- Cutting Edge analytical techniques to manipulate and adapt models

Day 3: Advanced Programme

0830 Registration and coffee

0900 **A general unified framework for derivative pricing**

- A derivative pricing formula for general processes
- Solving the PDE or Knowing the Probability Density function. A Dual Problem
- Benefit of a standardization of derivative pricing models

1030 Morning break

1100 **Extending the black-scholes framework: Pure jump models**

- Pure Jump Models: The Stochastic Time Hypothesis and mixtures of probabilities densities
- Solving the Pricing Problem via numerical algorithms in Excel and MATLAB
- Calibrating Jump Models: procedures and solutions in Excel and MATLAB with extensive evaluation tests

1230 Lunch

1330 **Extending the black-scholes framework: classical variants in a usable standard form**

- Stochastic interest rates models: a Martingale derivation
- The Constant Elasticity of Variance Model
- The Displaced Diffusion Model
- Solving the Pricing Problem via numerical algorithms in Excel and MATLAB and Calibration

1500 Afternoon break

1530 **Extending the black-scholes framework: sabr-like models**

- The SABR extensions and its particularities
- The SABR as a stochastic CEV
- Standard semi-analytical pricing representations for SABR
- Solving the Pricing Problem via numerical algorithms in Excel and MATLAB and Calibration

1700 **Q/A SESSION**

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Speaker biographies



Marcello Minenna,

has been teaching for more than a decade in the fields of Financial Mathematics in several

Italian and foreign universities and is presently teaching “Topics in quantitative finance” at Bocconi University (Milan).

He received his PhD and MA in mathematics for finance from the State University of Brescia and from Columbia University.

He is the author of several publications including the bestselling Riskbook “A Guide to Quantitative Finance”.

He is the Head of the Quantitative Analysis and Financial Innovation Unit at CONSOB (the Italian Securities and Exchange Commission) and has been addressed by Risk Magazine as the “quant enforcer” and the “quant regulator”.



Paolo Verzella,

was Assistant Professor in Mathematical Finance at Milano Bicocca University and has taught courses in mathematics

and finance in Italian Universities namely Bocconi and Politecnico of Milano.

Paolo received his Phd in Mathematics for Financial markets from Milano Bicocca University. His research interests focus mainly on Numerical Methods for Option Pricing, Optimisation Problems and Applied Harmonic Analysis and also includes more general areas of finance such as Structured Products and Monte Carlo methods.

He is a Senior Analyst at the Quantitative Analysis and Financial Innovation Unit at CONSOB (the Italian Securities and Exchange Commission).

Pre-course reading

As a delegate attending Marcello Minenna on Derivative Pricing and Model alibration: Tools and Techniques, you will receive a complimentary book aimed to support the level of course attending. All books have been written by Marcello Minenna and will be issued to you at the course registration

Beginner/Intermediate Course

A GUIDE TO QUANTITATIVE FINANCE, Edited By **Marcello Minenna**

With clearly explained theory and step-by-step instructions for building and using the equations, this comprehensive toolkit allows quantitative professionals, at all levels, to put derivative pricing and risk controlling models into practice.

This self-contained and methodical guide is all you will need to fully grasp the mathematics underlying the pricing of derivatives. And most importantly, will empower you to put your quantitative skills into practice.

Intermediate/Advanced Course

OPTION PRICING VIA QUADRATURE, By **Marcello Minenna** and **Paolo Verzella**

Most option pricing models and techniques employed by today's analysts are rooted in the Black-Scholes model, but analysts are now moving beyond this established model to quadrature mathematics: numerical calculation under a curve or, more generally, using numerical integration to calculate a definite integral.

Readers will gain a clear idea of the pros and cons of every single method discussed. You will be guided through the implementation of the preferred pricing formula knowing exactly how this formula performs and why.

To read more on each book please visit www.riskbooks.com