

Calibration Methods, Industry Applications and Software Examples

A course oriented towards market practitioners, risk managers and banking regulators

Hong Kong, April 13-16, 2004

Instructor: [Salih Neftci](#)

Course Description: This is a four half-day course on the traditional and modern calibration methods used in the analysis and pricing of financial instruments. All methods will be implemented using Mathematica as a tool to facilitate the understanding of the analytical methods. Real world, practical examples will be used. There is no prerequisite concerning programming knowledge.

This course was a resounding success in the first presentation, in Europe in October 2003.

Objectives: Calibration of models and parameter values in the most important task of a financial market professional. Risk managers, regulators and Central Banks have major stakes in performing model calibration correctly and efficiently. This is the first step for a correct valuation of trading books. The course intends to introduce all the major state-of-the-art calibration and numerical techniques.

Target Audience: Traders, analysts, risk managers in financial institutions, as well as professionals working in regulatory agencies and Central Banks.

13 April

- 9:15 – 10:45 **Basics of Approximation Theory:** Taylor series, approximation errors and measures.
- Examples of simple calibration problems.**
- Using state prices in calibration.**
- 10:45 – 11:00 Coffee time
- 11:00 – 12:30 **Inverse problems in finance:** Calibrating model volatilities.
- How to handle inverse problems in finance?:** General theory, examples and discussions.
- Dupire's problem and the solution.** How to derive the local volatility surface? Numerical examples from equity markets.

14 April

- 9:15 – 10:45 **Derivation of the Dual PDE and its relevance**
- Definition and uses of local volatility.** Use in Monte Carlo models.
- Example:** Cliquets and calculation of forward volatilities.
- 10:45 – 11:00 Coffee time
- 11:00 – 12:30 **Numerical Methods Concerning PDE's and Trinomial Trees:** Similarities of the two methods, explicit and implicit schemes, extensive exercises concerning numerical solution of PDE's.
- Tree Models and their Calibration:** how to calibrate binomial and trinomial trees, applications to fixed-income derivatives

15 April

9:15 - 10:45

Calibrating and Estimating Smile Dynamics: Examples with observed data, examples of pricing using smile dynamics.

Johnson and Lee model. Examples.

10:45 – 11:00

Coffee time

11:00 – 12:30

Recent Developments in Implementing Monte Carlo Methods. How to implement Monte Carlo methods optimally?

15: 30 – 16:45

Seminar on “Financial Engineering of Speculative Reminbi Positions and Implications for HKD” by Salih Neftci

16 April

9:15 – 10:45

Using Kernel methods to smooth volatility surfaces.

Calculating probability densities using Levy processes. Applications in finance.

10:45 – 11:00

Coffee time

Estimation and Calibration Methods Dealing with Credit Derivatives: Calculation and modeling of risk-neutral default probabilities, estimation and calibration of default correlations.

Calibrating Forward Libor Model volatilities.