

SUPER COMPUTER CONSULTING INC.

1070 Westfield Way, Mundelein, IL 60060 USA

Phone: (847) 837-0200

Fax: (847) 837-0228

e-mail: izzy@supercc.com

<http://www.supercc.com>

ADVANCED MODELLING TECHNIQUES FOR PRICING AND HEDGING DERIVATIVES (Model Building Bootcamp)

Warm-up session on pricing and valuing derivatives

- The price of any instrument is the present value of the expected value of its cash flows
- The risk neutrality assumption
- Normal and log normal distributions
- The stochastic model for the underlying instrument
- Special cases: commodities, interest rates, weather and catastrophe derivatives
- The time value of money
 - Net present value of cash flows
 - Converting between yield curves:
 - the par bond curve
 - the zero coupon curve
 - the forward curve
 - discount factors
 - When should each curve be used?

Workshop 1: building a spreadsheet to convert from the par bond yield curve to the spot curve and vice versa using boot strapping and other methods.

Mastering the theory and practice behind option pricing models

- Discovering where you can find the underlying data for your calculations
 - Reuters, Bloomberg, and other data feeds
- Learning how to price European options using:
 - closed form formulas
 - tree building

- numerical quadrature
- Monte Carlo techniques
- finite difference methods
- A comparison between different types of trees:
 - equal probability trees and other trees
 - when should each one be used?
- Explaining what the assumptions behind the different models are
- Fully understanding the differences that arise between the various models
- Sanity check: “is it the price reasonable?”

Workshop 2: building a spreadsheet to price European options using the methods described above.

Understanding the importance of the Greeks

- The meaning of Delta, Gamma, Vega, Rho and Theta
 - Examining what the implications are when their value changes
 - What do traders look for?

Workshop 3: modifying your spreadsheet to compute Delta, Gamma and the other Greeks.

Getting to grips with the pricing and valuing of exotic options

- Learn how to price exotic options using:
 - a tree to handle American and Shout options
 - Monte Carlo to handle Asian options and Barrier options
 - quadrature to handle Compound options and Chooser options
 - techniques to improve and speed up the Monte Carlo algorithm

Workshop 4: creating the model to price the exotic option of your choice

Options on interest rates: applying them in practice

- Examining how yield curves are modelled
- Applying the different interest rates models:
 - Cox Ingersoll Ross,
 - Black, Derman and Toy
 - Ho and Lee
 - Vasicek, Hull and White
 - Longstaff and Schwartz

- Black-Karasinski
- Brace and Musiela
- Explaining the advantages and disadvantages of each model
- How to choose the right model for your particular needs
- How to successfully overcome the problem of calibrating your model to current market conditions
- Using binomial and trinomial interest rate trees
- Incorporating volatility into your tree calculations
- Learning how to deal with the different length of time in interest rates when building your tree

Workshop 5: building a binomial tree and pricing a callable bond

Understanding duration and convexity

- Describing the concepts of duration, convexity and option adjusted spread (OAS)
- Learning what their uses are:
 - adjusted duration and MacAulay duration
 - the case of the “century” bond
 - using duration as a hedge ratio
- How to use OAS as a measure of relative value

Workshop 6: modifying your spreadsheet to compute duration, convexity and OAS