SUPER COMPUTER CONSULTING INC.

1070 Westfield Way, Mundelein, IL 60060 USA
Phone: (847) 837-0200
Fax: (847) 837-0228
e-mail: info@supercc.com
http://www.supercc.com

Advanced Volatility
(a two day session)

Day One

Uses of Volatility

Where are variance forecasts used?

Volatility for contingent claim pricing

- Volatility for asset allocation decision
- Volatility for Value at Risk

Using volatility for proprietary trading

A practitioner's guide

Volatility in the futures and currency markets

- Theoretical relationship between volatility and expected returns
- Random walk test based on volatility: Is the markets trending or is it a "range market"?
- Maximum drawdown: an alternative risk measure
- Volatility in managed futures funds
- Using the Sharpe ratio to value a trading system
- Volatility and correlation trades

Volatility and option pricing

An introduction to option pricing theory

Two principles of option pricing

-     -   the no arbitrage condition
-     -   the reverse engineering principle
- Developing a model for the underlying

- Option value = Implicit Value + Time Premium
- The no arbitrage pricing principle
    - a simple European option
    - introducing volatility
    - a simple binomial tree with three nodes
- A review of stochastic processes
    - The Black Scholes insight
- The Black Scholes Framework
    - what are the key assumptions?
    - dealing with the assumptions behind most pricing models
    - constant volatility
    - constant interest rates
    - costless trading with no taxes or restrictions ("frictionless")
    - unlimited borrowing and lending of capital is allowed at the same risk free rate
    - unlimited short sales of securities
    - no cash flows during the option's life
    - Black Scholes strengths and limitations

The stochastic process in detail

Taking a close look at the stochastic process of the underlying

Stochastic processes

- Stationary and ARIMA models
- Random walk processes
- Normal, lognormal and discrete distributions
- The random walk hypothesis
- Volatility as standard deviation
- How stochastic processes influence derivative prices

Historical Volatility

An in-depth review of historical volatility estimation techniques

Which historical period should you use?

- What data frequency should you look at?
- Using various estimators: Close Close, Open High Low Close etc.
- When should each estimator be used?
- What type of data is suitable for which estimator?
- Parkinson rules
- Exponential smoothing techniques
- A short introduction to Arch and Garch

Implied Volatility

Estimation and application of implied volatility

How to gauge implied volatility?

- Real life difficulties: the synchronization problem
- The volatility skew and smile
- Is implied volatility a good predictor of future volatility?

Implied and historical - a comparison

The strengths and weaknesses of both techniques

Statistical studies of their predictive powers

- Historical vs. Actual
- Implied vs. Actual
- Implied and historical vs. actual
- Getting the best out of both methods and avoiding the pitfalls

Volatility insensitive structures

Covering European, American and Exotic options

Their price changes very little over a wide range of volatility

- Why are people interested in these structures?
- How to create them?
- Creating structures which are extremely sensitive to volatility

Day Two

The volatility smile and skew

Why are they caused and what are their effects

What is the difference between a smile and a skew

- Looking at various volatility smiles in several markets on various dates
- The probability of a stock market crash is close to zero, yet they do happen
- Is volatility caused by trading or by news
- Non stationary economics
- The volatility term structure

- The concept of "volatility days"
- How does this effect option pricing?
- The concept of forward/forward volatility
- Computing the forward/forward volatility

Pricing with uncertain volatility

Option pricing in the context of the smile

Pricing using a binomial tree (review)

- Tree with a volatility term structure
- Implied volatility trees
  - How are they constructed?
  - Are they useful?

Hedging with uncertain volatility

How is hedging done in the presence of a volatility smile?

The Black Scholes Delta and its weaknesses

- Several attempts to solve it
- Floating Delta
- Model driven Delta
- Proprietary Delta
- other techniques

Applying best practice techniques for accurate volatility forecasting

A review of stochastic volatility models

The ARCH family of models

  - Basic ARCH models
  - GARCH models
  - Exponential GARCH (E-GARCH)
- Diffusion models with mean reversion assumptions
- Regime based volatility models
- Vector based volatility modeling with application to Tactical Asset Allocation (TAA)
- Forecasting volatility using the above and other techniques

Alternative risk measures

Investigating alternatives to using volatility as a risk measure

Alternative measures of risk to variance

– Semi variance and downside movements

- Expected utility approach – application to TAA
- Combining volatility models – backing out the fundamental asset risk from historical and implied volatility using stochastic volatility models
- The RAROC model and its use in capital allocation

Practical applications for volatility management

Managing and trading volatility

Dynamic hedging of volatility exposures

- Portfolio approach to measuring volatility risk
- Exploiting opportunities for trading in volatility

How to short volatility

Buying and selling options results in volatility exposures

Short straddle

- Short strangle
- The double barrier option allows you to short volatility while risking only the premium
- What actually happened in the forex markets with the "box trade"

Practical application of Garch and M-Garch to financial forecasting

Practical tools for financial forecasting

Model identification

- Conditional vs. unconditional moments
- Testing procedures
- Applications to the financial markets

Volatility of averages

Volatility of the average is lower than the volatility of its parts

- The diversification effect
- Correlation and its relationship to volatility

- The basket option
- The Asian option
- Uses of basket and Asian options for hedgers
- Stories from the fields

Equity Markets

Special issues relating to equity warrants

A review of the warrant market

- Warrants vs. options
- Which volatility should be used
  - of the firm
  - of the share
- How to account for dilution?
- What about dividends?
- Stock options vs. stock index options volatilities
- Identifying opportunities from historical correlations

Interest rate applications

Volatility and options on interest rates

Modeling yield curve movements

- The Japanese example
- A comparison of several models
- Different valuation models: Black Derman and Toy (BDT), Heath Jarrow Morton (HJM), Vasicek etc.
- Advantages and disadvantages of the models
- Pricing of complex interest rate derivatives

Advanced research and techniques

Some of the latest research on volatility

Feedback loops – how hedging warrants impacts the volatility of the underlying asset

- Prediction of volatility with
  - Wavelets
  - Logit functions
  - Genetic algorithms
  - Neural nets
  - Do these techniques really work?