MATHFINANCE

the bridge between investment banking and academic research in mathematical finance

Dr Attilio Meucci, CFA

Advanced Risk and Portfolio Management

the only heavily quantitative, omni-comprehensive, intensive buy-side bootcamp

4th, 5th and 6th June 2008
Frankfurt, Germany

Course Highlight

The course covers all aspects of quantitative risk and portfolio management from the foundations to the newest developments.

Statistics: multivariate distributions, copulas, location-dispersion ellipsoid, correlation and other measures of co-dependence
Multivariate estimation: non-parametric, maximum-likelihood under thick tails, shrinkage, robust, Bayesian, extreme value theory
Market modeling: quest for invariance in different markets, advanced dynamics, factor models, principal component analysis
Pricing: FFT projection to horizon, delta-gamma, full Monte Carlo
Portfolio evaluation: stoch. dominance, satisfaction, utility/certainty equivalent
Risk management: value at risk, expected shortfall, coherent measures; risk decomposition in elliptical and generic markets
Classical portfolio management: trading/prospect theory, total return management, benchmark allocation, mean-variance and pitfalls
Advanced portfolio management: mean-CVaR, mean-VaR, Black-Litterman and beyond, copula opinion pooling, Bayesian, robust cone programming
Liquidity: transaction costs, optimal execution, algorithmic trading

The most advanced statistical and optimization techniques are introduced and thoroughly discussed by means of live MATLAB® simulations, intuitive geometrical representations, figures and plenty of examples.

The course is based on Dr. Meucci's bestseller *Risk and Asset Allocation* – *Springer*. Delegates will be given a complimentary copy of the book, as well as all the code used in the live demos.

Audience

Buy-side practitioners (portfolio managers and risk managers with solid quantitative background) will deepen and broaden their understanding of the recipes they implement everyday and will learn the most cutting-edge techniques.

Academics and **sell-side practitioners** (traders, financial engineers, quantitative analysts, research teams) will understand the big-picture *and* the details of buy-side finance in a quantitative language familiar to them.

Attilio Meucci

- Senior Vice President Lehman Brothers
- Adjunct Professor MFM, Courant-NYU
- CFA chartholder
- PhD Mathematics
- MA Economics
- BA Physics cum laude

learn more at
www.symmys.com

To register and for more information

www.mathfinance.com
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Charity Support!

Each euro paid by delegates will turn into a 50 cent donation to **Doctors Without Borders** http://www.msf.org/ and **Gandhi Kinderhilfe**, http://www.gandhi-kinderhilfe.de/ provided minimum fixed costs are covered. Attilio Meucci will waive his fees for charity.

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Day 1 – Wednesday, 4 June 2008

Morning Session (8:30-12:30)

Multivariate Statistics

- Representations of distributions
  - analytical (pdf, cdf, quantile, cf)
  - Monte Carlo simulations
- Copula-marginal factorization
  - marginals/grades
  - pdf, cdf, simulations of copulas
  - special copulas
- Dependence/concordance statistics
  - Schweizer-Wolff measure
  - Kendall tau
  - Spearman rho
- Summary statistics
  - location-dispersion ellipsoid
  - principal component factorization
  - higher order statistics
- Correlation: theory, practice and pitfalls
- Multivariate distributions for the markets
  - (matrix-variate) normal
  - Student t and elliptical
  - Log-distributions
  - Wishart distribution
  - Order statistics
  - Mixture distributions

Afternoon Session (14:00-18:00)

Multivariate Estimation

- Estimators: definition and evaluation
  - loss, bias, inefficiency, error
  - generalized hypothesis testing
- Non-parametric estimators
  - order statistics and VaR estimator
  - sample mean/covariance: best-fitting ellipsoid
  - sample factor loadings: ordinary least squares
- Multivariate MLE: location, scatter, loadings
  - normal hypothesis: sample estimators
  - non-normal hypothesis: outlier rejection
- Multivariate shrinkage: location, scatter, loadings
  - Stein mean
  - Ledoit-Wolf covariance
- Multivariate robust: location, scatter, loadings
  - assessing robustness: the influence function
  - M-robust estimators
  - outlier detection and high-breakdown ellipsoid
- Multivariate Bayesian: location, scatter, loadings
  - analytically tractable examples
  - numerical techniques
- Missing observations and unbalanced panels
  - EM algorithm
  - ML marginalization

Day 2 – Thursday 5 June 2008

Morning Session (8:30-12:30)

Market Modeling

- The quest for invariance: i.i.d. processes
  - equities: log-returns
  - fixed-income: changes in yield to maturity
  - derivatives: changes in ATM implied volatility
- Advanced dynamics
  - ARMA, long-memory processes
  - GARCH, stochastic volatility, subordination
  - multivariate generalizations
- Projection to horizon: the FFT technique
- Pricing
  - analytical
  - second-order (gamma/convexity)
  - full Monte Carlo
- Dimension reduction
  - Principal component analysis
  - Explicit factors

Afternoon Session (14:00-18:00)

Risk Management

- Dimension reduction, notable examples
  - Capital Asset Pricing Model
  - Multi-factors models
  - PCA of the swap market
- Investor's objectives
  - Total return
  - Benchmark allocation
  - Net profits
- Global portfolio evaluation: stochastic dominance
- Summary portfolio evaluation: satisfaction
  - non-dimensional indices (Sharpe, info ratio)
  - expected utility and certainty-equivalent
  - quantiles and value at risk (VaR)
  - coherent measures and exp. shortfall (CVaR)
  - spectral measures of performance
- Volatiliy/VaR/CVaR/Risk decomposition
  - elliptical markets: semi-analytical
  - generic markets: Monte Carlo panel smoothing

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Day 3 – Wednesday, 6 June 2008

Morning Session (8:30-12:30)

Portfolio Management I

- Constrained optimization: computationally tractable problems
  - linear and quadratic programming
  - second order and semi-definite cone programming
- Mean-variance optimization
  - analytical: two-fund theorem
  - numerical: quadratic programming
  - pitfalls of the mean-variance approach
- Total return vs. benchmark allocation
- Market asymmetries: mean-CVaR optimization
- Estimation risk: allocations as decisions
  - opportunity cost
  - allocation decisions evaluated as estimators
- Simple allocation techniques
  - general equilibrium/benchmark implied allocation
  - prior allocation
  - sample-based allocation

Afternoon Session (14:00-18:00)

Portfolio Management II

- Bayesian allocation
  - predictive return
  - classical-equivalent
- Black-Litterman allocation
  - views on parameters
  - views on market
- Beyond Black-Litterman: non-normal markets
- Robust allocation (SOCP)
  - elliptical uncertainty sets
  - box uncertainty sets
- Robust/Bayesian allocation
- Liquidity issues
  - trading costs (fixed, execution, opportunity)
  - implementation shortfall: temporary vs permanent impact
  - optimal execution of one-security trades
  - trading portfolios: the multivariate case

This event is organised by:
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