

*Dr Attilio Meucci, CFA*

## Advanced Quantitative Risk and Portfolio Management

*“Do not trust black-box software applications  
Learn first-hand and avoid mistakes while managing your positions”*

**Saturday 24 & Sunday 25, March 2007  
MathFinance, Frankfurt, Germany**

### Course Overview

The course, which is taught in full-semester format at the Master's in Financial Mathematics - Courant Institute of New York University and in the Master's in Financial Engineering at Columbia University, covers all aspects of quantitative portfolio management and risk management from the foundations to the state-of-the-art in the industry.

The course is based on Dr Meucci's bestseller, *Risk and Asset Allocation* - Springer (details on page 3). All delegates will be given a complimentary copy of the book.

- **Multivariate estimation techniques:** non-parametric, maximum-likelihood under thick tails, shrinkage, robust, Bayesian
- **Market modeling:** copulas, market location-dispersion ellipsoid, factor models, principal component analysis, FFT projection of market to the horizon, delta-gamma and full Monte Carlo pricing
- **Portfolio evaluation:** stochastic dominance, utility, value at risk, expected shortfall, coherent measures
- **Allocation techniques:** trading/prospect theory, total return management, benchmark allocation
- **Portfolio optimization under estimation risk:** Black-Litterman, Bayesian, cone programming and robust optimization



### Dr Meucci's Profile

- Vice President  
Lehman Brothers
- Adjunct Professor  
MFM, Courant-NYU
- Adjunct Professor  
MSFE, IEOR-Columbia

Learn more at

[www.symmys.com](http://www.symmys.com)

### Audience

The course is designed for portfolio managers, risk managers, financial engineers, financial analysts, quantitative analysts, traders, and researchers.

The required level of mathematical background is kept to a minimum: 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. All the software will be made available to the delegates.

### To register and for more information

Visit [workshop.mathfinance.com/2007/qrpm/index.html](http://workshop.mathfinance.com/2007/qrpm/index.html)  
Alternatively, call + 49 - 700 - 628 43462  
or send inquiries to [ansua.dutta@mathfinance.com](mailto:ansua.dutta@mathfinance.com)

## Day 1 – Saturday 24 March 2007

**Morning Session: 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 and concordance summary statistics
  - Schweizer-Wolff measure
  - Kendall tau
  - Spearman rho
- Summary statistics and location-dispersion ellipsoid
  - Principal component factorization
  - Statistical interpretation
- Correlation: theory, practice and pitfalls
- Multivariate distributions for the markets
  - Normal distribution
  - Student t distribution
  - Elliptical distributions
  - Log-distributions
  - Wishart distribution
  - Order statistics

**Afternoon Session: Estimation Techniques**

- Estimators: definitions and practical evaluation
- Non-parametric estimators
  - Order statistics and VaR estimator
  - Sample mean/covariance: best-fitting ellipsoid
  - Sample factor loadings and ordinary least squares
- Maximum-likelihood estimators: assumptions on the market distribution
  - Normal hypothesis: sample estimators
  - Non-normal hypothesis: outlier rejection
- Shrinkage estimators: efficiency versus bias
  - Stein mean
  - Ledoit-Wolf covariance
- Robust estimators: what if the assumptions on the market distribution are wrong?
  - Assessing robustness: the influence function
  - High-breakdown estimators
- Bayesian estimators: including the practitioner's experience
  - Analytically tractable examples
  - Numerical techniques
- Missing observations in unbalanced panels
  - EM algorithm
  - ML marginalization

## Day 2 – Sunday 25 March 2007

**Morning Session: Modeling and Evaluation**

- The quest for invariance in the markets
  - Equities: log-returns
  - Fixed-income: changes in yield to maturity
  - Derivatives: changes in ATM implied volatility
- Projection of the market distribution at the investment horizon: the FFT technique
- Pricing: analytical, approximate (delta-gamma), full Monte Carlo
- Dimension reduction, theory
  - Principal component analysis (PCA)
  - Explicit risk factors
- Dimension reduction, notable examples
  - Capital Asset Pricing Model
  - Multi-factor models
  - PCA of swap market
- Investor's objectives
  - Total return
  - Benchmark allocation
  - Net profits
- Global portfolio evaluation: dominance
- Summary portfolio evaluation: satisfaction
  - Sharpe ratio and information ratio
  - Expected utility and certainty-equivalent
  - Quantiles and value at risk
  - Expected shortfall, conditional value at risk
  - Other coherent measures of performance

**Afternoon Session: Portfolio Optimization**

- Constrained optimization: computationally tractable problems
  - Linear and quadratic programming
  - Second order and semi-definite cone programming
- Mean-variance optimization
  - Numerical solutions
  - Pitfalls of the mean-variance approach
  - Mean-variance as sub-optimal two-step approach
- Market asymmetries and the Mean-CVaR approach
- Total return vs. benchmark allocation
- Simple allocation techniques
  - General equilibrium / benchmark-implied allocations
  - Sample-based allocation: leverage of estimation risk
- Advanced allocation techniques
  - Bayesian allocation
  - Black-Litterman allocation
  - Copula-opinion pooling allocation
  - Resampled allocation
  - Robust allocation
  - Robust Bayesian allocation

## More about the trainer

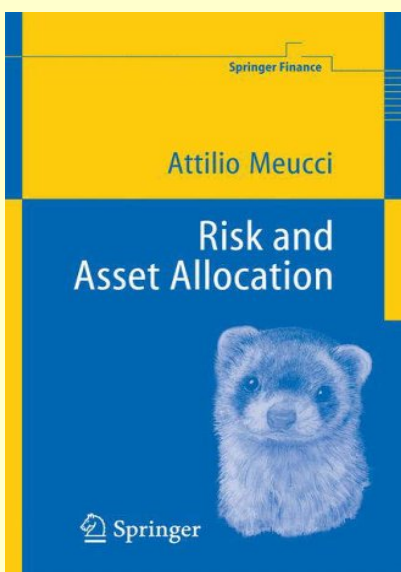
Attilio Meucci holds a BA summa cum laude in Physics and a PhD in Mathematics from the University of Milan, an MA in Economics from Bocconi University in Milan, and is CFA charterholder.

Attilio Meucci is a vice president at Lehman Brothers, Inc., New York, in the research division. Before joining Lehman, he was a trader at Relative Value International, a hedge fund in Greenwich, CT. Previously, he was at Bain & Co., where he designed solutions for risk management, portfolio insurance, tactical and strategic asset allocation.

Attilio Meucci is the author of the bestseller "Risk and Asset Allocation" and several other publications. He has taught graduate courses on quantitative portfolio management and risk management in top schools worldwide and he is frequently invited as a speaker to conferences, financial institutions and universities.

Find more information on Dr. Attilio Meucci at [www.symmys.com](http://www.symmys.com).

## About "Risk and Asset Allocation" - Springer Quantitative Finance



This encyclopedic book contains a detailed exposition spanning all the steps of one-period allocation from the foundations to the most advanced developments.

Multivariate estimation methods are analyzed in depth, including non-parametric, maximum-likelihood under non-normal hypotheses, shrinkage, robust, and very general Bayesian techniques. Evaluation methods such as stochastic dominance, expected utility, value at risk and coherent measures are thoroughly discussed in a unified setting and applied in a variety of contexts, including prospect theory, total return and benchmark allocation. Portfolio optimization is presented with emphasis on estimation risk, which is tackled by means of Bayesian, resampling and robust optimization techniques.

All the statistical and mathematical tools, such as copulas, location-dispersion ellipsoids, matrix-variate distributions, cone programming, are introduced from the basics. Comprehension is supported by a large number of figures and examples, as well as real trading and asset management case studies.

"This exciting new book takes a fresh look at asset allocation and offers up a masterly account of this important subject. The quantitative emphasis and included MATLAB software make it a must-read for the mathematically oriented investment professional!"

*Peter Carr, Head of Quantitative Research, Bloomberg LP, Director of MMF Courant, NYU*

"Meucci's *Risk and Asset Allocation* is one of those rare books that take a completely fresh look at a well-studied problem, optimal financial portfolio allocation based on statistically estimated models of risk and expected return. Designed for graduate students or quantitatively oriented asset managers, Meucci provides a sophisticated and integrated treatment, (...) This is rigorous and relevant!"

*Darrell Duffie, Professor of Finance, Graduate Business School, Stanford University*

"A wonderful book! Mathematically rigorous and yet practical, heavily illustrated with graphs and worked examples, Attilio Meucci has written a comprehensive treatment of asset allocation starting from statistical concepts, covering investment primitives, and leading to portfolio optimization in a Bayesian context with parameter uncertainty."

*Bob Litterman, Head of Quantitative Resources, Goldman Sachs Asset Management*

"This book takes the reader on a journey through portfolio management starting with the basics and reaching some fascinating terrain. Attilio Meucci shows a real talent for explaining the most difficult of subjects in a very clear manner."

*Paul Wilmott, wilmott.com*

"This book fills a gap (...) It brings together in a logical sequence a vast swathe of work by statisticians and economists on optimal allocation among risky assets (...) Meucci's book is comprehensive and rigorous, from presenting basic statistical tools to framing the optimization problem and solving it."

*Risk Magazine review by Jacques Pezier, ICMA Centre, University of Reading*