SYMMYS
Advanced Risk and Portfolio Management®

Updated Jul 13 2015

Advanced Risk & Portfolio Management Bootcamp®

by Attilio Meucci

July 13-18, 2015
New York University - Kimmel Center, 60 Washington Square South, New York City
http://symmys.com/arpm-bootcamp

What you get

- ✓ **Knowledge:** in-depth understanding of buy-side modeling from the foundations to the most advanced statistical and optimization techniques, in six intensive days of theory and MATLAB live examples and exercises
  - **Market modeling:** random walk, ARMA, GARCH, Levy, long memory, stochastic volatility
  - **Multivariate statistics:** non-parametric, non-normal MLE, shrinkage, robust, Bayesian estimation; copula/marginal factorization; location-dispersion ellipsoid
  - **Factor modeling:** theory and pitfalls of time-series and cross-sectional factor models, CAPM, APT, principal components analysis, random matrix theory
  - **Pricing**: full evaluation, Greeks, stress-matrix interpolation; analytical, Monte Carlo, historical
  - **Risk analysis:** diversification, stochastic dominance, expected utility, Sharpe ratio, Omega, Kappa, Sortino, value at risk, expected shortfall, coherent and spectral measures
  - **Portfolio construction:** robust/SOCP optimization, shrinkage/Bayesian allocations, Black-Litterman and beyond; transaction costs, liquidity, market impact; statistical arbitrage; convex/concave dynamic strategies, CPPI, delta-replication
- ✓ **Textbook:** *Risk and Asset Allocation - Springer* by Attilio Meucci
- ✓ **Code:** full set of case studies; temporary MATLAB and NAG licenses
- ✓ **Certification:** All attendees will be awarded
  - 40 credits - CFA Institute Continuing Education Program
  - 40 credits - GARP Continuing Professional Educational Program
  - Certificate of Attendance - Advanced Risk and Portfolio Management Bootcamp
  - Certificate in Advanced Risk and Portfolio Management (optional)
- ✓ **Meet the stars:** Almgren, Carr, Dupire, Gatheral, Lipton, Litterman, , Shreve…

What you pay

$1,100 (Academic/Student); **$1,600** (Supporter); **$2,100** (Professional); **group rates** (contact us).
After expenses, profits will be donated to charities.

Audience

- ✓ Finance professionals with quantitative background
  - Portfolio managers/risk managers on the buy-side will learn the latest developments in the field and deepen their knowledge of mainstream approaches
  - Sell-side professionals will bridge the gap to quantitative buy-side finance
- ✓ Academics and students

Instructor

Attilio Meucci, PhD, CFA.
Founder, SYMMYS and Chief risk officer, KKR.
Author, *Risk and Asset Allocation - Springer*.
Regular contributor, *Risk Magazine*, *GARP Risk Professional Magazine*.

Registration / information

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Day 1 - Monday, 13 July 2015 - Eisner and Lubin auditorium (room 401)

Morning Session
Introduction/Quest for Invariance (8:30-12:30)

- **P vs Q: the worlds of quantitative finance**
- **The "Checklist": modular steps of ARPM**
  - P1: Quest for Invariance
  - P2: Estimation
  - P3: Projection
  - P4: Pricing
  - P5: Aggregation
  - P6: Attribution
  - P7: Evaluation
  - P8: Optimization
  - P9: Execution
  - P10: Ex-Post Analysis
- **Invariance and the random walk**
  - Equities: log-returns
  - Fixed-income: changes in yield to maturity
  - Derivatives: (log) changes in vol. surface
- **Advanced dynamics in discrete time**
  - Autocorrelation and AR(1) processes
  - ARMA processes and Wold's theorem
  - Long memory: fractional integration
  - Volatility clustering: GARCH

Afternoon Session
Quest for Invariance/Projection/Pricing (13:30-16:00)

- **Advanced dynamics in continuous time**
  - Random walk: Levy processes
  - Autocorrelation: Ornstein-Uhlenbeck
  - Long memory: fractional Brownian motion
  - Volatility clustering: stochastic volatility
  - Volatility clustering: subordination
- **Projection to investment horizon**
  - Analytical projection
  - Numerical projection: Fast Fourier Transform; simulations
  - Annualization of skewness, kurtosis, etc.
  - Square-root/linear risk ellipsoid propagation

Review & Exercises (16:00-18:30)

Guest lecture Fabio Mercurio (18:30-19:15)

Day 2 - Tuesday, 14 July 2015 - Eisner and Lubin auditorium (room 401)

Morning session
Quest for Invariance II (8:30-12:30)

- **Pricing at investment horizon**
  - Full analytical: log-distributions
  - Full numerical: scenario pricing (Monte Carlo/historical)
  - Taylor approximation: theta-delta/vega- gamma; carry-duration-convexity
  - Stress-matrix approximation
- **Multivariate statistics**
  - Distribution taxonomy
  - Representations: pdf, cdf, cf, quantiles, scenario/probabilities
  - Spectral theorem / covariance visualization
- **Copulas**
  - Copulas in theory
  - Copulas in practice: Copula-Marginal Algorithm
- **Multivariate dynamics**
  - Multivariate Ornstein-Uhlenbeck process
  - Cointegration
  - Statistical arbitrage
  - Time-series, cross-sectional, statistical/PCA LFM's
  - Factor analysis

Afternoon session
Linear Factor Models (13:30-16:00)

- **Linear Factor Models**
  - Systematic-idiosyncratic vs dominant-residual LFM's Distributional r-square
  - Time-series, cross-sectional, statistical/PCA LFM's
  - Factor analysis
- **Applications of LFM's**
  - Multivariate estimation
  - Asset pricing theory
  - Systematic Strategies
  - Risk modeling
  - Portfolio optimization
  - Risk attribution/hedging
- **LFM's case studies**
  - Swap market: PCA and Fourier basis
  - Stock market: fundamental, macro, random matrix theory
- **Factor modeling pitfalls**
  - Returns vs. invariants vs. P&L
  - The idiosyncratic myth
  - CAPM vs. APT vs. LFM's
  - Time-horizon beta

Review & Exercises (16:00-18:30)
Speed Mingling (18:30-20:00)

Day 3 - Wednesday, 15 July 2015 - Eisner and Lubin auditorium (room 401)

Morning session **Estimation I** (8:30-12:30)	Afternoon session **Estimation II** (13:30-16:00)
▪ **Estimators** - General definitions - Evaluation: bias, inefficiency, error - Stress-testing - Generalized p-values, generalized t-statistics ▪ **Multivariate non-parametric estimators** - Sample quantile and order statistics. - Sample mean/covariance and best-fitting ellipsoid - Sample factor loadings, betas, and OLS ▪ **Multivariate maximum-likelihood estimators** - Normal hypothesis: sample estimators - Non-normal hypothesis: fat tails and outlier rejection ▪ **Shrinkage estimators** - Stein mean - Ledoit-Wolf covariance	▪ **Robust estimators** - Assessing robustness: the influence function - Huber's "M" robust estimators: location, scatter and betas - Outlier detection and high-breakdown estimators - Minimum-volume ellipsoid and minimum-covariance determinant ▪ **Missing data** - EM algorithm - ML marginalization
	Review & Exercises (16:00-18:30)
	Guest lecture Peter Carr (18:30-19:15

Day 4 - Thursday, 16 July 2015 - Eisner and Lubin auditorium (room 401)

Morning session **Risk Management I** (8:30-12:30)	Afternoon session **Risk Management II** (13:30-16:00)
▪ **Portfolio aggregation** - P&L vs. returns - Holdings vs. weights ▪ **Risk attribution** - Bottom-up approach - Factors on Demand - Portfolio-specific factor models - Non-Greek few-out-of-many hedging ▪ **Investor's objectives** - Total return - Benchmark allocation - Net profits ▪ **Portfolio evaluation** - Stochastic dominance - Satisfaction indices ▪ **Non-dimensional indices** - Sharpe ratio, Omega, Sortino ratio, Kappa ▪ **Diversification** - Review of common definitions - Minimum Torsion Bets - Effective number of bets	▪ **Expected utility and certainty-equivalent** - Analytical solutions: mean-variance as satisfaction - Numerical solutions ▪ **Quantiles and value at risk (VaR)** - Semi-analytical solutions in elliptical markets - Cornish-Fisher approximation - Extreme value theory (EVT) - Numerical solutions - Contribution to VaR from securities/factors ▪ **Coherent measures of performance** - Expected shortfall (ES) and conditional value at risk (CVaR) - Contribution to ES from securities/factors - Spectral measures of performance ▪ **Stress Testing for estimation risk** - Basic stress testing - Panic copulas with Copula-Marginal Algorithm - Fully Flexible Probabilities (time/state/entropy pooling conditioning) - Fully Flexible Bayesian networks
	Review & Exercises (16:00-18:00)
	Guest Lecture by Rob Almgren (18:00:18:45)
	ARPM Bootcamp Gala Dinner (19:00-22:50) See last page

Day 5 - Friday, 17 July 2015 - Eisner and Lubin auditorium (room 401)

Morning session
Portfolio Management I (8:30-12:30)

- **Constrained optimization: computationally tractable problems**
  - Linear and quadratic programming
  - Second order and semi-definite cone programming
- **Two-step heuristics**
  - Affine equivariance of expectation and covariance
  - Analytical mean-variance: two-fund theorem
  - Numerical mean-variance: quadratic programming
  - Mean-CVaR and alternative trade-offs
- **Benchmark vs. total-return portfolio management**
  - Expected outperformance, tracking error, info ratio
  - Frontier in total-return coordinates
  - Frontier in relative-return coordinates
- **Pitfalls of mean-variance**

Afternoon session
Portfolio Management II (13:30-16:00)

- **Estimation risk**
  - Allocation as a decision
  - Opportunity cost as loss of an estimator
- **Simple allocation techniques**
  - Prior allocation: efficiency
  - Sample-based allocation: unbiasedness
- **Robust allocation**
  - Box uncertainty sets
  - Elliptical uncertainty sets (second-order cone programming)

Review & Exercises (16:00-18:30)

Day 6 - Saturday, 18 July 2015 - Eisner and Lubin auditorium (room 401)

Morning session (8:30-12:30)
Portfolio Management III

- **Multivariate Bayesian estimation**
  - Theoretical background
  - Analytical solutions: Normal-Inverse Wishart model
  - Numerical solutions: Monte Carlo Markov Chains
- **Bayesian allocation**
  - Predictive return allocation
  - Classical-equivalent allocation
- **Tactical portfolio construction**
  - Rosenberg-Grinold
  - Black-Litterman
  - Black-Litterman for derivatives
- **Beyond Black-Litterman**
  - Entropy Pooling and Fully Flexible Views
  - Non-normal markets
  - Non-linear views
  - Generalized stress-testing
  - Ranking allocation

Afternoon session(13:30-16:00)
Portfolio Management IV

- **Dynamic allocation strategies**
  - Convex/concave strategies
  - CPPI
  - Delta-replication
  - Drawdown control
- **Liquidity**
  - Transaction costs
  - Market impact
  - Best execution

Review & Exercises (16:00-18:30)

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ARPM Bootcamp Gala Dinner - Thursday, 16 July 2015
Rosenthal Pavilion (Kimmel Center, 10th floor)

Main courses

19:00 – 19:20 Table Assignment

19:20 – 19:30 Welcome

19:30 – 20:00 Corporate Supporters

19:30-19:35: Doug Summa, Partner - PwC

19:35-19:40: John Holden, Vice President, Global Markets - NAG

19:40-19:45: Mehmet Bayraktar, Managing Director, Analytics and Risk Research - MSCI

19:45-19:50: Dan Rosen, Managing Director, Risk and Analytics - S&P Capital IQ

19:50-19:55: Sebastian Ceria, CEO - Axioma

19:55-20:00: Dan DiBartolomeo, Chief Executive Officer - Northfield

20:00 – 20:10 Educational Supporters

20:00-20:05: Jeff Kutler, Senior VP, Editor-in-Chief - GARP

20:05-20:10: Peter Sun, A Principal and Consulting Actuary - SOA

Wine

20:20 – 21:40 Guests addresses – "One More Reason" charity donations

20:20-20:30: Introduction to One More Reason

20:30-20:40: Rob Almgren & Bard Prison Initiative

20:40-20:50 Peter Carr & Cornell Prison Education Program

20:50-21:00: Bruno Dupire & Smile Train

21:00-21:10: Jim Gatheral & Saint Luis University Prison Program

21:10-21:20: Bob Litterman & World Wildlife Fund

21:20-21:30: Alex Lipton & NYU Prison Education Program

21:30-21:40: Steven Shreve & Bedford Hills College Program

Dessert

21:40-22:50 Networking and Awards

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