Syllabus

Portfolio Choice and Asset Pricing—MAFIRM Collegio Carlo Alberto

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Setup

• Teaching style: Introduction of new theory is alternated with in-class exercises to facilitate immediate understanding of the concept.

• Students should bring a laptop with Excel, Python, Matlab or comparable software.

Grading

• Final Exam: 33 points
  – Consists of 3 parts A, B, and C with each 11 points
  – Individual, closed book
  – One A4 handwritten “cheat sheet” allowed
  – Duration: 2 hours

• Practice Exam
  – Similar setting as Final Exam
  – Optional: Students can substitute the result from one part of the practice exam with the final exam (see example below), but not with an eventual retake.\footnote{Example:
Result practice exam: part A: 11 part B: 0 part C: 8
Result in final exam: part A: 10 part B: 5 Part C: 5
The student will now use result C from the practice exam so that the final grade = 11 + 5 + 8 = 24.}
Prerequisite Knowledge and Skills

• Basic Linear Algebra and Calculus
  – Elementary matrix and vector operations
  – Constrained optimization (Lagrangian)
  – Solving system of equations
  – Recommended Book: Simon and Blume 1994: Mathematics for Economists (Strictly Required: Chapters 1-8, 17-18, 30.2)

• Statistics and Probability
  – Expected value, Variance and Covariance
  – Multivariate Gaussian Distribution

• Basic knowledge of Excel, Python, Matlab, or other related program

Content

• Chapter 1: Arbitrage-free markets and pricing by replication
  – Basic model of financial markets
  – Futures and options
  – Complete and incomplete markets
  – Law of one price and pricing by replication
  – Exploiting arbitrage opportunities
  – First fundamental theorem of asset pricing
  – Second fundamental theorem of asset pricing
  – Pricing kernel and risk-neutral pricing
  – Pricing on a binomial tree
  – Examples: pricing American options and convertible bonds
  – Case study 1: valuation of an executive stock options package

• Chapter 2: Modern portfolio theory and Factor Models
  – Lotteries and risk-aversion
  – Mean-variance preferences
  – Mean-variance portfolio optimization with a single and multiple risky assets
– Mean-variance portfolio optimization without riskless asset
– Minimum variance portfolio, capital allocation line, efficient frontier
– CAPM (derivation and interpretation)
– Empirical test of CAPM
– Case study 2: CAPM and the cost of capital
– Pricing kernel consistent with mean-variance optimization
– Roll’s Critique
– Parameters to estimate a factor models
– Macro, fundamental and statistical factors
– Fama-French 3-Factor model
– Interpretation of factor models
– Smart beta
– Event Studies
– 1-Factor CAPM data mining exercise

• **Chapter 3: Consumption-based Asset Pricing**
  – Utility theory and (Arrow-Pratt) risk aversion
  – Static portfolio optimization in complete and incomplete markets
  – Dynamic portfolio optimization in complete and incomplete markets
  – Dynamic Asset Pricing in complete and incomplete markets
  – Consumption CAPM
  – Equity Premium Puzzle

**Related Textbooks**