

Syllabus

Portfolio Choice and Asset Pricing—MAFIRM Collegio Carlo Alberto

Prof. Matthijs Breugem

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.¹

¹Example:

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
 - Recommended Book: Dekking et al 2005: A Modern Introduction to Probability and Statistics, Understanding Why and How (Strictly Required: Chapters 1-10, 19-22)
- 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

- Cochrane (2010): “Asset Pricing”. ISBN: 978-8122431247
- Ang (2014): “Asset Management”. ISBN: 978-0199959327
- Pedersen (2015): “Efficiently Inefficient”. ISBN: 978-0691166193