

26:711:685 Optimization Models in Finance

Course Description

The objective of the course is to provide the students with knowledge and skill sufficient for correct formulation, analysis and solution of optimization models. Particular attention will be devoted to models applicable to various financial planning problems, including models of risk-averse optimization. Specific topics include optimality conditions for linear and nonlinear programming, duality, mean-risk optimization, optimization of coherent measures of risk, and optimization with stochastic dominance constraints. The course will also prepare the students for independent research on problems involving risk modeling and optimization.

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Week	Topic
1	Introduction to optimization models.
2	Elements of convex analysis.
3	Linear programming models. Optimality.
4	Duality in linear programming. Application to asset pricing.
5	Nonlinear programming models. Optimality.
6	Duality in nonlinear programming. Economic interpretation of Lagrange multipliers.
7	The portfolio selection problem. Two-fund and one-fund theorems.
8	Value at risk.
9	Theory of mean-risk optimization models.
10	Average value at Risk.
11	Coherent measures of risk.
12	Stochastic dominance.
13	Optimization with stochastic dominance constraints.
14	Introduction to multistage models
15	Information on professional optimization software

Prerequisites

26:960:575 Probability and Statistics

Reading List

Lecture Notes.

D.G. Luenberger, *Investment Science*, Oxford University Press, New York 1998

A. Ruszczyński, *Nonlinear Optimization*, Princeton University Press, 2006.

Evaluation Criteria

The course grade will be based on the following components:

1. Homework assignments (30%)
2. Computational projects (20%)
3. Midterm exam (20%)
4. Final exam (30%)