Optimization Methods in Finance

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1 Motivating Examples

- 1. Tracking error and volatility constraints
- 2. Approximating covariance matrices
- 3. Optimization approach to solve such decision problem

2 The Conic Programming Problem

- 1. Definition
- 2. Connection with Linear Programming
- 3. Standard form

3 Second-order cone programming

- 1. Definition
- 2. Ellipsoidal uncertainty for linear programing
- 3. Conversion of quadratic constraints into secondorder cone constraints

4 Semidefinite programming

- 1. Introduction to semidefinite programming
 - (a) Definition
 - (b) Observations on semidefiniteness
 - (c) Cone of positive semidefinite matrices
 - (d) Standard form
 - (e) Properties

2. S-procedure

- (a) Statement
- (b) Usefulness
- 3. Ellipsoidal uncertainty for quadratic constraints
 - (a) Problem formulation
 - (b) Reformulation using S-procedure

5 Examples and CP software

- 1. Solve the first motivating example
 - (a) Quantifying the notion of tracking error
 - (b) Problem formulation
 - (c) Reformulation as the second-order cone programming form
- 2. Demonstrate the use of MATLAB with the Optimization toolbox function