Fall 2018

FIN 372.6 / STA 372.6
Optimization Methods in Finance

TTh 9.30a-11.00a UTC 3.134

Unique: 03470/04540

Course Description

This course deals with optimization methods that help in financial decision-making. It will cover a broad range of relevant quantitative techniques for decision-making. Each technique will be discussed along with relevant theory and will be illustrated and motivated using important applications in finance, such as portfolio selection, option pricing, index tracking and risk management. Specific topics/techniques will include linear, quadratic, nonlinear, and integer programming; dynamic programming; and advanced simulation methods.

The course will extensively use R. This is a high-level language and interactive environment for numerical computation, visualization, and programming. Prior experience is not expected. However, through several group projects, you will acquire basic programming knowledge. The prerequisite for this course is any flavor of STA371 including STA375.

Instructor:

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Office Hrs: Tue 11.00-Noon

Teaching Assistant:

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Office Hrs: Thu 2.00p-3.00p

Textbook

We do not have a prescribed textbook. I will be using the following texts as reference material. You do not need to own any of these. The list is provided here only for the sake of reference.

- "Optimization methods in finance" by Cornuejols and Tutuncu. The mathematical level at which this book is written is significantly higher than what is expected from students in the class. So, do not get alarmed if you skim through this and find it intimidating.
- "Practical Management Science" by Winston and Albright. This book is at slightly a lower level than the class. But it does provide good reading material for reviewing most of the concepts.

Course material and web page

Course announcements, syllabus, assignments, lecture slides and other course material will be posted on Canvas (canvas.utexas.edu). It will also be used to administer assignments, tests and to report grades.

Group Projects

The focus of this course is in solving quantitative problems, especially in teams. Hence the course will center on, about 6, group projects. Since in most work environments you do not decide whom you work with, we will be randomly

Computing

We will mostly use R along with R Studio.

We will go through many demonstrations in class. However, unless specified, it is not necessary to have your laptops during these times. Some tutorial videos and all completed programs from the demonstrations will always be posted on the class website.

assigning teams. Your team will also change for every project. By the end of the semester you would have ideally learnt to work with several team members. Feedback from each member you have worked with will be obtained and anonymously summarized for you.

Project reports are to be submitted on Canvas by midnight on their due date. Please do not wait until the last minute to submit. For each individual, his/her lowest project score will be dropped in calculating the aggregate grade.

Assignments, test and grading

One assignment preceding each Group Project – to be completed individually. These are non-graded. But you will have to complete and submit the assignment to get credit for the group project that follows. If the solutions are below an acceptable threshold, you might be asked to rework them before you will be offered credit.

There will be one final test (tentatively on Dec 13, 9a-Noon) that will account for 30% of your final grade. All group projects together will account for the rest.

Scholastic Dishonesty

The McCombs School of Business has no tolerance for acts of scholastic dishonesty. The responsibilities of both students and faculty with regard to scholastic dishonesty are described in detail in the Policy Statement on Scholastic Dishonesty for the McCombs School of Business. By teaching this course, I have agreed to observe all the faculty responsibilities described in that document. By enrolling in this class, you have agreed to observe all the student responsibilities described in that document. If the application of that Policy Statement to this class and its assignments are unclear in any way, it is your responsibility to ask me for clarification. Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. You should refer to the Student Judicial Services website at http://deanofstudents.utexas.edu/sjs/ or the *General Information Catalog* to access the official University policies and procedures on scholastic dishonesty as well as further elaboration on what constitutes scholastic dishonesty.

Scholastic dishonesty in this course includes copying or collaborating during an exam, discussing or divulging the contents of an exam with another student who will take the test, and use of homework solutions from another student or semester.

Students with disabilities:
The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Division of Diversity and Community Engagement, Services for Students with Disabilities: http://www.utexas.edu/diversity/ddce/ssd/ or at 471-6259, 471-4641 TTY.

Emergency Preparedness
In the first class, we will review the emergency preparedness and emergency plan provided by the university. However, if you would like more information regarding emergency preparedness, visit http://www.utexas.edu/safety/preparedness.

Privacy in Canvas: Information in Canvas is protected by your UTEID login. Please be aware that I will use a merged Canvas site for all sections of the course that I am teaching this semester. This will allow students in other sections to see that you are enrolled in the course and send you email from within Canvas. However, they will not actually learn your email address and no other personal data will be revealed through Canvas. If you have any concerns, please contact the ITS Help Desk at 475-9400 for help removing your name from view of other students.

Tentative Schedule

Lecture	Date	Topic	
1	30-Aug	Introduction	Syllabus, introductions and course overview
2	4-Sep	Linear Optimization	Brief intro/review of Linear Algebra
3	6-Sep	"	Introduction to R
4	11-Sep	"	Intro to Optimization and Formulating Linear Programs
5	13-Sep	"	Solving linear programs in R
6	18-Sep	"	Feasibility and Unboundedness
7	20-Sep	"	Sensitivity Analysis
8	25-Sep	Integer Programming	Intro to Integer Programming
9	27-Sep	"	Solving IPs through linear relaxation
10	2-Oct	"	Binary restrictions, Capital Budgeting
11	4-Oct	"	Logical Constraints, Fixed cost models
12	9-Oct	Nonlinear Programming	Basic ideas and introduction
13	11-Oct	"	Solving with and without constraints
14	16-Oct	"	Quadratic Programming
15	18-Oct	"	Portfolio optimization
16	23-Oct	"	Black Litterman model
17	25-Oct	Simulation	Review of probability, distributions and basic simulation
18	30-Oct	"	Generating discrete and continuous random numbers
19	1-Nov	"	Simulating random processes
20	6-Nov	"	Simulating multi-dimensional processes
21	8-Nov	"	Pricing European options
22	13-Nov	"	Risk Neutral Pricing
23	15-Nov	Dynamic Programming	Intro to Dynamic programming
24	20-Nov	"	Deterministic DPs and the Bellman equation
25	27-Nov	"	Binomial pricing
26	29-Nov	"	American and European option pricing
27	4-Dec	Finals review	Finals review/Buffer class
28	6-Dec	Course summary	Course summary and final review