

FIN 372 / RM 376

Quantitative Methods in Finance

T Th 11.00a-12.30p. UTC 4.134

Unique: 03580 / 04505

Course Description

This course deals with quantitative methods that help in financial decision-making. It will cover a broad range of relevant quantitative techniques in optimization and simulation. 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, risk measures and volatility estimating. Specific topics/techniques will include linear, quadratic, nonlinear, and integer programming; dynamic programming; and advanced simulation methods.

The course will extensively use MATLAB. This is a high-level language and interactive environment for numerical computation, visualization, and programming. Prior experience in MATLAB it is not expected. The prerequisite for this course is any flavor of STA371.

Textbook

The class does 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 and Exam

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 have much say in who you work with, we will be

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randomly 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. This will allow for any unexpected difficulties (with the material, Canvas etc.), which occur much more frequently than one would expect. For each individual, his/her lowest project score will be dropped in calculating the aggregate grade.

There will be one final test.

Grading:

The final test will account for 30% of your final grade. All group projects together will account for the rest.

Tentative Schedule

Lecture	Date	Topic	Subtopic
1	14-Jan	Introduction	Syllabus, introductions and course overview
2	16-Jan	Linear Optimization	Introduction to Optimization
3	21-Jan	"	Graphical Solution Methods and the Simplex
4	23-Jan	"	Solving linear programs using MATLAB
5	28-Jan	"	Sensitivity Analysis and Dual Prices
6	30-Jan	"	Feasibility and Unboundedness
7	4-Feb	"	More linear programs
8	6-Feb	Integer Programming	Intro to integer programming
9	11-Feb	"	Solving IPs through linear relaxation
10	13-Feb	"	Binary restrictions, Capital Budgeting
11	18-Feb	"	Logical Constraints, Fixed cost models
12	20-Feb	Nonlinear Programming	Basic ideas and introduction
13	25-Feb	"	Solving with and without constraints
14	27-Feb	"	Volatility Estimation
15	4-Mar	"	Quadratic Programming
16	6-Mar	"	Portfolio optimization
-	11-Mar	Spring Break	-
-	13-Mar	Spring Break	-
17	18-Mar	Dynamic Programming	Intro to Dynamic programming
18	20-Mar	"	Deterministic DPs and the Bellman equation
19	25-Mar	"	The knapsack problem
20	27-Mar	"	Stochastic DPs
21	1-Apr	"	Option Pricing and the binomial Lattice
22	3-Apr	Simulation	Review of probability, distributions and basic simulation
23	8-Apr	"	Generating discrete and continuous random numbers
24	10-Apr	"	Convergence and errors in simulation
25	15-Apr	"	Common random numbers and variance reduction techniques
26	17-Apr	"	Pricing European options
27	22-Apr	"	Simulating random processes
28	24-Apr	"	Simulation and optimization
29	29-Apr	"	Pricing American options
30	29-Apr	Course summary	Course summary and final review

Computing

We will mostly use MATLAB. The class has obtained special license for you to use MATLAB on your laptops (PC and MAC). So you do not have to purchase the software. Details on how to get it installed will be discussed in class.

We will go through a number of 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.

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.