

Department of Industrial and Systems Engineering
Fall 2012

Analysis of Capital Investments

(ISyE 513)

Lecture: Monday and Wednesday, 4:00PM-5:15PM 1153 Mechanical Engineering Building

Jeff Linderoth

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Office hours: Tuesday and Friday, 8:30AM-9:30AM (also by appt.)

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A second course in quantitative methods for analyzing capital investments in technological environments, both public and private. Replacement models; comparison of alternative investment models; risk analysis; case studies. P: Ind Engr 313, Ind Engr 323, Stat 311.

TEACHING ASSISTANT

This course will have a teaching assistant. Eric may be asked to give some lectures during the course of the semester if I need to be away on travel.

Teaching Assistant: Eric Anderson

Office: 3146 Mechanical Engineering Building

Office Hours: 4-5PM, Tuesday and Thursday.

email: eanderson4@wisc.edu

Eric and I will hopefully be able to answer questions you have. I will be using a Piazza forum (www.piazza.com) to keep track of any questions you have. Students may feel free to help other students on the forum, but *do not* post answers to the forum. You will soon receive an email from Piazza asking you to enroll in the course. If you do not have access to the Piazza forum, please let me know.

COURSE MATERIALS

Required Texts

There are no required texts. However, the course coverage will be split to cover material from the two recommended texts below.

Recommended Text

The following texts are on reserve at the library:

D. Luenberger. *Investment Science* (Oxford University Press, 1998). *This book is a good introduction to many financial investment concepts. We will use this for background and for all coverage of financial investment theory that we do.*

T. Copeland and V. Antikarov. *Real Options: A Practitioner's Guide* (Cengage Learning, 2003). *This is a book about real options, primarily as pertaining to capital investments. It is a practically-oriented book that offers many good "recipes" for using real option analysis for incorporating the impact of uncertainty into decision-making*

Web Site

The course web site will be available through the the Learn@UW system: <https://learnuw.wisc.edu/>. This web site will be very important for the course, as we will use it for making assignments, turning in assignments, and posting lecture notes and other material. At first little material will be posted, but things will be added regularly during the course. Therefore please keep yourself aware of what is there.

COURSE OVERVIEW

This three-credit course introduces students to practical techniques for analyzing capital investments using real options analysis. There is also coverage some coverage of theory behind financial investments.

Objectives

This course is intended to equip you with the following skills and insights:

1. Develop advanced knowledge of theories, tools and techniques for analyzing complex capital investments.
2. Understand classical methodologies for building and valuing portfolios of investment products
3. Be able to recognize, formulate and, using prepared computer packages, solve capital investment problems.
4. Understand the reasons why the applicable techniques work, and the effects on the solutions of variations in the data or in the assumptions underlying the models.
5. Be able to formulate recommendations based on results of the modeling process and communicate them to individuals who are not specialists in the methods used.

There are other course objectives that will become clear as the course proceeds, but those listed above are the most important. The assignments given in this course are specifically designed to evaluate your progress in the above areas.

REQUIREMENTS AND GRADING

Lectures

For instruction, the course will contain twice-weekly lectures. Learning is an interactive process. As such, attendance at lectures and discussion is mandatory, and a (small) portion of your grade will depend on your participation.

Homework

Students learn by doing. There will be (roughly) bi-weekly homework assignments, and a portion of the grade will depend on your performance on these assignments. Eric and I will grade the assignments. Not all problems assigned will be graded.

Exams

There will be two (in-class) quizzes. The first quiz is scheduled to take place on October 15, and the second quiz is scheduled to take place on December 3. The final exam will be held on December 17, from 7:25PM-9:25PM. The format of the quiz and exam will be announced beforehand. Portions of the exam may *require* the use of a computer, so if you do not have a laptop computer, you may need to borrow one from the library for the quiz.

Grading Scheme

The grade will be based on the following weighting of components.

- 5% Participation
- 30% Homework
- 20% Quiz #1
- 20% Quiz #2
- 25% Final Exam

I typically grade on a curve. Information about your standing in the class and grade during the class will be given after the first and second quiz. Grade distribution for each assignment can be found on the [learn@uw](#) source page.

COURSE STATEMENTS

Homework and Case Study Submission Policy

Homework exercises will be assigned as a means to help you understand the concepts and to give you practice in applying them. They will generally be due on Wednesday morning. Each assignment will be (partially) graded and the grades returned to you. Homework will be submitted electronically through the web site.

In general, **late homework will receive no credit**. You typically will have at least one week or more to complete the homework assignment, so it is hard to imagine a reasonable excuse. Please complete your work in advance of the deadline, just in case “something comes up”, and you are unable to complete the assignment at the last minute.

Learning is a collaborative process, so you are encouraged to verbally discuss the course work, including homework, with other students. However, work that you hand in *must have been prepared by you alone*. Further, you must cite all collaborators, as described in the section on “Use of External Sources” below.

Schedule Conflicts

Sometimes students have legitimate conflicts that prevent them from taking an exam at the scheduled time. In accordance with University policy, I request that you notify me of any such conflicts within the first two weeks of class. If for some reason you become aware of such a conflict

after the first two weeks of class, I request that you notify me as soon as you become aware of the conflict. In such cases, I will work with you to schedule a make-up exam, provided that you have a legitimate reason.

Academic Integrity

You are encouraged to share ideas with each other on class assignments **orally**. However, you must ultimately demonstrate your understanding of the material by writing up your own solutions without the help of other students or their written work, including source code of the models you build. You may discuss the assignments with your classmates. However, you may not share any code **or spreadsheets**, copy a solution from another person, or carry out an assignment together. Discussion should **only involve verbal communication**. **All assignments need to be written up entirely separately.**

Submitting someone else's work as your own is academic misconduct. Such cheating and plagiarism will be dealt with in accordance with University procedures (see the Academic Misconduct Guide for Students: <http://www.wisc.edu/students/misconduct.htm>.)

Use of External Sources

Extensive materials related to the topics we will be covering in this class are available on the Internet. You may use supplementary material to enhance your understanding of the course material. If you use external references of any kind, even if they are not quoted verbatim, **YOU MUST CITE THEM!** This rule will be strictly enforced and violations will be dealt with harshly. Again, I encourage you to seek outside sources, but **you must acknowledge the source of any ideas that are not your own.**

You are all grown-ups. **Do not cheat.** If you have any question or concern about what constitutes cheating or improper collaboration, *please* contact me. If I suspect that you are cheating, you will make me sad. Then you will make me mad. Do not do this. If you don't think that Eric and I will know if you are copying or inappropriately using other people's work to do your assignments, you are wrong.

SCHEDULE

I have never taught this course before, so I do have a good feeling about how fast we will progress through the material.

I am planning on covering the following material before the first quiz on October 15:

- Theory of Interest (LUENBERGER Chap 2, (Little bit) of 3)
- Applied Interest Rate Analysis (LUENBERGER Chap 5)
- Single period decision problems (LUENBERGER Chap 6-Chap 9)

The second portion of the course will focus almost exclusive on (real) options and will cover material from LUENBERGER Chap 10-Chap 14 and COPELAND Chap. 1, and Chap. 4-8.

The learn@uw web site will contain a (frequently updated) document `schedule.pdf` that should contain up-to-date information about homework assignments, their due dates, and topic content and coverage. I will also make frequent announcements about