REAL OPTION ANALYSIS
FINANCE 5325
Department of Finance
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Course Description: Real option analysis is an extension of the traditional DCF models by considering the value of flexibility (the ability to wait and learn before investing) associated with real investment opportunities. This course presents the motivation and the methods for applying real option analysis (ROA) to value the optionality or flexibility associated with various real investment opportunities. Real options analysis is most useful for evaluating investments with great uncertainty and flexibility (new product development, R&D activity, patents, joint ventures, emerging markets etc.). ROA can also be used to value a firm and is especially relevant for start-up firms and technology based firms.

Course Objectives:

1. to provide you with a conceptual understanding of real option analysis such that you can enter conversations regarding its applications,

2. to create a mindset such that you are always thinking about and looking out for real options,

3. to provide you with the building blocks of real option analysis in order for you to be able to value common simple real options,

4. to provide you with the tools to value complex real options, and

5. ultimately, to generate an interest in this area so that you will continue to learn more about this subject in the future after this class is over.

Requirements: The requirements for this course are that you actively participate in the learning process, you complete the four problem set assignments, you complete the real option application project, you complete a take-home midterm, and you complete an in-class comprehensive final exam.

Course Participation: The more we participate, the more we will learn. Therefore, you are expected to actively participate in the learning process by reading, thinking and talking about the material related to the course and by working through the assigned problems in order to be familiar with the issues to be discussed in class. The level and quality of your participation which may occur in class, before or after class, through e-mails, over the phone, in my office, or anywhere else people communicate, and will make up 10% of your grade.

Problem Set Assignments: There will be four assignments that will consist of a set of problems to solve in an attempt to provide you the opportunity to practice applying the various models presented in class. These problem sets can be worked in groups of no more than two students and will make up 20% of your grade. **Hard copies of the assignments should be turned in at the beginning of class (excel files should be submitted via email)**.

Take-Home Midterm: There will be a take-home midterm which will consist of a problem set to be handed out on Monday, April 24th and will be due on Monday, May 1st. This midterm must be completed individually (no group collaboration) and will make up 20% of your grade. **Hard copies of the midterm should be turned in at the beginning of class (excel files should be submitted via email)**.

Real Option Application Project: You are asked to identify a real option application, estimate/assume reasonable inputs and develop a model(s) to value this option. Accompanying your valuation model will be a short (approximately two or three pages) write-up describing the situation that creates the option, the procedures used to estimate inputs, the model used to value the real option, the results, and the implication of your analysis. This project can also be worked in groups of no more than two students. An initial description of your real option application (completing the template) is due Sunday, May 7th (via email) and the final report is due Monday, June 5th. An alternative (for a few groups) to handing in a write-up of your project would be to do an in-class presentation on June 5th. This project will make up 25% of your grade. **Hard copies of the report or presentation should be turned in at the beginning of class (excel files should be submitted via email)**.

Final Exam: The final exam is a closed book, comprehensive, in-class exam on Friday, June 9th and will make up 25% of your grade.

Required Readings: Various Articles available via Canvas (click on Modules).

Recommended Readings: Copeland and Antikarov, Real Options: A Practioner's Guide, Texere, 2001.

Supplementary Readings: Ross, Westerfield, & Jaffe, Corporate Finance, 9th Ed.,
Chapters 5 & 6: Review of Traditional Capital Budgeting
Chapter 7 (pages 218-225): Intro. to Real Option Analysis
Chapters 22: Option Valuation Models

Brealey, Myers, & Allen, Principles of Corporate Finance, 9th Ed.
Chapters 6 & 7: Review of Traditional Capital Budgeting
Chapter 21: Understanding Options
Chapter 22: Valuation of Options
Chapter 23: Real Options

Trigeorgis, Real Options: Managerial Flexibility and Strategy in Resource Allocation, The MIT Press, 1996.

Amram and Kulatilaka, Real Options: Managing Strategic Investment in an Uncertain World, Harvard Business School Press, 1999

STUDENTS WITH DISABILITIES

Seattle University is committed to providing students with disabilities an equal opportunity to participate in all its classes and activities. This goal is fundamental to our belief in social justice. The university provides supplemental support services through the Disabilities Services office. Please contact the Disabilities Services office to receive accommodation.

ACADEMIC HONESTY

We expect that you will abide by the University's Academic Honesty Code. "Seattle University is committed to the principle that academic honesty and integrity are important values in the educational process and that violations in this area should be dealt with in the appropriate manner."

Link: http://www.seattleu.edu/home/learning_teaching/bulletins_of_information/

If you are not sure about whether a particular action is acceptable according to the Academic Honesty Code, you should check with me *before* engaging in it. Verified instances of plagiarism, cheating and the usage of unauthorized sources in exams, papers and other academic projects will lead to a severe penalty.

COURSE SCHEDULE & ASSIGNMENTS

Date	Topic, Readings, and Assignments

3/27 **I. Introduction to Real Option Analysis**

Readings:
- Business Week, *Exploiting Uncertainty*, June, 1999
- Triantis and Borison, *Real Options: State of the Practice*, JACF, Summer 2001
- Copeland and Keenan, *How Much is Flexibility Worth*, The McKinsey Quarterly, 1998
- Eapan, *Accidental Real Options Practitioner*,JACF, Winter 2003
- Copeland & Antikarov - Chapters 1 & 2

4/3 **II. Valuing Real Options Using the Black-Scholes Option Pricing Model**

Readings:
- Arnold & Shockley, *Value Creation at Anheuser-Busch: A Real Option Example*. JACF, Summer 2001
- Damodaran, *The Promise of Real Options*, JACF, summer 2000

Assignment: Problem Set 1, Due 4/10

4/10 **III. Valuing Real Options Using the Binomial Option Pricing Model**

Readings:
- Hervert, *Real Options Primer: A Practical Synthesis of Concepts and Valuation Approaches*, JACF, Summer 2001
- Brealey, Myers, & Allen, *Brealey, Myers Allen on Real Options*, Journal of Applied Corporate Finance, Fall 2008
- Copeland & Antikarov – Chapter 4 (pages 95-117)

Assignment: Problem Set 2, Due 4/24

4/17 **No Class – Easter**

4/24 **IV. Additional Valuation Applications Using the Binomial Option Pricing Model**

Readings:
- Royer, *Why Bad Projects are so Hard to Kill?*, Harvard Business Review, February 2003
- Fink, *Reality Check*, CFO magazine, September 2001
- Copeland & Antikarov – Chapter 5

Take-Home Midterm, Due 5/1

5/1 **V. Advanced Valuation Applications Using the Binomial Option Pricing Model**

Readings: Brous, Buchanan, and Orcutt, *Valuing Raise Your Rate Certificates of Deposit,* 2014

Real Option Application Project Description, Due Sunday 5/7 (submit via email)

5/8 **VI. Estimating the Value and Volatility of the Underlying Asset**

Readings: Copeland & Antikarov – Chapter 9

Assignment: Problem set 3, Due 5/15

5/15 **VII. Valuing Compound Real Options**

A. Valuing Simultaneous Compound Options
B. Valuing Sequential Compound Options

Readings: Shockley & Et.al., T*he Option Value of an Early-Staged Biotechnology Investment*, JACF, Winter 2003
Copeland & Antikarov – Chapter 6, pages 163-171
Copeland & Antikarov – Chapter 6, pages 171-179.

Assignment: Problem Set 4, Due 5/22

5/22 **VIII. Valuing Rainbow Options**

Readings: Copeland & Antikarov – Chapter 10
Brous, *Valuing an Early-Stage Biotechnology Investment as a Rainbow Option,* JACF, Spring 2011

Real Option Application Project, Due 6/5

5/29 **No Class: Memorial Day**

6/5 **Course Wrap-Up & Student Presentations of Their Real Option Application Project**

6/9 **Final Exam**

Important Due Dates:

Monday 4/10	Problem Set 1
Monday 4/24	Problem Set 2
Monday 5/1	Take-Home Midterm
Sunday 5/7	Real Option Application Project Description
Monday 5/15	Problem Set 3
Monday 5/22	Problem Set 4
Monday 6/5	Real Option Application Project
Friday 6/9	Final Exam