

IOE 453 – DERIVATIVE INSTRUMENTS

University of Michigan – Winter 2008

IOE 1610, Monday/Wednesday 10:30 – 12:00 p.m.

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 Wednesdays, 1:00 – 2:30 p.m., LBME 1121

Course Objective:

To provide you with a thorough understanding of the theory of the arbitrage-free derivatives pricing and to introduce you to the mathematical and numerical tools necessary for that.

Course Outcomes (ABET Course Outcomes):

By the end of the semester you will learn about

1. The basics of derivative securities and derivative securities markets.
2. Mathematical and numerical tools required for implementing theoretical derivatives pricing models.
3. The use of derivative instruments for financial risk management and for financial engineering.

Prerequisites:

IOE 201 -- *Economic Decision Making*.
IOE 365/265 -- *Probability and Statistics for Engineers* or
IOE 366 -- *Linear Statistical Models*.
IOE 310 -- *Introduction to Optimization Methods*.
Or Instructor's consent.

Required Textbook:

John C. Hull: "*Options, Futures, and Other Derivatives*", 6th edition, Prentice Hall (will refer to it as Hull)

I strongly encourage you to avail yourself to the resources on the CD-ROM that comes with the textbook. These resources not only will help you to master the material better, but also will allow you to gauge your progress in the course.

Other Course Materials:

Other course-related materials (e.g. lecture notes, articles, and assignments) will be made available at the instructor's discretion. Although the textbook and the lectures will give you a good foundation in derivative instruments, if you are planning to become a finance

professional, it is imperative that you keep up with the current financial developments. I strongly urge you to read the financial section of a major newspaper (for example, the *New York Times* or the *Wall Street Journal*) frequently. The *New York Times* and the *Wall Street Journal* are available from UM libraries. In addition, you can access the *New York Times* for free at www.nytimes.com (after registration). You can subscribe for a semester to the *Wall Street Journal* at <http://subscribe.wsj.com/semester>. The cost of student subscription to the *Wall Street Journal* is \$19.95. If you decide to subscribe, please, use “V. Babich” as the referring professor. It is also useful to become familiar with good business magazines. I recommend *The Economist* (available from the UM libraries). Other possible choices are *Business Week* and *Barron’s*.

Reading financial sections of newspapers requires some preparation and the knowledge of financial terms and jargon. If you are unfamiliar with this jargon, a good source to learn it is “The Financial Times Guide to Using The Financial Pages”. Also, check out documents posted on the IOE 453 CTools site (<http://ctools.umich.edu/>). Many investment sites have excellent tutorials and help sections (e.g. <http://finance.yahoo.com> is free and award-winning). You can turn to them for a quick, but comprehensive explanation of financial concepts. Finally, do not hesitate to look up Wikipedia entries or to google for the financial terms unfamiliar to you.

CTools site for IOE 453 and E-mail Communications:

Various course documents, announcements, and other resources will be posted on the CTools site for IOE 453: <http://ctools.umich.edu/>. Please, make sure to check the site often. I encourage you to post questions about exams, assignments, lectures or anything else pertinent to the course on the appropriate “Discussion” threads on the IOE 453 CTools site. Either the GSIs or myself will post an answer to your question fairly quickly (usually within 24 hours). I encourage you to use CTools to ask all non-confidential questions instead of e-mailing them because this benefits everyone in the class. I have set up space under “Resources\Interesting Articles” so that everyone can modify it. Please, feel free to post any interesting, course related, articles there.

The GSI or I will usually respond to your e-mails within 24 hours (sometimes longer if either one of us is traveling). You might be able to get an answer to your non-confidential question faster by posting it on CTools.

Course Policies

Policies Adherence:

For all of us to function effectively in a large course like IOE 453 it is essential that everyone, without exceptions, strictly follows the course policies listed in this syllabus. Therefore, please, read them very carefully and contact me if you have any questions. By taking the course you are agreeing to follow these policies.

Homework:

Homework assignments provide practice, help fix ideas introduced in class or in the text, and constitute a partial guide as to what to expect on exams. Unless otherwise indicated, every homework problem is worth 10 points. Your answers will be graded for readability, comprehensiveness, and brevity.

Cases:

Case studies are excellent learning tools because they allow you to tackle messy, unstructured problems you are likely to encounter in your future careers. You will have an opportunity to work on three business cases in this course: American Barrick Resources Corp.: Managing Gold Price Risk, Pine Street Capital Case and Sally Jameson Case. Further case instructions will be posted on CTools site for IOE 453 (<http://ctools.umich.edu>).

Submission of Assignments:

Unless otherwise indicated, all assignments must be submitted **electronically** on the CTools course site by 11:45 pm of the day the assignment is due. Be sure to make a copy of your homework before turning it in. Please, make sure that you not only uploaded, but also **submitted** your file and, please, verify that **CTools shows your assignment as submitted**. Your file should be readable by the standard software (either Adobe Acrobat, MS Word, or MS Excel, in the order of preference). Unfortunately, our software cannot read files in MS Office 2007 format. If you are using MS Office 2007, please, save your file in the Office 2003 format before submitting it. CTools dates all submission and marks all assignments, which are even a second past the deadline, as **late**. For every 15 minutes that an assignment is late the team will lose 1% of the grade. For example, if an assignment is due at 11:45 pm on Thursday and a team's submission is marked by CTools at any time between 11:45 pm (Thursday) and 12:00 am (Friday), the team losses 1% and the team's score is multiplied by 0.99. If a team's submission is marked by CTools at any time between 0:31 am and 0:45 am (Friday), the team's score will be multiplied by 0.96 and so on. **No points will be given after the solutions are posted** (we will make an effort to post solutions a day after a homework is due). You should make every effort to turn in your assignment before the deadline if you wish to receive full credit for your work. Too many times students lose points (for themselves and their teammates) by not following these submission instructions. To be fair to everyone in the course, there will be no exceptions to the submission rules. A good

strategy to avoid losing points unnecessarily is for every team member to assume the responsibility of double-checking that the team report is submitted on time. I would like to emphasize that **the entire team will lose points for late submissions** regardless who was actually responsible to the submission.

Quizzes:

Periodically you may be given short in-class quizzes. Quizzes are intended not only to help you and me to gauge your understanding of the material, but also help you to get used to the pressure of an in-class test, such as a mid-term or a final exam. Unless otherwise indicated, every quiz is worth 10 points.

Exams:

There will be two exams (mid-term and final) in this course. The mid-term exam will be given on Wednesday February 20, 2008 from 10:30 a.m. to 12:00 p.m. Location(s) for the mid-term exam will be announced in class. The final exam will be given on Monday April 21, 2008 from 4:00 p.m. to 6:00 p.m. Location(s) for the final exam will be announced in class. Students must take exams at the scheduled date and time. Please, schedule your other activities, including travel, so that they do not conflict with the exam times. As a general rule there will be no make-up exams. If there are highly unusual and absolutely unavoidable extenuating circumstances, the instructor may agree to change the exam time (see section on make-ups and excuses for the documentation you must provide in such a case). However, all changes must be scheduled with the instructor at least **2 weeks** prior to the original examination date. Having several exams on the same day does not constitute an extenuating circumstance. No one will be excused from taking an exam. All exams are in-class, closed-book and closed-notes exams (you are allowed to bring a one-side of a page formula sheet for the mid-term exam and two-side of a page formula sheet for the final exam). The homework and the quiz questions provide a rough guide to the level and difficulty of the exam questions. While the final exam will emphasize the material covered in the second half of the semester, the final exam is comprehensive and may contain questions that refer to the earlier material.

Teamwork:

You are required to work in teams (four or five students per team) on homework assignments and cases. A team is expected to submit a single, jointly-written report per assignment. Make sure to list all of the team members who have substantially contributed to the work on the assignment on the title page of your report. I would like to caution you against granting an undeserved credit. By raising somebody's grade unfairly, you are lowering your own and everyone else's grade at the same time. To make sure that all members of your team receive a fair grade, you may be asked to assess their contribution to the team several times during the semester. I urge you to make every effort to contribute to the team, because, if your team members indicate that your contribution was greater than the team's average, you will receive more points than the average for your team. However, if your team members indicate that you have not pulled your weight, you will receive fewer points than the rest of the team. Zero contribution will earn you zero points.

After the midterm exam, you will have an opportunity to dissolve your existing teams and form the new ones, if you wish.

Please, do not hesitate to contact me if you need any help or if you perceive a potential problem. However, be aware that I might not be able to help you if your team has fired you for not doing your fair share of work.

Only individual work is allowed on the exams and quizzes.

Ethics and etiquette:

Any work that you turn in under your name must be your own (see also **Teamwork**). If you use sources other than the textbook you must cite them. All students are expected to be familiar with the **Engineering Honor Code** (see <http://www.engin.umich.edu/students/honorcode/>) and are bound by its requirements. Cheating and plagiarism will not be tolerated. Finally, please, bring a mature, professional attitude to class. Your effort to arrive on-time and not to chat or engage in extraneous activities during class will be greatly appreciated. Eating during class is strongly discouraged.

Computer use:

You are not permitted to use a computer or any other device that is or can be net-connected during class unless otherwise indicated by the instructor.

Regrades:

If you believe an exam or a problem set question was graded in error and wish to have it regraded, you must **submit the entire exam/problem set to the GSI together with a written explanation for requesting the regrade**. This must be done within **one week** from the date the exam/problem set was returned. Be aware that an exam/problem set that is regraded will result in all of the graded problems being regraded so that you may not only gain but also lose points by resubmitting.

Make-ups, Excuses, etc.:

No make-ups will be offered. However, I will drop one of your lowest quiz grades. If you anticipate a problem, please, let me know at once. If you missed (or have to miss) an assignment or a class due to an illness or unavoidable extenuating circumstances, you must bring a note from your doctor or from the dean's office or from another office that can verify and support your request. Again, to be fair to everyone in the course, no exceptions will be made to this rule either.

Attendance and Class Participation:

Active class participation is important. You are expected to come to class prepared for the day's discussion (please, see section on preparation). Your class performance may be factored into your final grade. Evidence supports the assertion that poor performance is strongly correlated with poor attendance. Therefore, class attendance may be monitored.

Preparation:

Before the class you should read the relevant chapters from the textbook and attempt to

answer questions from the “Questions and Problems” section at the end of the chapter. After the class, you should re-read the pertinent chapters more carefully and solve the assigned homework problems.

Name cards:

Please, bring a name card to class. This will help not only the instructor and GSIs, but also other students. Your name card will allow the instructor to keep track of your class participation.

Assistance:

In this course, as you will see, we will cover the material at a very fast pace. It is your responsibility to keep up with the material. If you find that you are falling behind and you feel that the course material is extremely difficult, do not hesitate to seek help. Attend review sessions with the GSI. Stop by the instructor’s office during office hours (or make an appointment if you cannot meet during regular hours). Ask other students. Consider hiring a tutor. Remember that the longer you wait before dealing with the problem the harder it is to fix it. Nobody will be able to help you (despite our best intentions) if you wait until the week before the final (or midterm) exam. We will try to use CTools as a media for providing assistance as much as possible. Further instructions on using CTools will be distributed in class.

Feedback:

If you have any problems with the course, the instructor, or the GSI or if you have any ideas on how to make this course more useful, understandable, or enjoyable, please, do not hesitate to contact the instructor at any time. **Your feedback is greatly appreciated.** However, please, recognize that not all suggestions can be immediately implemented. For example, I often receive comments about the very same lecture that “it was too slow” and “it was too fast”. It is very helpful to me if the subject line of your e-mail contains “IOE 453”. This way I will know which e-mails are important.

Grading (approximate):

Grading will be done relative to the performance of all the students in the course. An approximate distribution of weights follows

Cases	10%
Quizzes and Homework	30%
Mid-term Exam	25%
Final Exam	35%

Bonus Points:

You will have multiple opportunities to earn bonus points in this course.

The instructor and the GSIs will give extra points to the students who help with the course (e.g. by assisting other students, providing interesting, course related examples or articles, actively participating in the class discussion, etc.)

You may receive participation points by posting relevant and interesting materials on CTools or by presenting them in class. I have set up space under “Resources\Interesting Articles” so that everyone can modify it. Please, feel free to post your articles there. Please, talk to me if you would like to make a presentation in class.

We will have in-class activities (e.g. games), which will allow teams or individual students to earn bonus points.

To encourage cooperation among the team members, bonus points will be awarded based on each team’s joint achievements. Specifically, for each exam, a team will be awarded extra-credit bonus points if every team member receives a grade in the top 25% of the class.

The instructor and the GSI may also take away points for unprofessional, unethical, or disruptive behavior.

Course Outline

Below is a tentative course outline. We may adjust it from time to time depending on our progress.

7-Jan-08	Syllabus, Introduction, Chapter 1
9-Jan-08	Introduction, Chapter 1
14-Jan-08	Futures Markets, Chapter 2
16-Jan-08	Hedging Strategies Using Futures, Chapter 3
21-Jan-08	<i>No class: Martin Luther King, Jr. Birthday</i>
23-Jan-08	Interest Rates, Chapter 4
28-Jan-08	Interest Rates, Chapter 4
30-Jan-08	Forward and Futures Prices, Chapter 5
4-Feb-08	Interest Rate Futures, Chapter 6
6-Feb-08	Interest Rate Futures, Chapter 6
11-Feb-08	Options Markets, Chapter 8
13-Feb-08	Stock Options, Chapter 9
18-Feb-08	Trading Strategies, Chapter 10, American Barrick Case
20-Feb-08	Mid-term Exam
25-Feb-08	<i>No class: Mid-Winter Recess</i>
27-Feb-08	<i>No class: Mid-Winter Recess</i>
3-Mar-08	Binomial Trees, Chapter 11
5-Mar-08	Black-Scholes Model, Chapter 13 (excl. Section 13.6)
10-Mar-08	Black-Scholes Model, Ch 13
12-Mar-08	Options on Stock Indices, Currencies, and Futures, Ch 14
17-Mar-08	Options on Stock Indices, Currencies, and Futures, Ch 14
19-Mar-08	The Greek Letters, Ch 15, Pine Street Capital Case
24-Mar-08	Pine Street Capital Case
26-Mar-08	Volatility Smiles, Ch 16
31-Mar-08	Numerical Procedures, Ch 17
2-Apr-08	Numerical Procedures, Ch 17
7-Apr-08	Numerical Procedures, Ch 17
9-Apr-08	Financial Weapons of Mass Destruction, Ch 32
14-Apr-08	Sally Jameson Case
21-Apr-08	Final Exam