

Financial Risk Management

Fall 2010

Professor Alessio Saretto

Office: CBA 6.270

Office hours: Monday 11:00 to 12:00 and by appointment.

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Class hours: M-W 09:30 to 11:00 in GSB 3.1310

Course web page: via Blackboard

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Course Description

This course is designed to improve the student's understanding of the energy market with particular accent to how financial derivatives are used. The emphasis of the course is on developing the analytical skills necessary to utilize the basic mathematical models which are most commonly used to price derivatives. Besides the technical aspects that characterize the pricing of derivative securities, various institutional details relative to the energy markets will be presented.

After completion of this course, students will have acquired the tools needed to price basic energy derivatives and to use these financial instruments in the context of managing investments by energy firms. There is a long list of applications suitable to the basic concepts that will be introduced in the class, for example: pricing of basic energy options, hedging market, credit and currency risk, evaluating financing alternatives (such as convertible debt or debt with warrants attached), evaluating tax arbitrage strategies (such as converting short term gains to long term gains by "locking in" positions with a hedge strategy), investing cash in various short term instruments (such as asset backed securities with prepayment options), valuating alternatives for financing acquisitions (such as a stock for convertible bond swap).

This course assumes that this is the students' first in-depth course in analysis and use of derivative securities. However, the course is fairly quantitative and the students should be familiar with the basic concepts of financing decision making, calculus, probability and statistics (for example basic statistics such as mean, variance, and correlation, and how to interpret regression analysis). Students should also be comfortable using data analysis packages such as Excel, Matlab or equivalent.

Course grades will be determined as follows

Midterm I	20%
Midterm II	20%
Midterm III	20%
Assignments	30%
Class participation	10%

Final grades will be given on a curve, according to official University guidelines.

Exams

The exams are closed book however you are allowed to have one 8.5”x11” sheet of notes. The exams will be a combination of true/false, short answer essays, and problems. You must take the exams at the scheduled times. I expect that you arrive on time, exit quietly, and conduct yourself properly during the exams.

Assignments

There will be 8 short on-line quizzes in the form of multiple choice questions. The link to the on-line quizzes will be available on Blackboard. Each of these quizzes will have questions that cover material presented in the previous class. These assignments are to be done individually. Furthermore, you will have to complete 6 homework assignments and hand them in to be graded. These assignments can be done in small groups of 3-4. All assignment are due before the beginning of class as indicated below in the course outline. Each assignment has an equal weight towards the 30% of the grade.

Academic Integrity

Each student in this course is expected to abide by the University of Texas Honor Code. [See the UT Honor Code below.] Unless it is a group assignment, any work submitted by a student in this course for academic credit will be the student’s own work. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action. For more details, please see UT’s policy regarding academic integrity (http://deanofstudents.utexas.edu/sjs/acint_student.php).

University of Texas Honor Code:

“The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.”

Attending the Class

The class is mainly structured as a series of lectures. Since the topic is a bit technical there is a lot of material that I need to cover. That does not mean that there will not be any class discussion, nonetheless you should expect less than what is typical for an MBA class. Please be in class before the lecture starts. If, by some serious reason, you are late, enter the classroom from the back door. You are not allowed to use any computer, personal data assistant, and/or smart phone while in class. You should, however, bring a scientific calculator that you will use to solve problems in class. Note that I will not take attendance and therefore class participation points will be awarded only based on active participation during class.

Students with disabilities

Any student with a documented disability who requires academic accommodations should contact Services for Students with Disabilities (SSD) at (512) 471-6259 (voice) or 1-866-329-3986 (video phone). Faculty are not required to provide accommodations without an official accommodation letter from SSD. Please notify me as quickly as possible if the material being presented in class is not accessible (e.g., instructional videos need captioning, course packets are not readable for proper alternative text conversion, etc.). Contact Services for Students with Disabilities at 471-6259 (voice) or 1-866-329-3986 (video phone) or reference SSD's website for more disability-related information: http://www.utexas.edu/diversity/ddce/ssd/for_cstudents.php

Readings

The required textbook for the course is:

Hull, John, *Options, Futures, and Other Derivatives*, Prentice Hall, 7th edition, 2008.

Suggested (but not required) readings are:

- Garp, *Foundations of Energy Risk Management*, Wiley and Sons, 2009.
- Eydeland, Alexander and Kristof Wolyniec, *Energy and Power Risk Management*, Wiley and Sons, 2003.
- Pilipovic, Dragana, *Energy Risk*, McGraw Hill, 2nd Edition, 2007.

I will also provide a set of lecture notes before class. The lecture notes will be also posted on the course website. These notes are *not* a substitute for attending classes since the class discussion will add value to the notes.

Hours

The class is scheduled to meet every Monday and Wednesday from 9:30 to 11:00 in GSB 3.130. I will have office hours on Monday from 11:00 to 12:00 and by appointment. An email will be sufficient to schedule a visit.

Course outline

This is a tentative outline of the topics that will be covered. There might be some slight variation due to time constraints. You are expected to read the material in the text (all chapters refer to the required textbook, unless otherwise noted) prior the relevant lecture.

WEEK 1

Wednesday August 25:	Course Outline and Introduction
Readings:	No assigned reading for this class.
Assignment:	No assignment is due before this class session.
Goal:	Introduction to the energy market and commodities and their basic functioning.

WEEK 2

Monday August 30:	Introduction to Derivatives
Readings:	Chapter 2 - Mechanics of futures markets Chapter 7 - Swaps Chapter 8 - Mechanics of options markets
Assignment:	No assignment is due before this class session.
Goal:	Introduction to derivative contracts (forward, futures, swaps and options).
Wednesday September 1:	Basic Use of Derivatives
Readings:	Chapter 2 - Mechanics of futures markets Chapter 7 - Swaps Chapter 8 - Mechanics of options markets
Assignment:	Quiz 1 (link on Blackboard) is due by 9:30am.
Goal:	To understand the common uses of derivatives (hedge, speculate and lock in arbitrage) and the main idea behind the law of one price.

WEEK 3

Monday September 6:	No Class
Wednesday September 8:	Risks in the Energy Value Chain
Readings:	No assigned reading for this class.
Assignment:	Quiz 2 (link on Blackboard) is due by 9:30am.
Goal:	To understand the structure of the energy industry, the so called value chain, and the sources of risk that affect firms operating in the energy industry.

WEEK 4

Monday September 13: Futures and Forwards
 Readings: Chapter 5 - Determinants of forward and futures
 Assignment: No assignment is due before this class session.
 Goal: To understand the basic functioning of a forward and futures contract and its application to energy commodities.

Wednesday September 15: Swaps
 Readings: Chapter 7 - Swaps
 Assignment: Quiz 3 (link on Blackboard) is due by 9:30am.
 Goal: To understand the basic functioning of a swap contract and its application to energy commodities.

WEEK 5

Monday September 20: Options
 Readings: Chapter 8 - Mechanics of Options Markets
 Chapter 9.1, 9.4 - Properties of Stock Options
 Chapter 10 - Trading Strategies Involving Options
 Assignment: Quiz 4 (link on Blackboard) is due by 9:30am.
 Goal: To understand the basic properties of options; the basic pricing relationships and the possible payoffs that can be obtained combining different options.

Wednesday September 22: Outside speaker — Robert Jones
 Assignment: Quiz 5 (link on Blackboard) is due by 9:30am.

WEEK 6

Monday September 27: Midterm I
 Reading: Study!
 Goal: Do as well as you can!
 Note: You are allowed a one page, single side, cheat-sheet. Please bring a scientific calculator. No food is allowed during the exam. If you finish early, please, gather your things quickly and exit the room quietly.

Wednesday September 29: Introduction to Stochastic Behavior of Prices
 Readings: Chapter 12 - Wiener process and Ito's lemma
 Assignment: No assignment is due before this class session.
 Goal: To understand the rationale behind a very useful valuation method called Monte Carlo simulation.

WEEK 7

Monday October 4: **Black and Scholes Model**
 Readings: Chapter 13 - The Black-Scholes-Merton model
 Assignment: Homework 1 (file on Blackboard) is due in class.
 Goal: To understand the basic working of the Black and Scholes pricing formula.

Wednesday October 6: **Binomial Trees (part I)**
 Readings: Chapter 11 - Binomial Trees
 Assignment: Quiz 6 (link on Blackboard) is due by 9am.
 Goal: To understand how to price an option by setting it equal to the value of a portfolio that replicates the value of the option at any point in time.

WEEK 8

Monday October 11: **Binomial Trees (part II)**
 Readings: Chapter 19 - Binomial Trees
 Assignment: Homework 2 (file on Blackboard) is due in class.
 Goal: To extend the binomial tree pricing method to take into account of dividends and early exercise.

Wednesday October 13: **Trinomial Trees**
 Readings: Chapter 19.4 - Alternative Procedures for Constr. Trees
 Chapter 30.7 - A General Tree-Building Procedure
 Assignment: Homework 3 (file on Blackboard) is due in class.
 Goal: To extend the binomial tree pricing method to take into account of mean-reversion in prices.

WEEK 9

Monday October 18: **Outside speaker — Ehud Ronn**

Wednesday October 20: **Midterm II**
 Reading: Study!
 Goal: Do as well as you can!
 Note: You are allowed a one page, single side, cheat-sheet. Please bring a scientific calculator. No food is allowed during the exam. If you finish early, please, gather your things quickly and exit the room quietly.

WEEK 10

Monday October 25:	Volatility Estimation
Readings:	Chapter 18 - Volatility smiles
Assignment:	Quiz 7 (link on Blackboard) is due by 9am.
Goal:	To understand how to calculate the volatility of an asset from historical observations of price changes.
Wednesday October 27:	Implied Volatility and Volatility Surface
Readings:	Chapter 18 - Volatility smiles
Assignment:	Homework 4 (file on Blackboard) is due in class.
Goal:	To understand how to extract a market estimate of volatility from the price of an option.

WEEK 11

Monday November 1:	Outside speaker — Vincent Kamisky
Assignment:	Homework 5 (file on Blackboard) is due in class.
Wednesday November 3:	Intro to Models with Stochastic Volatility
Readings:	Chapter 18 - Volatility smiles
Assignment:	No assignment is due before this class session.
Goal:	Introduction to stochastic volatility. To understand how to price an option with stochastic volatility by Monte Carlo Estimation.

WEEK 12

Monday November 8:	Valuing Energy Options
Readings:	No assigned reading for this class.
Assignment:	Homework 6 (file on Blackboard) is due in class.
Goal:	To understand how energy specific options, such as swing and crack spread options, work.
Wednesday November 10:	Outside speaker — TBA

WEEK 13

Monday November 15:	A Closer Look at the Electricity Market
Readings:	No assigned reading for this class.
Assignment:	No assignment is due before this class session.
Goal:	To understand how the spot and forward market for electricity is organized - on-peak and off-peak, next hour and next day
Wednesday November 17:	Outside speaker — TBA

WEEK 14

Monday November 22: **Weather Derivatives**
Readings: Chapter 25 - Weather, Energy and ...
Assignment: Quiz 8 (link on Blackboard) is due by 9am.
Goal: To understand how firms can protect themselves from quantity risk by taking hedging against changes in demand related to changes in the weather.

Wednesday November 24: **TBA**

WEEK 15

Monday November 29: **Credit Default Swaps**
Readings: Chapter 22 - Credit Risk
Assignment: No assignment is due before this class session.
Goal: To understand how firms can protect themselves from credit risk by using a CDS.

Wednesday December 1: **Midterm III**
Reading: Study!
Goal: Do as well as you can!
Note: You are allowed a one page, single side, cheat-sheet. Please bring a scientific calculator. No food is allowed during the exam. If you finish early, please, gather your things quickly and exit the room quietly.