MFIN8860/MFIN2202: Derivatives & Risk Management  
(Thursday, 7:00; Fulton 117)

PREREQUISITE
Investments, MFIN8801 or MFIN1151

COURSE MATERIAL
2. Bodie, Kane, Marcus (BKM), Investments, McGraw-Hill, 8th, 9th, or 10th edition, or Essentials of Investments (ESS), McGraw-Hill, 7th, 8th, 9th or 10th edition
3. Supplemental materials, available on Canvas. Log on to your Agora account (portal.bc.edu), find your courses, and click the link for MFIN8860/MFIN2202. You will find there, arranged in modules for each week:
   - Lecture notes [Print out and bring to class the lecture notes for each week’s unit]
   - Problem sets and solutions
   - Weekly quizzes—through Canvas
   - Sample midterms and final exams [included in modules for Weeks 7 and 14]
   - Readings
   - Spreadsheets [included in the final module on Canvas]

COURSE DESCRIPTION
This course is an introduction to derivative assets such as futures, forwards, swaps, and options, financial engineering, risk management, and mortgage and credit derivatives. We will cover the pricing of these derivative assets as well as securities that contain embedded options. We will consider risk management strategies such as static and dynamic hedging. Applications will be considered from equity, commodity, bond, and mortgage-backed markets.

GRADING
There will be graded mid-term and final exams, which will each have roughly equal weight.

For each week’s lecture, I will post a short “quiz” on Canvas, to be completed after that lecture but before the next class. These will be comparatively straightforward questions, with quantitative answers, designed to make sure that you understand the class material. You will submit your solutions through Canvas, which will also grade them (simply as correct or incorrect). The system will allow
you three tries at each question. The quizzes must be submitted the evening before class: specifically, before Wednesday, at 8:00 pm. Correct answers will be available through Canvas at 8:01.

Although these are called quizzes in Canvas, I mean them primarily as learning exercises. You may work with classmates on them, but each student must submit his or her own solutions. I occasionally will ask someone to present a solution in front of class—if your submitted solution is correct, I will feel free to call on you. These quizzes will account for 10% of your course grade.

In addition to the quizzes, you will also find on Canvas more open-ended problem sets corresponding to each lecture. You will find the solutions to some, but not all, of these problems on Canvas. I also will sometimes ask for volunteers to present solutions to the unsolved problems in class. Your willingness to volunteer will count toward your class participation grade, which also will account for 10% of your course grade.

SPECIAL ACCOMMODATIONS

If you are a student with a documented disability seeking reasonable accommodations in this course, please contact Kathy Duggan, (617) 552-8093, dugganka@bc.edu, at the Connors Family Learning Center regarding learning disabilities and ADHD, or Paulette Durrett, (617) 552-3470, paulette.durrett@bc.edu, in the Disability Services Office regarding all other types of disabilities, including temporary disabilities. Advance notice and appropriate documentation are required for accommodations.
COURSE OUTLINE

1. Review: Risk management using derivatives

   Topics:
   - Financial engineering
   - Portfolio strategies using derivatives
   - Review of spot-futures parity, put-call parity
   - Credit risk instruments

   Readings:
   - McDonald: Ch. 2
   - BKM, Ch. 20, 22 or ESS, Ch. 15 and Sections 17.1 – 17.2

   Prepare quiz 1 after this lecture

2. Financial forwards and futures

   Topics:
   - Index arbitrage and transaction costs
   - Synthetic positions and quasi-arbitrage

   Readings:
   - McDonald, Sections 5.1-5.4 and 6.1
   - BKM, Section 23.2 or ESS, Sec. 17.3-17.5

   Prepare problem set 1 and quiz 2 after this lecture

3. Commodity Contracts (Bring to class Lectures 3 and 4!!)

   Topics:
   - Convenience yields, carrying costs
   - Price discovery
   - Seasonality, basis risk

   Readings:
   - BKM, Section 23.5
   - McDonald: Sections 6.3-6.5

   Prepare problem set 2 and quiz 3 after this lecture
4. Hedging and hedge funds

Topics:
- The optimal hedge ratio
- Asset mismatches: basis risk and the effectiveness of the hedge
- Application: pure plays and portable alpha
- Hedge funds, tail risk, and the problems of performance evaluation

Readings:
- BKM, Ch 26 edition or ESS, 8th or 9th ed, Ch 20
- McDonald: Section 5.5
- “When It Comes to Fund Performance, History Is Often Written by the Winners,” Wall Street Journal, August 6, 2012
- “Pair Trading examples,” industry publication, January 9, 2012

Prepare problem set 3 and quiz 4 after this lecture

5-6. FRAs & Swaps

Topics:
- Motivation for swaps
- Swaps and FRAs
- Pricing swaps from forward rate curve
- Risk management

Readings:
- Review yield curve: BKM, Ch. 15 or ESS, Sec 10.6
- BKM, Section 23.4 or ESS, Sec. 17.6
- McDonald: Sec. 6.2, 7.1-7.2, 8.1-8.2

This unit will take two weeks. Problem set 4 reviews elements of both weeks. Prepare quiz 5 after the first week on swaps.

** Midterm review session: TENTATIVE TIME: Sunday, October 9, 11:00 **

7. October 13, MIDTERM

[Bring a note sheet (double-sided, optional) and a calculator (necessary) to the exam]
8. **Option pricing: binomial model**

*Topics:*
- Arbitrage derivation of derivative prices
- Risk-neutral pricing
- Early exercise decisions
- Calibration of model

*Readings:*
- BKM, 21.1 - 21.3 or ESS, Sec. 16.1-16.2
- McDonald: Ch. 10

*Prepare problem set 5 and quiz 6 after this lecture*

9. **Exotic options and Monte Carlo pricing**

*Topics:*
- Path dependency
- Risk-neutral distribution
- Modeling stock price jumps and fat-tailed distributions

*Readings:*
- BKM, Sec. 20.7 or ESS, Sec. 15.4
- *Posted on Canvas:* Excerpts from Ch 14 and Ch 19 of McDonald’s other text.

*Prepare problem set 6 and quiz 7 after this lecture*

10. **Option pricing: Black-Scholes model**

*Topics:*
- The Black-Scholes equation
- Option deltas and elasticities
- Implied volatility
- Delta hedging

*Readings:*
- BKM, Sec. 21.4-21.6 or ESS, Sec. 16.3-16.5
- McDonald: Chapter 11, Sections 1,2,4,5

*Prepare problem set 7 and quiz 8 after this lecture*
11. Dynamic hedging (*Bring to class Lectures 9A and 9B!!*)

*Topics:*
- Dynamic hedging in the binomial model
- Dynamic hedging using the Black-Scholes model
- The Greek letters (delta, gamma, lamda, theta, vega, etc.) and why they matter

*Readings:*
- McDonald: Section 11.3

*Prepare problem set 8 and quiz 9 after this lecture*

12. Mortgage-backed securities and derivatives

*Topics:*
- Static vs. option-adjusted spreads
- Mortgage pricing and interest rate risk; extension risk
- CMO design, pricing

*Readings:*
- BKM, Section 16.2

*Prepare problem set 9 and quiz 10 after this lecture*

**November 24: Thanksgiving Break, no class**

13. Credit Risk and Credit Derivatives

*Topics:*
- Credit transfer instruments: CDOs and CDS
- Special topics

*Readings:*
- McDonald, Section 12.5

14. **FINAL EXAM (December 8)** [Review session tentatively scheduled for December 4, 11:00]

[Bring a note sheet (double-sided, optional) and a financial calculator (necessary) to the exam]