

**Spring 2006
BAFI 431:
Fixed Income Markets and Their Derivatives**

**Instructor Peter Ritchken
Office Hours: Thursday 2.00pm - 5.00pm,
(or by appointment)
Tel. No. 368-3849**

My web page is:

<http://weatherhead.cwru.edu/ritchken>

The Course Material will be posted on the BAFI 431 section of my web. page.

This class is concerned with fixed income securities, interest rate risk management, mortgages, and credit risk management. Fixed income securities account for about two thirds of the market value of all securities that are outstanding in the world, and hence this topic is worthy of at least one full course!

BAFI 430 is a prerequisite for this class. Knowledge of derivatives, and particularly the Black Scholes model, will be assumed.

Textbooks

The required textbook for this class is

1. Fixed Income Securities: Tools for Today's Markets, by B. Tuckman, published by Wiley.

This book is great. The concepts are very clear. You will not get lost here! Yet the level is fairly good.

2. My electronic book and class notes from my web page

Other books that you may find useful are

Fixed Income Markets And Their Derivatives by S. Sundaresan, published by South Western. This is a good reference book, full of details, but one can get lost in the details.

Bond Markets, Analysis And Strategies, by F. Fabozzi, published by Prentice Hall. This is a well written, easy to read book.

Spreadsheet Modeling in Investments by Craig Holden, published by Prentice Hall. This is an outstanding book that introduces you to spreadsheet models and walks you through the building of spreadsheets for investments, including fixed income. I strongly recommend this book if you want to learn more about excel.

The grade for the course will be determined as follows:

Mid Term	35%
Final	35%
Homework	10%
Cases	10%
Project	10% (plus tie-breaker)

The **Mid Term Exam Date** will be March 9th) .

The **Final Exam** is scheduled for Thursday evening of exam week. (May 4th)

Grading:

Your grade for this course will be based on your performance in two exams, on the group projects and on the homework assignments. Please note that the final exam is not cumulative and will cover only the material discussed after the mid-term exam. You are allowed to bring your calculators and one sheet of formulas to the exams. The weights for the different components in your overall grade are as follows:

Mid-term Exam:	35%
Final Exam:	35%
Case Reports :	15%
Case Projects:	5%
Homework :	10%

I will give partial credit for partially correct answers in your homeworks and exams. My grading of your reports will be relative in nature and, to some extent, subjective. This is unavoidable given the nature of class projects. Of course, I will provide extensive comments on various aspects of your reports so that you can better understand the reasons for your grade. Your overall course grade will also be based on relative grading where the mid-point of the B-grade distribution will be at or near the overall mean/median class score. Students who score “significantly” above (below) the mean/median can expect to receive A (C or lower) grades. Please note that I do not use any automatic cutoff levels for any grade. This ambiguity is deliberate in order to make the grading truly relative and also to discourage student obsession with scores (I want you to focus more on understanding the material).

Homework:

Finance, by its very nature, is a quantitative subject and this course is no exception. Problem-solving is also a powerful tool in reinforcing your understanding of the economic concepts we will deal with in class. Therefore, it is absolutely essential that you solve the end-of-chapter textbook problems. Homework must be turned in at the beginning of class. These problem sets must be solved individually and must reflect your own work. Absolutely no extensions are provided.

Since the exams will comprise of problems that are similar in style and difficulty to the homework problems and end-of-chapter exercises, please devote ample time to developing your problem-solving skills and talk to me as often as you need to resolve your difficulties. Generally, homework will be assigned each week. All homework assignments carry equal weight. Your lowest grade on a homework will be discarded. Full solutions will be provided to the homework problems and posted in **Blackboard**. I would appreciate it if you did not e-mail me your homework since I am always virus weary, and probably will fail to print it out and put it with the rest of the classes assignments.

Cases

We will study several cases depending on time. Students must establish a team for the semester. Each team can have up to 5 members. You should submit the names of all members in your team to me before the end of February.

Each member of your team should read the case carefully, and then discuss it with the other members of the group before tackling the questions. Each group must submit a case report with answers to these questions. The case report must be typed, double-spaced and no more than 5-6 pages long (with any supporting exhibits, etc.). Please provide your reasoning and all relevant supporting information from the case and elsewhere when answering these questions. Remember that I am not looking for one “right” answer but rather I am interested in seeing how you think about and reason out the issues. The case will then be discussed in class.

Presentation

Every team will be responsible for the following

- Preparation and distribution to the class of a set of notes on the topic, one week prior to the presentation
- Preparation of a set of overheads for distribution to the class.
- Preparation of a set of problems that illustrate the main ideas.
- Preparation of a solution set for the problems.

I will work closely with each group, provide you with ideas and guidance. Each team will make a presentation to the class. After the students have heard the presentation, read all

the material provided, and solved the problems, students will provide me with feedback which will be used as input into your grade for the project.

The topics for the presentation will apply some of the skills that you will have learnt in the first part of the class. The types of projects that I have in mind include:

- Credit Derivatives- What they are and how they can be used.
- Credit Derivatives- Valuation.
- Mortgage backed securities: An overview of products.
- Prepayment models for Mortgage backed securities.
- Hedging Pipeline Risk in Mortgage Markets.
- Bond refunding
- The ins and outs of Municipal Bonds.
- Case Studies involving Bloomberg, involving exotic/structured products.
- Value at Risk Systems for Interest Rate Risk.
- Special topics in Pricing of Corporate Bonds
- Special topics in Pricing of Corporate Securities.
- Implementing derivative models on the computer
- Investigating special interest rate products that trade on option or futures exchanges in Europe and/or US and/or Asia

The list is endless and I will mention some in class. Once your team identifies some area, they should meet with me to help consolidate the material.

The material covered in these presentations will be tested in the final exam.

Class Participation:

I strongly encourage you to participate in the classroom discussions. I want all of you to feel free to stop me at any time during my lecture to ask a question or seek a clarification. If I make a point that you disagree with, do not hesitate to challenge me. I believe that such give-and-take can enliven the lecture and bring up different perspectives of looking at an issue and it can also lead to a discussion of interesting supplementary issues. In order for all of us to get to know each other, please use nameplates in class.

Office Hours

I have office hours on Thursday **afternoons, 3.45 –5.45pm**. If you cannot see me during the scheduled window, you need to make an **appointment**. For part time students, perhaps you can call me in my office during office hours and I can respond to your questions on the phone or we can set up an appointment. If you have **urgent** questions then e-mail me.

A Very Tentative Course Outline

I will provide you with some reading assignments so that, time permitting, you can prepare for the next class. The class notes will be placed on my web page. Most of my handouts will be password protected, and I will provide the password to you. What follows is a very tentative course outline. I may depart from it quite considerably, based on how we proceed, class interests etc. For example, credit derivatives is very timely and we may want to spend some time on this topic. I also have not given as much attention to Mortgage Backed Securities and their derivatives as I should. Finally, we could spend a significant amount of time on corporate securities, such as Convertibles, Warrants etc.

PART ONE: The Basic Products

1. Bond Price Arithmetic

- Future Values and Compounding Intervals
- Annualizing Holding Period Returns
- Compounding over fractional periods
- Discounting
- Bond Prices and Yield-to-Maturity
- Annuities and Perpetuities
- Price Quotations and Accrued Interest
- Interest Rate Conventions
- Yields as a Method for Communicating Prices

2 Treasury Bills, Notes, Bonds and Strips

- The T- Bill Market
- The T-Note and T- Bond Market
- Stripped Coupon Bonds
- Arbitrage Relationships between Strips and Coupon Bonds
- Other Short Term Money Market Instruments

Readings: Chapter 1 of Tuckman, and Chapter 1 and 2 of Ritchken

Self Reading: Chapter 3 of Ritchken

3 Organization of Government Bond Markets

- The Role of the Federal Reserve Bank
- The Primary Dealer Market
- US Treasury Auctions
- The Secondary market
- Market Size, Volume, and other Statistics
- Repurchase Agreements and the Repo Market

4. Spot Rates, Par Rates and Forward Rates

- The Discount Function
- Yield to maturity for discount Bonds
- Yield to Maturity for Coupon Bonds.
- Establishing Forward Prices of Discount and Coupon Bonds
- Forward Rates, and Forward Rate Curves.
- Forward Rates and Yields to Maturity
- Par Rates and Par Rate Curves.

Readings: Chapter 2 and 3 of Tuckman, Chapter 4 of Ritchken

5. ED Deposits, ED Futures, and FRAs

- The Eurodollar Market
- Eurodollar Futures
- Using ED Futures
- Forward Rate Agreements
- Pricing Forward Rate Agreements
- Eurodollar Futures and FRAs

Readings: Chapter 16 and 17 of Tuckman, Chapter 5 of Ritchken

6 Interest Rate Swaps

- Interest Rate Swaps.
- Pricing Interest Rate Swaps
- Pricing Forward Starting Swaps.
- Pricing Floaters and Forward Starting Floaters.
- Constructing the LIBOR Curve using EDs, ED Futures, and Swaps.

Readings: Chapter 18 of Tuckman, Chapter 6 of Ritchken

7 Constructing Zero Curves.

- More on Discount Rates, Spot Rates and Forward Rates.
- Practical Considerations
- Spline technology
- Examples

Readings Chapter 4 of Tuckman, Chapter 7 of Ritchken

PART TWO RISK MANAGEMENT 1

8 Measures of Price Sensitivity 1

- Sensitivity of Coupon Bond Prices
- Maturity and Duration
- Linear and Quadratic Approximations to Bond Price Changes.
- Duration and Convexity of Bonds and Bond Portfolios
- Bullets, Bellbars and Ladders
- DVO1

- Immunization
- Examples and Case Studies

Readings: Chapter 5 and 6 of Tuckman, Chapter 8 of Ritchken

9 Measures of Price Sensitivity 2

- Key Rate Durations
- Present Value of a Basis Point
- Applications of Key Rate Durations.
- Strip Equivalents.
- Key Rate Duration Profiles of Options
- Applications

Readings: Chapter 6 of Tuckman, Chapter 9 of Ritchken

10 Simple Hedging Strategies using Futures.

- Short Term Contracts, T-Bill Futures and ED Futures.
- Duration Based Hedging
- Long Term Interest Rate Futures
- Hedging with T-Bond Futures
- Creating Synthetic Instruments and Asset Allocation
- Applications

Readings: Chapter 20 of Tuckman, Notes from Ritchken

11 Fixed Income Derivatives

- The wide variety of interest rate claims
- Over the counter interest rate claims
- Caps, floor and options on ED futures
- Swaptions: markets and their applications
- The Black Model
- Market convention for quotations.
- What makes pricing interest rate claims difficult

Readings: Chapter 19 of Tuckman, Chapter 11 of Ritchken

PART 3: PRICING INTEREST RATE CLAIMS

12 Theories of the Term Structure

- Term Structure in a Certain Economy
- Term Structure in an Uncertain Economy
- The Unbiased Expectations Hypothesis
- The Local Expectations Hypothesis
- The Return to Maturity Hypothesis

- Preferred Habitat and Liquidity Premium Theories.
- The use of the Yield Curve for Extracting Forecasts of Future Spot Rates
- Empirical Evidence.

Readings; Chapter 12 of Ritchken

13 Arbitrage Free Pricing

- Pricing Under Uncertainty
- Pricing Under Risk Neutrality and under Risk Aversion
- Risk Neutral Pricing Trick
- Local Expectations Hypothesis and Arbitrage Free Pricing
- Examples
- Externally Consistent Pricing

Readings: Chapter 13 of Ritchken and Chapter 9 of Tuckman

14 Single Factor Models for Pricing Interest Rate Claims

- Single Factor Models
- Binomial Approximation for the Square Root Model
- The Cox Ingersoll Ross model
- Pricing Options on Bonds.
- Calibrating Single Factor Models.
- Applications

Readings: Chapter 14 of Ritchken and Chapter 9 of Tuckman

15 The Art of Term Structure Modeling* (we may skip this)

- Term Structure Constrained Models
- Properties of an Interest Rate Option Model
- Ho Lee Model and Vasicek Models
- Black Derman Toy, and Black Karasinski Models
- Other Simple Models

Readings: Chapter 11-14 of Tuckman.

16 Risk Management of an Interest Rate Book

- Identifying where the risk is.
- Identifying hedging instruments
- Establishing the hedge
- Evaluating the robustness of the hedge
- Marking to Market and Marking to Model.
- Examples and Case Studies.

PART FOUR: CORPORATE SECURITIES AND CREDIT RISK

17 Corporate Bonds and Credit Risk

- Basics of Corporate Bonds
- Option Features in Corporate Bonds
- Callable Bonds and Bond Refunding
- Convertible Bonds
- Advanced Pricing of Corporate Bonds
- Option Adjusted Spread.
- Valuing Bonds and Bank Loans.

Readings: My Notes

18 Credit Derivatives

- Definitions and Examples
- Economic rationale
- Valuation
- Credit Swaps

Readings: My Notes

PART FIVE: MORTGAGES AND THEIR DERIVATIVES

19 Mortgages and Mortgage Backed Securities

- Mortgage Backed Securities
- Mortgage Backed Derivative Markets
- Prepayment Functions
- Pricing and Hedging

Readings: Chapter 21 of Tuckman

20 Special Topics

- More on Corporate Securities
- Structured Products
- Credit Risk Revisited.

Readings: Notes will be distributed

Those of you who desire to pursue a career in the financial industry may want references to other advanced textbooks and journal articles. I will be happy to advise you on such references and discuss additional material with you. Feel free to drop by my office.

Academic Integrity:

All students in this course are expected to adhere to university standards of academic integrity. Cheating, plagiarism, and other forms of academic dishonesty will not be tolerated in this course. This includes, but is not limited to, consulting with another person during an exam, turning in written work that was prepared by someone other than you, and making minor modifications to the work of someone else and turning it in as your own. Ignorance will not be permitted as an excuse. If you are not sure whether something you plan to submit would be considered either cheating or plagiarism, it is your responsibility to ask for clarification. Either ask me about it or consult credible sources of information on the subject. Two useful internet sites are

<http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml>

<http://www.unc.edu/depts/wcweb/handouts/apa.html>.

Please remember that you have agreed to Standards Regarding Academic Integrity (a copy of which can be found at

<http://weatherhead.case.edu/pdpao/policy/policyhome.html>) which outlines your responsibility in greater detail.