

MIT Sloan School of Management
15.438 -- Fixed Income Securities and Derivatives
Spring 2017

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Overview

Fixed income securities and derivatives make up the largest segment of global capital markets, and those products and institutions continue to evolve at a rapid pace. This course is designed for students seeking to develop a sophisticated and durable understanding of fixed income valuation and hedging methods, and a basic familiarity with major markets and instruments. Tools for quantifying, hedging, and speculating on risk are emphasized. The skills acquired will be most useful for those planning a career in sales and trading, portfolio management, commercial banking, investment banking, insurance, as a hedge fund manager, or as a senior manager in a public sector financial institution or central bank.

Prerequisites

15.401/15.411, 15.414 or 15.415 is required. 15.437 is recommended but not required. Students without that background may find that some topics require additional study time.

Some valuation tools will be developed using Excel and Visual Basic. Students should be familiar with spreadsheets, and be prepared to learn to use some features of Visual Basic in spreadsheet applications.

Materials

Class notes for each topic, related Excel spreadsheets and programs, and supplementary readings will be made available on Stellar or Study.net, or distributed in class. Homework assignments, additional practice problems and practice exam questions will also be posted on Stellar over the course of the term. **It is important that you download the class notes, look them over before class, and print them out so that you can write notes on them during class.** They are an essential part of the course, and are intended to serve as a fairly comprehensive study guide along with the text.

Required text: *Fixed Income Securities; Tools for Today's Markets, (BTAS)* by Bruce Tuckman and Angel Serat, 3rd Edition, 2012, Wiley Finance. This book offers a concise, elegant, and practitioner-oriented presentation of most of the topics we will cover.

Cases and supplemental readings:

There are several cases that will be used as the basis for class discussions and homework problems: (1) Deutsche Bank: Finding Relative-Value Trades; (2) Structured Credit Index Products and Default Correlation; and (3) Orange County, Value at Risk (free from the web).

An important supplemental reading is the chapter “Credit Risk” in the textbook by Robert McDonald called *Derivatives Markets*. (The main text has limited information on this important topic.)

Other supplemental readings are listed below.

Optional texts:

Fixed Income Securities (FIS), Pietro Veronesi, 1st Edition, 2010, Wiley. This book provides in depth and rigorous coverage of most of the topics covered, as well as many practical examples. I think most people will find the required textbook BTAS more accessible, but I’ve included parallel readings from FIS on the syllabus as optional readings for those who may prefer its more formal approach.

The Handbook of Fixed Income Securities, by Frank Fabozzi, 8th Edition, 2011, McGraw-Hill. This classic work (or an earlier edition) is an excellent source of descriptive material about markets, instruments and trading strategies.

Grading and expectations

The final grade is based on these components:

1. **(20%) Assignments:** There are five assignments. They can be completed individually or in groups of up to 4 people. Only one copy per group should be submitted for grading. Assignments must be submitted in class or online by 5pm on the date indicated, with no exceptions.
2. **(30%) Midterm:** In class 4/4.
3. **(45%) Final exam:** Cumulative and in-class.
4. **(5%) Class participation:** Participation and attendance are important. Please have your name card out and be prepared to take an active part in class discussions. The TA will keep track of attendance and quality of class participation.

Group sizes for the assignments are limited to four people or fewer, no exceptions. Although you are not required to join a group, it is strongly recommended that you do so to enhance the learning experience.

Exams: Exams must be completed independently and within the allotted time. Only the materials that are explicitly permitted may be used as references and nothing else.

Homework: you can consult with any other current class members and refer to all class materials distributed this term, but looking at solutions to problem sets from previous years is not permitted.

Classroom etiquette: No laptops (unless an explicit exception is announced) or cell phones. Please use a printout of the class notes for note-taking. Arrive/leave on time. Inform me in advance by e-mail if there are special circumstances.

Office Hours

My office hours are on Tuesdays from 3 to 4 p.m. in E62-640. I'm also available by appointment (e-mail dlucas@mit.edu).

Review Sessions and TA Office Hours

The TA for the course is Hyungjune Kang <hj_kang@mit.edu>

He will hold periodic review sessions throughout the term and before the exams; dates TBA.

TA office hours are Thursdays noon to 1pm in E51-242.

Course Outline, Readings, and Deliverables

Schedule of topics is subject to change. Check Stellar for most recent information.

**Reading should be completed in advance of class except for the first lecture.
All FIS readings are optional; "*" denotes an optional reading.**

Topic 1: Introduction, and Calculating Yields, Prices and Returns

2/7 & 2/9

Course Overview

Measuring and Calculating Yields, Prices and Returns

Floating Rate Bonds

Brief Intro to Yield Curves and Discount Functions

Featured Market: The Money Market

Readings:

BTAS "An Overview of Global Fixed Income Markets"; pp 47-49; Chapter 1; Chapter 2 (to pg. 74 and Appendices A and B); Chapter 3 (to pg. 105);

FIS 1* (except 1.4); 2* (to page 60).

Topic 2: Basic Fixed Income Tools I

2/14 & 2/16

Duration and Convexity

Duration and Convexity-based Risk Management Strategies

Readings:

BTAS pp. 119-121; Chapter 4; Chapter 5; Chapter 6*

FIS 3* (to page 103); 4* (to page 142, and Appendix on PCA*)

Homework #1 due 2/16

Topic 3: Basic Fixed Income Tools II

2/23, 2/28,
& 3/2

More on Yield Curves and Strip Curves

Forward Rates and Forward Curves

Macroeconomic Models of Interest Rates and the Yield Curve

Intro to Continuous Time Models of the Yield Curve

Featured Market: The U.S. Treasury Market

Discussion Case: Deutsche Bank: Finding Relative-Value Trades

Readings:

BTAS Chapter 2 pp 75-87, Appendices C, E, F, Chapter 7*, Chapter 8*

FIS 2* (pp 61-71); 5* (pp 154-162); 7*

Homework #2 due 3/2

Topic 4: Forwards, Futures and Swaps
3/7, 3/9,
3/14, 3/16
Covered Interest Rate Parity
Valuing Forwards and Futures
Interest Rate Swaps
Hedging Strategies
Speculating on Spreads
Currency swaps
Featured Markets: Repurchase Agreements and Interest Rate Futures

Readings:
BTAS Chapters 12; 13; 14; 15; 16 (through p. 450)
FIS 1.4*; 5.2-5.8*; 6.1*

Homework #3 due 3/16

MIDTERM, 4/4 in class

Topic 5: Options on Fixed Income Securities
4/6, 4/11
4/13
Options Basics
Valuing Callable and Puttable Bonds on Binomial Trees
Mortgage Prepayment Risk
Valuing Caps and Floors
Effective Duration and OAS
Featured Market: Municipal Securities

Readings:
BTAS pp 201-205; Chapter 7; 8
FIS 6.2*; 9*; 10*; 11*; 12.1-12.2*

Topic 6: Continuous Time Models for Options Pricing
4/20

Readings:
BTAS Chapters 9, 10, 11*
FIS 14.1-14.3*; 14.4*, 15.1-15.2*

Homework #4 due 4/20

Topic 7:

4/25, 4/27

5/2 & 5/4

Credit Risk

Understanding and Modeling Credit Risk

Credit Derivatives

Featured Markets: Corporate Bonds and CDS*Discussion case: Structured Credit Index Products and Default Correlation*

Readings: R. McDonald, "Credit Risk"; CreditMetrics Technical Document"; "Corporate Default Study,"* by Standard and Poors; "Valuing Federal Loans and Loan Guarantees: The Effect of Risk*," CBO.

Topic 8:

5/9, 5/11,

5/16 & 5/18

Securitization

Value at Risk

Securitization Basics

Asset-backed Securities

Mortgage-backed Securities

Featured Market: The Mortgage Market

Readings:

FIS 3.8; 3.9*; 4.5; 8; 12.3; 13.1-13.3; 13.4-13.5*; 13.6; Excerpts from Fannie Mae Prospectus*

*Discussion case: Orange County, Value at Risk**Available on Web at www.gsm.uci.edu/~jorion/oc/case.html**Homework #5 due 5/11***In-class Final (week of 5/22)**

V. 2-Feb-17