

UNIVERSITY OF PENNSYLVANIA
The Wharton School

FNCE 225/725:
FIXED INCOME SECURITIES

Prof. Domenico Cuoco

Fall 2021

Office: 3257 SH-DH

Phone: 898-8290

E-mail: cuoco@wharton.upenn.edu

Course Description

The course covers fixed income securities (including fixed income derivatives) and provides an introduction to these securities and the markets in which they are traded, as well as to the tools that are used to value them and to assess and manage their risk.

Quantitative models play a critical role in the valuation and management of fixed income securities. Although every effort will be made to introduce these models as intuitively as possible and the technical requirements are limited to basic calculus and statistics, the class is by its nature quantitative and will require a steady amount of work.

In addition, some computer proficiency will be required for the assignments, although familiarity with a spreadsheet program (such as *Microsoft Excel*) will suffice.

Prerequisites

The prerequisites for the course are the introductory finance and statistics, i.e., FNCE 100/611 and STAT 101/621.

Textbook and Readings

The course will be based primarily on lecture notes (copies of the slides used in class) and on the following recommended textbook:

- Pietro Veronesi, *Fixed Income Securities*, Wiley, 2010.

The lecture notes will be made available ahead of each class through *Canvas*.

Requirements and Grading

The final grade for the course will be based on three home assignments, with the following weights:

- Assignment 1: 30%
- Assignment 2: 35%
- Assignment 3: 35%

Course Outline

Below is a tentative outline of the course, illustrating the planned progression of topics and the corresponding readings.

PRELIMINARIES

1. The Market for Fixed Income Securities

Lecture notes and Textbook, Sections 1.1-1.2 and 1.6-1.7

2. Interest Rates and Discount Factors

Lecture notes and Textbook, Sections 2.1-2.3, 5.1 and 7.3

TREASURY SECURITIES

3. Treasury Securities

Lecture notes and Textbook, Sections 2.4-2.8

4. The Term Structure of Treasury Rates

Lecture notes and Textbook, Section 2.9

INTEREST RATE RISK MANAGEMENT

5. Interest Rate Risk Management: Duration and Convexity

Lecture notes and Textbook, Chapter 3 and Section 4.1

6. Interest Rate Risk Management: Factor Models

Lecture notes and Textbook, Sections 4.2-4.6

FIXED INCOME FORWARDS AND INTEREST RATE SWAPS

7. Key Money Market Rates

Lecture notes and Textbook, Sections 1.3-1.4 and 7.1

8. Fixed Income Forwards

Lecture notes and Textbook, Sections 5.2-5.3

9. Interest Rate Swaps

Lecture notes and Textbook, Sections 5.4-5.5

BINOMIAL INTEREST RATE MODELS AND OTC FIXED INCOME OPTIONS

10. Binomial Interest Rate Models: Introduction

Lecture notes and Textbook, Section 6.2 and Chapters 9-10

11. Binomial Interest Rate Models: Refinements

Lecture notes and Textbook, Sections 11.2.1, 11.2.3 and 12.1

12. The Ho-Lee and Simple Black-Derman-Toy Models

Lecture notes and Textbook, Section 11.1

13. Interest Rate Caps and Floors

Lecture notes and Textbook, Sections 11.2.2 and 20.1.1-20.1.3

14. The Black-Derman-Toy Model

Lecture notes and Textbook, Sections 11.3, 11.5 and 20.1.4

15. Interest Rate Swaptions

Lecture notes and Textbook, Sections 11.2.4, 12.2 and 20.2

ON-EXCHANGE FIXED INCOME DERIVATIVES

16. Fixed Income Futures: Introduction

Lecture notes and Textbook, Section 6.1

17. Fixed Income Futures: Refinements

Lecture notes and Textbook, Sections 6.5 and 11.4

18. Fixed Income Futures Options

Lecture notes

MORTGAGE-BACKED SECURITIES

19. Monte Carlo Simulation

Lecture notes and Textbook, Sections 13.1-13.5

20. Mortgage-Backed Securities

Lecture notes and Textbook, Section 1.5, Chapter 8 and Sections 12.3 and 13.6

CONTINUOUS-TIME INTEREST RATE MODELS

21. The Continuous-Time Ho-Lee Model

Lecture notes and Textbook, Sections 14.1, 14.3, and 19.1-19.2

22. The Hull-White Model

Lecture notes and Textbook, Sections 19.3-19.4 and 22.3.3

CORPORATE BONDS AND CREDIT DERIVATIVES

23. Corporate Bonds

Lecture notes

24. Credit Default Swaps

Lecture notes