

FIRE 622: Fixed Income Securities

Chintal A. Desai, Ph.D.
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E-mail: cdesai2@vcu.edu

Classroom: B2121 Snead Hall

Office Room: B4135 Snead Hall

Office Hours (in-person): Tue 4 to 6 p.m.; and by appointment

Website: <https://www.chintaladesai.info/>

Class Hours: Tue 7:00 pm- 9:40 pm

Course Description / Learning objectives:

This quantitative course enhances a student's understanding of fixed-income securities. The learning philosophy is to first understand a given finance concept using the economic paradigms. As an example, valuation of a financial security must follow the law of one price, else the arbitrage opportunities can generate riskless profits. Then, to solidify a given concept, we will apply that concept to solve valuation problems of a fixed-income security.

This course covers the valuation and application of various fixed income securities and their derivatives. Fixed income securities are financial claims including annuity, zero coupon bonds, regular coupon bonds such as Treasury notes and corporate bonds, floating rate notes, callable bonds, etc., issued by public or private entities.

We will begin the course with the concept of continuous compounding and term structure of interest rate. Then, we will learn about bond valuation based on the no-arbitrage principle. Our first derivative instrument will be a simple forward (interest) rate contract. Then, we will in detail learn about various plain-vanilla bond options, both European and American. We will also learn about the bonds with embedded options such as callable bonds. Finally, we will learn about Floating Rate Notes and Interest Rate Swaps. If time permits, we will also discuss Home Mortgages.

Course Prerequisites: FIRE 520

Learning Resources

- 'Adventures in Debentures' is a course pack created by Professor Michael Gibbons during the many years he taught this course. Professor Haluk Unal of University of Maryland graciously gave the electronic copies of Professor Gibbons' notes. The instructor is thankful to Professor Gibbons (and Professor Unal) for allowing his personal notes for VCU students. I will make the relevant chapters of this course packet available to you via Canvas.
- For some portion, I will post my personal handouts and class notes of the earlier semesters.
- Inexpensive scientific calculator.
- Recommended Textbook:
 - This course does not have a required textbook, but following textbooks cover most of the material we will cover in class.
 - Frank Fabozzi, Introduction to Fixed-Income Analysis and Portfolio Management, MIT press
 - Pietro Veronesi, Fixed Income Securities, Wiley

Course Structure

Class Structure

The class is structured in an in-person format. During each class, a student will be introduced to a concept related to a fixed income security followed by interactions among students and the instructor. Once the concept is reasonably understood, we will take problems based on that concept. The instructor will solve the problems with students during the class. The students are highly encouraged to read the topic in advance from the instructor's handouts or assigned material, before it is discussed during the class. And during the class, they must contribute to the class discussion and solve the problems with the instructor.

Assessments

Class Participation / Attendance

The academic rigor of the course requires the students to actively attend each class session, take notes, and go over the material. If a student misses the class, then it will be difficult for that student to follow the material covered in the subsequent classes. To avoid that, a student is required to take the class material from other students and try to understand on their own before coming to the next class or asking doubts to the instructor. The students need to actively participate during the class. They need to interact and express their ideas on the material being discussed during the class. The instructor will take attendance in each class.

The class participation/attendance points **are purely at the discretion of the instructor**. The maximum of class participation/attendance points are 10 points.

Homework Quizzes

The homework quizzes will be given throughout the semester. Each quiz will contain instructions such as the duration, deadline, number of attempts (mostly two), and number of points. Each homework quiz must be submitted individually. **All quizzes need to be submitted through Canvas. NO LATE SUBMISSION IS ALLOWED.** For some of the homework assignments, I may ask students to submit the homework hand-written in a group of three. The final homework points will be based on the combined scores of all homework quizzes. There are no partial credit points in the homework quizzes. The homework quizzes are worth of 10 points. The homework related doubts must be resolved before the homework is due. This is mainly to discourage tendency of waiting-till-the-last-day-of-exam. All doubts must be clarified in-person during the office hours.

Exams

There will be two exams. Each exam will be given in the classroom, and **it will be a paper-pencil based**. A student is allowed to bring their calculator. During the exam, a student is allowed to bring their scientific and/or financial calculator and **one** 3 x 5-inch index card on which they can write on both sides. A student is NOT allowed to use smart phone, textbook, class notes, tablet, smart watch, and any other electronic gadget. The final exam is cumulative and covers the entire portion of the semester.

The instructor will grade each exam copy. The partial credit will be only given if the instructor

finds that the student has understood the material and has made a genuine effort to answer the given question. In addition, the student **must show their work clearly. By just writing numbers on the paper without appropriate heading will not earn any credit.** A student can collect their exam copy during the office hours within three weeks of the exam. The grade dispute, if any, must be resolved while the concerned student is in the instructor's office. The uncollected copies will be distributed in the classroom.

There will be no make-up exam. The student can have a make-up exam only on those extenuating circumstances, for example hospitalization, in which the university requires the instructor to give a make-up exam. Please note that the make-up exam is more difficult and challenging than a regular exam due to limited pool of possible questions.

Each exam is worth of 40 points.

Grading Policy

The grade will count the assessments using the following proportions:

- **80%** of your grade will be determined by in-person class exams (40% each).
- **10%** of your grade will be determined by homework quizzes.
- **10%** of your grade will be determined by class participation / attendance.

Other Information

- Syllabus Policy Statement <https://provost.vcu.edu/faculty/faculty-resources/syllabus/>
- Library resources <https://www.library.vcu.edu/>

Class Schedule

The class schedule is tentative and subject to changes.

Week 01, Syllabus, Continuous compounding

Week 02, Valuation of Bonds using Synthetics

Week 03, Discount factor and evolution of term-structure of interest rates

Week 04, Forward Contracts

Week 05, Uncertainty regarding bond returns

Week 06, Introduction to Bond Options

Week 07, Valuation of plain vanilla European Bond Options

Week 08, Exam 1 (Tuesday 3/4) in-class

Week 09, Spring Break

Week 10, Put-Call Parity Theorem and valuation of American Bond Options

Week 11, Bonds with Embedded Options

Week 12, Bonds with Embedded Options (Continue)

Week 13, Floating Rate Notes

Week 14, Interest Rate Swaps

Week 15, Home Mortgages

Final Exam, During VCU Final Exam Week (5/6/25)