

**46-956 Intro to Fixed Income**

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**Lectures:** Tuesdays & Thursdays 3:20 – 4:40 PM

**Discussion Sessions:** Fridays 9:30 – 11:00 AM

**Course Description:** The main purpose of this course is to introduce the most important fixed income securities and the mathematical treatment of those securities. Roughly speaking, the term “fixed income security” is used here to include *debt securities* and *derivatives* on debt securities. For the simplest kinds of fixed income securities, the payments (both amounts and dates) are known with certainty at the time the security is issued. We will refer to such securities as having *deterministic cash flows* or *fixed cash flows*. Many important fixed income securities have payments that are uncertain (i.e., random) due to features of optionality (e.g., a callable bond) or because the payments are linked to *interest rates* that fluctuate with time. In order to analyze such securities it is necessary to model the way in which interest rates will evolve in time. This is a very challenging and interesting endeavor. Roughly the first half of the course will be devoted to studying securities with deterministic cash flows. We will focus on bonds and annuities. We will study interest rates and yields, discount factors, duration, convexity, DV01, one-factor hedging, and some simple trading strategies. We will also introduce a few multifactor hedging techniques. The second half of the course will focus on term-structure modeling in a binomial world. We will study options, forwards, futures, swaps and swaptions, bonds with embedded options, and mortgage backed securities. In many important situations, payments are uncertain due to risk of *default*. For the most part, we will ignore default risk -- this topic will be treated in subsequent MSCF courses. If time permits, we will discuss some simple models for default in a binomial setting. The course will focus on the mathematical analysis of fixed income securities rather than on institutional practice. However, we will make a serious effort to respect actual market conventions as much as possible in examples and exercises. We will make use of *Canvas* <https://www.cmu.edu/canvas/> to post homework assignments, important announcements, lecture notes, and other course materials.

**Official Textbook:** *Fixed Income Securities: Tools for Today's Markets*, by Bruce Tuckman and Angel Serrat (3<sup>rd</sup> Edition)

**Additional Recommended Textbook:** *Fixed Income Securities: Valuation, Risk, and Risk Management*, by Pietro Veronesi

**Problem Sets:** There will be six homework assignments to be handed in and several sets of review problems. Homework will be due at 11:59 PM on Tuesdays. The numerical answers to most homework problems will be given with the assignment, so that you can get some immediate feedback and catch errors in your reasoning at the earliest possible time. The lowest score on the homework will be dropped (i.e., I will use the highest 5 scores for computing your course grade). Late homework cannot be accepted for credit. (Late means any time after 11:59 PM on the due date.) Solutions to the review problems do not need to be handed in. **It is expressly prohibited to access course materials from previous years for 46-956 or 21-378.**

**Homework Submission:** The main body of your write-up should be submitted by attaching a single PDF file to the Assignment on Canvas. Supporting spreadsheets (and other computer codes) can also be submitted.

**Final Exam:** The Final Exam will be given on Wednesday October 21 (time TBA). The format of the exam and the procedures for taking will be announced on October 7. The exam will be administered according to MSCF policy as found in the Student Handbook at <https://canvas.cmu.edu/courses/3194/pages/mscf-final-exam-schedules-and-policy>.

**Course Grades:** Your course grade will be based on

- 25% Homework Average
- 75% Final Exam Score

**Make-Up Final:** A make-up final will be given for students whose course grade is C+ or below. Students who take the make-up exam can raise their course grade up to a maximum of B-. The make-up exam will **not** be used to lower course grades (unless the student is caught cheating on the makeup).

**Note on Discussion Sessions:** The Discussion Sessions will be devoted to answering questions about lecture material, discussing homework problems, and also discussing current market conditions as well as some trading ideas.

**Office Hours:** Will be announced on Canvas.

**Policy on Collaboration:** You are encouraged to work together on homework problems. Discussing homework problems with one another can be an extremely valuable learning experience. However, you are expected to produce write-ups of the solutions completely on your own. It is a violation of the rules on academic integrity to copy part (or all) of another student's solution. You should write up your own solutions separately, not referring to a common document. Furthermore, you should not submit any work that you do not fully understand. You are not permitted to use solutions from any other sources, including the internet. During the final exam, you may not give nor receive assistance. Violations of these rules will be treated seriously according to the MSCF Handbook.

**Sharing of Course Materials:** It is expressly forbidden to make any unauthorized recordings of Lectures, Discussion Sessions, or Office Hours. It is also expressly forbidden to share course materials (including Lecture Videos, Lecture Notes, Assignments, Exams, Spreadsheets, etc.) with anyone outside of this class, unless you obtain permission from the instructor in advance.

**Some Good Advice from the Provost's Task Force on Students' Well Being:** Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, getting enough sleep, taking some time to relax, and avoiding drugs and alcohol. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful. If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at <http://www.cmu.edu/counseling/>. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.

**Accommodations for Students with Disabilities:** If you have a disability and have an accommodations letter from the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu).