MIT Sloan School of Management 15.438/15.4381 Fixed Income Securities and Derivatives Spring 2025

Instructor: Prof. Haoxiang Zhu (<u>zhuh@mit.edu</u>) TA: Luis Bolio (<u>lbolio@mit.edu</u>) Tuesdays and Thursdays, 10am-11:30am, E51-335

<u>Overview</u>

Fixed income securities and derivatives make up the largest and most dynamic segment of global capital markets, with products and institutions continuing to evolve at a rapid pace. This course is designed for students seeking to develop a sophisticated and durable understanding of valuation and risk management techniques, a basic familiarity with major markets and instruments, and insights into current market developments. Tools for valuation, and for quantifying and managing 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, hedge funds, or as a senior manager in a public sector financial institution or central bank.

<u>Prerequisites</u>

Mastery of basic financial concepts, as covered in an introductory class (i.e., 15.401/15.411, 15.414/415 or equivalent), is required. Please speak to Prof. Zhu if you have a question about the adequacy of your preparation.

Some valuation tools will be made available in Excel spreadsheets with embedded Visual Basic code. You should be familiar with spreadsheets and also be prepared to use programming tools, which could be Visual Basic or a programming language of your choosing.

<u>Materials</u>

Class notes for each topic, related spreadsheets and programs, and supplementary readings covering current events will be made available on Canvas or Study.net, or distributed in class. Homework assignments, additional practice problems and practice exam questions will also be posted on Canvas over the course of the term. It is highly recommended that you look over the notes before class and 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. It is necessary to print them because computer/tablet/phone usage is not allowed in class unless explicit permission is given.

Recommended text: *Fixed Income Securities; Tools for Today's Markets*, by Bruce Tuckman and Angel Serat, 4th Edition. This latest edition is recommended because of its updated coverage, but earlier ones can also be used for most topics. The book offers relatively concise, elegant, and practitioner-oriented presentations of most of the material we cover. To get the maximum benefit from the logical flow of the textbook, you may want to read the book straight through.

Cases and projects:

We may use a number of cases as the basis for class discussions and homework problems, which will illustrate how the tools you acquire can be put to practical value. Those will be available on Canvas.

In addition, I may suggest ideas for projects. Students can take the projects, at their discretion, for extra credits or in lieu of certain assignments. The exact arrangement will depend on the nature and time commitment of the projects.

Optional texts and supplementary reading:

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.)

Fixed Income Securities, Pietro Veronesi, 1st Edition, 2010, Wiley. This book provides in depth and rigorous coverage of many of the topics covered, as well as many practical examples. 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, 9th Edition, 2021, McGraw-Hill. This classic work (or an earlier edition) is a good source of descriptive material about markets, instruments and trading strategies, very helpful for prepping for job interviews.

Grading and expectations

The final letter grade is based on these components

(30%) Assignments: There are five graded assignments that are an important part of the learning process. They can be completed individually or in self-selected groups of up to 4 people. Only one copy per group should be submitted for grading. People can switch between groups during the semester without special permission; just be sure to include all current members' names on each submission. You are not required to join a group, but doing so can enhance your understanding of the material. It is highly recommended that you work through all the questions on your own first for the best learning experience.

Use of AI programs like ChatGPT is permitted and it can enhance learning and the clarity of your writing. However, you are responsible for the accuracy of your answers. AI tools will not be permitted for use during exams, and over-reliance on them will be an impediment to doing well in the class. It is an honor code violation to include your name on an assignment where you have not made a meaningful contribution to the work submitted. Assignments must be submitted in class or online by 11:59pm on the date indicated with no exceptions.

2. (25%) Midterm: In-class.

- 3. (30%) Final exam: Cumulative and in-class (on the last day of class).
- 4. (10%) In-class pop quizzes. These are short questions that gauge your basic understanding of the materials. The quizzes are given in class, on a random set of days, and are to be completed individually. If you miss a class when a pop quiz is given, you lose the credit for that quiz. If there are N quizzes, the best N-1 count toward your grade. There is no separate category for in-class attendance (except the participation credit for guest lectures, see next point).
- 5. (5%) Class participation in guest lectures. I plan to invite some guest speakers, likely senior people from the financial industry or policy circles. Because you represent MIT, it is important to attend and actively participate in these guest lectures.
- 6. (TBD) Optional projects.

Exams: Exams must be completed independently and within the allotted time. Students are allowed to bring two double-sided letter-sized cheat sheets and a hand calculator. You may not consult other materials.

Classroom etiquette: Except for taking notes or other permitted in-class activities, **no inclassroom usage of laptops, tablets or cellphones is permitted.** I highly recommend printing out the class notes in advance for in-class notetaking. Arriving late or leaving early can be disruptive to others; inform me or the TA in advance by e-mail if you must do so. (As noted above, however, late arrivals or early departures do not harm your final grade unless we have a pop quiz or guest lecture that day.)

Listeners: Taking the class for a grade is highly recommended for a superior learning experience. Listeners are welcome to attend the class if there is sufficient space in the classroom, but listeners don't have access to the course website or other class resources.

Prof's Office Hours

By appointment. Email <u>zhuh@mit.edu</u>.

Recitation Sessions and TA Office Hours

TBA

<u>Topics</u>

*denotes optional reading

- 1. Module 1 Fundamentals of interest rates and yield curve analysis
 - Tuckman and Serrat Chapters 0, 1, 2, 3, 4, 5, 6*, 10
 - This module covers the basics of the term structure of interest rates and yield curve. We start with interest rates being the only risk in the markets, without other complexities such as default risk, prepayment risk, and tax treatments. The fact that interest rates vary by maturity and linked across maturity is a key source of richness in investment strategies and technical complexity in this market. The U.S. Treasury securities market (including repo) will be used as a primary example in this module.
- 2. Module 2 Many faces of fixed income markets
 - Tuckman and Serrat Chapters 11, 12, 13, 14, 15, 16
 - In the second module we will expand into other segments of U.S. fixed income markets, including municipal securities, corporate securities, and mortgage-backed securities, among others. In addition to default risk, each market has its own unique features: corporate bonds often have embedded options, municipal securities often have favorable tax treatments, and mortgage-backed securities present prepayment risks. Moreover, fixed income markets are also fertile ground for innovation in forward, futures, options, swaps, and other derivatives, which are important tools for expressing investment views and managing risks.
- 3. Guest lectures, interspersed throughout the semester. Schedule and topic TBD.