IEOR E4710 Term Structure Models

Instructor: Prof. Tim LEUNG (http://www.columbia.edu/~tl2497/)
Office Hours: Wed 2-2:30pm and Fri 1-1:30pm, MUDD 312.

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Course Objective/Description:
The goal of this course is to introduce the principal models that are used to model the term structure of interest rates in the financial markets. These models include discrete-time models, single- and multi-factor models, Heath-Jarrow-Morton models and the so-called Market models. We will study all of these models and use them to price various fixed-income securities that are commonly traded in the market-place, as well as a few exotic ones. The securities we will discuss include bonds, bond options, caps, floors, swaptions, etc. When we cannot compute prices analytically, we will use numerical methods (typically Monte-Carlo, PDE, and Fourier Transform Methods) to determine their prices. Numerical methods will be discussed. Finally, if time permits we will examine some aspects of fixed income portfolio management, and credit derivatives. Some of these latter topics will be introduced and studied via the assignments.

Tentative Plan:
Part 1: Introduction to term structure of interest rates, treasury bonds, and municipal bonds, and bonds ETFs.
Part 3: General Lattice Model for derivative pricing
Part 4: Continuous-time model, No-arbitrage principle, dynamic hedging (using bonds), and bond & bond option price.
Part 5: Affine Term Structure Models, short rate models
Part 6: HJM methodology
Part 7: Forward Measure Approach
Part 8: Market Models.
Part 9 (if time permits) -- A number of lectures will be dedicated to some of the following topics: - LIBOR scandal, Financial Crisis, Inflation risk and derivatives, Fixed income & insurance derivatives

All course materials, including all lecture notes and HWs, will be posted on CourseWorks. Recommended (not required) textbooks:
(A relatively inexpensive entry-level text that provides a nice introduction to interest rate modeling at the MS level.) Chapter 1 posted on CourseWorks.

2. Interest Rate Models: Theory and Practice (Springer Finance) by Damiano Brigo and Fabio Mercurio.
(One thick book on interest rate modeling, more of reference text than a course text. Available through CU library (electronic version also available))
4. Most relevant reading materials are the lecture notes and the handouts posted on Courseworks.

Assignments: Given approximately bi-weekly. You can work with other students in the class, but you must write up your own solution.

Grading:
Assignments 25%; Midterm (only one) 30%; Final 45%.