DEBT INSTRUMENTS AND MARKETS
NEW YORK UNIVERSITY, STERN SCHOOL

Syllabus Fall 1998
B40.3333

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Course Description

This course describes the important fixed income securities and markets, and in turn develops tools for valuing these securities and managing their interest rate risk. Historically, *fixed-income* refers to securities which promise fixed cash flows over their lives. Now, we generally view any fixed-income instrument as one in which its value depends on the level of interest rates. Thus, along with an analysis of fixed-rate bonds, we will also look at other securities, such as floaters, inverse floaters, bond options, caps/floors, callable bonds, swaps, mortgage-backed securities, and emerging market debt, among others.

The study of fixed income securities is highly quantitative in nature. Students should be comfortable with mathematics such as algebra, linear algebra and basic calculus, as well as statistical concepts such as probability distributions, mean, variance, covariance, and regression. A basic background in finance is required, such as the core course, *Foundations in Finance*. Although some previous coursework in options is helpful, it is not necessary to have taken an options course as the analysis of fixed-income derivatives will be self-contained. Students will need to use a calculator that can raise a number to an arbitrary power, and are expected to be **very** familiar with a spreadsheet package like *Excel* (including, for example, its solver function). It is my experience that if students do not satisfy this criteria, then they tend to struggle in the class.

Course Materials

The main course material is a collection of presentation slides which will be used in each lecture. Hardcopies of these slides are available at the bookstore. Students should make notes directly onto their hardcopy, and thus can spend more time listening and participating in the lecture. A secondary course material is a collection of readings, which provide additional discussion of the issues brought up during the lectures. These materials will be handed out periodically during the semester.

Two recommended readings (but *not required*) are:
Tuckman, **Fixed Income Securities** , Wiley, 1995, and
Sundaresan, **Fixed Income Markets and Their Derivatives**, South-Western, 1997.
These readings should be available at the NYU Professional Bookstore. Also, any large chain, such as Barnes and Noble (if you like their prices better), will probably also carry a copy of the book. The Tuckman book coincides a little closer to the lecture materials in that Tuckman uses a similar methodology to value fixed-income securities. On the other hand, Sundaresan's book contains more institutional material, has more examples, and reads more like a standard textbook.

For those of you who are planning a career in the fixed-income sector, any of the following three books may also be helpful:
Das, **Swap & Derivative Financing**, Revised edition, Probus, 1995.
Fabozzi and Fabozzi, **The Handbook of Fixed Income Securities**, 4th edition, Irwin, 1995.
Stigum, **The Money Market**, 3rd edition, Dow Jones-Irwin, 1990.
These are all highly regarded books, which are very encompassing in their particular area. Again, these books should be available at any large bookstore. I do not recommend them here because the course is self contained and these books are very expensive (in the $100 plus range).

Course Requirements

Grades will be based mainly on exam scores: midterm (40%), and final (60%). Problem sets will be graded on a check, check-plus, check-minus, or no credit basis. These problem sets count for borderline cases, of which 24% of the class found themselves in, for example, last year.
With respect to the exams, you are allowed one 8.5x11 inch page of notes for the midterm and two 8.5x11 inch pages of notes for the final.
With respect to the problem sets, because the material in the course is analytical and new concepts build on old ones, it will be essential to do the problem sets in order to follow the lectures and succeed on the exams. In order to facilitate learning, I encourage students to work together on these problem sets. Groups of students working together should submit just one assignment. All students in the same group will get the same grade. I will not accept late assignments even if a dog ate it. (Someone's did a few years back).

On the next page, I provide a tentative schedule for the lectures in the class.

TENTATIVE SCHEDULE OF LECTURES

Topic I: Introduction
Course overview and survey of major fixed income markets (September 8).

Topic II: Valuation of Fixed Cash Flows
This part of the course covers the valuation of fixed cash flows, including an analysis of the discount function, no arbitrage valuation, bond portfolio replication, and important concepts such as yield-to-maturity and forward rates. (September 10,15,17).

Topic III: The Interest Rate Sensitivity of Instruments with Fixed Cash Flows
This part of the course covers the interest rate sensitivity of fixed cash flows, including the important concepts of duration and convexity, and how these concepts apply to a portfolio of securities. These tools are then used to show how to hedge the interest rate risk of securities with fixed cash flows. (September 22,24,29).

Topic IIIA: Orange County and the Reverse Repo Transaction
This lecture puts some of the ideas in topic III into perspective by discussing how Orange County lost $1.7 billion in losses. Of additional interest, I discuss an important financing market in the fixed income area, namely the repo market. (October 1).

Advanced Lecture: Estimating the Term Structure Using Spline Estimation
This lecture covers material that will not be **tested**. However, the topic has enough practical importance that we provide one lecture on how institutions in practice estimate the zero curve. This lecture also allows students additional time to study for the midterm exam. (October 6).

Midterm Exam (In class: October 8)

Topic IV: Valuation and Interest Rate Sensitivity of Interest-Rate Dependent Cash Flows
This part of the course covers the techniques for valuing cash flows which depend on interest rates. The lectures will include a description of the major characteristics of interest rates, the development of a popular, Wall Street one-factor model of interest rates, and a valuation and hedging methodology for this model. (October 13,15,20).

Topic V: Fixed-Income Options
These lectures will focus on the valuation of fixed-income options, and embedded options in fixed-income securities. As options are a building block for many securities, these lectures are crucial for the understanding of later concepts. I will start with an overview of options, and then show how to value options and measure their interest rate sensitivity using the valuation framework within a one-factor setting. Particular emphasis will be placed on studying one type of embedded option that is common in the fixed-income market, namely callable bonds. (October 22,27,29;November 3).

Topic VI: Floaters, Inverse Floaters, Caps and Floors

This part of the course covers floating rate notes and inverse floaters. Since these securities often involve some type of embedded option, such as a cap, floor or collar, I also discuss these embedded options here as well. (November 5,10).

Topic VII: Swaps

This topic covers an analysis of the ever important swaps market, including a detailed description of this market, along with an analysis of the valuation and interest rate sensitivity of interest-rate based swaps. (November 12,17).

Topic VIII: Mortgage-Backed Securities

This series of lectures covers a description of the mortgage market, including mortgages, mortgage-backed securities and collateralized mortgage obligations. The analysis will not only provide a description of these markets, but also will analyze the distribution rules for cash flows, as well as providing a method for valuing and measuring the interest rate sensitivity of mortgage backs. (November 19,24;December 1).

Topic IX: Miscellaneous Topics

The above schedule is ambitious with respect to the completion of all of these topics. To the extent we follow the schedule, the final part of the course involves an introduction to and analysis of some important areas not covered yet. These tentatively include lectures on interest rate-based futures contracts, and emerging market debt (with particular emphasis on so-called Brady Bonds). (December 3,8).

TopicX: Course Review

An overview of the important concepts of the course. (December 10)

Final Exam

Section 1: December 17th, 10:45AM - 12:45PM

Section 2: December 17th, 3:15PM - 5:15PM