New York University Stern School of Business

B40.3333       Debt Instruments and Markets

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Course Description

This course will be taught from the perspective of an institutional fixed income portfolio manager. There is a significant amount of creativity and discipline in designing portfolio strategies that satisfy the objectives of institutional clients and organizing an investment team to deliver superior performance relative to established benchmarks and competitors. This course will cover essentially the same topics as other sections of Debt Instruments and Markets at Stern. However, we take our motivation from the perspective of a portfolio manager who needs to understand how these standard topics impact investment choices and performance.

The prerequisite for this course is B01.2311 Foundations of Finance. It is assumed that students have a basic understanding of bond valuation, duration, convexity, portfolio theory, capital asset pricing models, option valuation and futures pricing. These prerequisites allow us to start from the perspective of a portfolio manager having clearly defined measures of performance and guideline restrictions. In this context, portfolio construction requires assessment of the relevant contributions that individual securities, sectors and hedge instruments make to the client’s objective function. Please review Chapters 1-10 of the textbook for much of the debt markets prerequisite material (definitions, analytics, and markets).


This course will include a combination of lectures and case discussions. The textbook, assigned readings and lecture material are all relevant to analyzing and solving the cases. 75% of the grade will be based on group/team work (9 comprehensive group case write-ups and an evaluation by your team members). The remaining 25% of a student’s grade will be a function of individual performance (class participation – voluntary and cold calls). No in-class written exams/tests. Attendance is mandatory
for the following reasons. This course is designed to cumulate knowledge and apply it in subsequent classes and case applications. Students are certainly capable and expected to read and absorb the assigned materials on their own. The role of the Professor in class is to provide the bridge from theory to practice with investment technology and information about the business environment that is not readily available in textbooks. Furthermore, it should be obvious that a student cannot obtain a class participation grade without being in class.

FF in the outline below refers to the textbook and AR refers to additional readings or presentation materials. HBS cases are from the Harvard Business School and B&Y Cases are from Michael A. Berry and S. David Young, Managing Investments: A Case Approach, Dryden Press, 1990 (BY).

**Course Outline**

I. **Introduction**

   FF, Chapter 23 Active Bond Portfolio Management Strategies  
   FF, Chapter 24 Indexing  

   a. Bond Markets: Supply and Demand  
   b. Fixed Income Benchmarks and Strategies  
   c. Active Portfolio Management  
   d. Risk Dimensions of Fixed Income Securities  

II. **Agency MBS Prepayment Risk, Valuation and Hedging**

   FF, Chapter 11 Agency Mortgage Pass-Through Securities  
   FF, Chapter 12 Agency Collateralized Mortgage Obligations and Stripped Mortgage-Backed Securities  
   FF, Chapter 17 Interest-Rate Models  
   FF, Chapter 19 Analysis of Residential Mortgage-Backed Securities  
   FF, Chapter 27 Interest-Rate Futures Contracts  
   FF, Chapter 28 Interest-Rate Swaps, Caps, and Floors  
   AR, Time-Varying Empirical Duration and Slope Effects for Mortgage-Backed Securities, JFI September 1998  
   AR, Key Rate Durations: Measures of Interest Rate Risks, JFI Sept 1992
AR, An Introduction to CMO Residuals

a. Agency MBS Structure
   i. Securitized Pools of Home Mortgages
   ii. Interest Only and Principal Only Strips
   iii. Collateralized Mortgage Obligations (CMOs)
   iv. CMO Residuals

b. Valuation of Agency MBS
   i. Interest Rate Process
   ii. Prepayment Model
   iii. Option-Adjusted Spread to Libor (OASL)
   iv. Relative Value Trades

c. Risk Management
   i. Effective Duration, Slope, Volatility, Swap Spread, Prepayments
   ii. Static and Dynamic Hedging
   iii. Stress Tests and Value at Risk (VaR)

III. Mortgage Credit Risk (Non-Agency MBS)

FF, Chapter 13 Non-Agency Residential Mortgage-Backed Securities
AR, The ABCs of HELs, JFI June 2005
AR, Modeling of Mortgage Defaults, JFI Spring 2008
AR, A Loss Severity Model for Residential Mortgages, JFI Fall 2008
FF, Chapter 14 Commercial Mortgage Loans and Commercial Mortgage Backed Securities (CMBS)
FF, Chapter 16 Collateralized Debt Obligations
AR, Commercial Mortgage Default and Refinancing Risk: A Primer, JPM Special Real Estate Issue 2009

a. Valuation of Non-Agency Residential MBS
   i. Interest Rate and Home Price Processes
   ii. Prepayment, Delinquency, Default and Loss Severity Models
   iii. Credit Option-Adjusted Spread to Libor (COASL)
   iv. Relative Value Trading Strategies
   v. Risk Management

b. Commercial Mortgage Backed Securities
c. Collateralized Debt Obligations
d. Residential Mortgage Credit Default Swaps
e. ABX and CMBX Indices
IV. Corporate Credit Risk, Return, Valuation and Hedging

- FF, Chapter 18 Analysis of Bonds with Embedded Options
- FF, Chapter 20 Analysis of Convertible Bonds
- FF, Chapter 21 Corporate Bond Credit Analysis
- FF, Chapter 22 Credit Risk Modeling
- FF, Chapter 30 Credit Derivatives
- AR, Empirical Duration of Corporate Bonds and Credit Market Segmentation, JFI Summer 2010

a. Valuation
   i. Reduced Form Models
   ii. Structural Models
   iii. Interest Rate and Firm Value Processes
   iv. Default and Loss Severity
   v. Credit Option-Adjusted Spread to Libor (COASL)

b. Risk Management
   i. Effective Duration, Slope, Volatility, Swap Spread, Default
   ii. Credit Default Swaps and CDX Indices

c. Corporate Bond Portfolio Strategies and Performance

V. The Investment Process

- FF, Chapter 26 Bond Performance: Measurement and Evaluation
- AR, Portfolio Construction: Alphas, Betas, and Macro Factors
- AR, Performance Attribution and the Investment Management Process
- AR, Replicating Bond Indices with Liquid Derivatives, JFI Spring 2006

VI. Liability Driven Investments (LDI) for Pension Plans

- FF, Chapter 25 Liability-Driven Strategies
- AR, Managing Pension Liability Credit Risk: Maintaining a Total Portfolio Perspective, JPM Fall 2009
VII. **B&Y Case: Hedging Mortgage-Back Securities**

1) The obvious way to try to hedge an MBS portfolio is with MBS futures, such as the GNMA I. Why is this not a completely satisfactory hedge? Which MBSs, if any, could be hedged with the GNMA I?

2) The price volatility of a MBS depends on the volatility of interest rate changes and prepayments. If the current coupon rate is 10 percent, will a MBS with an 8 percent coupon be more or less volatile than a MBS with a 15 percent coupon? What if the current coupon rate is 5 percent?

3) A hedging strategy can be designed using T-note futures, which usually requires dynamic hedging. Consider the case of a portfolio that is fully hedged with Treasury futures. If dynamic hedging is not used, describe a scenario in which the hedged position comes undone with a resulting large loss.

4) King has $6,500,000 of GNMA 11s in his portfolio. Design a hedge for these MBSs using T-note futures and T-note options. See GNMA Prices in Excel File.

5) Describe qualitatively how Mr. King should hedge his portfolio.

VIII. **HBS Case: Harrington Financial Group**

1) Describe what can go wrong when thrifts originate and hold 30-year fixed rate mortgages funded by short-term retail deposits?

2) What is the benefit of extending liabilities to match the duration of assets? Is this a good thing when it reduces net interest margin? Why not just originate only adjustable rate mortgages that match the maturity/duration of the liabilities?

3) When is buying securitized MBS preferable to originating mortgage loans in the local community and holding them in portfolio? How does this decision translate into return on equity?

4) Smith Breeden talks about pricing loans and deposits. How do you think this is implemented?
5) What is the leverage employed by the shareholders of Harrington Financial Group? What was their return on investment at the time of the IPO?

6) Smith Breeden strongly advocates managing a bank on a mark-to-market basis. What are the pros and cons?

7) Bank regulators are concerned with capital adequacy. Regulators require stress tests on the bank’s market value of portfolio equity (MVPE) for instantaneous interest rate shifts of plus/minus 1%, 2%, and 3%. How does Harrington Bank manage this risk? (See HFG Monthly Financial Report) What other bank risks should the regulators consider?

8) What should Harrington Bank do about its mix of retail and wholesale assets and liabilities? What are the implications for franchise value?

IX. **HBS Case: Smith Breeden Assoc: The Equity Plus Fund (A&B)**

1) Describe the portfolio strategies of the Short Duration (Exhibit 1) and the Intermediate Duration (Exhibit 2) Funds. How does each fund generate alpha and minimize tracking error?

2) Describe the Equity Plus Fund strategy. How would you market the strategy?

3) How would you estimate the expected excess return and tracking error of the strategy? What would cause the strategy to underperform?

4) Does it make sense for retail investors to use the three Smith Breeden funds exclusively as their source of stocks, bonds and cash?

5) Suppose you could generate alpha from selecting among the bonds in Barclay’s U. S. High Yield Corporate Bond Index. How would you transport that alpha to a S&P 500 Enhanced Index Fund?

6) What should Smith Breeden do with its mutual fund business?
X.  **HBS Case: Rosetree Mortgage Opportunity Fund**

1) Describe the supply and demand dynamics in the housing market that resulted in the observed home price volatility since 2000.

2) What role do the government sponsored agencies play in the housing market?

3) How can subprime mortgage bonds be rated AAA? Did subprime mortgages trigger the financial crisis of 2007-2008?

4) What effect does the vintage (date of origination) have on loan quality?

5) How would you characterize the quality of the loan portfolio under consideration at origination? Now?

6) What indicative price should Villegas offer to the selling bank

XI.  **B&Y Case: A Tale of Two Models (A)**

1) What are the essential components of a convertible bond? Why is it advantages for a company to call a convertible bond at or near the conversion price?

2) Sally Dawson reviews two other models (Value Line and Sprenkle) for use in valuing these bonds. How could they be used in valuing convertible bonds and why might they be better than the BS model in this regard?

3) Fill in the table in case Exhibit 8 and compute the corresponding values for the HCA 2008. Explain the changes that occur in the value of the convertible as volatility and the risk-free rate change.

4) What are the weaknesses of using the Black/Scholes model to value convertible bonds as is done in case Exhibit 8? The HCA 2008 can be called in two years. How will this provision affect the value of the convertible? Estimate how much the call provision will affect the value of the convertible bond.
XII. **B&Y Case: A Tale of Two Models (B)**

1) Value the HCA 2008 convertible bond referenced in the "A Tale of Two Models (A)" case.

2) What are the underlying assumptions of the binomial option pricing model? Compare it to the Black/Scholes Model.

3) Under what circumstances does the binomial option pricing model give the same value as the Black/Scholes model?

4) Explain the dividend capture play in this case if you were valuing a listed option on the equity of HCA. Assume a value for the dividend.

XIII. **HBS Case: Delphi Corp. and the Credit Derivatives Market (A)**

1) Describe the strategies used by participants in the global credit derivatives market.

2) Discuss the structure of a synthetic collateralized debt obligation in the case. During the financial crisis, Goldman Sachs appeared before congress and settled a lawsuit with the government associated with creating a synthetic CDO of subprime mortgages for Paulson & Co. Is there an analogy to the synthetic corporate bond CDO described in the case?

3) Explain the market’s view of Delphi Corporation implicit in the price patterns of its publicly traded stock and bonds.

4) How does the Delphi CDS spread relate to the bondholder’s expected excess return on its investment?

5) How can Jane Bauer-Martin implement each of her investment options under consideration with credit derivatives?

XIV. **HBS Case: Long-Term Capital Management, L.P. (A)**

1) Are the incentives of the Principals and employees of LTCM aligned with investors?
2) Describe the view that motivates the swap spread trade. How can this trade lose money?

3) Describe the fixed-rate mortgage trade. How can this trade lose money? Mortgages are typically hedged with either or a combination of Treasury Futures, Eurodollar Futures or Swaps. How is LTCM’s view on swap spreads reflected in their choice of hedge instrument? How would you hedge mortgages when swap spreads are extraordinarily wide? Or when swap spreads are at a normal/fairly priced level?

4) Describe how LTCM sells volatility in the fixed-income and equity option products. How can this trade lose money? How can the mortgage trade also be characterized as selling volatility?

5) Discuss risk management at LTCM. How does “value at risk” limit loss exposure? What information does “stress testing” provide? What is the effect of correlation among trades on portfolio risk? How can you test LTCM’s correlation assumptions with the data in Exhibit 1?

6) In September of 1997, the Principals debated whether or not the Fund had excess capital. What course of action should they take?

XV. HBS Case: Pension Management at General Motors

1) What are the major implications of the new pension standards for financial reporting?

2) What are the arguments in favor of investing in high alpha strategies? What can go wrong?

3) What are the pros and cons of shifting pension assets from equities to bonds? Make an asset allocation recommendation. See Excel data file.

4) Are there any other tactics for dealing with the volatility introduced by the new pension standards?