BF308 Fixed Income Securities

Academic Year: 2009-10  Semester: 2
Course Coordinator: William Leon  Other Instructor(s):
Pre-requisites: 1. BF215 Investment Analysis & Portfolio Management
                2. BF212 Mathematical Methods for Finance OR
                   BF307 Derivative Securities.
No. of AUs: 4

Course Description and Scope

In the past two decades, there were tremendous innovations in fixed income securities. These developments have spurred enormous growths in the fixed income markets that eventually led to the sub-prime crisis involving mortgage-backed bonds, collateralized debt obligations and credit derivatives. The crisis highlights some of the dangers of uncontrolled innovations and developments.

This course introduces students to the financial world of fixed income securities and their markets, explains the risks of these securities and presents the tools used in their valuations. The course introduces both the theoretical and practical aspects of fixed income investment. The topics covered include analysis of fixed income securities and markets, term structure of interest rates, valuation tools, estimation and measurement methodologies, etc. The scope of the course material covers most of the topics in the fixed income securities portion of the Chartered Financial Analysis examination.

Course Learning Objectives

Students will learn about term structure models, features of fixed income market; and how to analyze and price different types of fixed income securities.

Learning & Teaching Methods

3 hours of seminar per week commencing in Week 1 and ending in Week 13.

Course Assessments

<table>
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<tr>
<th>Components</th>
<th>Marks</th>
<th>Individual/Group</th>
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<tr>
<td>Coursework</td>
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<tr>
<td>Class Participations &amp; Presentation / Assignments /</td>
<td>50</td>
<td>Individual / Group</td>
</tr>
<tr>
<td>Quizzes / Project</td>
<td></td>
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<tr>
<td>Open-book examination</td>
<td>50</td>
<td>Individual</td>
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<tr>
<td>Total</td>
<td>100</td>
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Class Participation & Presentation (10%)

The objective of class participation and presentation is to train students' critical thinking and presentation skills. Students are expected to participate actively in class discussion and will be required to make class presentations either individually or as part of a group.

Assignments¹ (10%)

The objective of the assignments is to train students' critical thinking and writing skills. Instructors will assign questions as homework and students will answer the questions clearly and concisely, and submit their answers in typed written form.

Quizzes (15%)

The objective of the quizzes is to assess students' knowledge and understanding of the material taught. The quizzes will consist of multiple choice and short questions.

Project (15%)

The objective of the project is to train students to write a credit analysis of a company and its bond issues. This project involves a thorough credit analysis of a company that had issued traded bonds and includes, but not limited to, the following:

- A background research on the company and the industry the company operates in. This should include information about the company's outstanding bond issues, credit rating, management, bond covenants, etc.
- A detailed financial analysis of the company over a five-year period. This should use the latest 5 years of financial data including all up-to-date information.
- An assessment on the likelihood of changes in the company's credit rating. This should include an assessment of the probabilities of credit downgrading or upgrading, and an evaluation of the impact on required yield and price of all the company’s outstanding bond issues.

Assessment Plan

<table>
<thead>
<tr>
<th>Course Learning Objective</th>
<th>Assessment Method</th>
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<tbody>
<tr>
<td>Understand term structure of interest rate.</td>
<td>Class Presentation, Assignment,</td>
</tr>
<tr>
<td>Able to explain workings of fixed income market.</td>
<td>Quiz, Written Exam</td>
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<tr>
<td>Able to analyze and price fixed income securities.</td>
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</table>

¹ Detailed information will be provided later.
Readings & References

F1 Frank J. Fabozzi
*Fixed Income Analysis*, 2nd Edition
John Wiley & Sons, 2006

F2 Frank J. Fabozzi
*Fixed Income Mathematics*, 4th Edition
McGraw-Hill, 2006

C Moord Choudhry
*Fixed Income Markets*, 2nd Edition
John Wiley & Sons, 2004
(ISBN:0470821361)

S1 Gary Strumeyer
*Investing in Fixed Income Securities: Understanding the Bond Market*
John Wiley & Sons, 2005

S2 Suresh Sundaresan
*Fixed Income Markets and Their Derivatives*, 2nd Edition
South-Western, 2002

T Bruce Tuckman

*Bloomberg and Reuters*
Bloomberg and Reuters Bridge Station provide real time and historical price, trading data, news and analytics on the fixed income markets. Access to Bloomberg and Reuters is available at the library and at the financial trading rooms.

Course Instructor(s)

<table>
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<tr>
<th>Instructor</th>
<th>Office</th>
<th>Phone</th>
<th>E-mail</th>
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<tbody>
<tr>
<td>William C. H. Leon</td>
<td>S3-B1A-29</td>
<td>6790 5647</td>
<td><a href="mailto:achleon@ntu.edu.sg">achleon@ntu.edu.sg</a></td>
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</tbody>
</table>
**Proposed Weekly Schedule**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Learning Objectives</th>
<th>Readings / Activity</th>
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</table>
2. Describe the relations among bond’s price, bond's coupon rate, bond’s price relative to par value, market required yield, and interest rate.  
3. Explain how features of a bond affect the bond’s interest rate risk, how yield volatility affects the price of a bond with embedded options and how changes in volatility affect the value of a callable and a putable bond, and why a floating rate security’s price may differ from its par value. | F1 Ch. 1 & 2  
F2 Ch. 2 |
| 2.   | Overview of Fixed Income Securities & Their Markets | 1. Describe the sectors of fixed income markets, the types of fixed income securities, and the major issuers and investors of fixed income securities.  
2. Explain the process how different fixed income securities are created, issued and traded, the methods used by institutional investors to finance purchase of a security, the bankruptcy process and the bondholder rights | F1 Ch. 3 & 4 |
| 3.   | Valuation of Fixed Income Securities & Measurement of Interest Rate Risk | 1. Explain the fundamental principles of bond valuation, the deficiency of traditional bond valuation approaches, the steps in a valuation process, the effects on price of a bond as discount rate changes and as the bond approaches its maturity date, the arbitrage-free pricing approach and the role of Treasury spot rates in a valuation process.  
2. Compute the price of a bond given a term structure of default free spot rates and a term structure of credit spreads.  
3. Discuss the relations between price and yield for an option-free bond, a callable bond, a prepayable security and a putable bond.  
4. Explain why duration does not account for yield curve risk for a portfolio of bonds and how yield level affects interest rate risk of a bond.  
5. Compute and interpret duration, effective duration, convexity and effective convexity of a bond, and approximate price change of a bond in response to a change in interest rate.  
6. Compute price value of a basis point of a bond. | F1 Ch. 5 & 7  
F2 Ch. 3–7, 12–14 |
<table>
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| 4.   | Yield Measures, Spot Rates, Forward Rates & Term Structure of Interest Rates | 1. Describe the types of yield measures, and explain their underlying assumptions and limitations.  
2. Describe the types of yield spread measures, the determinants of yield spread, the relations between credit spreads and well-being of a firm and the economy, and the relation between yield spreads and embedded options.  
3. Describe the term structure of interest rates, the shapes of yield curve, the shifts in yield curve and the interest rate models.  
4. Explain the theories of term structure of interest rates and their implications on market's expectation about future interest rates.  
5. Describe the types of securities and interest rates that are used to construct a theoretical spot rate curve, and discuss their advantages and disadvantages.  
6. Compute the theoretical spot rate curve using bootstrapping methodology given a yield curve derived from on-the-run Treasury issues.  
7. Describe the nominal spread and static spread, compute static spread given a spot rate curve, and explain why static spread differs from and is better than nominal spread.  
8. Explain forward rates, compute forward rates from spot rates and forward discount factors from forward rates, and price bond using forward rates. | F1 Ch. 6 & 8  
F2 Ch. 8, 10, 15–16 |
| 5.   | Principles of Credit Analysis | 1. Identify the types of credit risk.  
2. Describe what a rating agency does and the factors considered by rating agencies in rating securities.  
3. Explain the meaning of credit ratings, rating watches, rating outlooks and a rating transition matrix.  
4. Describe the credit analysis process, and compare and contrast the credit analysis of different securities.  
5. Compute key ratios used by credit analyst to assess the ability of a company to satisfy its debt obligations, and explain the limitations of such ratios.  
6. Evaluate the credit quality of a security given information about the issuer.  
7. Explain credit scoring and credit risk models, and their limitations in predicting the likelihood of corporate bankruptcy. | F1 Ch. 15  
F2 Ch. 19, 28 |
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| 6.   | Valuation of Fixed Income Securities with Embedded Options | 1. Explain the advantages and disadvantages of a callable, a putable and a prepayable security for an issuer and an investor.  
2. Describe the binomial model, its interest rate modelling strategy and the backward induction valuation methodology.  
3. Compute the value of a bond with embedded option given an interest rate tree and an exercise rule of the option, and discuss the effect of changes in interest rate volatility on the value of a bond with embedded option.  
4. Explain the relations among the values of a bond with embedded option, the corresponding option-free bond and the embedded option.  
5. Compute option-adjusted spread using a binomial model, interpret option-adjusted spread with respect to benchmark interest rates and discuss the importance of benchmark interest rates in interpreting spread measures.  
6. Compute effective duration and effective convexity using a binomial model. | F1 Ch. 9  
F2 Ch.16–18 |
| 7.   | Convertible Bonds | 1. Describe the basic features of a convertible bond.  
2. Discuss the components of a convertible bond that must be included in an option-based valuation approach.  
3. Explain the risk vs. return characteristics of a convertible bond, and compare them against those of the underlying common stock. | F1 Ch. 9  
F2 Ch. 18 |
<p>| 8.   | Recess | | |</p>
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| 9.   | Mortgage- & Asset-Backed Securities | 1. Describe residential and commercial mortgage loans, their cash flow characteristics, the factors that affect prepayments and how they result in contraction and extension prepayments risks. 2. Explain the motivations to create mortgage-backed securities, asset-backed securities, collateralized mortgage obligations and collateralized debt obligations. 3. Explain the basic structural features of and parties to a securitization transaction, and how various tranching and enhancements help to mitigate risks. 4. Compute, interpret and discuss the use and limitations of cash flow yield, nominal yield, static yield, theoretical value, option-adjusted spread, option cost, effective duration and convexity for mortgage- and asset-backed securities. | F1 Ch. 10–12  
F2 Ch. 20–25 |
| 10.  | Interest Rate Derivatives | 1. Discuss the characteristics of interest rate futures, forward contracts, options, caps, floors and swaps, and contrast them against each other. 2. Compute the implied repo rate for an acceptable-to-deliver bond for a Treasury futures contract and explain how this rate is sued to choose the cheapest-to-deliver issue. 3. Compute the theoretical value of an interest rate futures contract, and discuss how the delivery options affect the value. 4. Compute the theoretical value of an option on a bond, discuss the factors that affect the option value and how to measure the option sensitivity to these factors, and compare the role of delta and duration in approximating price changes. 5. Compute the value of a cap, a floor and a caplet given a binomial interest rate tree. 6. Discuss the positions of counterparties in an interest rate swap, in a floating rate bond purchased by borrowing on a fixed rate basis, in an interest rate future, and describe how an interest rate swap can synthesize fixed- and floating-rate securities. 7. Compute the swap rate, swap spread and value of a swap, and the new floating rate payments and value of a swap if interest rates change. | F1 Ch. 13–14 & 22  
F2 Ch. 18 |
| 11.  | Credit Derivatives | 1. Describe the types of credit risk. 2. Define a credit event and an asset swap. 3. Discuss the types, features, valuation and use of credit derivatives. | F1 Ch. 24  
F2 Ch. 19 |
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<tr>
<td>12.</td>
<td>Bond Management Strategies</td>
<td>1. Describe the investment management process, and explain the performance risk and tracking error.</td>
<td>F1 Ch. 16–19</td>
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<td>2. Discuss the general principles for bond management strategies, and explain the various immunization and matching strategies.</td>
<td>F2 Ch. 29</td>
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<td>13.</td>
<td>Project Presentation / Quiz / Revision</td>
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