UNSW Course Outline

FINS5536 Fixed Income Securities and Interest Rate Derivatives - 2024

Published on the 22 May 2024

General Course Information

Course Code : FINS5536
Year : 2024
Term : Term 2
Teaching Period : T2
Is a multi-term course? : No
Faculty : UNSW Business School
Academic Unit : School of Banking and Finance
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Postgraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Studies pricing, hedging and risk management of fixed income securities and interest rate derivatives. Includes: term structure dynamics (including bond price lattices, spot and forward rate models), analytical and numerical techniques, duration measures, interest rate derivative

securities (including options, futures and swaps), the interaction between interest rate risk and credit risk, mortgage-backed securities and value-at-risk, the concepts of general collateral, an accessible treatment of the arbitrage-free models of the term structure, including the concept of state prices and no-arbitrage.

Course Aims

The aims of this course are to expose the students to a variety of interest rate products and help them understand how to price them, and when to use them for hedging. There are several reasons why a course in fixed income securities and interest rate derivatives is so useful. First, in general, derivative securities, including interest rate derivatives, can be quite risky. In some cases, firms have lost millions and even billions of dollars in interest rate derivatives. It is important to understand their riskiness. Second, interest rate derivatives are mathematically sophisticated, even more so than equity derivatives. For example, there is not just one interest rate; there can be a different interest rate for each maturity, known as the term structure of interest rates. So, it is important to know how to price interest rate derivatives correctly. Finally, interest rate products are very popular. World-wide, there are trillions of dollars invested in interest rate derivatives.

This course has FINS5513 (Investments and Portfolio Selection) as a prerequisite. Some of the topics discussed in FINS5535 (Derivatives and Risk Management Techniques) may benefit students taking FINS5536, but FINS5535 is not a prerequisite. We have attempted to keep overlap between the two courses to a minimum. As a result, you can take either course independently of the other, in either order.

Students also need to be able to use a word processing package (such as WORD) and a spreadsheet (such as EXCEL). Some quantitative skill such as basic mathematical ability in dealing with algebraic manipulation is expected.

Course Learning Outcomes

Course Learning Outcomes	Program learning outcomes
CLO1 : Understand the basics of bond pricing, duration and convexity, as well as duration-based portfolio management.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO2 : Understand the term structure of interest rates—that is, the relationship between a bond's yield and its maturity—as well as the term structure of volatilities, and the relationship between a bond's volatility and its duration.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO3 : Understand interest rate futures and forward contracts and their market conventions, using them for hedging, defining an optimal hedge ratio, and pricing them using no-arbitrage arguments.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO4 : Understand interest rate swaps, including the comparative advantage argument, the pricing of floating rate debt, and the valuation of swaps.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO5 : Understand how to model interest rates and bonds using binomial trees, based on delta-hedging (no-arbitrage) arguments, and risk-neutral pricing.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO6 : Understand how to price options on bonds using binomial trees, as well as Black's formula, with volatility depending on the bond's duration. Also, understand how to price caps, floors, collars, swaptions, and other related securities.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO7 : Understand how to price options on zero coupon bonds and coupon bonds using the Hull-White model, which is similar to Black-Scholes, but with mean-reversion in the risk-free interest rate.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO8 : Understand how to price mortgage-backed securities, including the timing risk due to the prepayment option. Understand some derivatives on mortgage-backed securities, such as interest-only and principle-only strips, and collateralised mortgage obligations (CMOs).	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO9 : Understand features of corporate bonds, such as callability, convertibility, sinking fund provisions. Also, understand the Merton model of risky debt, the dilution effect caused by convertible debt and warrants, and the key features of CDSs and CDOs as well as the role they played in the global financial	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO5 : Responsible Business Practice

crisis.	
CLO10 : Understand the definition of Value-at-Risk and apply it to bonds and options.	• PLO1 : Business Knowledge • PLO2 : Problem Solving

Course Learning Outcomes	Assessment Item
CLO1 : Understand the basics of bond pricing, duration and convexity, as well as duration-based portfolio management.	• Quizzes • Group Assignment
CLO2 : Understand the term structure of interest rates—that is, the relationship between a bond's yield and its maturity—as well as the term structure of volatilities, and the relationship between a bond's volatility and its duration.	• Quizzes • Group Assignment
CLO3 : Understand interest rate futures and forward contracts and their market conventions, using them for hedging, defining an optimal hedge ratio, and pricing them using no-arbitrage arguments.	• Quizzes
CLO4 : Understand interest rate swaps, including the comparative advantage argument, the pricing of floating rate debt, and the valuation of swaps.	• Quizzes
CLO5 : Understand how to model interest rates and bonds using binomial trees, based on delta-hedging (no-arbitrage) arguments, and risk-neutral pricing.	• Quizzes
CLO6 : Understand how to price options on bonds using binomial trees, as well as Black's formula, with volatility depending on the bond's duration. Also, understand how to price caps, floors, collars, swaptions, and other related securities.	• Final Exam • Group Assignment
CLO7 : Understand how to price options on zero coupon bonds and coupon bonds using the Hull-White model, which is similar to Black-Scholes, but with mean-reversion in the risk-free interest rate.	• Final Exam
CLO8 : Understand how to price mortgage-backed securities, including the timing risk due to the prepayment option. Understand some derivatives on mortgage-backed securities, such as interest-only and principle-only strips, and collateralised mortgage obligations (CMOs).	• Final Exam
CLO9 : Understand features of corporate bonds, such as callability, convertibility, sinking fund provisions. Also, understand the Merton model of risky debt, the dilution effect caused by convertible debt and warrants, and the key features of CDSs and CDOs as well as the role they played in the global financial crisis.	• Group Assignment • Final Exam
CLO10 : Understand the definition of Value-at-Risk and apply it to bonds and options.	• Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates	Program learning outcomes
Quizzes Assessment Format: Individual	40%		• PLO1 : Business Knowledge • PLO2 : Problem Solving
Group Assignment Assessment Format: Group	20%		• PLO1 : Business Knowledge • PLO2 : Problem Solving
Final Exam Assessment Format: Individual	40%		• PLO1 : Business Knowledge • PLO2 : Problem Solving

Assessment Details

Quizzes

Assessment Overview

The two quizzes will be multiple choice. They are based on material from the lecture notes and practice problems.

PLO1, PLO2

Course Learning Outcomes

- CLO1 : Understand the basics of bond pricing, duration and convexity, as well as duration-based portfolio management.
- CLO2 : Understand the term structure of interest rates—that is, the relationship between a bond's yield and its maturity—as well as the term structure of volatilities, and the relationship between a bond's volatility and its duration.
- CLO3 : Understand interest rate futures and forward contracts and their market conventions, using them for hedging, defining an optimal hedge ratio, and pricing them using no-arbitrage arguments.
- CLO4 : Understand interest rate swaps, including the comparative advantage argument, the pricing of floating rate debt, and the valuation of swaps.
- CLO5 : Understand how to model interest rates and bonds using binomial trees, based on delta-hedging (no-arbitrage) arguments, and risk-neutral pricing.

Detailed Assessment Description

Assessment Name: Quiz #1 **Weight:** 20% **Assessment Due Date / Timing:** Saturday of Week 4

online

Assessment Name: Quiz #2 **Weight:** 20% **Assessment Due Date / Timing:** Saturday of Week 7 online

Assessment Length

Each quiz is one hour long

Submission notes

The quizzes will be held online

Assessment information

The first quiz will be held on Saturday of Week 4 and will cover material right up to, and including, the end of Week 3 lecture.

The second quiz will be held on the Saturday of Week 7 and will cover material right up to, and including, the end of Week 5 lecture.

The quizzes will be multiple choice. The exams are based on material from the lecture notes and practice problems. The formula sheet, which will be available on Moodle, is also helpful for the exam.

Assignment submission Turnitin type

This is not a Turnitin assignment

Group Assignment

Assessment Overview

The project will be based on a number of spreadsheets that will be provided to the students.

The project is partly based on material from the second half of the course, and so will only be made available during the last three weeks of session. It is a group assignment (groups of size <= 5). Students will choose their groups themselves.

PLO1, PLO2

Course Learning Outcomes

- CLO1 : Understand the basics of bond pricing, duration and convexity, as well as duration-based portfolio management.
- CLO2 : Understand the term structure of interest rates—that is, the relationship between a bond's yield and its maturity—as well as the term structure of volatilities, and the relationship

between a bond's volatility and its duration.
- CLO6 : Understand how to price options on bonds using binomial trees, as well as Black's formula, with volatility depending on the bond's duration. Also, understand how to price caps, floors, collars, swaptions, and other related securities.
- CLO9 : Understand features of corporate bonds, such as callability, convertibility, sinking fund provisions. Also, understand the Merton model of risky debt, the dilution effect caused by convertible debt and warrants, and the key features of CDSs and CDOs as well as the role they played in the global financial crisis.

Detailed Assessment Description

The assignments will be submitted using the Assignment link in Moodle.

Late submission will incur a penalty of 5% per day or part thereof (including weekends) from the due date and time. An assessment will not be accepted after 5 days (120 hours) of the original deadline unless special consideration has been approved. An assignment is considered late if the requested format, such as hard copy or electronic copy, has not been submitted on time or where the 'wrong' assignment has been submitted.

Assessment Length

Three weeks

Submission notes

Submission will be via Moodle, further details will be provided later.

Assignment submission Turnitin type

This is not a Turnitin assignment

Final Exam

Assessment Overview

The final will also be multiple choice. It does not directly cover material from the previous CLOs, although knowledge of those topics is used in these CLOs. As with the quizzes, the exam is based on material from the lecture notes and practice problems.

PLO1, PLO2

Course Learning Outcomes

- CLO6 : Understand how to price options on bonds using binomial trees, as well as Black's formula, with volatility depending on the bond's duration. Also, understand how to price caps, floors, collars, swaptions, and other related securities.
- CLO7 : Understand how to price options on zero coupon bonds and coupon bonds using the Hull-White model, which is similar to Black-Scholes, but with mean-reversion in the risk-free

interest rate.
- CLO8 : Understand how to price mortgage-backed securities, including the timing risk due to the prepayment option. Understand some derivatives on mortgage-backed securities, such as interest-only and principle-only strips, and collateralised mortgage obligations (CMOs).
- CLO9 : Understand features of corporate bonds, such as callability, convertibility, sinking fund provisions. Also, understand the Merton model of risky debt, the dilution effect caused by convertible debt and warrants, and the key features of CDSs and CDOs as well as the role they played in the global financial crisis.
- CLO10 : Understand the definition of Value-at-Risk and apply it to bonds and options.

Detailed Assessment Description

The final exam does not directly cover the chapters covered by the two quizzes.

If applicable, students should notify their employers of the requirement to attend exams. Failure to show up at the exams does not automatically lead to reassessment. The exams are not learning tools and will not be returned to students. If you have questions about your performance on the quizzes, see the lecturer during consultation hours.

Assessment Length

2 hours

Submission notes

Final Exam is to be held during the university examination period. The university will set the exam date.

Assignment submission Turnitin type

This is not a Turnitin assignment

General Assessment Information

As a student at UNSW you are expected to display academic integrity in your work and interactions. Where a student breaches the UNSW Student Code with respect to academic integrity, the University may take disciplinary action under the Student Misconduct Procedure. To assure academic integrity, you may be required to demonstrate reasoning, research and the process of constructing work submitted for assessment.

To assist you in understanding what academic integrity means, and how to ensure that you do comply with the UNSW Student Code, it is strongly recommended that you complete the Working with Academic Integrity module before submitting your first assessment task. It is a free, online self-paced Moodle module that should take about one hour to complete.

Grading Basis

Standard

Requirements to pass course

In order to pass this course students must:

- Achieve a composite mark of at least 50 out of 100
- Engage actively in course learning activities and attempt all assessment requirements
- Meet any additional requirements specified in the assessment details
- Meet the specified attendance requirements of the course (see Schedule section)

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Bond Mathematics
Week 2 : 3 June - 9 June	Lecture	Yield Curve
Week 3 : 10 June - 16 June	Lecture	Futures & Forwards
Week 4 : 17 June - 23 June	Lecture	Swaps
	Assessment	Quiz #1 on Saturday of Week 4
Week 5 : 24 June - 30 June	Lecture	Binomial Trees
Week 6 : 1 July - 7 July	Other	No Lectures this week
Week 7 : 8 July - 14 July	Lecture	Options #1 (binomial pricing, Black's formula, options on coupon bonds)
	Assessment	Quiz #2 on Saturday of Week 7
Week 8 : 15 July - 21 July	Lecture	Options #2 (Caps, Floors, FRAs, Inverse Floaters, etc.)
Week 9 : 22 July - 28 July	Lecture	Options #3 (Hull and White) & Corporate Debt
Week 10 : 29 July - 4 August	Lecture	Mortgage Backed Securities & Value-at-Risk
	Assessment	Group Assignment is tentatively due on the Monday of Week 11, which will be confirmed later.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

The timing of topics is only approximate. If I do not finish a topic in one lecture I will continue where I left off in the following lecture. If I finish a topic early, I will move on to the next topic.

Course Resources

Prescribed Resources

The website for this course is on Moodle.

Lecture Notes

The only required text is the lecture notes. The lecture notes and important announcements will be available on UNSW Moodle. Practice problems with solutions will also be made available on the course website. The assessments for this course are primarily based on the lecture notes and practice problems.

Recommended Resources

Reference Books

Sundaresan, S. (2009), Fixed Income Markets and Their Derivatives, 3rd Edition, Southwestern. NOTE: the lecture notes were originally based on Sundaresan's book, but the textbook is not required reading. Copies are available in the library if needed.

Hull, J.C. (2015), Options, Futures, and Other Derivatives, 8th Edition, Prentice Hall.

Hull, J.C., with S. Treepongkaruna, R. Heaney, D. Pitt, D. Colwell, Fundamentals of Futures and Options Markets, (Australian edition) Prentice-Hall, 2014

Additional Costs

None. All reference books should be available in the library.

Course Evaluation and Development

Feedback is regularly sought from students and continual improvements are made based on this feedback. At the end of this course, you will be asked to complete the myExperience survey, which provides a key source of student evaluative feedback. Your input into this quality enhancement process is extremely valuable in assisting us to meet the needs of our students and provide an effective and enriching learning experience. The results of all surveys are carefully considered and do lead to action towards enhancing educational quality.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Lecturer	Shane Miller				Tuesday 5:30 - 6:00pm, prior to the lecture in Ainsworth Building, Room G02	No	Yes

Other Useful Information

Academic Information

COURSE POLICIES AND SUPPORT

The Business School expects that you are familiar with the contents of this course outline and the UNSW and Business School learning expectations, rules, policies and support services as listed below:

- Program Learning Outcomes
- Academic Integrity and Plagiarism
- Student Responsibilities and Conduct
- Special Consideration
- Protocol for Viewing Final Exam Scripts
- Student Learning Support Services

Further information is provided on the key policies and support page.

Students may not circulate or post online any course materials such as handouts, exams, syllabi or similar resources from their courses without the written permission of their instructor.

STUDENT LEARNING OUTCOMES

The Course Learning Outcomes (CLOs) – under the Outcomes tab – are what you should be able to demonstrate by the end of this course, if you participate fully in learning activities and successfully complete the assessment items.

CLOs also contribute to your achievement of the Program Learning Outcomes (PLOs), which are developed across the duration of a program. PLOs are, in turn, directly linked to UNSW graduate capabilities. More information on Coursework PLOs is available on the key policies and support page. For PG Research PLOs, including MPDBS, please refer to the UNSW HDR Learning Outcomes.

Academic Honesty and Plagarism

As a student at UNSW you are expected to display academic integrity in your work and interactions. Where a student breaches the UNSW Student Code with respect to academic integrity, the University may take disciplinary action under the Student Misconduct Procedure. To assure academic integrity, you may be required to demonstrate reasoning, research and the

process of constructing work submitted for assessment.

To assist you in understanding what academic integrity means, and how to ensure that you do comply with the UNSW Student Code, it is strongly recommended that you complete the Working with Academic Integrity module before submitting your first assessment task. It is a free, online self-paced Moodle module that should take about one hour to complete.

Submission of Assessment Tasks

SPECIAL CONSIDERATION

You can apply for special consideration when illness or other circumstances beyond your control interfere with your performance in a specific assessment task or tasks, including online exams. Students studying remotely who have exams scheduled between 10pm and 7am local time, are also able to apply for special consideration to sit a supplementary exam at a time outside of these hours.

Special consideration is primarily intended to provide you with an extra opportunity to demonstrate the level of performance of which you are capable. To apply, and for further information, see Special Consideration on the UNSW Current Students page.

Special consideration applications will be assessed centrally by the Case Review Team, who will update the online application with the outcome and add any relevant comments. The change to the status of the application immediately sends an email to the student and to the assessor with the outcome of the application.

Please note the following:

1. Applications can only be made through Online Services in myUNSW (see the UNSW Current Students page). Applications will not be accepted by teaching staff. The lecturer-in-charge/ course coordinator will be automatically notified when your application is processed.
2. Applying for special consideration does not automatically mean that you will be granted a supplementary exam or other concession.
3. If you experience illness or misadventure in the lead up to an exam or assessment, you must submit an application for special consideration, either prior to the examination taking place, or prior to the assessment submission deadline, except where illness or misadventure prevent you from doing so.
4. If your circumstances stop you from applying before your exam or assessment due date, you must apply within 3 working days of the assessment or the period covered by your supporting documentation.

5. Under the UNSW Fit To Sit/Submit rule, if you sit the exam/submit an assignment, you are declaring yourself well enough to do so and are cannot subsequently apply for special consideration.
6. If you become unwell on the day of – or during – an exam, you must stop working on your exam, advise your course coordinator or tutor and provide a medical certificate dated within 24 hours of the exam, with your special consideration application. For online exams, you must contact your course coordinator or tutor immediately via email, Moodle or chat and advise them you are unwell and submit screenshots of your conversation along with your medical certificate and application.
7. Special consideration requests do not allow the awarding of additional marks to students.

Further information on Business School policy and procedure can be found under "Special Consideration" on the key policies and support page.

LATE SUBMISSION PENALTIES

For assessments other than examinations, late submission will incur a penalty of 5% per day or part thereof (including weekends) from the due date and time. An assessment will not be accepted after 5 days (120 hours) of the original deadline unless special consideration has been approved. An assignment is considered late if the requested format, such as hard copy or electronic copy, has not been submitted on time or where the 'wrong' assignment has been submitted.

For assessments which account for 10% or less of the overall course grade, and where answers are immediately discussed or debriefed, the LIC may stipulate a different penalty. Details of such late penalties will be available on the course Moodle page.

FEEDBACK ON YOUR ASSESSMENT TASK PERFORMANCE

Feedback on student performance from formative and summative assessment tasks will be provided to students in a timely manner. Assessment tasks completed within the teaching period of a course, other than a final assessment, will be assessed and students provided with feedback, with or without a provisional result, within 10 working days of submission, under normal circumstances. Feedback on continuous assessment tasks (e.g. laboratory and studio-based, workplace-based, weekly quizzes) will be provided prior to the midpoint of the course.

Faculty-specific Information

PROTOCOL FOR VIEWING FINAL EXAM SCRIPTS

UNSW students have the right to view their final exam scripts, subject to a small number of very specific exemptions. The UNSW Business School has set a protocol under which students may view their final exam script. Individual schools within the Faculty may also set up additional local processes for viewing final exam scripts, so it is important that you check with your School.

If you are completing courses from the following schools, please note the additional school-specific information:

- Students in the **School of Accounting, Auditing & Taxation** who wish to view their final examination script should also refer to this page.
- Students in the **School of Banking & Finance** should also refer to this page.
- Students in the **School of Information Systems & Technology Management** should also refer to this page.

COURSE EVALUATION AND DEVELOPMENT

Feedback is regularly sought from students and continual improvements are made based on this feedback. At the end of this course, you will be asked to complete the myExperience survey, which provides a key source of student evaluative feedback. Your input into this quality enhancement process is extremely valuable in assisting us to meet the needs of our students and provide an effective and enriching learning experience. The results of all surveys are carefully considered and do lead to action towards enhancing educational quality.

QUALITY ASSURANCE

The Business School is actively monitoring student learning and quality of the student experience in all its programs. A random selection of completed assessment tasks may be used for quality assurance, such as to determine the extent to which program learning goals are being achieved. The information is required for accreditation purposes, and aggregated findings will be used to inform changes aimed at improving the quality of Business School programs. All material used for such processes will be treated as confidential.

TEACHING TIMES AND LOCATIONS

Please note that teaching times and locations are subject to change. Students are strongly advised to refer to the Class Timetable website for the most up-to-date teaching times and locations.