STAT6046

Financial Mathematics

Course Description

Compound interest functions; valuation of annuities certain; loans repayable by instalments; comparison of value and yield of cash flow transactions; valuation of fixed interest securities, with and without tax on interest and capital gains; duration and volatility of securities; introduction to concept of immunisation and matching; consumer credit contracts; introduction to stochastic interest rate models.

Mode of Delivery	On campus
Prerequisites	To enrol in this course you must have completed STAT7055 or be enrolled in the Master of Statistics, Master if Actuarial Studies or Master of Actuarial Practice.
Co-taught Courses	STAT2032. Graduate students attend joint classes with undergraduates but are assessed separately.
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Research Interests	Predictive Modelling in Actuarial Science
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SEMESTER 1

2017

COURSE OVERVIEW

Learning Outcomes

Upon successful completion of the requirements for this course, students should have the knowledge and skills to:

1. Define and describe the use of cash flow models, simple and compound rates of interest and discount as well as compare and distinguish between nominal and effective rates of interest and discount.
2. Describe various types of annuities and perpetuities and use them to solve financial transaction problems.
3. Describe equations of value and various tools like linear interpolation & annuity tables.
4. Compare capital budgeting decision tools like Net Present Values, Internal Rates of Return and Discounted Payback Periods.
5. Analyse basic fixed interest financial transactions like Loan Valuation, Fixed Interest securities (eg. Bonds) and employ the skills developed in this course to evaluate such transactions. Incorporate the effects of taxation on such financial transactions.
6. Explain arbitrage and its use in the valuation of forward contracts. Employ term structure of interest rates to calculate forward and spot rates.
7. Define interest rate risk in terms of duration and convexity of fixed interest products. Define immunisation and assess its use in mitigating interest rate risk
8. Understand the basics of stochastic interest rate models and use it to evaluate simple cash flow models.

Assessment Summary

Assessment Task	Value	Due Date	Date for Return of Assessment
1. Short online quizzes	0%	Weeks 2 onwards	*NA*
2. Mid-semester exam	20%	Week 6 or 7	*TBC*
3. Assignment	10%	19 May 4pm	*Prior to Final Exam*
4. Final exam	70%	Exam period	*30 June*

Research-Led Teaching

Wherever possible the examples used in this course will reflect real world situations to emphasize the use of the techniques covered.

Feedback

Staff Feedback

Students will be given feedback in the following forms in this course:

- Written comments
- Feedback to the whole class and to individuals

Student Feedback

ANU is committed to the demonstration of educational excellence and regularly seeks feedback from students. One of the key formal ways students have to provide feedback is

through Student Experience of Learning Support (SELS) surveys. The feedback given in these surveys is anonymous and provides the Colleges, University Education Committee and Academic Board with opportunities to recognise excellent teaching, and opportunities for improvement.

For more information on student surveys at ANU and reports on the feedback provided on ANU courses, go to
http://unistats.anu.edu.au/surveys/selt/students/ and
http://unistats.anu.edu.au/surveys/selt/results/learning/

Policies

ANU has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and implement them. You can find the University's education policies and an explanatory glossary at:
http://policies.anu.edu.au/

Students are expected to have read the Academic Misconduct Rule before the commencement of their course.

Other key policies include:

- Student Assessment (Coursework)
- Student Surveys and Evaluations

Required Resources

All basic course materials will be available on Wattle. Students will be required to print these out themselves if they want a hard copy of them.

Additional course costs

There are no additional course costs

Examination material or equipment

Both the mid-semester and final examinations are **closed-book**. **A formula sheet will be provided.** You are also allowed to bring in a non-programmable calculator and a dictionary (these must not contain any material added by the student, and will be subject to random checks during the course of the examination).

COURSE SCHEDULE

Week	Summary of Activities	Assessment
0	Access to Wattle site for all enrolled students	
1	Cash-flow models. Simple and compound interest. Accumulated and present values.	

2	Nominal and effective rates of interest and discount. Force of interest.	
3	Introduction to annuities and their valuation.	
4	Perpetuities. Continuous, increasing, decreasing and indexed annuities.	
5	Equations of value. Introduction to linear interpolation and annuity tables. Dealing with inflation.	
6	Loan valuation and payments. Capital budgeting including NPV, IRR and DPP.	
7	Measuring investment performance. TWRR and MWRR. Valuation of fixed interest securities, with and without tax on interest and capital gains.	Mid-semester Exam
8	Calculating yields. Allowing for callable features and inflation. Extending to property and share valuation.	
9	Arbitrage and valuation of forward contracts. Yield curve and term structure of interest rates. Calculating forward and spot rates.	
10	Interest rate risk: duration, effective duration and convexity. Conditions for and determination of immunisation.	
11	Introduction to stochastic interest rate models. Revision.	Assignment Due
12	Final Revision	

ASSESSMENT REQUIREMENTS

The ANU is using Turnitin to enhance student citation and referencing techniques, and to assess assignment submissions as a component of the University's approach to managing Academic Integrity. For additional information regarding Turnitin please visit the ANU Online website.

Students may choose not to submit assessment items through Turnitin. In this instance you will be required to submit, alongside the assessment item itself, copies of all references included in the assessment item.

Assessment Tasks

Assessment Task 1: Mid-semester Exam

Details of task:

The mid-semester exam will be 1.5 hours long. Specific details regarding examination conditions and the time and location for this examination will be provided on Wattle and in lectures once confirmed.

The mid-semester examination is optional and **redeemable**. No deferred examination will be offered for the mid-semester exam, instead the weighting will be moved to the final exam.

Assessment Task 2: Assignment

Details of task:

The assignment questions will be provided to all students at the relevant time on the course Wattle page. Students are expected to complete this assignment individually. Students will need to submit hard copy assignments and are encouraged to use Excel to complete the assignment. The due date is 19 May 4:00pm.

Assessment Task 2: Final Exam

Details of task:

The final exam will be 3 hours long and will cover the entire syllabus. Specific details regarding examination conditions and the time and location for this examination will be provided on Wattle and in lectures once confirmed.

Assignment submission

Hard Copy Submission: Students should submit their hard copy assignments to the physical assignment box on Level 4, CBE Building 26C. Assignments must include the cover sheet available on Wattle. Please keep a copy of tasks completed for your records.

Extensions and penalties

Extensions and late submission of assessment pieces are covered by the Student Assessment (Coursework) Policy and Procedure.

The Course Convener may grant extensions for assessment pieces that are not examinations or take-home examinations. If you need an extension, you must request it in writing on or before the due date. If you have documented and appropriate medical evidence that demonstrates you were not able to request an extension on or before the due date, you may be able to request it after the due date.

No submission of assessment tasks without an extension after the due date will be permitted. If an assessment task is not submitted by the due date, a mark of 0 will be awarded.

Returning assignments

Marked assessments will be returned as soon as they are marked. Feedback will be provided via Wattle.

Resubmission of assignments

There is no possibility to resubmit assignments.

Reading Lists

There are **no prescribed textbooks** for this course. All course materials will be provided via the course Wattle page.

Supplementary Reading:

- Stephen Garrett (2013) An Introduction to the Mathematics of Finance, Second Edition, Butterworth-Heinemann, ISBN: 978-0080982403
  This book is available as an online textbook on the ANU Library page: Mathematics of Finance in ANU Library
- Course Material for CT1: Financial Mathematics, ACTED Australia

Scaling

Your final mark for the course will be based on the **raw** marks allocated for each of your assessment items. However, your final mark may not be the same number as produced by that formula, as marks may be **scaled**. Any scaling applied will preserve the rank order of raw marks (i.e. if your raw mark exceeds that of another student, then your scaled mark will exceed the scaled mark of that student), and may be either up or down.

Privacy Notice

The ANU has made a number of third party, online, databases available for students to use. Use of each online database is conditional on student end users first agreeing to the database licensor's terms of service and/or privacy policy. Students should read these carefully.

In some cases student end users will be required to register an account with the database licensor and submit personal information, including their: first name; last name; ANU email address; and other information.

In cases where student end users are asked to submit 'content' to a database, such as an assignment or short answers, the database licensor may only use the student's 'content' in accordance with the terms of service – including any (copyright) licence the student grants to the database licensor.

Any personal information or content a student submits may be stored by the licensor, potentially offshore, and will be used to process the database service in accordance with the licensors terms of service and/or privacy policy.

If any student chooses not to agree to the database licensor's terms of service or privacy policy, the student will not be able to access and use the database. In these circumstances students should contact their lecturer to enquire about alternative arrangements that are available.

Tutorial Seminar Registration

Tutorial signup for this course will be done via the Wattle website. Detailed information about signup times will be provided on Wattle or during your first lecture. When tutorials are available for enrolment, follow these steps:

1. Log on to Wattle, and go to the course site
2. Click on the link "Tutorial enrolment"
3. On the right of the screen, click on the tab "Become Member of….." for the tutorial class you wish to enter
4. Confirm your choice

If you need to change your enrolment, you will be able to do so by clicking on the tab "Leave group…." and then re-enrol in another group. You will not be able to enrol in groups that have reached their maximum number. Please note that enrolment in ISIS must be finalised for you to have access to Wattle.

SUPPORT FOR STUDENTS

The University offers a number of support services for students. Information on these is available online from http://students.anu.edu.au/studentlife/

ACTUARIAL PROFESSION INFORMATION

Exemption from Actuarial Professional examination

The Australian National University is accredited by the Actuaries Institute to provide students with exemptions from the Part I professional examinations of the Institute. Exemptions are recommended subject to obtaining sufficiently high grades in designated courses. This course closely follows the syllabus of Subject CT1 of the IAAust.

To qualify for an exemption from the IAAust professional examination CT1, students are required to receive a mark of 60% or greater in this course. The standard required by the Institute of Actuaries of Australia for an exemption will be upheld and thus no quota applies to the percentage of students receiving each grade in this course.

University subscription to the Institute of Actuaries

The Institute of Actuaries of Australia (IAAust) allows students to become IAAust University Subscribers free of charge. Full time undergraduates studying at an Institute accredited university who are members of a university student actuarial society are eligible.

To sign up, go to:
http://www.actuaries.asn.au/becoming-an-actuary/becoming-a-university-subscriber

The University Subscriber offer is not a membership of the IAAust but a subscription to receive information on career opportunities, invitations to selected IAAust events and online publications. You might also consider joining the IAAust – there are advantages in doing so while a full-time student.

For membership information, go to
http://www.actuaries.asn.au/becoming-an-actuary/becoming-a-member/becoming-a-student-member