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.

<table>
<thead>
<tr>
<th>Mode of Delivery</th>
<th>On campus</th>
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<tbody>
<tr>
<td>Prerequisites</td>
<td>STAT1008 – Quantitative Research Methods OR</td>
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<tr>
<td></td>
<td>STAT1003 – Statistical Techniques</td>
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<tr>
<td>Co-taught Courses</td>
<td>STAT2032 – Financial Mathematics</td>
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<tr>
<td>Course Convener</td>
<td>Abhinav B Mehta</td>
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</tr>
<tr>
<td>Consultation hours:</td>
<td>Please check wattle site for the latest</td>
</tr>
<tr>
<td></td>
<td>information</td>
</tr>
<tr>
<td>Bio and research interests</td>
<td>Abhinav is an Associate Lecturer in RSFAS, Fellow of the</td>
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<tr>
<td></td>
<td>Higher Education Academy and an Associate of the Institute of</td>
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<td></td>
<td>Actuaries of Australia. His research interests are in the field of</td>
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<td></td>
<td>Crime Statistics, Medical Statistics and Biostatistics</td>
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<td></td>
<td>He is also pursuing his PhD in Statistics from RSFAS.</td>
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<tr>
<td>Tutor</td>
<td>TBA</td>
</tr>
<tr>
<td>Student Administrators</td>
<td>Anna Pickering</td>
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<td></td>
<td>Level 4, ANUCBE Bldg. 26C</td>
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<td></td>
<td><a href="mailto:Anna.Pickering@anu.edu.au">Anna.Pickering@anu.edu.au</a></td>
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</tbody>
</table>

http://programsandcourses.anu.edu.au/course/STAT6046
Course Overview

Course Learning Outcomes
On satisfying the requirements of this course the student will 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.
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.
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.

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

Technology, Software, Equipment
All course notes and materials will be provided via Wattle. You will need access to a computer to get the materials necessary for the course. We will use MS Excel in this course. Some in class work will be illustrated using MS Excel. Learning guides and short video lectures will be made available on wattle for students to learn the application of the concepts taught in this course. Students will have to complete their assignment using MS Excel or a spreadsheet program.

Co-teaching
This course will be taught alongside STAT2032. There will be some material in this course which may not be relevant to STAT2032 but applies only to STAT6046. This will be clearly identified during the lecture and/or tutorial. Students enrolled in STAT6046 will need to demonstrate a deeper understanding of the concepts and material. This will be done through different assessment tasks and lecture and tutorial material.

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

- Responses to the online quizzes
• Responses to the assignment
• Through one on one conversations during consultations

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/

COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Summary of Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Access to Wattle site for all enrolled students</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Cash-flow models. Simple and compound interest. Accumulated and present values.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nominal and effective rates of interest and discount. Force of interest. Introduction to annuities and their valuation.</td>
<td>Quiz A to be completed online</td>
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<tr>
<td>3</td>
<td>Perpetuities. Continuous, increasing, decreasing and indexed annuities.</td>
<td>Quiz B to be completed online</td>
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<tr>
<td>5</td>
<td>Loan valuation and payments. Capital budgeting including NPV, IRR and DPP.</td>
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<tr>
<td>6</td>
<td>Measuring investment performance. TWRR and MWRR.</td>
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<tr>
<td>7</td>
<td>Valuation of fixed interest securities, with and without tax on interest and capital gains.</td>
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<tr>
<td>8</td>
<td>Calculating yields. Allowing for callable features and inflation. Extending to property and share valuation.</td>
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<tr>
<td>10</td>
<td>Interest rate risk: duration, effective duration and convexity. Conditions for and determination of immunisation.</td>
<td>Assignment Due 20 October</td>
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<tr>
<td>11</td>
<td>Introduction to stochastic interest rate models.</td>
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<tr>
<td>12</td>
<td>Revision</td>
<td></td>
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</tbody>
</table>
COURSE ASSESSMENT

Assessment Summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Title</th>
<th>Value</th>
<th>Due Date</th>
<th>Linked Learning Outcomes</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Quiz A</td>
<td>5%</td>
<td>Week 4</td>
<td>LO1</td>
</tr>
<tr>
<td>2</td>
<td>Quiz B</td>
<td>5%</td>
<td>Week 6</td>
<td>LO2</td>
</tr>
<tr>
<td>3</td>
<td>Assignment</td>
<td>20%</td>
<td>20 October</td>
<td>LO3 – LO7</td>
</tr>
<tr>
<td>4</td>
<td>Final Exam</td>
<td>70%</td>
<td>Exam Period</td>
<td>All</td>
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</tbody>
</table>

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.

This course does not require the students to use Turnitin for assignment submission.

As a further academic integrity control, students may be selected for a 15-minute individual oral examination of their written assessment submissions.

Any student identified, either during the current semester or in retrospect, as having used ghost writing services will be investigated under the University’s Academic Misconduct Rule.

Assessment Task 1 & 2: Quizzes A & B

Details of task:
The quizzes are to be attempted online on Wattle. The quizzes are worth 5% each of your overall score in the course. You will get at least 45 minutes to complete each quiz. Both the quizzes are compulsory. Under no circumstances will you be able to attempt the quiz outside of the allocated time period. Announcements will be made during lectures and on the Wattle course site regarding the availability of the quiz.

There will be a mix of multiple choice questions and numerical evaluation questions. Quiz A will cover LO1 of the course. Quiz B will cover LO2 from the outcomes mentioned above.

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
Feedback via Wattle

Assessment Task 3: Assignment
Details of task:
The assignment questions will be provided to all students at the relevant time on the course Wattle page. The assignment is designed to assess the students’ application of the various topics covered in this course. The students are expected to complete this assignment individually. Students will have to complete their assignment using a spreadsheet (MS Excel). The submission is online via Wattle. More details will be provided during the lectures and on Wattle.
The assignment is compulsory and is worth 20% of your overall mark for this course.

Assignment Submission
All students must hand in an assignment of their own original work. The assignment is to be submitted online on Wattle at the pre-specified location. You must attach a coversheet with your assignment.

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.

Examinations
The final examination 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.

Examination material
Details about the material or equipment that is permitted in an examination room will be provided in class and on Wattle.

https://wattlecourses.anu.edu.au/

Scaling
Your final mark for the course will be based on the raw marks allocated for each assignment or examination. 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 or equal the scaled mark of that student), and may be either up or down.
READING LISTS

All course material will be provided via the course Wattle page. There are no prescribed textbooks for this course. Although there are some supplementary material that can enhance student learning.

Supplementary Reading (Not Compulsory)

  
  This book is available as an online textbook on the ANU Library page: Mathematics of Finance in ANU Library. You can download individual chapters for your personal use. Please ensure you follow the ANU guidelines on copyright issues.


- J.J. McCutcheon and W.F. Scott (1986) *An Introduction to the Mathematics of Finance*, published for the Institute of Actuaries and Faculty of Actuaries by Heinemann

- Formula and Tables for Actuarial Examinations, 2002, ACTED Australia

- Course Material for CT1: Financial Mathematics, ACTED Australia

TUTORIAL AND/OR 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.

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 licensor's 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.

**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/](http://students.anu.edu.au/studentlife/)

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

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/](http://policies.anu.edu.au/)

Students are expected to have read the Student Academic Integrity Policy before the commencement of their course.

Other key policies include:

- Student Assessment (Coursework)
- Student Surveys and Evaluations

**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/Membership/MembershipoftheInstitute/Subscriber.aspx

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