ACST202

Mathematics of Finance

S1 Day 2013

Applied Finance and Actuarial Studies

Contents

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General Information

Unit convenor and teaching staff
Unit Convenor
Jim Farmer
jim.farmer@mq.edu.au
Contact via jim.farmer@mq.edu.au
E4A 616
Refer to the unit's web site

Credit points
3

Prerequisites
ACST101(Cr) and MATH133(P) and GPA of 2.50

Corequisites

Co-badged status

Unit description
This unit provides a rigorous mathematical development of compound interest theory, using calculus where appropriate, applying the theory to problems more complex than those encountered in ACST101. Topics include the force of interest and its relationship to interest rates, inflation and capital gains tax, discrete and continuous term certain annuities, project appraisal, loans, bonds, yield curves, matching and immunisation, pricing by the 'no arbitrage' assumption, and forward rate agreements. Students are assumed to be able to use the basic functionality of a spreadsheet package of their choice. The concepts developed in this unit are required in several subsequent units in the actuarial degree. Students gaining a grade of credit or higher in this unit are eligible for exemption from subject CT1 of the professional exams of The Institute of Actuaries of Australia.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Be able to demonstrate a deep understanding of compound interest theory in both discrete and continuous time.

Be able to demonstrate a deep understanding of the use of annuities.

Be able to demonstrate application of the above concepts to a range of practical problems in finance, including loans, analysis of investment projects, valuation of fixed interest securities, including the use of yield curves & use of the “no arbitrage” pricing method, forward contracts and immunisation theory.

Assessment Tasks

Name	Weighting	Due
Quizzes	20%	Various over weeks 2 to 4.
Test	10%	Test held Tuesday 19 March
Final Exam	70%	During final exam period

Quizzes

Due: **Various over weeks 2 to 4.**
Weighting: **20%**

Quizzes on Topic 1 to 4. These are completed online via the iLearn system.

No extensions will be granted. Students who have not submitted the task prior to the deadline will be awarded a mark of 0 for the task, except for cases in which an application for special consideration is made and approved.

For eligibility for special consideration in respect of the final exam, a minimum mark of 65% is required for the quizzes.

On successful completion you will be able to:

- Be able to demonstrate a deep understanding of compound interest theory in both discrete and continuous time.
- Be able to demonstrate a deep understanding of the use of annuities.

Test

Due: **Test held Tuesday 19 March**
Weighting: **10%**

The test will be approximately 45 minutes long and will be held during the normal lecture time.

Students who do not attempt the test will be awarded a mark of 0 for the task, except for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:

- Be able to demonstrate a deep understanding of compound interest theory in both

discrete and continuous time.

Final Exam

Due: **During final exam period**
Weighting: **70%**

To be eligible for a passing grade in this unit a pass is required in the final examination.

Non-programmable calculators with no text-retrieval capacity are allowed.

The University Examination period in Session 1 2013 is from Tuesday 11 June to Friday 28 June.

The Macquarie University examination policy details the principles and conduct of examinations at the University. The policy is available at: http://www.mq.edu.au/policy/docs/examination/policy.htm

On successful completion you will be able to:

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- Be able to demonstrate a deep understanding of the use of annuities.
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Delivery and Resources

Classes

There are 4 hours of face-to-face teaching per week consisting of 3 hours of lectures and 1 hour of tutorial.

Since all tutorials are held in the same timeslot, we take the opportunity to stream tutorials by performance. Ignore the tute location showing in eStudent. Consult the list of tute locations that will appear on the unit’s web site on Tuesday of Week 1 of classes.

The timetable for classes can be found on the University web site at:

http://www.timetables.mq.edu.au/

Teaching and Learning Strategy

This unit is taught via lectures and tutorials. However, a significant amount of the lecture time will be spent on attempting problems. The emphasis is on learning by doing.

Unit Web Page

The web page for this unit can be accessed via the “login” button on http://ilearn.mq.edu.au

Required and Recommended Texts and/or Materials

No textbooks are prescribed for this unit. Detailed notes, exercises and solutions are available on the unit's web site. The web site also contains a list of all textbooks we are aware of covering significant amounts of the material in this unit.

Technology Used and Required

You will require a calculator. For the test and the final exam, you may only use non-programmable calculators which are not able to store text. You may find it useful to be able to construct spreadsheets to verify your solutions to tutorial exercises. We do not prescribe any particular brand of spreadsheet.

Unit Schedule

Week	Topics Covered in Lectures
1	0. Preliminaries. (Reading only) 1. Interest Rates – Discrete time scenarios
2	2. Inflation and Capital Gains Tax 3. Forces of Interest – Continuous time scenarios
3	4. Level Annuities
4	5. Varying Annuities
5	6. Loans
6	7. Project Appraisal
7	8. Measuring Investment Performance
2-week study break	
8	9. Bonds
9	10. Yield Curves
10	11. Forward Contracts

11	12. Bond Statistics
12	13. Immunisation
13	

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://www.mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://www.mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://www.mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://www.mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Special Consideration Policy http://www.mq.edu.au/policy/docs/special_consideration/policy.html

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Support

Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at: http://students.mq.edu.au/support/

UniWISE provides:

- Online learning resources and academic skills workshops http://www.students.mq.edu.au/support/learning_skills/
- Personal assistance with your learning & study related questions.
- The Learning Help Desk is located in the Library foyer (level 2).
- Online and on-campus orientation events run by Mentors@Macquarie.

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

Details of these services can be accessed at http://www.student.mq.edu.au/ses/.

IT Help

If you wish to receive IT help, we would be glad to assist you at http://informatics.mq.edu.au/help/.

When using the university's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students and it outlines what can be done.

Graduate Capabilities

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Be able to demonstrate a deep understanding of compound interest theory in both discrete and continuous time.
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Assessment tasks

- Quizzes
- Test
- Final Exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Be able to demonstrate a deep understanding of compound interest theory in both discrete and continuous time.
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Research and Practice

Mathematics of finance has a long history. Most of the mathematical theory used in this unit was developed over a century ago. Hence the research we are using can be found in textbooks on mathematics of finance, rather than needing to source recent research papers.

The development of computers in the 1960s, cheap electronic calculators in the 1970s and spreadsheets in the 1980s revolutionised the subject of mathematics of finance. Before computers many maths of finance problems were conceptually simple but the sheer length of the calculations required made exact calculations expensive to implement, and many clever approximate techniques were developed to work around this. Now, many approximate techniques are not required, since computers can easily implement the lengthy calculations required to apply the theory exactly. While a textbook from 50 years ago might contain many concepts that are now irrelevant, it probably also contains most of the theory we still need for this unit.

Computers did also lead to the development of new ideas in mathematics of finance, notably in stochastic modelling. That material mostly falls in ACST306/816 and ACST307/817 rather than in this unit.