ACST202

Mathematics of Finance

S1 Day 2015

Dept of Applied Finance and Actuarial Studies

Contents

General Information

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

Angela Chow
angela.chow@mq.edu.au

Credit points
3

Prerequisites
ACST101(Cr) and MATH133 and GPA of 2.50 (out of 4.0)

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.

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.

General Assessment Information

Macquarie University uses the grades HD, D, Cr, P and F for grading the achievements of students in units of study. The meaning of each symbol is explained in the grading policy at

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

A Standardised Numerical Grade (SNG) gives you an indication of how you have performed within the band for your descriptive grade. The SNG is not a mark, and you may not be able to work it out based on your raw examination and other assessment marks. Nor are you able to determine you are "one mark away" from a different grade.

When you work as an actuary or in any other profession, if you have a dangerous misunderstanding of a concept you may provide incorrect advice to a client, possibly with severe financial consequences for your client and yourself. However, if you realise that you don’t understand a concept you may refrain from giving advice on it until you have filled the gaps in your knowledge. That is, dangerous misunderstandings have more serious consequences than a recognised lack of knowledge.

The grading philosophy and marking scales adopted in this unit (and in many other university units) reflect this situation. Correct relevant statements earn marks. Statements revealing dangerous misunderstandings result in the deduction of marks. If your answers reveal that your misunderstandings are very severe or numerous, you might earn a negative mark for a question. If a part of a question is worth x marks, the smallest mark you can be allocated for that part is –x marks.

As an example, a minor error when keying numbers into your calculator is not usually regarded as a dangerous error provided the resulting incorrect answer is plausible. However, if a calculator error results in an obviously unreasonable answer, such as a present value of a future cash flow which exceeds the size of that future cash flow, or a level monthly loan repayment that exceeds the amount of the loan, and you fail to state that you realise this answer is unreasonable, this would be regarded as a dangerous misunderstanding.

Assessment Tasks

Name	Weighting	Due
Quizzes - Basic Theory	15%	Various - See iLearn calendar
Quizzes - Applications	15%	Various - See iLearn Calendar

Name	Weighting	Due
Final Examination	70%	Standard Exam Period

Quizzes - Basic Theory

Due: **Various - See iLearn calendar**
Weighting: **15%**

You should complete these quizzes online. They are on this unit's iLearn web site.

In answering the assessable quizzes, you may consult your notes or any textbooks you like, but you may not seek assistance from any humans in any way whatsoever. This includes seeking assistance in interpreting what the questions mean. You should not discuss any of the quiz questions with any of your class mates until after the deadline for submitting the quiz has passed, even if you have already submitted the quiz and so can no longer change your answers.

There are 3 quizzes covering topics 1 to 3.

Once you start a quiz, you have a maximum of 2 hours to complete it. The quiz for a topic becomes available at 11:59 pm on the Friday after the tutorial on that topic, and closes 96 hours (4 days) later. You may start the quiz anytime within that range, but if you start it within 2 hours of the end of that range then it still closes at the end of that range, meaning you get less than 2 hours to complete it.

No extensions will be granted. Students who have not attempted 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.

On successful completion you will be able to:

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

Quizzes - Applications

Due: **Various - See iLearn Calendar**
Weighting: **15%**

You should complete these quizzes online. They are on this unit's iLearn web site.

In answering the assessable quizzes, you may consult your notes or any textbooks you like, but you may not seek assistance from any humans in any way whatsoever. This includes seeking assistance in interpreting what the questions mean. You should not discuss any of the quiz questions with any of your class mates until after the deadline for submitting the quiz has passed, even if you have already submitted the quiz and so can no longer change your answers.

There are 4 quizzes covering topics 4 to 7.

Once you start a quiz, you have a maximum of 2 hours to complete it. The quiz for a topic becomes available at 11:59 pm on the Friday after the tutorial on that topic, and closes 96 hours (4 days) later. You may start the quiz anytime within that range, but if you start it within 2 hours of

the end of that range then it still closes at the end of that range, meaning you get less than 2 hours to complete it.

No extensions will be granted. Students who have not attempted 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.

On successful completion you will be able to:

- 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.

Final Examination

Due: **Standard Exam Period**
Weighting: **70%**

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

Students are permitted to use non-programmable calculators with no text-retrieval capacity.

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

In the exam, you are required to write your answers on the ruled (right hand) pages of the answer booklet provided. Anything written on the unruled (left hand) pages will not be marked.

On successful completion you will be able to:

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

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 both 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 at the start of Week 2 of classes.

Class times can be found at: http://www.timetables.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.

We are required to point out that you need access to a computer to access material on the unit's iLearn web site.

Unit Web Site

The web site for this unit can be accessed at http://ilearn.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 Schedule

Since students often seem to print this schedule, there is a more printer-friendly version available in the administration section of this unit's iLearn web site.

Week	Week Begins	Topics Covered in Lectures
1	23 Feb	0. Preliminaries. (Reading only) 1. Interest Rates – Discrete time scenarios
2	2 March	2. Inflation and Capital Gains Tax 3. Forces of Interest – Continuous time scenarios
3	9 March	4. Level Annuities
4	16 March	5. Varying Annuities
5	23 March	6. Loans

6	30 March	7. Project Appraisal 31 March – Last day to drop units without charge
2-week study break		
7	20 Apr	8. Measuring Investment Performance 9. Investments and Industry Jargon (Reading only)
8	27 Apr	10. Bonds
9	4 May	11. Yield Curves
10	11 May	12. Forward Contracts
11	18 May	13. Bond Statistics
12	25 May	14. Immunisation
13	1 June	(Topic 14 tutes. Tutes lag lectures by one week.)

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://mq.edu.au/policy/docs/academic_honesty/policy.html

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

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

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

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

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

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

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your

student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Supplementary Exams

Further information regarding supplementary exams, including dates, is available here

http://www.businessandeconomics.mq.edu.au/current_students/undergraduate/how_do_i/special_consideration

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

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

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit 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.

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.
- 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

- Quizzes - Basic Theory
- Quizzes - Applications
- Final Examination

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.
- 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

- Quizzes - Basic Theory
- Quizzes - Applications
- Final Examination

Changes from Previous Offering

There have been no significant changes to content since the previous offering.

Research and Practice, Global and Sustainability

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 and ACST307 rather than in this unit.

While some topics in this unit mention Australian conventions and market features, the mathematical concepts in this unit are independent of any legislative constraints and so do not recognise national or planetary boundaries.

Changes since First Published

Date	Description
20/02/2015	Due to a late change to a tutorial time, the availability times for the onlines quizzes have been changed.