ACST8081

Mathematics of Finance

Session 1, In person-scheduled-weekday, North Ryde 2025

Department of Actuarial Studies and Business Analytics

Contents

General Information

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Credit points 10
Prerequisites Admission to MActPrac
Corequisites
Co-badged status

Unit description
This unit begins with coverage of the basics of data analysis and modelling. It continues with a rigorous mathematical development of compound interest theory, using calculus where appropriate, applying the theory to more complex financial problems. 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 and the definitions of various insurance and annuity contracts. Students will be required to use an Excel spreadsheet to solve problems throughout the unit. The concepts developed in this unit are required in several subsequent units in the actuarial degree. Students gaining a credit average in both ACST8081 and ACST8082 (minimum mark of 60 on both units) will satisfy the requirements for exemption from the professional subject CM1 of the Actuaries Institute.

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:

ULO1: Demonstrate an understanding of compound interest theory.

ULO2: Identify and describe various types of annuities and apply them to solve complex financial problems involving annuities.

ULO3: Apply the compound interest theory to a range of practical problems in finance, including loans, analysis of investment projects, valuation of fixed interest securities,

yield curves, the no-arbitrage pricing method, forward contracts and immunisation theory.

ULO4: Describe the basic principles of actuarial modelling.

ULO5: Define simple life table functions and various assurance and annuity contracts.

ULO6: Explain how the compound interest theory can be applied to a wide range of practical problems in financial mathematics.

General Assessment Information

Late Assessment Submission Penalty (written assessments)

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11.55pm. A 1-hour grace period is provided to students who experience a technical concern.

For any late submissions of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

Assessment Tasks

Name	Weighting	Hurdle	Due
Class Test	20%	No	07/04/2025
Assignment	20%	No	24/05/2025
Final Exam	60%	No	University Examination period

Class Test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 10 hours
Due: **07/04/2025**
Weighting: **20%**

The test will be approximately 90 minutes, to be held during class time.

On successful completion you will be able to:
- Demonstrate an understanding of compound interest theory.
- Identify and describe various types of annuities and apply them to solve complex financial problems involving annuities.
- Apply the compound interest theory to a range of practical problems in finance, including

loans, analysis of investment projects, valuation of fixed interest securities, yield curves, the no-arbitrage pricing method, forward contracts and immunisation theory.

• Describe the basic principles of actuarial modelling.

Assignment

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 20 hours
Due: **24/05/2025**
Weighting: **20%**

This is an individual assignment which focuses on problem solving using Excel spreadsheet.

On successful completion you will be able to:
• Demonstrate an understanding of compound interest theory.
• Identify and describe various types of annuities and apply them to solve complex financial problems involving annuities.
• Apply the compound interest theory to a range of practical problems in finance, including loans, analysis of investment projects, valuation of fixed interest securities, yield curves, the no-arbitrage pricing method, forward contracts and immunisation theory.
• Explain how the compound interest theory can be applied to a wide range of practical problems in financial mathematics.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 28 hours
Due: **University Examination period**
Weighting: **60%**

The final examination will be closed book, a three-hour written paper with ten minutes reading time, to be held during the University Examination period.

On successful completion you will be able to:
• Demonstrate an understanding of compound interest theory.
• Identify and describe various types of annuities and apply them to solve complex financial problems involving annuities.
• Apply the compound interest theory to a range of practical problems in finance, including loans, analysis of investment projects, valuation of fixed interest securities, yield curves, the no-arbitrage pricing method, forward contracts and immunisation theory.
• Describe the basic principles of actuarial modelling.

- Define simple life table functions and various assurance and annuity contracts.

- Explain how the compound interest theory can be applied to a wide range of practical problems in financial mathematics.

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[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment

- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

- The timetable for classes can be found on the University website at: https://timetables.mq.edu.au/

- There is no required textbook.

- Unit materials are available for download from iLearn.

- Students will be required to use iLearn, Excel and a non-programmable calculator.

Unit Schedule

Week 1: Principles of data analysis; Actuarial modelling; Theory of interest

Week 2: Theory of interest

Week 3: Cash flow and valuation

Week 4: Annuity

Week 5: Annuity; Loan repayment schedule

Week 6: Loan repayment schedule; Capital budgeting

Week 7: Revision; Class test

Semester break

Week 8: Capital budgeting; Investment valuation

Week 9: Investment valuation

Week 10: Arbitrage and forward contracts

Week 11: Interest rate structure and risk; Assignment

Week 12: Assignment; Introduction to life insurance

Week 13: Revision

Note: This is only a tentative schedule. The actual schedule will be adjusted from time to time in accordance with the progress of lectures.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) 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 connect.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

Student Support

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

dents.mq.edu.au/support/

Academic Success

Academic Success provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues
- Student Advocacy provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via the Service Connect Portal, or contact Service Connect.

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Changes since First Published

Date	Description
15/02/2025	The date for class test is moved from 8 April to 7 April due to different class times between ACST2002 and ACST8081.
03/02/2025	The times of assessment tasks have been corrected.

Unit information based on version 2025.03 of the Handbook