



# ACST8041

## Financial Mathematics

Session 1, In person-scheduled-weekday, North Ryde 2023

*Department of Actuarial Studies and Business Analytics*

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## General Information

Unit convenor and teaching staff

Xian Zhou

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Credit points

10

Prerequisites

Admission to MActPrac

Corequisites

Co-badged status

Unit description

This unit begins with a rigorous mathematical development of compound interest theory and 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, duration matching and immunisation. 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 performing satisfactorily well in ACST8041 will meet the requirements to earn credit from Exam FM of the Society of Actuaries.

## 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 and perform calculations related to the time value of money using the theory of interest.

**ULO3:** Explain the key concepts of loans and solve practical problems involving loans.

**ULO2:** Identify and solve complex problems involving various types of non-contingent annuities or cash flow sequences.

**ULO4:** Define various key concepts of bonds and perform related calculations about bonds.

**ULO5:** Apply the principle of no-arbitrage to perform the basic valuation of forward contracts.

**ULO6:** Demonstrate an understanding of the term structure of interest rates, key measures used in cash flows matching and immunization for asset liability management and perform related calculation using these concepts.

## 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
<a href="#">Class test</a>	20%	No	5 April 2023
<a href="#">Assignment</a>	20%	No	19 May 2023
<a href="#">Final examination</a>	60%	No	Examination Period

### Class test

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **5 April 2023**

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 and perform calculations related to the time value of money using the theory of interest.
- Identify and solve complex problems involving various types of non-contingent annuities

or cash flow sequences.

## Assignment

Assessment Type <sup>1</sup>: Quantitative analysis task

Indicative Time on Task <sup>2</sup>: 20 hours

Due: **19 May 2023**

Weighting: **20%**

Problem-solving questions requiring detailed solutions using Excel or R.

On successful completion you will be able to:

- Explain the key concepts of loans and solve practical problems involving loans.
- Identify and solve complex problems involving various types of non-contingent annuities or cash flow sequences.
- Define various key concepts of bonds and perform related calculations about bonds.

## Final examination

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 28 hours

Due: **Examination Period**

Weighting: **60%**

The final examination will be closed book, a three-hour 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 and perform calculations related to the time value of money using the theory of interest.
- Explain the key concepts of loans and solve practical problems involving loans.
- Identify and solve complex problems involving various types of non-contingent annuities or cash flow sequences.
- Define various key concepts of bonds and perform related calculations about bonds.
- Apply the principle of no-arbitrage to perform the basic valuation of forward contracts.
- Demonstrate an understanding of the term structure of interest rates, key measures used in cash flows matching and immunization for asset liability management and perform

related calculation using these concepts.

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<sup>1</sup> 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.

<sup>2</sup> 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; Assignment

**Week 11:** Interest rate structure and risk

**Week 12:** 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 \(https://policies.mq.edu.au\)](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 \(https://students.mq.edu.au/support/study/policies\)](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 \(https://policies.mq.edu.au\)](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 [ask.mq.edu.au](https://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto: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://students.mq.edu.au/support/>

## The Writing Centre

The [Writing Centre](#) 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 [AskMQ](#), 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/](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.