# ACST8041

**Financial Mathematics**

Session 2, In person-scheduled-weekday, North Ryde 2023

*Department of Actuarial Studies and Business Analytics*

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## Disclaimer

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## General Information

| Unit convenor and teaching staff | Xian Zhou  
xian.zhou@mq.edu.au |
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<td>10</td>
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**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](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

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
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<tr>
<td>Class test</td>
<td>20%</td>
<td>No</td>
<td>30/08/2023</td>
</tr>
<tr>
<td>Assignment</td>
<td>20%</td>
<td>No</td>
<td>16/10/2023</td>
</tr>
<tr>
<td>Final examination</td>
<td>60%</td>
<td>No</td>
<td>Examination period</td>
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Class test

Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 10 hours
Due: 30/08/2023
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 1: Quantitative analysis task
Indicative Time on Task 2: 20 hours
Due: 16/10/2023
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 1: Examination
Indicative Time on Task 2: 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.
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**

Please refer to iLearn for details of delivery.

**Unit Schedule**

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

**Week 2:** Theory of interest

**Week 3:** Cash flow and valuation; Annuity

**Week 4:** Annuity

**Week 5:** Loan repayment schedule

**Week 6:** Revision; Class test

**Week 7:** Capital budgeting

**Semester break**

**Week 8:** Investment valuation

**Week 9:** Investment valuation; Arbitrage and forward contracts

**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). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals 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 ask.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://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
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/.

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.