



ACST3007

Quantitative Asset and Liability Modelling 2

Session 2, In person-scheduled-weekday, North Ryde 2026

Department of Actuarial Studies and Business Analytics

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General Information

Unit convenor and teaching staff Zhuo Jin zhuo.jin@mq.edu.au
Credit points 10
Prerequisites ACST3006
Corequisites
Co-badged status ACST8088
Unit description The topics covered in this unit include: an introduction to stochastic processes; martingales; an introduction to stochastic calculus; Ito's lemma; forwards, futures, swaps and options; arbitrage-free pricing via replicating portfolio and risk neutral probability measures; the Girsanov theorem; the Black-Scholes option pricing model for European options; the 'Greeks' and dynamic hedging; term structure of interest rates; relations among short rates, forward rates and default-free zero-coupon bonds; interest rate models; firm-value and intensity-based credit risk models; ruin theory; valuation of basic guarantees. Students gaining a credit average in both ACST3006 and ACST3007 (minimum mark of 60 on both units) will satisfy the requirements for exemption from the professional subject CM2 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: Understand the use of stochastic calculus in modelling security prices and valuation of option pricing approaches.

ULO2: Demonstrate an understanding of the Black-Scholes option pricing model via both the partial differential equation approach and the risk-neutral pricing approach.

ULO3: Describe the use of interest models in term of structure modelling and pricing of zero-coupon bonds.

ULO4: Describe the different approaches to modelling credit risk.

ULO5: Apply ruin theory to insurance problems.

Assessment Tasks

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
<u>Formal examination</u>	60%	No	Exam period	Individual	No	Observed
<u>Formal examination: Test</u>	20%	No	22/10/2026	Individual	No	Observed
<u>Professional practice: Stochastic models</u>	20%	No	04/09/2026	Individual	Yes	Open AI

Formal examination

Assessment Type ¹: Examination

Indicative Time on Task ²: 28 hours

Due: **Exam period**

Weighting: **60%**

Groupwork/Individual: Individual

Short extension ³: No

AI Approach: Observed

The purpose of this assessment is for you to formally demonstrate the expertise you have gained in this unit.

You will participate in a 3-hour exam held during the University Examination period. Important information about the exam will be made available on the unit iLearn page. You should also review the [MQ Exams website](#) for general tips.

Deliverable(s): Formal exam

Individual assessment

On successful completion you will be able to:

- Understand the use of stochastic calculus in modelling security prices and valuation of option pricing approaches.
- Demonstrate an understanding of the Black-Scholes option pricing model via both the partial differential equation approach and the risk-neutral pricing approach.
- Describe the use of interest models in term of structure modelling and pricing of zero-coupon bonds.
- Describe the different approaches to modelling credit risk.

- Apply ruin theory to insurance problems.

Formal examination: Test

Assessment Type ¹: Examination

Indicative Time on Task ²: 12 hours

Due: **22/10/2026**

Weighting: **20%**

Groupwork/Individual: Individual

Short extension ³: No

AI Approach: Observed

The purpose of this assessment is for you to demonstrate your understanding and knowledge of key topics from the unit.

You will participate in a formal invigilated test held during class time. Feedback on this test will help you assess your progress through the unit content.

Deliverable(s): Test (approximately 90 minutes) during class time.

Individual assessment

On successful completion you will be able to:

- Understand the use of stochastic calculus in modelling security prices and valuation of option pricing approaches.
- Demonstrate an understanding of the Black-Scholes option pricing model via both the partial differential equation approach and the risk-neutral pricing approach.
- Describe the use of interest models in term of structure modelling and pricing of zero-coupon bonds.

Professional practice: Stochastic models

Assessment Type ¹: Problem-based task

Indicative Time on Task ²: 20 hours

Due: **04/09/2026**

Weighting: **20%**

Groupwork/Individual: Individual

Short extension ³: Yes

AI Approach: Open AI

The purpose of this assessment is for you to demonstrate your problem-solving skills using Excel for actuarial applications.

You will solve a set of actuarial problems based on content covered in class.

Skills in focus:

- Digital skills

- Discipline knowledge
- Work readiness
- Critical thinking and problem solving
- Communication skills

Deliverable(s): PDF report and Excel worksheet(s).

Individual assessment

On successful completion you will be able to:

- Understand the use of stochastic calculus in modelling security prices and valuation of option pricing approaches.
- Demonstrate an understanding of the Black-Scholes option pricing model via both the partial differential equation approach and the risk-neutral pricing approach.
- Describe the use of interest models in term of structure modelling and pricing of zero-coupon bonds.

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
- [Academic Success](#) 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.

³ An automatic short extension is available for some assessments. Apply through the [Service Connect Portal](#).

Delivery and Resources

Notes and tutorial materials will be provided in iLearn

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](https://policies.smq.edu.au) (<https://policies.smq.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 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://students.mq.edu.au/support/>

Academic Success

[Academic Success](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Ask a Study Coach](#)
- [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 <https://students.mq.edu.au/support/technology/service-desk>.

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.

Unit information based on version 2026.03 of the [Handbook](#)