ACST8087

Quantitative Asset and Liability Modelling 1

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

Department of Actuarial Studies and Business Analytics

Contents

General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites
STAT8310 and ACST8081

Corequisites

Co-badged status

Unit description
This unit examines: rational expectations theory, rational choice theory, behavioural economics, properties of risk measures, risk and insurance companies, stochastic interest rate models, mean-variance portfolio theory, asset pricing models, single and multifactor returns models, binomial lattice models for option pricing and methods for calculating outstanding claims provisions in general insurance. Students gaining a credit average in both ACST8087 and ACST8088 (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: Apply decision making via utility functions, and describe rational expectations theory, rational choice theory, behavioural economics and three different forms of market efficiency.
ULO2: Employ the use of Capital Asset Pricing Model (CAPM), single/multi index models and Arbitrage Pricing Theory (APT) Model in asset pricing and analyse investment risk using various risk measures.
ULO3: Apply the binomial option pricing models to value European and American type options.

ULO4: Apply a stochastic approach to the theory of interest on the mean and variance of the accumulation of a sequence of payments to solve practical problems.
ULO5: Use various methods of run-off triangles for valuation and reserving of liabilities.
ULO6: Extend the binomial option pricing models to value various types complex options.

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
Assignment	20%	No	Thursday 3 April 11:55pm
Class Test	20%	No	Thursday 22 May 3:00pm
Final Exam	60%	No	The University Examination period

Assignment

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 20 hours
Due: **Thursday 3 April 11:55pm**
Weighting: **20%**

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

On successful completion you will be able to:

- Apply decision making via utility functions, and describe rational expectations theory, rational choice theory, behavioural economics and three different forms of market efficiency.
- Employ the use of Capital Asset Pricing Model (CAPM), single/multi index models and Arbitrage Pricing Theory (APT) Model in asset pricing and analyse investment risk using

various risk measures.

Class Test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 10 hours
Due: **Thursday 22 May 3:00pm**
Weighting: **20%**

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

On successful completion you will be able to:

- Apply the binomial option pricing models to value European and American type options.
- Apply a stochastic approach to the theory of interest on the mean and variance of the accumulation of a sequence of payments to solve practical problems.
- Extend the binomial option pricing models to value various types complex options.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 28 hours
Due: **The 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:

- Apply decision making via utility functions, and describe rational expectations theory, rational choice theory, behavioural economics and three different forms of market efficiency.
- Employ the use of Capital Asset Pricing Model (CAPM), single/multi index models and Arbitrage Pricing Theory (APT) Model in asset pricing and analyse investment risk using various risk measures.
- Apply the binomial option pricing models to value European and American type options.
- Apply a stochastic approach to the theory of interest on the mean and variance of the accumulation of a sequence of payments to solve practical problems.
- Use various methods of run-off triangles for valuation and reserving of liabilities.
- Extend the binomial option pricing models to value various types complex options.

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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 Session 1 2025 Timetable is available via Publish.

There is no required textbook. Unit materials are available for download from iLearn.

Recommended textbooks

• Investment Science; David Luenberger

• Choices, Values, and Frames; Amos Tversky and Daniel Kahneman

• Modern Portfolio Theory and Investment Analysis; Edwin J. Elton, Martin J. Gruber, Stephen J. Brown and William N. Goetzmann

• Investment Mathematics and Statistics; Andrew Adams, Della Bloomfield, Philip Booth and Peter England

• Options, Futures and Other Derivatives; John Hull

Optional ActEd material

• The ActEd CM2, that can be purchased directly from ActEd.

Unit Schedule

Week	Lecture Topics
1.	Utility Theory, Decision making via utility functions
2.	Stochastic dominance, Behavioural finance
3.	Mean-Variance portfolio theory
4.	The CAPM
5.	Single/Multi index models, Arbitrage pricing theory (APT)
6.	Measurements of investment risk
(Assignment due - Thursday 3 April 11:55pm)	
7.	Options

Semester Break

8. Single/Multi period Binomial option pricing model
9. American option pricing via Binomial model
10. Runoff triangle
11. Class Test (Thursday 22 May 3:00pm)
12. Stochastic interest rate models / Efficient market hypothesis
13. Revision

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://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 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.

Unit information based on version 2025.03 of the Handbook