



ACST8088

Quantitative Asset and Liability Modelling 2

Session 2, Special circumstance 2020

Department of Actuarial Studies and Business Analytics

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Disclaimer

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Notice

As part of [Phase 3 of our return to campus plan](#), most units will now run tutorials, seminars and other small group learning activities on campus for the second half-year, while keeping an online version available for those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face and online activities for your unit, please go to [timetable viewer](#). To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

General Information

Unit convenor and teaching staff

Convenor and Lecturer

Chong It Tan

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4ER 738

Refer to iLearn

Angela Chow

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Credit points

10

Prerequisites

(STAT810 or STAT8310 or STAT806) and (ACST881 or ACST8081)

Corequisites

Co-badged status

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 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: 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.

ULO6: Explain various concepts in stochastic calculus in the risk-neutral valuation approach.

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Final Exam</u>	60%	No	University Examination Period
<u>Class Test</u>	20%	No	23 October 12pm
<u>Assignment</u>	20%	No	9 October 12pm

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:

- 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.

Class Test

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 13 hours

Due: **23 October 12pm**

Weighting: **20%**

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

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.
- Explain various concepts in stochastic calculus in the risk-neutral valuation approach.

Assignment

Assessment Type ¹: Quantitative analysis task

Indicative Time on Task ²: 20 hours

Due: **9 October 12pm**

Weighting: **20%**

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

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.
- Explain various concepts in stochastic calculus in the risk-neutral valuation approach.

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

Classes

It is intended that learning in this session will be a combination of pre-recorded online lecture and on-campus tutorials. Please refer to iLearn for further details.

Required and Recommended Texts and/or Materials

Required texts

Detailed lecture notes and tutorial exercises are available on the unit's iLearn site.

Recommended Textbooks

- Options, Futures and Other Derivatives (9th edition); John Hull
- An Introduction to the Mathematics of Financial Derivatives (2nd edition); Salih N. Neftci
- Interest Rate Models: An Introduction; Andrew J. G. Cairns
- Insurance Risk and Ruin (2nd edition); David C. M. Dickson

Each copy of these books is available in the Reserve section of the Library and can be purchased from the Macquarie University Co-op bookshops.

Technology Used and Required

Students need to be able to use a computer softwares (such as Excel, R) to analyse financial problems. Although the unit does not aim to teach students how to use these softwares, you are encouraged to make use of spreadsheets and other software packages for the assignment.

Unit Webpage

The webpage for this unit can be accessed via the iLearn site at: <http://ilearn.mq.edu.au>

Teaching and Learning Strategy

The unit is taught using two-hour lecture and one-hour tutorial each week. You are expected to read lecture materials in advance of the lectures. The tutorial is an opportunity for you to attempt questions for each section of work, or to ask questions. It is highly recommended to try to solve questions in advance of the tutorials.

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#) (<https://staff.m>

mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

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

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/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

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)

- [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

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

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.