ACST3007
Quantitative Asset and Liability Modelling 2
Session 2, Weekday attendance, North Ryde 2021
Department of Actuarial Studies and Business Analytics

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Notice
Some on-campus classes have moved online for the first two weeks of Session, before returning to campus in Week 3. If you are studying a unit outside of the primary Session 2 timetable, please contact your teaching staff team for further details.

Some classes/teaching activities cannot be moved online and must be taught on campus. To find out if you are enrolled in one of these classes/teaching activities, you can check to see if your unit is on the list of units with mandatory on-campus classes/teaching activities.

Your Unit Convenor will provide more information via an iLearn announcement when your iLearn unit becomes available.
General Information

Unit convenor and teaching staff
Convenor and Lecturer
Chong It Tan
chongit.tan@mq.edu.au
4ER 738

Credit points
10

Prerequisites
ACST306 or ACST3006

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 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://students.mq.edu.au/important-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.

### General Assessment Information

Assessment criteria for all assessment tasks will be provided on the unit iLearn site.

It is the responsibility of students to view their marks for each within-session-assessment on iLearn within 20 days of posting. If there are any discrepancies, students must contact the unit convenor immediately. Failure to do so will mean that queries received after the release of final results regarding assessment tasks (not including the final exam mark) will not be addressed.

#### Late submissions of assessments

Sometimes unavoidable circumstances occur that might prevent you from submitting an assessment on time and, in that case, you may be eligible to lodge a [Special Consideration request](#).

Unless a [Special Consideration request](#) has been submitted and approved, please note that no extensions to assessment deadlines will be granted. Assessments that are submitted late will attract a late penalty:

1. There will be a deduction of 10% of the total available marks for each 24 hour period or part thereof that the submission is late.
2. No assessment will be accepted more than 72 hours after the original due date and time (incl. weekends).
3. No late submissions will be accepted for timed assessments (e.g., quizzes, online tests) or for tasks with a weighting of 10% or less.

### Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment</td>
<td>20%</td>
<td>No</td>
<td>29 September 12pm</td>
</tr>
<tr>
<td>Class Test</td>
<td>20%</td>
<td>No</td>
<td>20 October 3pm</td>
</tr>
<tr>
<td>Final Exam</td>
<td>60%</td>
<td>No</td>
<td>University Examination Period</td>
</tr>
</tbody>
</table>

### Assignment

Assessment Type 1: Quantitative analysis task
Indicative Time on Task 2: 20 hours
Due: **29 September 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.

Class Test
Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 12 hours
Due: **20 October 3pm**
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.

Final Exam
Assessment Type 1: Examination
Indicative Time on Task 2: 28 hours
Due: **University Examination Period**
Weighting: **60%**

The final examination will be a three-hour written exam 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.

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 Learning Skills Unit 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

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

A copy of these books is available in the Reserve section of the Library.

Technology Used and Required

Students need to be able to use 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.

**Unit Schedule**

Please refer to iLearn

**Policies and Procedures**

Macquarie University policies and procedures are accessible from Policy Central (https://staff.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). 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 (https://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/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

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 Enquiry Service
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

Equity 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.

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.