ACST3007

Quantitative Asset and Liability Modelling 2

Session 2, Special circumstance 2020

Department of Actuarial Studies and Business Analytics

Contents

Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and ot her small group learning activities on campus for the second half-year, while keeping an online ver sion available for those students unable to return or those who choose to continue their studies onli ne.

To check the availability of face-to-face and onlin e activities for your unit, please go to timetable vi ewer. To check detailed information on unit asses sments visit your unit's iLearn space or consult yo ur 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
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 and exotic options; the 'Greeks' and dynamic hedging; term structure of interest rates; relations among short rates, forward rates and zero-coupon bonds; interest rate models; firm-value; and intensity-based credit risk models. Students gaining a Credit average in both ACST3006 and ACST3007 (minimum mark of 60) will satisfy the requirements for exemption from professional subject CT8 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: Demonstrate an understanding of random walk, Brownian motions, martingale, stochastic calculus and Ito's lemma.

ULO2: Discuss the characteristics and the use of forward, futures, option and swap.
ULO3: Develop a solid understanding on the different valuation approaches under the Black-Scholes framework and perform the valuation of European and exotic options via the Black-Scholes model.
ULO4: Analyse the valuation of default-free zero-coupon bond using short rate interest models.
ULO5: Describe the valuation of defaultable zero-coupon bond based on firm-value and default intensity models.

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 working 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 marks (not including the final exam mark) will not be addressed.
- In the cases where a special consideration application is approved, the student may be offered an alternative assessment or may receive a mark based on the percentage mark achieved by the student in one or more other assessment tasks, at the unit convenor's discretion.

Assessment Tasks

Name	Weighting	Hurdle	Due
Final Exam	60%	No	University Examination Period
Class Test	20%	No	20 October 2pm
Assignment	20%	No	6 October 2pm

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:

- Demonstrate an understanding of random walk, Brownian motions, martingale, stochastic calculus and Ito's lemma.
- Discuss the characteristics and the use of forward, futures, option and swap.
- Develop a solid understanding on the different valuation approaches under the Black-Scholes framework and perform the valuation of European and exotic options via the Black-Scholes model.
- Analyse the valuation of default-free zero-coupon bond using short rate interest models.
- Describe the valuation of defaultable zero-coupon bond based on firm-value and default intensity models.

Class Test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 13 hours
Due: **20 October 2pm**
Weighting: **20%**

The test will be approximately 120 minutes, to be held during class time.

On successful completion you will be able to:

- Demonstrate an understanding of random walk, Brownian motions, martingale, stochastic calculus and Ito's lemma.
- Discuss the characteristics and the use of forward, futures, option and swap.
- Develop a solid understanding on the different valuation approaches under the Black-Scholes framework and perform the valuation of European and exotic options via the Black-Scholes model.
- Analyse the valuation of default-free zero-coupon bond using short rate interest models.

Assignment

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 20 hours
Due: **6 October 2pm**
Weighting: **20%**

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

On successful completion you will be able to:

- Demonstrate an understanding of random walk, Brownian motions, martingale, stochastic calculus and Ito's lemma.

- Discuss the characteristics and the use of forward, futures, option and swap.
- Develop a solid understanding on the different valuation approaches under the Black-Scholes framework and perform the valuation of European and exotic options via the Black-Scholes model.

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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

Classes

It is intended that learning in this session will be a combination of pre-recorded online lecture and on-campus tutorials. Tutorials will commence in week 2. The on-campus tutorial will be recorded and made available to students who are unable to attend.

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

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.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/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.

Changes since First Published

Date	Description
19/07/2020	Fix up spelling mistake