ACST828
Options, Futures and Derivatives
Semester 2, 2012

Department of Applied Finance and Actuarial Studies
Year and Semester: Semester 2 2012

Unit convenor: Dr. Tim Kyng

Prerequisites / corequisites: ACST603

Credit points: 4

Students in this unit should read this unit guide carefully at the start of semester. It contains important information about the unit. If anything in it is unclear, please consult one of the teaching staff in the unit.

ABOUT THIS UNIT

This unit aims to provide students with a knowledge and understanding of the principles and techniques underlying the theory and practice in Derivative Markets. You will learn about different valuation / modeling techniques and will need to understand the usefulness and shortcomings of these techniques when applied in practice. It primarily aims to give you the tools for quantitative analysis of transactions and securities including valuation and risk management for capital projects and securities. This includes computer based numerical implementation using spreadsheet software.

There are no specific pre-requisites other than ACST603, but students are assumed to have mathematical skills, some knowledge of probability and statistical theory, as well as knowledge of the fundamentals of finance. In particular you should be familiar with:

• Calculus: integration & differentiation,
• matrix algebra, including matrix inversion, multiplication, transposition, and properties of covariance matrices
• probability theory: discrete and continuous distributions, mathematical expectation
• statistical theory: iid samples, properties of statistical estimators

We will cover these topics in class but relatively briefly as it is assumed you know this from your previous studies.

Proficiency in spreadsheet programming would be an advantage

This unit is enables students to gain an understanding of the theoretical and practical skills necessary to understand financial derivatives. This unit is worth 4 credit points towards the M Com and other degrees.
Topics covered include:

- Interest rates, debt securities and the term structure of interest rates
- Forward contracts, futures contracts and Swap Contracts
- Introduction to options and the Black Scholes Formula
- Mathematical background for option pricing, Statistical Theory, Calculus, Brownian Motion, Ito’s Lemma
- The binomial option pricing method, dynamic hedging and the law of one price, risk neutral valuation
- Valuation Methodology: PDEs, Risk Neutral Discounted Expectation, Examples
- Numerical methods: Monte Carlo Simulation, Lattice Methods
- Exotic Options & Case Studies of applying numerical methods
- Standard Interest rate derivative products
- Applications of Options and Valuation Theory – Case Studies
- Use of spreadsheets for financial modelling, calculations and decision making.

TEACHING STAFF

- Dr. Tim Kyng, Lecturer in Charge, 98507289, timothy.kyng@mq.edu.au

CONTACTING STAFF

Students can contact the lecturer in charge via email, or by phone, or in person at E4A614.

- Consultation times

Consultation is available with students by appointment. Please contact your lecturer to arrange a mutually agreeable time.

You are encouraged to seek help at a time that is convenient to you from a staff member teaching on this unit during their regular consultation hours. In special circumstances, an appointment may be made outside regular consultation hours. Staff will not conduct consultations by email. You may, however, phone staff during their consultation hours.

In order to gain access to staff located at levels 1, 2 and 3 of building E4A during their consultation hours please ring the staff member from the phones available in the lobby (phone numbers of relevant staff members will be provided on Blackboard and are available next to the phones).

- Other ways of contacting staff

The best way to contact the lecturer in charge is by email.

Students experiencing significant difficulties with any topic in the unit must seek assistance immediately.

CLASSES

For campus students:

- A 2-hour lecture will be held each week at E4B 118 on Thursday from 9am to 11am.
A 1-hour tutorial / computer laboratory session will be held each week at E4B 118 on Thursday from 11am to 12 noon.

For distance students:

- All lecture and tutorial exercises and solutions will be available on iLearn.
- The timetable for classes can be found on the University web site at: [http://www.timetables.mq.edu.au/](http://www.timetables.mq.edu.au/)

**PRIZES**

- There are no prizes for this unit.

**REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS**

**Textbooks:**

There are no prescribed textbooks. Lecture notes will be provided.

**Reference Books:**


This book may be used to by students to learn about using excel for the various financial calculations involved in the course, during the tutorial / computer lab sessions.


OR


OR


**TECHNOLOGY USED AND REQUIRED**

- Students will require access to the internet to download lecture slides and tutorial solutions.
- The assignment and most tutorial exercises will require the use of word processing and/or spreadsheet programs.
- In most weeks we will be using excel spreadsheets for the various financial calculations needed. Our classes are held in a computer laboratory and all students will have access to a computer with the required software installed on it.
- Students will be instructed in how to use excel for the purposes of the unit
UNIT WEB PAGE

- Course material is available on the learning management system (iLearn)
- The web page for this unit can be found at: [URL to be advised]

LEARNING OUTCOMES

The learning outcomes of this unit are:

1. To be able to demonstrate knowledge and understanding of the main features and uses of the standard derivative securities.
2. To be able to explain the concepts of replication and the law of one price and how it relates to pricing for derivative securities.
3. Understand the risk neutral discounted expectation approach to derivative pricing and be able to apply it to deriving analytic formulae for some of the standard derivative securities and simpler exotic securities.
4. Develop expertise in using excel spreadsheet software to apply numerical methods for the valuation of derivative contracts and financial decision making
5. Be able to apply the knowledge of derivative contracts and the theory of derivative valuation to various hypothetical financial scenarios including hedging, speculation, valuation of securities, valuation of incentives and financial decision making.
6. Be able to explain the concepts covered in the course in a clear and concise manner and be able to communicate it to others effectively

GRADUATE CAPABILITIES

In addition to the discipline-based learning objectives, all academic programs at Macquarie seek to develop the capabilities the University's graduates will need to develop to address the challenges, and to be effective, engaged participants in their world.

This unit contributes to this by developing the following graduate capabilities:

1. Discipline Specific Knowledge and Skills: This knowledge and set of skills is outlined in detail above in the list of topics covered.
2. Critical, Analytical and Integrative Thinking: Students should be able to think for themselves and be able to critique, analyse and integrate information in solving problems and analysing situations arising in a corporate finance context
3. Problem Solving and Research Capability: Students should have the skills to do relevant research and formulate and solve problems relating to corporate finance, including developing spreadsheets for such problem solving.
4. Effective Communication: be able to communicate with both specialist and non specialist audiences about corporate finance and related topics

LEARNING AND TEACHING ACTIVITIES

- The unit is taught via lectures, tutorial exercises and the use of spreadsheet software for implementing models and calculations for the purpose of financial decision making
• Each lecture is self-contained and structured according to the summary provided in the “weekly curriculum” section below. Students are expected to read the relevant material prior to the lecture, so that they are familiar with the material to be covered. This will greatly enhance your learning experience.

• Dealing with advanced material in our subject area requires a range of generic skills. This unit aims at developing such skills. The lectures and in particular the assignments and tutorial exercises are tailored to enhance critical analysis, problem-solving and creative thinking, comprehension, computing and writing skills.

• You should take the time to work on the problem sets, since they will tend to be similar in nature to the problems you see on the test and exam. Solutions will be provided for the assigned selected questions.

• We cover many examples of financial valuation and decision making problems and how to solve these using spreadsheets. Our approach is one of learning by example and by practicing using excel to solve financial decision making problems.

**WEEKLY CURRICULUM:** All readings relate to course textbook by Berk

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
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<tbody>
<tr>
<td><strong>Week 1</strong></td>
<td>Beginning 30 July</td>
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<tr>
<td></td>
<td>Interest rates, debt securities and the term structure structure of</td>
<td>Lecture notes for week 1</td>
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<td>interest rates.</td>
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<td><strong>Week 2</strong></td>
<td>Beginning 6 August</td>
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<td></td>
<td>Forward contracts and futures contracts</td>
<td>Lecture notes for week 2</td>
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<td><strong>Week 3</strong></td>
<td>Beginning 13 August</td>
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<td>Interest rate and currency swaps, valuation and applications</td>
<td>Lecture notes for week 3</td>
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<td><strong>Week 4</strong></td>
<td>Beginning 20 August</td>
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<td>Introduction to options and the Black Scholes Formula</td>
<td>Lecture notes for week 4</td>
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<td><strong>Week 5</strong></td>
<td>Beginning 27 August</td>
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<td>The binomial option pricing method, dynamic hedging and the law of</td>
<td>Lecture notes for week 5</td>
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<td>one price, risk neutral valuation</td>
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<td><strong>Week 6</strong></td>
<td>Beginning 3 September</td>
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<td>Mathematical background for option pricing: Statistical Theory,</td>
<td>Lecture notes for week 6</td>
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<td>Calculus, Brownian Motion, Ito’s Lemma</td>
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<td><strong>Week 7</strong></td>
<td>Beginning 10 September</td>
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<td>Mid semester test.</td>
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<td><strong>Mid-Semester Break: 17 September – 28 September</strong></td>
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<td><strong>Week 8</strong></td>
<td>Beginning 1 October</td>
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<td>Valuation Methodology: PDEs, Risk Neutral Discounted Expectation,</td>
<td>Lecture notes for week 8</td>
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<td>Examples.</td>
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<td><strong>Week 9</strong></td>
<td>Beginning 8 October</td>
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<td>Numerical valuation methods: Monte Carlo Simulation and Lattice</td>
<td>Lecture notes for week 9</td>
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<td>Methods</td>
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<td><strong>Week 10</strong></td>
<td>Beginning 15 October</td>
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<td>Exotic Options &amp; Case Studies of applying analytical &amp; numerical</td>
<td>Lecture notes for week 10</td>
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<td>methods</td>
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<td>Week 11</td>
<td>Hedging, portfolio insurance, case studies</td>
<td>Lecture notes for week 11</td>
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<td>Week 12</td>
<td>Standard Interest rate derivative products and valuation models</td>
<td>Lecture notes for week 12</td>
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<tr>
<td>Week 13</td>
<td>Measurement of Market Risk</td>
<td>Lecture notes for week 13</td>
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**RESEARCH AND PRACTICE**

- This unit gives you practice in applying research findings in your assignments
- This unit gives you opportunities to conduct your own research

**RELATIONSHIP BETWEEN ASSESSMENT AND LEARNING OUTCOMES**

<table>
<thead>
<tr>
<th>Description</th>
<th>Case study</th>
<th>Assignments</th>
<th>Class test</th>
<th>Final exam</th>
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</thead>
<tbody>
<tr>
<td>Due date</td>
<td>Available Week 10 Due Week 13</td>
<td>Assignment 1: Available Week 4 Due Week 7 Assignment 2: Available week 8 Due week 11</td>
<td>Week 7</td>
<td>TBA</td>
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<tr>
<td>% Weighting</td>
<td>16.67%</td>
<td>16.67% each</td>
<td>10%</td>
<td>40%</td>
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<tr>
<td>Grading method</td>
<td>Against assessment criteria, analysis, judgement, recommendations</td>
<td>Against assessment criteria, analysis, judgement, recommendations</td>
<td>Multiple choice and / or written answers</td>
<td>Multiple choice and / or written answers</td>
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<tr>
<td>Submission method</td>
<td>Deliver to lecturer in charge</td>
<td>In class</td>
<td>In Class Test</td>
<td>Centrally conducted Examination</td>
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<tr>
<td>Feedback (type, method, date)</td>
<td>Assignments and comments returned to students</td>
<td>Assignments and comments returned to students</td>
<td>Tests returned to students.</td>
<td>N/A</td>
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<td>Estimated student workload (hours)</td>
<td>14</td>
<td>14</td>
<td>2</td>
<td>3</td>
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<td>Learning outcomes assessed</td>
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<td>2 *</td>
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<tr>
<td>Graduate capabilities assessed</td>
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<td>2 *</td>
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</table>
Extension requests: these should be discussed with your lecturer including reasons for the request.

Late submissions: depending on the reason given for the lateness and whether or not the solutions have been made publicly available, late submissions may or may not be accepted. If accepted, a penalty for lateness may or may not be applied. This will be made clear when the assessment task is publicly released. For some assessment tasks there will be no extensions granted and lateness will result in zero marks for that task. For other tasks, where a lateness penalty is not applied, the mark for that task will be based on your final exam mark.

A final examination is included as an assessment task for this unit to provide assurance that:

i) the product belongs to the student and

ii) the student has attained the knowledge and skills tested in the exam.

A 3 hour final examination for this unit will be held during the University Examination period, or during the class time in week 13. The final date of the exam is to be advised.

The University Examination period in Second Half Year 2012 is from 12 November to 30 November.

You are expected to present yourself for examination at the time and place designated in the University Examination Timetable. The timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of the examinations.

http://exams.mq.edu.au/

The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for Special Consideration. The University's policy on special consideration process is available at http://www.mq.edu.au/policy/docs/special_consideration/policy.html

If a Supplementary Examination is granted as a result of the Special Consideration process the examination will be scheduled after the conclusion of the official examination period. (Individual Faculties may wish to signal when the Faculties’ Supplementary Exams are normally scheduled.)

The Macquarie university examination policy details the principles and conduct of examinations at the University. The policy is available at:

http://www.mq.edu.au/policy/docs/examination/policy.htm

**Academic Honesty**

The nature of scholarly endeavour, dependent as it is on the work of others, binds all members of the University community to abide by the principles of academic honesty. Its fundamental principle is that all staff and students act with integrity in the creation, development, application and use of ideas and information. This means that:
• all academic work claimed as original is the work of the author making the claim
• all academic collaborations are acknowledged
• academic work is not falsified in any way
• when the ideas of others are used, these ideas are acknowledged appropriately.

Further information on the academic honesty can be found in the Macquarie University Academic Honesty Policy at http://www.mq.edu.au/policy/docs/academic_honesty/policy.html

**GRADES**

Macquarie University uses the following grades in coursework units of study:

HD - High Distinction
D - Distinction
CR - Credit
P - Pass
F - Fail

Grade descriptors and other information concerning grading are contained in the Macquarie University Grading Policy which is available at: http://www.mq.edu.au/policy/docs/grading/policy.html

**GRADING APPEALS AND FINAL EXAMINATION SCRIPT VIEWING**

If, at the conclusion of the unit, you have performed below expectations, and are considering lodging an appeal of grade and/or viewing your final exam script please refer to the following website which provides information about these processes and the cut off dates in the first instance. Please read the instructions provided concerning what constitutes a valid grounds for appeal before appealing your grade.

http://www.businessandeconomics.mq.edu.au/new_and_current_students/undergraduate_current_students/how_do_i/grade_appeals

**SPECIAL CONSIDERATION**

The University is committed to equity and fairness in all aspects of its learning and teaching. In stating this commitment, the University recognises that there may be circumstances where a student is prevented by unavoidable disruption from performing in accordance with their ability. A special consideration policy exists to support students who experience serious and unavoidable disruption such that they do not reach their usual demonstrated performance level. The policy is available at: http://www.mq.edu.au/policy/docs/special_consideration/policy.html

**STUDENT SUPPORT SERVICES**

Macquarie University provides a range of Academic Support Services. Details of these and other services for students can be accessed at http://www.student.mq.edu.au.

[Individual Unit Convenors may wish to add Unit/ Faculty specific support eg BESS, Room, PAL, E4B Consultation Room.]
Access to all student computing facilities within the Faculty of Business and Economics is restricted to authorised coursework for approved units. Student ID cards must be displayed in the locations provided at all times.

Students are expected to act responsibly when using University IT facilities. The following regulations apply to the use of computing facilities and online services:

- Accessing inappropriate web sites or downloading inappropriate material is not permitted. Material that is not related to coursework for approved units is deemed inappropriate.
- Downloading copyright material without permission from the copyright owner is illegal, and strictly prohibited. Students detected undertaking such activities will face disciplinary action, which may result in criminal proceedings.

Non-compliance with these conditions may result in disciplinary action without further notice.

Students must use their Macquarie University email addresses to communicate with staff as it is University policy that the University issued email account is used for official University communication.