

MACQUARIE
UNIVERSITY



FACULTY OF
BUSINESS AND ECONOMICS

Unit code: ACST828

Unit Name: Options, Futures and
Derivatives

Semester 2, year 2010

Department of Actuarial Studies

MACQUARIE UNIVERSITY
FACULTY OF Business and Economics
UNIT OUTLINE

2011, Semester 2

Unit convenor: Tim Kyng

Prerequisites / Corequisites:

There are no specific pre-requisites, but students are assumed to have mathematical skills, 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

Credit points: 4

Students in this unit should read this unit outline 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

- Unit description

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.

This unit 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.

TEACHING STAFF

Convenor:

Tim Kyng, Lecturer in Actuarial Studies, Room E4A 614, Ph: (02) 98507289, email tkyng@efs.mq.edu.au.

Consultation hours: Friday 3:00 pm – 5:00 pm
(Tentative and may be subject to change)

Tutor: Wen Xun Chan

Contact details: to be advised
Consultation hours: to be advised

- Teaching Assistant

Hong Xie is acting as a teaching assistant for this unit. Please address any enquiries about administration to Hong via the Private Mail facility on the unit website. If he can't answer your question he can pass the message on to the appropriate person.

CLASSES

- Number and length of classes:

2 hours face-to-face lecture per week
1 x 1 hour tutorial per week.

- Timetable for Lectures and Tutorials:

Lecture 1: Friday, 11:00 am – 1:00 pm, E4B214 2 hours

Tutorial 1: Friday, 2:00 pm – 3:00 pm, E4B214, 1 hour

The timetable for classes can be found on the University web site at:
<http://www.timetables.mq.edu.au/>

The lectures will NOT be recorded using i-lecture and posted on the website. However we do NOT recommend you to skip lectures. Skip lectures at your own risk!

REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

- Prescribed unit materials:

Lecture Notes and Tutorial Exercises: Available on the Blackboard

- Recommended texts:

There are no prescribed textbooks. Lecture notes will be provided on blackboard. The following books are highly recommended however.

Options Futures and Other Derivatives (6th Edition) by John Hull &
Solutions Manual to Options Futures and Other Derivatives (6th Edition) by John Hull

OR

Options Futures and Other Derivatives (7th Edition) by John Hull &
Solutions Manual to Options Futures and Other Derivatives (7th Edition) by John Hull

OR

Options Futures and Other Derivatives (8th Edition) by John Hull &
Solutions Manual to Options Futures and Other Derivatives (8th Edition) by John Hull

UNIT WEB PAGE

Course material is available on the learning management system (BlackBoard). To access the teaching website, go to <http://learn.mq.edu.au> and login using your usual login and password. You will then have access to the websites for all the units in which you are enrolled. If you have any trouble logging in (e.g. you have forgotten your password), please contact the Student IT Helpdesk in C5C244.

Before logging in, you should follow the link labelled "Technical Information" and read all the information there, including the Information Technology Security Policy and Rules and the Information Technology Usage Rules. This technical information also mentions a number of "plugins" that may be required. Of those listed, in this unit you will only need Acrobat Reader. Remember to close your browser when you have finished using the site. If you don't, another person can use the still running browser to access the website with your account.

Consult the web page frequently. You will find administrative updates, lecture notes, tutorials and assignments posted there.

LEARNING OBJECTIVES AND OUTCOMES

- The learning outcomes of this unit:

On completing this unit, students will be able to demonstrate that they understand the features and uses of derivative securities, how to derive analytic formulae for European call and put options and some of the more straightforward exotic options, and how to write spreadsheet programs to do a numerical valuation of various option pricing problems. In addition to the discipline-based learning

objectives, all academic programs at Macquarie seek to develop students' generic skills in a range of areas.

The aims of this unit include development of your skills in financial modelling, skills in using spreadsheets for numerical implementation of financial modeling, as well as communication skills, critical analysis and problem solving.

The broad learning objectives of this unit are as follows.

1. Explain the main features and uses of the standard derivative securities.
2. Explain the concepts of replication and the law of one price and how it relates to pricing for derivative securities.
3. Explain 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. Describe and apply numerical methods for the valuation of derivative contracts using spreadsheet software.
5. Explain the valuation formulae for those standard derivative securities for which an analytic valuation formula exists.
6. 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

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:
 - (a) Have an appreciation of the risk neutral approach to derivative valuation.
 - (b) Be adept in developing spreadsheet models to perform numerical calculations and modelling for financial derivatives and related financial decision making problems
 - (c) Have an intuitive understanding of the binomial option pricing model, the black scholes model, dynamic hedging and the law of one price and how these relate to derivative pricing
 - (d) Understand the main features and uses of the standard exchange traded financial derivatives
 - (e) Have the ability to apply the methods and knowledge covered to hedging, speculation, valuation of securities, valuation of incentives and financial decision making
2. Critical, Analytical and Integrative Thinking
3. *Problem Solving and Research Capability*

TEACHING AND LEARNING STRATEGY

- The unit will be taught by a combination of lectures, tutorials exercises and computer lab exercises. Concepts and examples will be discussed in the lectures. Problem sets will be discussed in tutorials and computer lab exercises.
- Numerical implementation using spreadsheets will be used to illustrate the concepts and teach students about the features of derivative securities. This will be a major feature of the unit. This makes the numerical calculations far less tedious and also teaches students valuable practical skills.
- The assignments will contain various exercises designed to lead you through the understanding of various concepts, proofs, derivations and so on in a step by step way. Working through these assignment questions is a key part of the learning process. Likewise the weekly exercises are also intended to assist with student learning.
- It is expected that students attend and fully participate in the lectures, tutorials and computer lab sessions. The students are expected to attempt tutorial questions before each tutorial session and to participate in the discussion of the solutions in each tutorial session. The students are encouraged to read in advance the lecture material before each lecture session.

Week-by-week list of the topics to be covered:

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Week	Topics covered
1	Interest rates, debt securities and the term structure structure of interest rates
2	Forward contracts and futures contracts
3	Swaps
4	Introduction to options and the Black Scholes Formula
5	The binomial option pricing method, dynamic hedging and the law of one price, risk neutral valuation
6	Mathematical background for option pricing: Statistical Theory, Calculus, Brownian Motion, Ito's Lemma
7	Mid Semester Exam
BREAK	
8	Valuation Methodology: PDEs, Risk Neutral Discounted Expectation, Examples
9	Numerical methods: Monte Carlo Simulation and Finite Difference Methods
10	Exotic Options & Case Studies of applying numerical methods
11	Standard Interest rate derivative products
12	Applications of Options and Valuation Theory – Case Studies
13	Revision

The above list of topics is tentative and may be subject to change depending on circumstances. Students can and should ask questions during lectures, breaks, tutorials or consultation hours. Students experiencing significant difficulties with any topic in the unit should seek assistance immediately.

RELATIONSHIP BETWEEN ASSESSMENT AND LEARNING OUTCOMES

Diagnostic Test: University policy requires us to conduct a diagnostic test early in the term. This does not count for assessment, but is used to identify students who may need extra assistance. This will be made available via Blackboard during the first three weeks of term.

In order to pass this unit, students must have satisfactory performance on both the coursework and the final exam.

The modes of assessment here are in alignment with university policy. They consist of the following elements.

Assessment:

- | | |
|---------------------|-----|
| • Assignment 1 | 20% |
| • Assignment 2 | 20% |
| • Mid semester exam | 20% |
| • Final Examination | 40% |

All students are required to achieve a minimum level of performance on the final examination AND have satisfactory overall performance in order to obtain a passing grade for the unit.

If there are any changes in lecture times and assignment due dates, an announcement will be posted on the Blackboard.

MID TERM EXAMINATION

There will be a 2 hour mid-term examination in the lecture period in week 7, which will cover all of the topics up to and including week 6. Students must attend this examination, unless clearly prevented from doing so by illness or misadventure. See University Guidelines regarding Special Consideration. This will be an open book exam.

Final Examination:

Exam duration: 3 hour exam plus 10 minutes reading time.

The final exam will cover all of the material in the course. This will be an open book exam. Students will be allowed to use:

- a calculator (one without text retrieval capability); and / or
- a laptop computer
- the desktop computers in the computer laboratory where the exam will be conducted
- their lecture notes and textbooks.

Assessment Tasks	Task 1	Task 2	Task 3
Title/Name	Assignment 1; Assignment 2	Mid Term Test	Final Examination
Description	Each assignment may include numerical, conceptual, methodology, derivations and spreadsheet modelling questions	2 hours; may include both multiple choice and detailed questions	3 hours plus 10 minutes reading; may include both multiple choice and detailed questions
Due date	To be advised.	In the lecture during week 7	In the lecture during week 13
Weighting	20% each	20%	40%
Grading method - marking criteria/ standards - expectations in relation to presentation	Based on level of understanding and problem solving skills; full solutions are expected for detailed questions	Based on level of understanding and problem solving skills; full solutions are expected for detailed questions	Based on level of understanding and problem solving skills; full solutions are expected for detailed questions
Submission method	Hard copy for written answers, electronic submission for spreadsheet programs	Answer book	Answer book
Feedback	Through marked scripts, class discussions and /or consultations within 10 working days after the due date	Through marked scripts, class discussions and /or consultations within 10 working days after the due date	No feedback will be provided on the final examination in line with university policies
Estimated student workload (hours)	12-24 hours	8 – 16 hours	10 – 20 hours
Learning outcomes assessed			
1	√	√	√
2	√	√	√
3		√	√
4	√	√	√
5		√	√
6	√	√	√
Graduate capabilities assessed			
1(a)-(d)	√	√	√
2	√	√	√
3	√	√	√

Normal examination rules apply to the conduct of the final exam. These rules are set out under the heading "Conduct of Examinations" in the Student Information section of the Macquarie University Handbook of Undergraduate Studies (page 42).

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://www.timetables.mq.edu.au/exam>

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. Information about unavoidable disruption and the special consideration process is available at <http://www.reg.mq.edu.au/Forms/APSCon.pdf>

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.)

You are advised that it is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is the final day of the official examination period.

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

UNIVERSITY POLICY ON GRADING

Macquarie University uses the grades HD, D, Cr, P, PC and F for grading the achievements of students in units of study. The meaning of each symbol is explained in Section 9 of the Bachelor Degree Rules in the current Macquarie University Handbook of Undergraduate Studies.

Academic Senate has a set of guidelines on the distribution of grades across the range from fail to high distinction. Your final result will include one of these grades plus a standardised numerical grade (SNG). The numerical marks resulting from assessment of your work in this unit will be used as an initial indicator of the quality of your learning and understanding. The use of these numerical marks is, however, only a starting point in determining the appropriate grade. In particular, note that the SNG ranges mentioned in the Handbook of Undergraduate Studies are not the raw marks. To obtain a grade you must satisfy the qualitative definition of that grade. Once your grade has been determined, you are allocated an SNG indicating your approximate position amongst students assigned that grade.

The following table indicates the range of SNGs for each grade.

HD	High Distinction	85-100
D	Distinction	75-84
Cr	Credit	65-74
P	Pass	50-64
F	Fail	0-49

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/for/new_and_current_students/undergraduate/admin_central/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 and procedure are available at:

http://www.mq.edu.au/policy/docs/special_consideration/policy.html

http://www.mq.edu.au/policy/docs/special_consideration/procedure.html

STUDENT SUPPORT SERVICES

Macquarie University provides a range of Academic Student Support Services. Details of these services 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.]

IT CONDITIONS OF USE

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 utilising 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 unit 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.

INSTITUTE OF ACTUARIES OF AUSTRALIA

The Institute of Actuaries of Australia (IAAust) has recently launched a new free offer for students to become IAAust University Subscribers. Full time undergraduates studying at an Institute accredited university who are members of a university student actuarial society are eligible. To sign up, go to

<http://www.actuaries.asn.au/Membership/MembershipoftheInstitute/Subscriber.aspx>.

The University Subscriber offer is not a membership of the IAAust but a subscription to receive information on career opportunities, invitations to selected IAAust events and online publications. You might also consider joining the IAAust – there are advantages in doing so while a full-time student. For membership information, go to

<http://www.actuaries.asn.au/Membership/MembershipoftheInstitute.aspx>

STUDENT SUPPORT SERVICES

The following can be added under the Student Support Services heading previously

BESS. Business and Economics Student Services (BESS) is located in room E4B106 and offers photocopying facilities, reading areas and reference material. Class tests will be returned to BESS. Information about facilities and services is at http://businessandeconomics.mq.edu.au/for/new_and_current_students/undergraduate/bess.

Consultation room. Consultation sessions with tutors may be held in the FBE Consultation Room E4B 104 at the times outlined previously under Consultation Times.

RULES REGARDING TESTS AND EXAMINATIONS

You should ensure that your handwriting in the class tests and in the final examination is legible. Sections of work that are not legible will not be marked. For true/false questions, answers that are not clearly legible as either T or F will be assumed to be wrong and marked accordingly.

CLASS ETIQUETTE

Mobile phones should be switched off during all lectures and tutorials. If there is a reason for you to keep your phone on you should request to be allowed to do so before the start of the class. Lectures commence at 5 minutes past the hour and you are expected to be punctual. You are expected to keep talking to a minimum during classes so as not to disrupt your fellow students (and the lecturer).

ELECTRONIC COMMUNICATION AND YOUR STUDENT FILE

Every business keeps a record of its correspondence with its customers. The University is no exception and it maintains a file for every student. Staff are required to ensure that copies of all correspondence with you are added to your file. Historically, “correspondence” meant letters, but nowadays it also includes electronic communication such as email. Staff have some discretion here and might not file copies of trivial emails, but it is difficult to define precise boundaries here, so it is safer to assume that any email you send to a staff member will be added to your file.

Some people regard email as more ephemeral than a letter and thus tend to take less care with issues such as clarity of expression, grammar and spelling. Before sending an email to a staff member, a good question to ask yourself is: “If a member of staff is reviewing my student file prior to writing a reference for me, and they see a copy of this email, would that staff member gain a favourable impression of my level of communication skills?”

In this context, email includes communications you send to staff with the mail tool in the unit’s web site. It does not normally include postings you make to the discussion area. However, in those very rare cases where a student makes an inappropriate posting to the discussion area, a copy of the posting would be added to that student’s file.