

**MACQUARIE UNIVERSITY**  
**ACST200/851 – MATHEMATICS OF FINANCE**  
**Unit Outline – 1<sup>st</sup> Semester 2007**

**1 About this Unit**

**1.1 Content**

Much of the work that actuaries do involves long term financial problems. For any problem spanning more than a few months, the effects of compound interest are significant. This unit is a study of compound interest, with a few very brief diversions into alternative systems of interest. As far as possible, the examples considered are real life problems, though in some cases we deliberately simplify scenarios so that we can concentrate on the interesting maths rather than getting slowed down by fiddly details.

**1.2 Timetable**

<b>Week</b>	<b>Week Begins</b>	<b>Topics Covered</b>
1	26 Feb	1. Compound Interest & Discount; Forces of Interest – Reading Topic
2	5 March	2. Inflation and Capital Gains Tax – Reading topic 3. Level Annuities
3	12 March	4. Varying Annuities
4	19 March	5. Loans
5	26 March	6. Bonds
6	2 April	7. Unit Pricing Systems – Reading Topic (Friday public holiday) 8. Yields on funds
2-week study break		
7	23 April	9. Project Appraisal – Reading Topic
8	30 April	10. Yield Curves
9	7 May	11. Forward Contracts
10	14 May	12. Bond Statistics
11	21 May	13. Immunisation
12	28 May	14. Stochastic Models
13	4 June	

Changes to the timetable may occur and any alterations will be advised in lectures.

**1.3 Unit objectives**

By the end of the unit you should be able to demonstrate competence in the range of techniques described in the unit notes and lectures. Ideally you will be able to demonstrate an understanding of the techniques rather than simply demonstrating the ability to rote learn formulae without understanding. You should also be able to demonstrate ethical behaviour by complying with examination rules and by not colluding on assessment tasks.

In addition to the discipline-based learning objectives, all academic programs at Macquarie seek to develop students' generic skills in a range of areas. One of the aims of this unit is that students develop their problem-solving skills.

## 1.4 Relationship to other units

The unit develops the techniques required to deal with compound interest problems more complex than those discussed in ACST101.

Most of the topics in this unit are concerned with cash flows which are certain to occur. In ACST255/859 you will revisit many concepts from this unit and apply them to situations where cash flows are no longer certain, but have a probability of occurrence. Some of the models considered in this unit may appear to involve unrealistic simplifying assumptions. ACST305/858 will relax some of these assumptions, giving more realistic models.

## 1.5 Exemptions – Information for those majoring in actuarial studies

This unit corresponds to the Part 1 professional subject CT1. You require a grade of Credit or better in this unit to receive the exemption.

## 2 Contacting Teaching Staff

The unit convenor and lecturer, Jim Farmer, can be contacted by the mail tool in the unit's web site. However, administration inquiries should be sent to the Administration Inquiries account and questions about the course material should be posted in the unit's discussion area. Tutors cannot be contacted other than at tutorials.

## 3 Classes

Class times can be found at: <http://www.timetables.mq.edu.au/>

## 4 Assessment

### 4.1 The Grading Process

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 10 of the Bachelor Degree Rules in the Macquarie University Handbook of Undergraduate Studies and in Section 7 of the Rules for the Degree of Master by Coursework in the Handbook of Postgraduate Studies. The handbooks are available online at <http://www.handbook.mq.edu.au>

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. To obtain a grade you must satisfy the qualitative definition of that grade. Once your grade has been determined, you are allocated a standardised mark in the appropriate range for that grade indicating your approximate position amongst students assigned that grade. This standardised mark is not your raw mark.

The following table gives an indication of the relative weighting of the assessment components. To pass the unit, you must pass the final exam as well as passing on the combined weighting shown below.

Quizzes	10%
Examination	90%

### 4.2 Dangerous misunderstandings are penalised

When you work as an actuary or in any other profession, if you have a dangerous misunderstanding of a concept you may provide incorrect advice to a client possibly with severe financial consequences for your client and yourself. However, if you realise that you don't understand a concept you may refrain from giving advice on it until you have filled the gaps in your knowledge. That is, dangerous misunderstandings have more serious consequences than a lack of knowledge.

The grading philosophy and marking scales adopted in this unit (and in many other university units) reflect this situation. Correct relevant statements earn marks. Statements revealing dangerous misunderstandings result in the deduction of marks. If your answers reveal that your misunderstandings are very severe or numerous, you might earn a negative mark for a question. If a part of a question is worth  $x$  marks, the smallest mark you can be allocated for that part is  $-x$  marks.

As an example, a minor error when keying numbers into your calculator is not usually regarded as a dangerous error provided the resulting incorrect answer is plausible. However, if a calculator error results in an obviously unreasonable answer, such as a present value of a future cash flow which exceeds the size of the that future cash flow, or a monthly loan repayment that exceeds the amount of the loan, and you fail to state that you realise this answer is unreasonable, this would be regarded as a dangerous misunderstanding.

## 5 Final Exam

The exam will be a three-hour paper with ten minutes reading time.

### 5.1 Exam Rules

You are responsible for familiarising yourself with the University's examination rules. These rules are available:

- On page 42 of the 2007 Handbook of Undergraduate Studies, available at <http://www.handbook.mq.edu.au/PDFs/2007/ug-general-student-info.pdf>
- On page 184 of the 2007 Handbook of Postgraduate Studies, available at <http://www.handbook.mq.edu.au/PDFs/2007/pg-general-student-info.pdf>

### 5.2 Material in Exam

You may not bring any notes, textbooks or dictionaries into the exam.

The exam will include multiple choice questions. You should bring several 2B pencils and an eraser.

The exam paper will include a table of the normal distribution, a table listing the day number of every day of the year (similar to Appendix E of the ACST101 textbook by Knox, et al) and various formulae from Topic 14 too ghastly to memorise. These tables are available in the downloads section of the unit's web site.

Calculators are allowed in the exam, but calculators that have a text-retrieval capacity, whether or not they have a full alphabet on the keyboard, are not allowed. Calculators may be checked during the exam, and the make and model may be recorded.

Communication devices, including but not restricted to mobile phones, text message receivers, pagers and wireless-equipped calculators, may not be brought into the exam. Devices able to record and play sounds are also banned. If a student is found to have brought such a device into the examination room, the argument that the device was turned off will NOT be regarded as an acceptable excuse.

### 5.3 Dates

The University Examination period in first semester 2007 is from Wednesday 13 June to Friday 29 June.

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.

Macquarie University policy is 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 official examination period.

## 6 Teaching and Learning Strategy

This unit is taught via lectures and tutorials. For some topics, detailed readings are provided and replace the “traditional” lecture format. Where this occurs, the lecture time is used for answering any questions arising from the readings. The readings are available on the unit’s web site.

## 7 Unit Web Site

The unit web site can be accessed via the logon facility at <http://online.mq.edu.au/student/>

## 8 Textbooks

The “ACST200/851 Unit Notes” are available from the University Co-Op Bookshop. Additional readings are available from the unit’s web site.

The following is a list of all textbooks I am aware of that cover material from this unit, with their Macquarie University call numbers. Some of these books have been used as prescribed texts for this unit in the past. However, feedback from students was that they did not provide good value for money, so we no longer prescribe a text.

- Broverman, Samuel. “Mathematics of Investment & Credit” 2<sup>nd</sup> Edition. Mad River Books. (<http://www.actexamdriver.com>) HG4515.3.B76/1996. The 3<sup>rd</sup> edition is on order.
- There is an associated electronic workbook for the above textbook. Details are available at: <http://www.actexamdriver.com/productdetails.cfm?PC=1478> .
- Donald D.W.A. “Compound Interest and Annuities Certain” 1970. Heinemann HG8790.D65/1970. Out of print. (While this book is dated 1970, the section explaining how to use hand-cranked calculating machines suggests this edition wasn’t significantly updated from the earlier 1953 edition. Given the existence of cheap electronic calculators, many of the techniques described in this book are now irrelevant.)
- Kellison, Stephen G. “The Theory of Interest” Irwin, HB539.K28/1991
- Knox, Zima and Brown. “Mathematics of Finance” 2nd Edition. McGraw Hill. HF5691.K56/1999 (This book does not cover any significant amount of ACST200 material, but is useful for revising ACST101 material.)
- McCutcheon, J.J. and Scott W.F. “An Introduction to the Mathematics of Finance” Heinemann. 1986. HF5691.M27. (Available for purchase via <http://wam.actuaries.org.uk>.)
- Sherris, Michael. “Money and Capital Markets” 2nd Edition. HG4515.S54
- Course notes for the UK courses may be purchased from ActEd. (<http://www.acted.com.au>)

Many of these books are quite expensive. Since the actuarial profession is small there are few economies of scale. Unfortunately, if you plan to continue in the actuarial profession, you'll have to get used to textbooks being expensive.

## **9 Cheating and Plagiarism**

To cheat in the context of university assignments, tests and examinations is to attempt to gain an unfair advantage by violating the principles of intellectual and scholarly integrity. Cheating also encompasses plagiarism.

The University defines plagiarism in its rules: "Plagiarism involves using the work of another person and presenting it as one's own." Plagiarism is a serious breach of the University's rules and carries significant penalties. You must read the University's practices and procedures on plagiarism. These can be found in the *Handbook of Undergraduate Studies* or on the web at: <http://www.student.mq.edu.au/plagiarism/>

The policies and procedures explain what plagiarism is, how to avoid it, the procedures that will be taken in cases of suspected plagiarism, and the penalties if you are found guilty. Penalties may include a deduction of marks, failure in the unit, and/or referral to the University Discipline Committee.

## **10 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>.