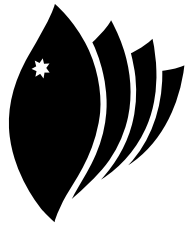


MACQUARIE  
UNIVERSITY



FACULTY OF  
BUSINESS AND ECONOMICS

**ACST358/818**  
**Survival Models**

**Semester 1, 2011**

*Department of Applied Finance  
and Actuarial Studies*

**MACQUARIE UNIVERSITY  
FACULTY OF BUSINESS AND ECONOMICS  
UNIT GUIDE**

**Year and Semester:** 2011 Semester 1

**Unit convenor:** Dr. Xian Zhou

**Prerequisites:** ACST255 (P); ACST211 (P); STAT271 (P); or equivalent  
**Co-requisites:** None

**Credit points:** 3 (ACST358) 4 (ACST818)

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**

- **Unit description:** This unit provides sophisticated statistical and probabilistic models for survival, sickness, insurance losses and other actuarial problems based on survival data. Techniques of survival analysis are used to estimate survival and loss distributions and evaluate risk factors in actuarial applications. Methods of both nonparametric and parametric estimation are utilised. Advanced models based on Markov chains and processes will also be introduced to capture the features of stochastic transitions between different survival or loss states and to estimate the transition rates.
- **Unit rationale:** The unit is a core unit of the degree program for actuarial studies. It covers a large part of the materials in the UK Institute of Actuaries (IA) syllabus for Subject CT4, and a prerequisite to units ACST359/819 Actuarial Modelling. Units ACST358/818 and ACST359/819 together cover the CT4 syllabus.

#### **TEACHING STAFF**

- **Convenor:** Dr. Xian Zhou, Room E4A 607, Ex 8566, [xian.zhou@mq.edu.au](mailto:xian.zhou@mq.edu.au)
- **Tutors:** Sijin Ou [sijin.ou@mq.edu.au](mailto:sijin.ou@mq.edu.au)  
Shunquan Zhang [shun.zhang@students.mq.edu.au](mailto:shun.zhang@students.mq.edu.au)  
Pan Jiang [pan.jiang@mq.edu.au](mailto:pan.jiang@mq.edu.au)
- **Teaching Assistant:** Owen Tong [owen.tong@students.mq.edu.au](mailto:owen.tong@students.mq.edu.au)

#### **CONSULTATION TIMES**

Dr. Xian Zhou: 2 – 4pm, Wednesdays during teaching weeks

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 any 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).

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

## CLASSES

- Lectures are held on
  - Wednesdays from 9:00am to 11:00am in C5C T1
  - Thursdays from 12:00pm to 1:00am in E7B T5
- Lecturer: Xian Zhou
- The lectures will NOT be recorded using i-lecture.
- Tutorials are held on
  - Thursdays 9:00am in C5C 240 (ACST358)                      Tutor: Jiang Pan
  - Thursdays 11:00am in W5C 213 (ACST358)                      Tutor: Sijin Ou
  - Thursdays 1:00pm in E7B 263 (ACST818)                      Tutor: Sijin Ou
  - Thursdays 4:00pm in W5A 205 (ACST358)                      Tutor: Shunquan Zhang
  - Thursdays 5:00pm in W6B 315 (ACST358)                      Tutor: Shunquan Zhang

(Each student should be enrolled in one of these tutorials)
- The timetable for classes can be found on the University web site at:  
<http://www.timetables.mq.edu.au/>
- Tutorials start in Week 2.
- Tutorial exercises will be available from the unit web site each week before tutorials.
- Tutorial exercises will not be assessed, but they form a very important part of the study and are closely related to the assessed components (quiz, class test and examination).
- Tutorials are important opportunities for you to work on the week's tutorial questions and to obtain help with them as needed. The more preparation you do for the tutorial, the more you will benefit from the session.
- Any alterations to classes will be advised in lectures and/or on the unit webpage.

## PRIZES

**Prizes for this unit:** The Hubert Vaughan Prize will be awarded for the most meritorious performance in ACST358; see:  
[http://www.businessandconomics.mq.edu.au/undergraduate\\_degrees/prizes\\_scholarships](http://www.businessandconomics.mq.edu.au/undergraduate_degrees/prizes_scholarships)

## REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

- The primary texts for the unit are the Lecture Notes provided by the Lecturer.
- Lecture Notes will be posted on the website before the lectures.
- The main additional reading materials are the ActEd CT4 notes (2011 edition).
- Reading of the ActEd CT4 notes will considerably enhance the benefits you can gain from the lectures.
- The ActEd CT4 notes can be purchased through ASSOC. More information about ASSOC can be found at its website <http://www.mqassoc.org>

## TECHNOLOGY USED AND REQUIRED

You will need access to the internet to obtain course information and download teaching materials.

## UNIT WEB PAGE

- Course material is available on the learning management system (Blackboard)
- The web page for this unit can be found at: <http://learn.mq.edu.au>
- The website will be used extensively for this unit so please consult the web page frequently. You will find administrative updates, lecture notes, tutorials and assignments posted there. Materials posted on the website may be updated from time to time.
- It is your responsibility to check the website regularly to make sure that you are up-to-date with the information for the unit.

## LEARNING OUTCOMES

The learning outcomes of this unit are:

1. Understand different types of survival models and key concepts of survival analysis.
2. Master the skills of nonparametric and parametric methods to estimate parameters and probability distributions.
3. Able to establish and evaluate the relationship between survival rate and risk factors.
4. Understand the ideas and concepts of Markov properties and processes.
5. Able to solve Markov transition probabilities via matrix theory and differential equations and to estimate the transition rates.
6. Capable of connecting the theory of survival models with practical actuarial problems.

## 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) Appreciation of probability and statistical models in actuarial applications.
  - (b) Expertise in model development, evaluation and selection.
  - (c) Ability to draw objective and meaningful statistical inference and conclusions from survival data analyses.
  - (d) Familiarity in applying methods of survival analysis and Markov processes to solve actuarial and financial problems in the real world.
2. Critical, Analytical and Integrative Thinking
3. Problem Solving and Research Capability
4. Effective Communication
5. Engaged and Ethical Local and Global citizens
6. Socially and Environmentally Active and Responsible
7. Capable of Professional and Personal Judgement and Initiative
8. Commitment to Continuous Learning

## TEACHING AND LEARNING STRATEGY

- The unit is taught through 3 hours of lectures and 1 hour of tutorial per week. Lectures will cover the topics and materials in accordance with the syllabus of Subject CT4 of Institute of Actuaries (IA). Tutorials will discuss exercise questions covered by the lectures.
- Students are expected to listen carefully to all lectures and tutorials; participate in discussions during tutorials, read relevant materials in advance; review the knowledge learnt in classes; and complete all assignments independently.
- A planned week-by-week list of the topics is as follows:

Week	Topics covered
1	Principle of actuarial modelling; Probability models
2	Survival analysis; Estimation of survival distributions
3	Estimation of survival distributions
4	Variance estimation; Quiz 1
5	Confidence intervals; Cox proportional hazards models
6	Cox proportional hazards models
7	Class Test; Stochastic processes
BREAK	
8	Markov chains
9	Markov jump processes
10	Markov jump processes; Estimation of transition intensities
11	Quiz 2; Applications of Markov processes
12	Applications of Markov processes; Summary
13	Revision

**Note:** This is only a tentative schedule. Alterations to the timing of Class Test and Quizzes, if any, will be advised in advance in lectures and/or via the unit website.

## RELATIONSHIP BETWEEN ASSESSMENT AND LEARNING OUTCOMES

Assessment	Task 1	Task 2	Task 3
Title/Name	Quiz 1; Quiz 2	Class Test	Final Examination
Description	Each quiz has 10 multiple choice questions and allows 45 minutes to complete	1 hour 45 minutes; with 5 questions for detailed answers	3 hours plus 10 minutes reading; including multiple choice and detailed questions
Due date (tentative)	Quiz 1: 17/03/2011 Quiz 2: 18/05/2011	06/04/2011	To be arranged by central time tabling
% Weighting	10%	20%	70%
Grading method - marking criteria/ standards - expectations in relation to presentation	According to correctness of answers	Based on level of understanding and problem solving skills; full solutions are expected.	Based on level of understanding and problem solving skills; full solutions are expected for detailed questions
Submission method	Answer sheet	Answer book	Answer book
Feedback	Through marked scripts (within one week after the due date), consultations and/or class discussions	Through marked scripts (within 3 weeks after the due date), consultations and/or class discussions	No feedback will be provided on the final examination in line with university policies
Estimated student workload (hours)	6 – 12 hours	5 – 10 hours	15 – 20 hours
Learning outcomes assessed			
1	√	√	√
2		√	√
3	√	√	√
4	√	√	√
5			√
6	√	√	√
Graduate capabilities assessed			
1(a)	√	√	√
1(b)		√	√
1(c)	√	√	√
1(d)		√	√
2	√	√	√
3		√	√
4	√		√
5			
6			
7	√	√	√
8			

- **Assignments:** There will be two assignments for this unit. They will not be assessed, but solutions will be provided. You are expected to complete all assignments independently.
- **Extension:** Not applicable
- **Late submissions:** Late submissions of answers will not be accepted
- **Attendance:** Attendance of lectures and tutorials is essential to the success of studying this unit, although it will not be recorded.
- **Examinations:** 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.

The University Examination period in First Half Year 2011 is from 6 June to 24 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. The University's policy on special consideration process is available at

[http://www.mq.edu.au/policy/docs/special\\_consideration/policy.html](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](http://www.mq.edu.au/policy/docs/academic_honesty/policy.html)

## GRADES

Please refer to relevant Bachelor Degree rule in the Handbook of Undergraduate Studies.

## 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 at:

[http://www.businessandconomics.mq.edu.au/for/new\\_and\\_current\\_students/undergraduate/admin\\_central/grade\\_appeals](http://www.businessandconomics.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 is available at:

[http://www.mq.edu.au/policy/docs/special\\_consideration/procedure.html](http://www.mq.edu.au/policy/docs/special_consideration/procedure.html)

By submitting a request for special consideration you are agreeing to be available to sit a Supplementary Examination if required. If a Supplementary Examination is granted as a result of the Special Consideration process then

- The examination will be scheduled after the conclusion of the official examination period.
- You do not have the right to request an alternative time, unless the scheduled time clashes with another Macquarie University supplementary exam that you are required to attend.
- Your performance in the Supplementary Examination replaces your performance in the original examination (if any). You do not have the right to subsequently request that your result be based on the original examination rather than the Supplementary Examination.
- If you fail to attend the Supplementary Examination you will be awarded the grade of “Fail – Absent”.



Note further that:

- A Supplementary Examination may be granted only if the application for special consideration meets all criteria set by the policy for special consideration (refer to [http://www.mq.edu.au/policy/docs/special\\_consideration/procedure.html](http://www.mq.edu.au/policy/docs/special_consideration/procedure.html)), including satisfactory performance in the coursework components of the unit and meeting the deadlines of the application process.
- The ground for special consideration does not provide special treatment on marking and grading. Your grade cannot be raised on the ground for special consideration without demonstration of satisfactory performance in a Supplementary Examination.
- For fairness to all students, Supplementary Examinations are carefully designed such that sitting a Supplementary Examination has no advantage over regular examination.
- Knowledge of the regular examination has little chance to help raising the performance in a Supplementary Examination (if granted).
- A student who failed a regular examination due to lack of understanding to the course contents is unlikely to make sufficient improvement by sitting a Supplementary Examination.

## EXEMPTIONS

The units ACST358/818 and ACST359/819 together correspond to the professional subject CT4. The exemption will be recommended if and only if a SNG of at least 60 is achieved in both units and the average SNG is at least 65.

## INSTITUTE OF ACTUARIES OF AUSTRALIA

The Institute of Actuaries of Australia (IAAust) allows students to become IAAust University Subscribers free of charge. 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

Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at <http://www.student.mq.edu.au>.

**BESS:** Business and Economics Student Services (BESS) is located in room E4B106. Information about facilities and services is at:

[http://businessandeconomics.mq.edu.au/for/new\\_and\\_current\\_students/undergraduate/bess](http://businessandeconomics.mq.edu.au/for/new_and_current_students/undergraduate/bess)

In this unit, answers to quizzes and class test will be returned via BESS.

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

**ACSTINFO:** This ACSTINFO site is used to distribute information to all students majoring in actuarial studies. The information supplied may include administrative information and job advertisements. You will retain access to this site during the vacation following the end of this semester. It is to your advantage to ensure you read information on this web site regularly. You should not assume that information posted there will also be repeated in lectures. To access the site, login at: <http://learn.mq.edu.au> and the site should appear among your list of units. When you first login, please read the section labelled “How to use this site.” This contains useful information which will help you determine when there is new information on the site which you should read.

## 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.

## 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.