ACST358

Survival Models

S1 Day 2017

Dept of Applied Finance and Actuarial Studies

Contents

Disclaimer

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General Information

Unit convenor and teaching staff Xian Zhou xian.zhou@mq.edu.au
Credit points 3
Prerequisites ACST255 and STAT272
Corequisites
Co-badged status
Unit description This unit develops probabilistic and statistical models for survival and death, health and sickness, loss and claims, and other insurance related problems. Students will learn sophisticated mathematical and statistical methods to estimate lifetime distributions and model parameters; evaluate estimation quality and errors; assess the effects of covariates and risk factors; and test the appropriateness and validity of the models. Survival analysis for censored and truncated data, Cox proportional hazards models with covariates, and Markov processes for multiple state models, will be discussed and studied in details. Students gaining a grade of credit or higher in both ACST358 and ACST359 are eligible for exemption from subject CT4 of the professional exams of the Institute of Actuaries of Australia.

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:

Understand different types of survival models and their connections with practical actuarial problems.

Master the skills of statistical inference to estimate parameters and probability distributions of survival models.

Grasp the ideas and concepts of Markov properties and processes.

Able to solve Markov transition probabilities via matrix theory and differential equations.

General Assessment Information

Extensions and penalties on coursework assessment tasks

- **Tasks 10% or less** – No extensions will be granted. Students who have not submitted the task prior to the deadline will be awarded a mark of 0 for the task, except for cases in which an application for disruptions to studies is made and approved.

- **Tasks above 10%** - No extensions will be granted. There will be a deduction of 10% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late (for example, 25 hours late in submission – 20% penalty). This penalty does not apply for cases in which an application for disruption of studies is made and approved. No submission will be accepted after solutions have been posted.

Submission of assessment tasks

- Answers to the quiz are to be submitted in paper form by 3pm, Wednesday 22 March 2017.

- Answers to the take-home test (Test 1) are to be submitted in paper form by 3pm, Monday 8 May 2017.

Open-book final examination

- The final examination will be open-book in the sense that students can bring in any materials written or printed on paper with any size and number of pages.

Gradebook

- 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.

- Assessment criteria for all assessment tasks will be provided on the unit iLearn site.

Supplementary exams

- Information regarding supplementary exams, including dates, is available at: http://www.businessandeconomics.mq.edu.au/current_students/undergraduate/how_do_i/special_consideration

Assessment Tasks

Name	Weighting	Hurdle	Due
Quiz	5%	No	22 March
Test 1	20%	No	8 May
Test 2	15%	No	6 June
Examination	60%	No	Examination Period

Quiz

Due: **22 March**
Weighting: **5%**

Take-home quiz with multiple-choice questions. Feedbacks to the quiz will be provided before the end of week 4 (Friday, 24 March).

On successful completion you will be able to:
- Understand different types of survival models and their connections with practical actuarial problems.

Test 1

Due: **8 May**
Weighting: **20%**

Take-home test with problem-solving questions

On successful completion you will be able to:
- Understand different types of survival models and their connections with practical actuarial problems.
- Master the skills of statistical inference to estimate parameters and probability distributions of survival models.

Test 2

Due: **6 June**
Weighting: **15%**

Class test with multiple-choice questions. It will be held during lecture hours in the lecture room (duration: 90 minutes).

On successful completion you will be able to:

- Understand different types of survival models and their connections with practical actuarial problems.
- Grasp the ideas and concepts of Markov properties and processes.

Examination

Due: **Examination Period**
Weighting: **60%**

Open-book final examination with problem-solving questions (duration: 3 hours plus 10 minutes reading)

On successful completion you will be able to:

- Understand different types of survival models and their connections with practical actuarial problems.
- Master the skills of statistical inference to estimate parameters and probability distributions of survival models.
- Grasp the ideas and concepts of Markov properties and processes.
- Able to solve Markov transition probabilities via matrix theory and differential equations.

Delivery and Resources

Classes

- This unit is taught through 3 hours of lectures and 1 hour of tutorials per week.

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

- Tutorials start in Week 2

Consultation hours

Refer to iLearn

Unit Web Page

- The web page for this unit can be found at: http://ilearn.mq.edu.au

Technology Used and required

- You will need access to the internet to obtain course information and download teaching materials from the unit website.

- It is your responsibility to check the unit website regularly to make sure that you are up-to-date with the information for the unit.

Required and Recommended Texts and/or Materials

- Lecture Notes are the required materials and will be posted on the website before the lectures.

- The main additional reading materials are the ActEd CT4 notes. This will also be used as background reading for ACST359/819.

Unit Schedule

Week 1: Principle of actuarial modelling; Probability models

Week 2: Survival analysis; Estimation of survival distributions

Week 3: Estimation of survival distributions; Variance estimation

Week 4: Variance estimation and confidence intervals

Week 5: Cox proportional hazards models

Week 6: Cox proportional hazards models; Stochastic processes

Week 7: Markov chains

Week 8: Test 1

Week 9: Markov chains; Markov jump processes

Week 10: Markov jump processes

Week 11: Markov jump processes; Applications of Markov processes

Week 12: Applications of Markov processes

Week 13: Test 2

Note: This is only a tentative schedule. The actual schedule will be adjusted from time to time in accordance with the progress of lectures.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy_2016.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration

In addition, a number of other policies can be found in the Learning and Teaching Category of 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/support/student_conduct/

Results

Results shown in *iLearn*, 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.

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 improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

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

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.

Graduate Capabilities

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Understand different types of survival models and their connections with practical actuarial problems.
- Master the skills of statistical inference to estimate parameters and probability distributions of survival models.
- Grasp the ideas and concepts of Markov properties and processes.
- Able to solve Markov transition probabilities via matrix theory and differential equations.

Assessment tasks

- Quiz
- Test 1
- Test 2
- Examination

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Understand different types of survival models and their connections with practical actuarial problems.
- Master the skills of statistical inference to estimate parameters and probability distributions of survival models.

- Grasp the ideas and concepts of Markov properties and processes.

- Able to solve Markov transition probabilities via matrix theory and differential equations.

Assessment tasks

- Quiz

- Test 1

- Test 2

- Examination

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Master the skills of statistical inference to estimate parameters and probability distributions of survival models.

- Able to solve Markov transition probabilities via matrix theory and differential equations.

Assessment tasks

- Test 1

- Examination