ACST358

Survival Models

S1 Day 2016

Dept of Applied Finance and Actuarial Studies

Contents

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 Co-taught with ACST818
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 key concepts of survival analysis.

Able to connect the concepts of survival models and statistical inference with practical actuarial problems.

Master the skills of nonparametric and parametric methods to estimate parameters and probability distributions.

Understand the ideas and concepts of Markov properties and processes.

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

General Assessment Information

Extensions and penalties on coursework assessment tasks:

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 11am, Wednesday 30 March 2016.

Answers to the take-home test are to be submitted in paper form by 3pm, Wednesday 18 May 2016.

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 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 tasks (not including the final exam mark) will not be addressed.

Supplementary exams:

Further information regarding supplementary exams, including dates, is available here

http://www.businessandeconomics.mq.edu.au/current_students/undergraduate/how_do_i/ disruption to studies.

Assessment Tasks

Name	Weighting	Due
Quiz	10%	30 March

Name	Weighting	Due
Test	20%	18 May
Examination	70%	Examination period

Quiz

Due: **30 March**
Weighting: **10%**

True/false and multiple-choice questions

On successful completion you will be able to:

- Understand different types of survival models and key concepts of survival analysis.
- Able to connect the concepts of survival models and statistical inference with practical actuarial problems.

Test

Due: **18 May**
Weighting: **20%**

Problem-solving questions

On successful completion you will be able to:

- Understand different types of survival models and key concepts of survival analysis.
- Able to connect the concepts of survival models and statistical inference with practical actuarial problems.
- Master the skills of nonparametric and parametric methods to estimate parameters and probability distributions.
- Understand the ideas and concepts of Markov properties and processes.
- Able to solve Markov transition probabilities via matrix theory and differential equations and to estimate the transition rates.

Examination

Due: **Examination period**
Weighting: **70%**

Open-book examination with a combination of true/false, multiple-choice and problem-solving questions.

On successful completion you will be able to:

- Understand different types of survival models and key concepts of survival analysis.

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- Master the skills of nonparametric and parametric methods to estimate parameters and probability distributions.

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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

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.

What is required to complete the unit satisfactorily

To be eligible to pass this unit, a pass is required in the final examination.

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: Confidence intervals; Cox proportional hazards models

Week 6: Cox proportional hazards models

Week 7: Stochastic processes; Markov chains

Week 8: Markov chains

Week 9: Markov jump processes

Week 10: Markov jump processes

Week 11: Applications of Markov processes

Week 12: Applications of Markov processes

Week 13: Revision

Note: This is only a tentative schedule. The actual schedule will depend on 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

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.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 http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

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 key concepts of survival analysis.
- Able to connect the concepts of survival models and statistical inference with practical actuarial problems.
- Master the skills of nonparametric and parametric methods to estimate parameters and probability distributions.
- Understand the ideas and concepts of Markov properties and processes.
- Able to solve Markov transition probabilities via matrix theory and differential equations and to estimate the transition rates.

Assessment tasks

- Quiz
- Test
- 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 key concepts of survival analysis.
- Able to connect the concepts of survival models and statistical inference with practical actuarial problems.
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Assessment tasks

- Quiz

- Test

- 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 nonparametric and parametric methods to estimate parameters and probability distributions.

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

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

Assessment tasks

- Test

- Examination

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcome

- Able to connect the concepts of survival models and statistical inference with practical actuarial problems.