



# ACST3058

## Survival Models

Session 1, Weekday attendance, North Ryde 2020

*Department of Actuarial Studies and Business Analytics*

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## General Information

Unit convenor and teaching staff

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Angela Chow

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Credit points

10

Prerequisites

(ACST255 or ACST2055) and (STAT272 or STAT2372)

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 Credit average in both ACST3058 and ACST3059 (minimum mark of 60) will satisfy the requirements for exemption from professional subject CT4 of the Actuaries Institute.

## 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:

**ULO1:** Develop and analyse different types of survival models and describe their connections with practical actuarial problems.

**ULO2:** Apply statistical inference technique to estimate parameters and probability distributions of survival models.

**ULO3:** Demonstrate an understanding of the concepts and properties of Markov processes.

**ULO4:** Determine Markov transition probabilities via matrix theory and differential equations.

## Assessment Tasks

### Coronavirus (COVID-19) Update

Assessment details are no longer provided here as a result of changes due to the Coronavirus (COVID-19) pandemic.

Students should consult [iLearn](#) for revised unit information.

[Find out more about the Coronavirus \(COVID-19\) and potential impacts on staff and students](#)

## General Assessment Information

### 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.

### Assessment marks:

- 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.

### Extensions and penalties on within session 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 special consideration 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 special consideration is made and approved. No submission will be accepted after solutions have been posted.

## Delivery and Resources

### Coronavirus (COVID-19) Update

Any references to on-campus delivery below may no longer be relevant due to COVID-19.

Please check here for updated delivery information: [https://ask.mq.edu.au/account/pub/display/unit\\_status](https://ask.mq.edu.au/account/pub/display/unit_status)

### 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 from Week 2.

### 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 unit materials and/or recommended readings:

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

## Unit Schedule

### Coronavirus (COVID-19) Update

The unit schedule/topics and any references to on-campus delivery below may no longer be relevant due to COVID-19. Please consult [iLearn](#) for latest details, and check here for updated delivery information: [https://ask.mq.edu.au/account/pub/display/unit\\_status](https://ask.mq.edu.au/account/pub/display/unit_status)

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: Assignment 1; holiday (Friday)

Week 8: Markov chains

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; Assignment 2

Week 13: Revision

**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](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Students seeking more policy resources can visit the [Student Policy Gateway](https://students.mq.edu.au/support/study/student-policy-gateway) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) 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> or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Supplementary exams

Information regarding supplementary exams, including dates, is available at:  
[http://www.businessandconomics.mq.edu.au/current\\_students/undergraduate/how\\_do\\_i/disruption\\_to\\_studies](http://www.businessandconomics.mq.edu.au/current_students/undergraduate/how_do_i/disruption_to_studies)

## 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](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## 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>

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@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/](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.