



# ACST8042

## Long Term Actuarial Modelling

Session 2, In person-scheduled-weekday, North Ryde 2024

*Department of Actuarial Studies and Business Analytics*

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#### **Disclaimer**

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## General Information

### Unit convenor and teaching staff

Unit Convenor

Yanlin Shi

[yanlin.shi@mq.edu.au](mailto:yanlin.shi@mq.edu.au)

Lecturer

Zhuo Jin

[zhuo.jin@mq.edu.au](mailto:zhuo.jin@mq.edu.au)

Credit points

10

Prerequisites

(ACST881 or ACST8081 or ACST8041) and (STAT810 or STAT8310 or STAT806)

Corequisites

Co-badged status

Unit description

This unit covers the analysis of cash flows dependent on uncertain events due to mortality, health, retirement and other factors. It introduces the concept of the expected present value of payments under various life insurance contracts, including whole life, term and endowment assurances; immediate and temporary annuities; and deferred assurances and annuities. Furthermore, important concepts of pricing and reserving for future contingent liabilities are discussed. Equations of value are established to calculate net premiums. Prospective and retrospective net premium reserves required to meet future liabilities are determined and compared. Techniques of survival analysis are used to estimate survival distributions and evaluate risk factors in actuarial applications. Students performing satisfactorily well in ACST8042 and ACST8043 will meet the requirements to earn credit from Exam FAM of the Society of Actuaries.

## 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:** Demonstrate an understanding of the properties and uses of various commonly

used mortality models.

**ULO2:** Perform the estimation and make inference for survival data.

**ULO3:** Explain and identify different features of long-term insurance coverages and the associated actuarial present values.

**ULO4:** Apply basic methods to calculate premiums and policy values for long term insurance coverages.

## General Assessment Information

Late Assessment Submission Penalty (**written assessments**)

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11.55pm. A 1-hour grace period is provided to students who experience a technical concern.

For any late submissions of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for [Special Consideration](#).

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Assignment</a>	20%	No	Week 8
<a href="#">Class test</a>	20%	No	Week 10
<a href="#">Final Examination</a>	60%	No	University Examination Period

### Assignment

Assessment Type <sup>1</sup>: Quantitative analysis task

Indicative Time on Task <sup>2</sup>: 20 hours

Due: **Week 8**

Weighting: **20%**

Problem-solving questions requiring detailed solutions using Excel or R.

On successful completion you will be able to:

- Demonstrate an understanding of the properties and uses of various commonly used mortality models.

- Perform the estimation and make inference for survival data.

## Class test

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **Week 10**

Weighting: **20%**

The test will be approximately 90 minutes to be held during class time.

On successful completion you will be able to:

- Demonstrate an understanding of the properties and uses of various commonly used mortality models.
- Perform the estimation and make inference for survival data.
- Explain and identify different features of long-term insurance coverages and the associated actuarial present values.

## Final Examination

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 28 hours

Due: **University Examination Period**

Weighting: **60%**

The final examination will be closed book, a three-hour paper with ten minutes reading time, to be held during the University Examination period.

On successful completion you will be able to:

- Demonstrate an understanding of the properties and uses of various commonly used mortality models.
- Perform the estimation and make inference for survival data.
- Explain and identify different features of long-term insurance coverages and the associated actuarial present values.
- Apply basic methods to calculate premiums and policy values for long term insurance coverages.

<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

### Classes

It is intended that learning this session will be a combination of pre-recorded online and face-to-face.

The timetables for classes can be found on the University website at: <https://timetables.mq.edu.au/2024/>

Pre-recorded lectures will be made available early in the week and students are expected to have watched/listened to them prior to attending any live or face-to-face classes.

Classes on tutorial questions will commence in week 2 of the session. Students are expected to have attempted the previous weeks tutorial questions before coming to this class.

### Required and Recommended Texts and/or Materials

No textbooks are prescribed for this unit. Detailed notes, exercises and solutions are available on the unit's web site.

### Technology Used and Required

You will require a calculator. For the final exam, you may only use non-programmable calculators which are not able to store text.

You will also need to be able to construct spreadsheets for tutorial exercises. You will also be required to use a spreadsheet for the assignment. We do not prescribe any particular brand of spreadsheet, although materials will be provided in MS Excel.

You require access to a computer to access material on the unit's iLearn web site.

### Unit Webpage

Course materials, including pre-recorded lectures, are available on the iLearn page.

To access the teaching website, go to [iLearn](#) and login using your usual login and password.

## Unit Schedule

Week	Week Begins	Topics covered in lectures	Assessment
1	22 Jul	Mortality Models I	

2	29 Jul	Mortality Models II	
3	5 Aug	Actuarial Present Values I	Quiz (optional)
4	12 Aug	Actuarial Present Values II	
5	19 Aug	Premium and Policy Values for Contracts I	
6	26 Aug	Premium and Policy Values for Contracts II	
7	2 Sep	Premium and Policy Values for Contracts III	
8	9 Sep	Premium and Policy Values for Contracts IV	Assignment
9	30 Sep	Analysis of profits	
10	7 Oct	Insurance Coverages + Class Test	Class test
11	14 Oct	Survival Estimation I	
12	21 Oct	Survival Estimation II	
13	28 Oct	Revision	

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). 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](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

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

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/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](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the 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

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study

- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

## Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

## 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.

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Unit information based on version 2024.02 of the [Handbook](#)