



# ACST357

## General Insurance Pricing and Reserving

S2 Day 2019

*Department of Actuarial Studies and Business Analytics*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff

Unit Convener

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Credit points

3

Prerequisites

ACST356 and STAT271

Corequisites

Co-badged status

Unit description

This unit examines the use of statistical models in general insurance. The models include those used in time series analysis, generalised linear statistical modelling and runoff triangle models. Time series models are considered for both single and multiple time series. These models are often used for forecasting and inferring the behaviour of times series. Generalised linear models are used in the pricing of insurance such as automobile or homeowner insurance. Runoff triangle models are used to predict outstanding insurance liabilities. The use of no claim discount systems as a method of experience rating is also described. A good knowledge of the material covered in STAT271 is essential. Students should understand regression analysis, and the nature and use of a statistical model. Students gaining a grade of credit or higher in both ACST356 and ACST357 are eligible for exemption from subject CT6 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:

Describe and apply important techniques used by actuaries to perform analysis and modelling in general insurance pricing and reserving, and perform statistical analyses relevant to this unit using the statistical package R.

Explain basic theories and methodologies of time series model building and forecasting as well as their applications

Describe and apply some important theories and techniques of generalized linear models (GLMs)

Apply deterministic and stochastic methods for calculating outstanding claims provisions in general insurance

Use run-off triangles for claims reserving and prediction

## General Assessment Information

- **Criteria and standards for grading**
  - Numerically correct answers based on correct reasoning
  - Assessment criteria for all assessment tasks will be provided on the unit iLearn site.
- **Submission methods**
  - Assignments are submitted via iLearn
  - The class test is in class in Week 7
- **Late assessments, extensions, penalties, resubmissions**
  - **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.
- **Midterm and Final examination conditions.**

- Non-programmable calculators with no text-retrieval capacity are allowed
  - No dictionaries permitted.
  - You are permitted ONE A4 page of paper containing reference material printed on both sides. The material may be handwritten or typed. The page will not be returned to you at the end of the final examination.
- **Availability of 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.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Early Assessment Quiz</u>	5%	No	Week 3
<u>Class Test</u>	20%	No	Week 7
<u>Assignment</u>	15%	No	Week 10
<u>Final Examination</u>	60%	No	In the university exam period

### Early Assessment Quiz

Due: **Week 3**

Weighting: **5%**

1. This will be an online quiz with five multiple choices questions.
2. It is envisaged that the online quiz will cover all materials in Weeks 1-2.
3. Please use the quiz as an indicator of whether you are progressing satisfactorily in the unit. If you are having difficulties, please see the Unit Convenor and consider withdrawing before the census date in week 4.

On successful completion you will be able to:

- Describe and apply important techniques used by actuaries to perform analysis and modelling in general insurance pricing and reserving, and perform statistical analyses relevant to this unit using the statistical package R.
- Describe and apply some important theories and techniques of generalized linear models (GLMs)

## Class Test

Due: **Week 7**

Weighting: **20%**

1. It is envisaged that the class test will cover all materials from Week 1 to Week 5.
2. The class test will be held in the lecture.

On successful completion you will be able to:

- Describe and apply important techniques used by actuaries to perform analysis and modelling in general insurance pricing and reserving, and perform statistical analyses relevant to this unit using the statistical package R.
- Describe and apply some important theories and techniques of generalized linear models (GLMs)
- Use run-off triangles for claims reserving and prediction

## Assignment

Due: **Week 10**

Weighting: **15%**

1. This will be a written assignment that will require use of the software package R.
2. The assignment must be done individually and must be your own work.
3. Further details will be provided on iLearn.

On successful completion you will be able to:

- Describe and apply important techniques used by actuaries to perform analysis and modelling in general insurance pricing and reserving, and perform statistical analyses relevant to this unit using the statistical package R.
- Explain basic theories and methodologies of time series model building and forecasting as well as their applications
- Describe and apply some important theories and techniques of generalized linear models (GLMs)
- Apply deterministic and stochastic methods for calculating outstanding claims provisions in general insurance
- Use run-off triangles for claims reserving and prediction

## Final Examination

Due: **In the university exam period**

Weighting: **60%**

It is envisaged that the final examination will cover all materials in the unit.

On successful completion you will be able to:

- Describe and apply important techniques used by actuaries to perform analysis and modelling in general insurance pricing and reserving, and perform statistical analyses relevant to this unit using the statistical package R.
- Explain basic theories and methodologies of time series model building and forecasting as well as their applications
- Describe and apply some important theories and techniques of generalized linear models (GLMs)
- Apply deterministic and stochastic methods for calculating outstanding claims provisions in general insurance
- Use run-off triangles for claims reserving and prediction

## Delivery and Resources

### Classes

The timetable for classes can be found on the University web site at:

<https://timetables.mq.edu.au/2019/>

## Required and Recommended Texts and/or Materials

### Required texts

A set of lecture notes and study pack including tutorial exercises and R examples are available for downloading from the ACST357/862 teaching website.

### Optional ActEd material

The ActEd CT6 are not set as required or recommended reading for this unit, since the lecture notes are comprehensive and detailed.

### Other useful references:

- Generalized linear models for Insurance Data. Cambridge University Press: Cambridge.
- Hossack, I.B., Pollard J.H, and Zehnwirth, B. (1999). Introductory statistics with applications in general insurance, second edition. Cambridge University Press: Cambridge.

- De Jong, P. and Heller, G.Z., (2008). Generalized linear models for Insurance Data. Cambridge University Press: Cambridge.
- Casualty Actuarial Society. (2001). Foundations of Casualty Actuarial Science, 4th edition. Casualty Actuarial Society.
- Kaas, R., Goovaerts, M., Dhaene, J. and Denuit, M. (2009). Modern actuarial risk theory using R, 2nd edition. Springer.

Some additional references will be listed in the lecture notes.

## Technology Used and Required

- Latex, PDF, Word and Excel are used for preparing the lecture and tutorial materials.
- The R statistical software package will be used throughout the unit. Excel may also be used in the unit.
- Students will be required to use a non-programmable calculator in the final examination and during the in-class test.

### Unit Web Page

To access the website, go to <http://ilearn.mq.edu.au> and login using your usual login and password.

## Teaching and Learning Strategy

- The unit is taught using three hours of lectures and a weekly tutorial. Tutorials will commence in Week 2.
- Concepts and examples (including computing examples in R using real datasets in finance and insurance) will be discussed in the lectures.
- Problem sets will be discussed in tutorials.
- You are expected to read lecture materials in advance of the lectures and to participate actively in the tutorial classes.

## What has changed since the previous offering of this unit?

Unit Guides, Lectures, Tutorials and Assessments Materials (Whenever Applicable)

## Unit Schedule

Week Number	Week Beginning Monday	Topic and Notes	Tutorial
1	29 July	Introduction to GLMs	No tutorial

2	5 August	GLMs	Tutorial Set 1
3	12 August	GLMs	Tutorial Set 2
4	19 August	GLMs	Tutorial Set 3
5	26 August	1. GLMs 2. Introduction to Claim Reserving	Tutorial Set 4
6	2 September	Outstanding Claims	Tutorial Set 5
7	9 September	1. Class Test 2. Outstanding Claims	No tutorial
STUDY BREAK		No classes No classes	STUDY BREAK
8	30 September	Outstanding Claims	Tutorial Set 6
9	7 October	Intro to Time Series	Tutorial Set 7
10	14 October	Time Series	Tutorial Set 8
11	21 October	Time Series	Tutorial Set 9
12	28 October	Time Series	Tutorial Set 10
13	4 November	Revision	Tutorial Set 11

## 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.)

Undergraduate 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](http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<http://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](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)

## Supplementary exams

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

## 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

- Describe and apply important techniques used by actuaries to perform analysis and modelling in general insurance pricing and reserving, and perform statistical analyses relevant to this unit using the statistical package R.
- Explain basic theories and methodologies of time series model building and forecasting as well as their applications
- Describe and apply some important theories and techniques of generalized linear models (GLMs)
- Apply deterministic and stochastic methods for calculating outstanding claims provisions in general insurance
- Use run-off triangles for claims reserving and prediction

### Assessment tasks

- Early Assessment Quiz
- Class Test
- Assignment

- Final 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

- Describe and apply important techniques used by actuaries to perform analysis and modelling in general insurance pricing and reserving, and perform statistical analyses relevant to this unit using the statistical package R.
- Explain basic theories and methodologies of time series model building and forecasting as well as their applications
- Describe and apply some important theories and techniques of generalized linear models (GLMs)
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### Assessment tasks

- Early Assessment Quiz
- Class Test
- Assignment
- Final 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

- Describe and apply important techniques used by actuaries to perform analysis and modelling in general insurance pricing and reserving, and perform statistical analyses

relevant to this unit using the statistical package R.

- Explain basic theories and methodologies of time series model building and forecasting as well as their applications
- Describe and apply some important theories and techniques of generalized linear models (GLMs)
- Apply deterministic and stochastic methods for calculating outstanding claims provisions in general insurance
- Use run-off triangles for claims reserving and prediction

## **Assessment tasks**

- Early Assessment Quiz
- Class Test
- Assignment
- Final Examination

## **Research and Practice**

### **Research and Practice**

The student will learn some basic theories and methodologies in time series analysis, generalized linear models and run-off triangles which are expected to be useful for researching and practising general insurance pricing and reserving.