ACST861

Mathematical Theory of Risk

S1 Day 2019

Department of Actuarial Studies and Business Analytics

Contents

General Information

Unit convenor and teaching staff
Unit convenor and lecturer
Jackie Li
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Contact via Email
E4A 610
Wednesdays 2pm-3pm during teaching weeks or by appointment

Credit points
4

Prerequisites
(ACST601 and ACST604) or (STAT680 and STAT683) or (admission to MActPrac post 2014)

Corequisites
STAT806 or STAT810

Co-badged status

Unit description
This unit explores the use of statistical models in insurance: statistical models of the claim frequency and of claim size are studied. These models are a basis for the study of risk theory, ruin theory and reinsurance. Credibility theory is studied as a form of experience rating. Decision theory and simulation are also studied. Students gaining a grade of credit or higher in this unit and ACST862 General Insurance Pricing and Reserving may apply 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:

Model insurance claims using loss distributions and Bayesian analysis, and develop research skills associated with this learning outcome

Perform Monte Carlo simulation for insurance models, and develop research skills associated with this learning outcome

Apply premium principles to price insurance products

Construct risk models with frequency and severity distributions and apply ruin theory to insurance problems, and develop research skills associated with this learning outcome
Apply credibility theory and decision theory to insurance problems

General Assessment Information

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.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment	15%	No	Week 3 and Week 12
Class Test	15%	No	Week 7
Final exam	70%	No	Exam period

Assignment

Due: **Week 3 and Week 12**
Weighting: **15%**

There are two written assignments due in Week 3 (5%) and Week 12 (10%). Marks will be granted for accuracy and clarity of the work submitted. ACST861 students are required to complete a larger assignment than ACST356 students.

No extensions will be granted. Students who have not submitted the task prior to the deadline will be awarded a mark of zero (0) for the task, except for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:

- Model insurance claims using loss distributions and Bayesian analysis, and develop research skills associated with this learning outcome
- Perform Monte Carlo simulation for insurance models, and develop research skills

associated with this learning outcome
- Apply premium principles to price insurance products
- Construct risk models with frequency and severity distributions and apply ruin theory to insurance problems, and develop research skills associated with this learning outcome
- Apply credibility theory and decision theory to insurance problems

Class Test

Due: **Week 7**
Weighting: **15%**

The class test covers the lecture content in Week 1 to Week 5. Students will have 90 minutes to complete the test. Marks will be granted for accuracy and clarity of the work submitted. It will be conducted in the Wednesday lecture in Week 7.

You are permitted one (1) 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 class test.

Students who do not attend the class test will be awarded a mark of zero (0) for the test, except for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:
- Model insurance claims using loss distributions and Bayesian analysis, and develop research skills associated with this learning outcome

Final exam

Due: **Exam period**
Weighting: **70%**

A three-hour (3) written exam will be held during the normal university exam period. Questions will cover the entire unit. Marks will be granted for accuracy and clarity of the work shown.

You are permitted one (1) 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 exam. Non-programmable calculators with no text-retrieval capacity are permitted.

Students who do not attend the final exam will be awarded a mark of zero (0) for the exam, except for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:

- Model insurance claims using loss distributions and Bayesian analysis, and develop research skills associated with this learning outcome
- Perform Monte Carlo simulation for insurance models, and develop research skills associated with this learning outcome
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Delivery and Resources

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

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

Lecture notes are available for download from iLearn. You will need to print the lecture notes and bring them to classes to complete.

From Week 8 onward, the required textbook is:

Dickson, D. (2016). Insurance Risk and Ruin. Cambridge University Press.

Other references include:

Hossack, I.B., Pollard, J.H. and Zehnwirth, B. (1999). Introductory Statistics with Applications in General Insurance. 2nd Edition. Cambridge University Press.

Klugman, S.A., Panjer, H.H. and Willmot, G.E. (2004). Loss Models: From Data to Decisions. 2nd Edition. Wiley: New York.

Casualty Actuarial Society (2001). Foundations of Casualty Actuarial Science. 4th Edition.

Students will be required to use iLearn, Excel, PDF, Word, and a non-programmable calculator.

Unit Schedule

Week 1 Loss Models I

Week 2 Loss Models II

Week 3 Loss Models III

Week 4 Loss Models IV

Week 5 Reinsurance and Deductibles

Week 6 Simulation

Week 7 Class Test

Week 8 Premium Principles

Week 9 Risk Models

Week 10 Ruin Theory

Week 11 Ruin Theory with Reinsurance

Week 12 Credibility Theory

Week 13 Decision Theory

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). 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). 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).

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

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

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

If you are a Global MBA student contact 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/.

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

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Model insurance claims using loss distributions and Bayesian analysis, and develop research skills associated with this learning outcome
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- Apply premium principles to price insurance products
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- Apply credibility theory and decision theory to insurance problems

Assessment tasks

- Assignment
- Class Test
- Final exam

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Model insurance claims using loss distributions and Bayesian analysis, and develop research skills associated with this learning outcome
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PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

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- Model insurance claims using loss distributions and Bayesian analysis, and develop research skills associated with this learning outcome
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