ACST840

Quantitative Research Methods II

S2 Day 2019

Department of Actuarial Studies and Business Analytics

Contents

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General Information

Unit convenor and teaching staff
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To be announced via iLearn

Pavel Shevchenko
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Credit points
4

Prerequisites
(Admission to MActPrac or (admission to MCom in Actuarial Studies and 16cp)) and
(STAT810 or STAT806)

Corequisites

Co-badged status

Unit description
This unit focuses on statistical approaches for research in Business and Economics and
related disciplines. Topics include a range of probability and statistical models, their
theoretical basis, the assessment and evaluation of the models, and methods of statistical
inference for data analysis. The unit will also consider applications of the above models and
techniques to the actuarial practice discipline.

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 the theoretical basis of a range of statistical models used in actuarial
> research and the practice of modelling and inference using statistical models.
> Critique, replicate and extend basic actuarial research using statistical models.
> Ask questions and communicate problems relating to statistical models, and to explain

and discuss ideas relating to implementation of statistical models.

Understand how a variety of statistical models are used in actuarial research and how empirical results are communicated in practice.

Using statistical software R to solve actuarial problems.

General Assessment Information

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.

Assessment Criteria

Assessment criteria for all assessment tasks will be provided on the unit iLearn site.

Final Examination

This unit does not have a final examination.

Self-assessment exercise

Self-assessment exercise question(s) will be released in Week 3. The solutions will be provided before the census date in Week 4. Please use the self-assessment exercise as an indicator of whether you are progressing satisfactorily in the unit. If you are having difficulties, please see the Unit Convenor before the census date and consider withdrawing from the unit.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	20%	No	6 Sep 2019
Assignment 2	40%	No	25 Sep 2019
Assignment 3	40%	No	15 November 2019

Assignment 1

Due: **6 Sep 2019**
Weighting: **20%**

Assignment 1 consists of True-False questions requiring explanations. Its main focus is on the concepts and understanding of the theory and methods. Each question has several parts. Students will answer each part with a choice of T (True) or F (False), and provide thorough and convincing explanations to justify the choice - in appropriate words and/or mathematical expressions.

It will be posted on iLearn by Sat, 31 Aug 2019.

Submit the answers in PDF file with typed contents via Turnitin on iLearn by 11pm on Friday, 6 Sep 2019. Handwritten copies are not acceptable.

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.

On successful completion you will be able to:
- Understand the theoretical basis of a range of statistical models used in actuarial research and the practice of modelling and inference using statistical models.
- Critique, replicate and extend basic actuarial research using statistical models.
- Ask questions and communicate problems relating to statistical models, and to explain and discuss ideas relating to implementation of statistical models.
- Understand how a variety of statistical models are used in actuarial research and how empirical results are communicated in practice.

Assignment 2

Due: **25 Sep 2019**
Weighting: **40%**

Assignment 2 consists of problem-solving questions requiring detailed solutions.

It will be posted on iLearn by Mon, 9 Sep 2019.

Submit the answers in PDF file with typed contents via Turnitin on iLearn by 11pm on Wednesday, 25 Sep 2019. Handwritten copies are not acceptable.

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.

On successful completion you will be able to:
- Understand the theoretical basis of a range of statistical models used in actuarial research and the practice of modelling and inference using statistical models.
- Critique, replicate and extend basic actuarial research using statistical models.
- Ask questions and communicate problems relating to statistical models, and to explain and discuss ideas relating to implementation of statistical models.

- Understand how a variety of statistical models are used in actuarial research and how empirical results are communicated in practice.
- Using statistical software R to solve actuarial problems.

Assignment 3

Due: **15 November 2019**
Weighting: **40%**

Assignment 3 consists of problem-solving questions requiring detailed solutions including numerical solutions using statistical software R.

It will be posted on iLearn by Friday, 1 November 2019.

Submit the answers in PDF file with typed contents (accompanied by R code file used to calculate the results) via Turnitin on iLearn by 11pm on Friday, 15 November 2019. Handwritten copies are not acceptable.

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.

On successful completion you will be able to:

- Understand the theoretical basis of a range of statistical models used in actuarial research and the practice of modelling and inference using statistical models.
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Delivery and Resources

Classes

• This unit is taught through 3 hours of lectures per week.

• The timetable for classes can be found on the University web site at: http://www.timetables.mq.edu.au/2019/

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

For weeks 1-8:

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

• The references listed in Lecture Notes are recommended materials. Some of them will be posted on the website and others are available via the library.

For weeks 9-13:

• Lecture Notes/Slides are required materials and will be posted on the website before the lectures.

• The references listed in Lecture Notes/Slides are recommended materials. Some of them will be posted on the website and others are available via the library.

• Statistical software R with R-studio will be used for demonstration and numerical examples.

Unit Schedule

The following is a tentative schedule only. It will be adjusted from time to time.

Week 1: Nonparametric statistical methods; one-sample location problem

Week 2: Estimation of location parameter; Two-sample location problem

Week 3: Two-sample dispersion and other problems; One-way layout

Week 4: One-way layout

Week 5: Two-way layout

Week 6: Two-way layout; Assignment 1

Week 7: Assignment 2

Week 8: Bootstrap estimation

Week 9: Machine learning methods - clustering

Week 10: Machine learning methods - parametric regressions (GLM, GAM, Neural Networks)

Week 11: Machine learning methods - regression trees (random forest, bagging, boosting)

Week 12: Bayesian methods and Markov chain Monte Carlo

Week 13: Modelling dependence using copulas

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

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

- Understand the theoretical basis of a range of statistical models used in actuarial research and the practice of modelling and inference using statistical models.
- Critique, replicate and extend basic actuarial research using statistical models.
- Ask questions and communicate problems relating to statistical models, and to explain and discuss ideas relating to implementation of statistical models.
- Understand how a variety of statistical models are used in actuarial research and how empirical results are communicated in practice.
- Using statistical software R to solve actuarial problems.

Assessment tasks

- Assignment 1

- Assignment 2
- Assignment 3

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

- Understand the theoretical basis of a range of statistical models used in actuarial research and the practice of modelling and inference using statistical models.
- Critique, replicate and extend basic actuarial research using statistical models.
- Ask questions and communicate problems relating to statistical models, and to explain and discuss ideas relating to implementation of statistical models.
- Understand how a variety of statistical models are used in actuarial research and how empirical results are communicated in practice.

Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3

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:

Learning outcomes

- Critique, replicate and extend basic actuarial research using statistical models.
- Understand how a variety of statistical models are used in actuarial research and how empirical results are communicated in practice.

Assessment tasks

- Assignment 2

- Assignment 3