



# ACST840

## Quantitative Research Methods II

S2 Day 2016

*Dept of Applied Finance and Actuarial Studies*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff

Lecturer and Unit Convemor

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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 used in Business and Economics and related disciplines. Topics include statistical modelling, time series analysis, ARCH, GARCH model, longitudinal and panel data models, generalized linear models and limited dependent variables. 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:

1. Understand the theoretical basis of a range of statistical models used in actuarial

research and the practice of modelling and inference using statistical models.

2. Critique, replicate and extend basic actuarial research using statistical models.
3. Ask questions and communicate problems relating to statistical models, and to explain and discuss ideas relating to implementation of statistical models.
4. Understand how a variety of statistical models are used in actuarial research and how empirical results are communicated in practice.

## 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.

### Student Research Projects and writeup of Research Presentation

As with most published research you will need to be quite economical with your use of words in these projects; expect them to require substantial editing to meet the length requirements, so you should budget your time as if writing a longer piece of work than it might seem from what will be submitted.

#### Feedback Prior to Census Date:

Feedback to the first assessment task will be provided by Thursday, 25 August. It will indicate whether you are progressing satisfactorily in the unit. If you are having difficulties, please see the Unit Convenor and consider withdrawing before the end of the census date on Friday of week 4.

## Assessment Tasks

Name	Weighting	Due
<a href="#">Report 1</a>	10%	22 Aug 2016
<a href="#">Project 1</a>	40%	23 Sep 2016
<a href="#">Report 2</a>	10%	11 Oct 2016
<a href="#">Project 2</a>	40%	11 Nov 2016

### Report 1

Due: **22 Aug 2016**

Weighting: **10%**

Write a summary of the research topics discussed in Weeks 1-3. Describe your understanding to

the theory and methods in these topics, and the knowledge you have gained. It should be printed on A4 size paper between 5-10 pages (12pt font, 1.5 line spacing).

Submission must be in PDF file via Turnitin on iLearn by 5pm on Monday 22 August 2016, followed by paper submission at the lecture time on Tuesday, 23 August.

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 disruptions to studies is made and approved.

On successful completion you will be able to:

- 1. Understand the theoretical basis of a range of statistical models used in actuarial research and the practice of modelling and inference using statistical models.
- 4. Understand how a variety of statistical models are used in actuarial research and how empirical results are communicated in practice.

## Project 1

Due: **23 Sep 2016**

Weighting: **40%**

Select a topic and one or more published research papers related to the topics discussed in Weeks 1-5. Summarize, describe, explain and critique the methods in the selected papers. Perform a similar analysis to an existing piece of research in a selected paper on available or simulated data. Write a project report in the style of a published paper, including background review, methodology development and statistical analysis. It is expected to be between 15-25 printed pages of A4 size (12pt font, 1.5 line spacing).

Submission must be in PDF file via Turnitin on iLearn, and also on paper to BESS, by 3pm on Friday 23 September 2016.

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 disruption of studies is made and approved. No submission will be accepted after solutions have been posted.

On successful completion you will be able to:

- 1. Understand the theoretical basis of a range of statistical models used in actuarial research and the practice of modelling and inference using statistical models.
- 2. Critique, replicate and extend basic actuarial research using statistical models.
- 3. Ask questions and communicate problems relating to statistical models, and to explain and discuss ideas relating to implementation of statistical models.

## Report 2

Due: **11 Oct 2016**

Weighting: **10%**

Summarize, describe and critique a published research paper in a reputable actuarial or closely related journal (demography, finance, statistics, etc). You should explain what was done, how it was done, what its contributions were and how it might have been done better or differently. It should be expected that it will be necessary to read more widely than the specific paper you discuss. Length: Approximately 5 pages / 2000 words. Submission should be via Turnitin at 2pm on the day of the class for that week, and also on paper at the start of the class.

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 disruptions to studies is made and approved.

On successful completion you will be able to:

- 1. Understand the theoretical basis of a range of statistical models used in actuarial research and the practice of modelling and inference using statistical models.
- 4. Understand how a variety of statistical models are used in actuarial research and how empirical results are communicated in practice.

## Project 2

Due: **11 Nov 2016**

Weighting: **40%**

Perform a similar analysis to an existing piece of research, and either extend the analysis in some way or perform an alternate analysis on similar data, using some methodology covered in class (or by agreement with the lecturer for this part of the unit). Finding some suitable data will be important -- if you can't get any for the research you have in mind you must choose a different piece of research.

Note that there are a number of useful data sets available in a package associated with the textbook, some of which could be used for this purpose; some other data sources may be mentioned during class or on iLearn.

Length: Approximately 12-15 pages / 5000 words, but a few pages of additional supplementary material may be included in a short appendix. You should hand in no more than 15 pages total, and fewer than 12 if there are few displays.

Submission should be via Turnitin at 2pm on the due date.

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 disruption of studies is made and approved. No submission will

be accepted after solutions have been posted.

On successful completion you will be able to:

- 1. Understand the theoretical basis of a range of statistical models used in actuarial research and the practice of modelling and inference using statistical models.
- 3. Ask questions and communicate problems relating to statistical models, and to explain and discuss ideas relating to implementation of statistical models.

## **Delivery and Resources**

### **Lecture and Workshop times**

Classes for ACST840 are scheduled as per the class timetable available at <http://www.timetables.mq.edu.au/>. There will be 3 hours face-to-face teaching per week typically consisting of two hours of lecture and one hour of workshop, where students will be expected to both ask and answer questions (of each other as well as the lecturer).

### **Technology used and required**

If you are enrolled in this unit, you will be listed in the ACST840 online unit (iLearn). Login at <http://ilearn.mq.edu.au/> The site will be used to post any additional lecture slides, handouts, and assigned work. The site contains a forum to which you will be expected to contribute (you'll be expected to contribute to discussion relating to your research - and others' research, for example). Please log in to the site on a regular basis. This course requires access to the R statistical package.

### **Required and Recommended Texts and/or Materials**

For Weeks 1-7, required and recommended learning/teaching materials consist of lecture notes and relevant research papers posted on iLearn. For the second half of the subject the textbook \*Computational Actuarial Science with R\*, Arthur Charpentier (2014), CRC Press. The text will be available as an ebook via the library site for the subject. Exercises may be assigned from this book, the lectures will be based on it, and it's a useful resource for the research topics for the second half of the course. [It is also available to buy, both as a paper book and an ebook.]

### **Workshop exercises and discussion**

Some weeks there will be exercises based on the previous week's material; attempting and discussing them will be an important part of the learning process for research. The performance on the exercises will not be assessed. Attempt any exercises during the week prior to the workshop they're to be discussed in, in order to be able to discuss them in iLearn beforehand, and in the face-to-face time. Most exercises require access to and some familiarity with the R statistical package. When set, they will generally be covered in the last lecture hour and will usually be on material in the previous week, but broader questions relating to research - including issues relating to student projects - during workshop time are also encouraged.

## Unit Schedule

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

- Week 1:** Survival models with long-term survivors
- Week 2:** Parametric models for competing risks
- Week 3:** Partially linear panel data regression models
- Week 4:** Models for recurrent event data
- Week 5:** Non-parametric credibility estimation
- Week 6:** Work on Project 1
- Week 7:** Statistical inference with R
- Week 8:** Bayesian statistical methods
- Week 9:** General insurance pricing
- Week 10:** Claims reserving and IBNR
- Week 11:** Prospective life tables
- Week 12:** Reinsurance and extremal events
- Week 13:** Finalize work on Project 2

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy [http://mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

**New Assessment Policy in effect from Session 2 2016** [http://mq.edu.au/policy/docs/assessment/policy\\_2016.html](http://mq.edu.au/policy/docs/assessment/policy_2016.html). For more information visit [http://students.mq.edu.au/events/2016/07/19/new\\_assessment\\_policy\\_in\\_place\\_from\\_session\\_2/](http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/)

Assessment Policy prior to Session 2 2016 <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy prior to Session 2 2016 <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Complaint Management Procedure for Students and Members of the Public [http://www.mq.edu.au/policy/docs/complaint\\_management/procedure.html](http://www.mq.edu.au/policy/docs/complaint_management/procedure.html)

Disruption to Studies Policy [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html) *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of 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/support/student\\_conduct/](https://students.mq.edu.au/support/student_conduct/)

## Results

Results shown in *iLearn*, 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).

## Supplementary Examinations

Further information regarding supplementary exams, including dates, is available here

[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 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)

## 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

### 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

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

#### Assessment tasks

- Report 1
- Project 1
- Report 2

### 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

- 2. Critique, replicate and extend basic actuarial research using statistical models.
- 3. Ask questions and communicate problems relating to statistical models, and to explain and discuss ideas relating to implementation of statistical models.

#### Assessment tasks

- Project 1
- Project 2

## 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

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

### Assessment tasks

- Project 1
- Report 2
- Project 2

## Changes from Previous Offering

This offering has made some changes in topics and assessment tasks from the previous offering. New topics include survival models with long-term survivors, competing risks, partially linear panel data regression models, recurrent event data, and non-parametric credibility estimation.