



ACST602

Statistical Modelling in Finance and Insurance

S2 Day 2014

Applied Finance and Actuarial Studies

Contents

<u>General Information</u>	2
<u>Learning Outcomes</u>	2
<u>Assessment Tasks</u>	3
<u>Delivery and Resources</u>	5
<u>Unit Schedule</u>	7
<u>Policies and Procedures</u>	8
<u>Graduate Capabilities</u>	10
<u>Changes from Previous Offering</u>	12
<u>Grading</u>	12
<u>Research and Practice</u>	12
<u>Changes since First Published</u>	12

Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

General Information

Unit convenor and teaching staff

Lecturer

Nino Kordzakhia

nino.kordzakhia@mq.edu.au

E4A 537

Refer to iLearn

Lecturer

Suzanne Curtis

suzanne.curtis@mq.edu.au

E4A 552

Refer to iLearn

Credit points

4

Prerequisites

ACST601 and ACST604

Corequisites

Co-badged status

Unit description

This unit covers linear statistical modelling in insurance and finance. Topics include: simple and multiple linear regression; ANOVA models; analysis of residuals, regression diagnostics and influential observations; theory of estimation; method of moments and maximum likelihood; properties of estimators; sampling distributions and properties of sample statistics; the t, F and χ^2 distributions; confidence intervals and hypothesis testing in a regression context; type I and II errors; power; chi squared tests; criteria for choosing models; goodness of fit tests, tests of association and homogeneity; and applications of linear modelling to problems in insurance and finance.

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 theory of estimation and sampling distribution;
Have a solid understanding of hypothesis test and linear regression models;
Understand and be able to carry out one and two sample tests, and chi-square tests;
Be able to assess model fit for simple regression models and have a solid understanding of model diagnostics;
Be able to interpret results from hypothesis tests and linear regression models;
Use R statistical package to carry out various hypothesis tests, fit simple linear regression models with continuous or categorical covariates, and produce relevant statistical plots/graphs.

Assessment Tasks

Name	Weighting	Due
<u>Assessed Coursework</u>	10%	Weekly
<u>Class test</u>	20%	10.05 am Week 7
<u>Assignment</u>	10%	11.05 am Week 11
<u>Final examination</u>	60%	University exam timetable

Assessed Coursework

Due: **Weekly**

Weighting: **10%**

One-hour tutorials will start on Thursday, Week 2.

In weeks 2 to 12 you will be required to submit tutorial and homework.

Students need to submit a hard copy of their solutions for all tutorial and homework questions at the beginning of tutorial class. Tutorial and homework questions are equally weighted and together worth 10% of the unit assessment.

No extensions will be granted. Students who have not submitted the solution to tutorial and homework questions will be awarded a mark of 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:

- Understand the theory of estimation and sampling distribution;
- Have a solid understanding of hypothesis test and linear regression models;
- Understand and be able to carry out one and two sample tests, and chi-square tests;
- Be able to assess model fit for simple regression models and have a solid understanding

of model diagnostics;

- Be able to interpret results from hypothesis tests and linear regression models;
- Use R statistical package to carry out various hypothesis tests, fit simple linear regression models with continuous or categorical covariates, and produce relevant statistical plots/graphs.

Class test

Due: **10.05 am Week 7**

Weighting: **20%**

The Class Test will be held in the lecture and covers the first 5 weeks of the material.

The Class Test will commence at 10.05 am, Thursday, Week 7.

The class test will be 50 minutes long.

You are permitted **ONE** A4 page of paper containing reference material printed on both sides. The material may be handwritten.

On successful completion you will be able to:

- Understand the theory of estimation and sampling distribution;

Assignment

Due: **11.05 am Week 11**

Weighting: **10%**

Assignment questions will be made available through iLearn.

Assignment is to be submitted in the class at 11.05 am, Thursday, Week 11.

No extensions will be granted. Students who have not submitted Assignment on time will be awarded a mark of 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:

- Understand the theory of estimation and sampling distribution;
- Have a solid understanding of hypothesis test and linear regression models;
- Understand and be able to carry out one and two sample tests, and chi-square tests;
- Be able to assess model fit for simple regression models and have a solid understanding of model diagnostics;
- Be able to interpret results from hypothesis tests and linear regression models;
- Use R statistical package to carry out various hypothesis tests, fit simple linear

regression models with continuous or categorical covariates, and produce relevant statistical plots/graphs.

Final examination

Due: **University exam timetable**

Weighting: **60%**

A three-hour final examination for this unit will be held during the University Examination period.

You are permitted **TWO** A4 pages of paper containing reference material printed on both sides.

The material may be handwritten. The pages will not be returned at the end of the final examination.

Calculators will be needed but must not be of the text/programmable type.

To be eligible to pass this unit, a pass is required in the final examination.

You are expected to present yourself for examination at the time and place designated in the University Examination Timetable. The timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of the examinations.

<http://exams.mq.edu.au/>

The Macquarie university examination policy details can be viewed at

<http://www.mq.edu.au/policy/docs/examination/policy.htm>

On successful completion you will be able to:

- Understand the theory of estimation and sampling distribution;
- Have a solid understanding of hypothesis test and linear regression models;
- Understand and be able to carry out one and two sample tests, and chi-square tests;
- Be able to assess model fit for simple regression models and have a solid understanding of model diagnostics;
- Be able to interpret results from hypothesis tests and linear regression models;
- Use R statistical package to carry out various hypothesis tests, fit simple linear regression models with continuous or categorical covariates, and produce relevant statistical plots/graphs.

Delivery and Resources

Technology required

The statistical software R will be used. This is a free software environment for statistical computing and graphics and is downloadable from the website

<http://www.r-project.org/>

in versions for Windows, MacOS and Unix platforms. R is also available in the computer labs in E4B. It is convenient to bring a memory stick when using these computers.

Lab opening hours and conditions of use can be found at

http://www.businessandconomics.mq.edu.au/new_and_current_students/undergraduate/student_resources/labs

WARNING: students are strongly advised not to remain alone in the labs after normal office hours. You should seek out a lab that has other students working in it and/or has a lab monitor.

You are encouraged to phone 9850 7112 (ext. 7112 from inside the lab) at any time after hours, during term time, if you require an escort to your vehicle or public transport.

Classes

Students will attend three one-hour lectures and one one-hour tutorial per week. The lecture notes will be available on iLearn before the lecture. Tutorial and homework exercises will be set weekly and will be available on iLearn before the tutorial.

The timetable for classes can be found at: <http://www.timetables.mq.edu.au>

iLearn

All unit materials, including administrative updates, lecture notes, tutorials and assignments, will be posted on the Unit website on iLearn at

<https://ilearn.mq.edu.au/login/MQ/>

Required and recommended texts and materials

“Mathematical Statistics with Applications” W Mendenhall, D Wackerly and R Scheaffer (library call number is QA276.M426) is the recommended textbook for this unit.

References that may be useful:

Chatterjee, S. Hadi, A. and Price, B. (2006). Regression Analysis by Example, John Wiley and Sons, QA278.2.C5

Devore, J. L. (1995). Probability and Statistics for Engineering and the Sciences, Duxbury Press, QA273.D46

Frees, E. W. (2010). Regression Modeling with Actuarial and Financial applications, Cambridge, HG878.1.F67

Kleinbaum D., Kupper, L.L., et al (1998). Applied Regression Analysis and Other Multivariable Methods, (3rd Edition) Brooks/Cole, QA278.A665

Faraway, J.J. (2002). Practical Regression and ANOVA using R. R. <http://cran.r-project.org/doc/contrib/Faraway-PRA.pdf>

R Development Core Team: An Introduction to R. <http://cran.r-project.org/doc/manuals/R-intro.pdf>

"The R Guide" (version 2.5) by John Fox. <http://cran.r-project.org/doc/contrib/Owen-TheRGuide.pdf>

Copies of these books are held in the Reserve section of the library.

Unit Schedule

Date	Week	Topic	Assessment
4 August	1	Functions of Random Variables Sampling distribution and the CLT	Tutorial 1 handed out
11 August	2	Estimation	Tutorial 1 in Tutorial 2 out
18 August	3	Estimation (cont.)	Tutorial 2 in Tutorial 3 out
25 August	4	Methods of Estimation	Tutorial 3 in Tutorial 4 out
1 September	5	Methodology of statistical tests. Test of population mean	Tutorial 4 in Tutorial 5 out
8 September	6	Type I and II errors. Power of tests and sample size	Tutorial 5 in Tutorial 6 out

15 September	7	Paired and two sample problems	Tutorial 6 in Tutorial 7 out CLASS TEST
22 September – 6 October		Mid-session break <i>6/10 Labour Day – NSW Public Holiday</i>	
7 October	8	Linear Models and Estimation by Least Square	Tutorial 7 in Tutorial 8 out
13 October	9	Linear Models and Estimation by Least Square (cont.)	Tutorial 8 in Tutorial 9 out
20 October	10	The Analysis of Variance	Tutorial 9 in Tutorial 10 out
27 October	11	Nonparametric Statistics	Tutorial 10 in Tutorial 11 out Assignment is due
3 November	12	Nonparametric Statistics (cont.)	Tutorial 11 in
10 November	13	REVISION	

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

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

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

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy 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/

Supplementary Exams

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

http://www.businessandconomics.mq.edu.au/current_students/undergraduate/how_do_i/special_consideration

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

IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use 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 theory of estimation and sampling distribution;
- Have a solid understanding of hypothesis test and linear regression models;
- Understand and be able to carry out one and two sample tests, and chi-square tests;
- Be able to assess model fit for simple regression models and have a solid understanding of model diagnostics;
- Be able to interpret results from hypothesis tests and linear regression models;
- Use R statistical package to carry out various hypothesis tests, fit simple linear regression models with continuous or categorical covariates, and produce relevant statistical plots/graphs.

Assessment tasks

- Assessed Coursework
- Class test
- Assignment
- Final examination

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 theory of estimation and sampling distribution;
- Have a solid understanding of hypothesis test and linear regression models;
- Understand and be able to carry out one and two sample tests, and chi-square tests;
- Be able to assess model fit for simple regression models and have a solid understanding of model diagnostics;
- Be able to interpret results from hypothesis tests and linear regression models;
- Use R statistical package to carry out various hypothesis tests, fit simple linear regression models with continuous or categorical covariates, and produce relevant statistical plots/graphs.

Assessment tasks

- Assessed Coursework
- Class test
- Assignment
- Final examination

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

- Understand the theory of estimation and sampling distribution;
- Have a solid understanding of hypothesis test and linear regression models;
- Understand and be able to carry out one and two sample tests, and chi-square tests;
- Be able to assess model fit for simple regression models and have a solid understanding of model diagnostics;
- Be able to interpret results from hypothesis tests and linear regression models;
- Use R statistical package to carry out various hypothesis tests, fit simple linear regression models with continuous or categorical covariates, and produce relevant statistical plots/graphs.

Assessment tasks

- Assessed Coursework
- Class test
- Assignment
- Final examination

Changes from Previous Offering

In this offering the unit material is updated with additional worked examples.

Grading

The Macquarie University grading policy can be found at <http://mq.edu.au/policy/docs/grading/policy.html>

Note that, in order to be awarded a particular Standardised Numerical Grade (SNG) and Grade, a student must meet the performance standard outlined in the grading policy in both the coursework and the examination sections of the unit.

A Standardised Numerical Grade (SNG) gives you an indication of how you have performed within the band for your descriptive grade. The SNG is not a mark, and you may not be able to work it out based on your raw examination and other assessment marks. Nor are you able to determine you are “one mark away” from a different grade.

Research and Practice

This unit uses research from external sources. References are given in "Required and recommended texts and materials".

Changes since First Published

Date	Description
07/08/2014	In weeks 2 to 12 you will be required to submit tutorial and homework. (In Bold)
07/08/2014	The Class Test will commence at 10.05 am, Thursday, Week 7.
07/08/2014	The class test is scheduled in the lecture (Week 7). The assignment submission time has been updated.

Date	Description
31/07/ 2014	The Unit Schedule had extras from previous version of Assessment Tasks and this has been fixed now.
