STAT680
Applied Statistics
S1 Day 2015
Dept of Statistics

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# General Information

<table>
<thead>
<tr>
<th>Unit convenor and teaching staff</th>
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<tbody>
<tr>
<td>Unit Convenor</td>
</tr>
<tr>
<td>Kenneth Beath</td>
</tr>
<tr>
<td><a href="mailto:ken.beath@mq.edu.au">ken.beath@mq.edu.au</a></td>
</tr>
<tr>
<td>Contact via <a href="mailto:ken.beath@mq.edu.au">ken.beath@mq.edu.au</a></td>
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<tr>
<td>E4A526</td>
</tr>
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<td>Wednesday 2-4</td>
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<table>
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<tr>
<th>Lecturer</th>
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<tbody>
<tr>
<td>Kehui Luo</td>
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<tr>
<td><a href="mailto:kehui.luo@mq.edu.au">kehui.luo@mq.edu.au</a></td>
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<tr>
<td>Contact via <a href="mailto:kehui.luo@mq.edu.au">kehui.luo@mq.edu.au</a></td>
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<table>
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<tr>
<th>Corequisites</th>
<th>STAT670</th>
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<table>
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<th>Co-badged status</th>
<th>STAT270</th>
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<table>
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<tr>
<th>Unit description</th>
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<td>This unit aims to extend and broaden statistical experience from STAT670. It focuses on relationships between categorical or continuous explanatory variables and a continuous response variable using the techniques of one-way and two-way analysis of variance and simple and multiple linear regression. Data management, graphical presentation of results, and power analysis are also investigated. The unit has a strong practical component built around a substantial collaborative project planned and carried out during the semester, and graduate capabilities such as communication, teamwork, problem solving and ethics are addressed in this context.</td>
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# Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at [https://students.mq.edu.au/important-dates](https://students.mq.edu.au/important-dates)
Learning Outcomes

1. Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries.
2. Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
3. Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
4. Interpret statistical results and summarise the results in a statistical report.
5. Apply statistical software packages in data analysis.
6. Be able to describe the types of missing data and simple solutions and their limitations.

General Assessment Information

Note that satisfactory performance in the final exam is required for a pass in the subject.

Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
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<tbody>
<tr>
<td>Tutorial Exercises Week 3</td>
<td>4%</td>
<td>18 March</td>
</tr>
<tr>
<td>Assignment 1</td>
<td>11%</td>
<td>22 April</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>15%</td>
<td>3 June</td>
</tr>
<tr>
<td>Statistics Report</td>
<td>10%</td>
<td>10 June</td>
</tr>
<tr>
<td>Final exam</td>
<td>60%</td>
<td>to be decided</td>
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Tutorial Exercises Week 3

Due: 18 March
Weighting: 4%

Tutorial Exercises from Week 3

This Assessment Task relates to the following Learning Outcomes:
- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
regression.

• Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.

Assignment 1

Due: 22 April
Weighting: 11%
Covers weeks 1-6

This Assessment Task relates to the following Learning Outcomes:
• Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
• Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
• Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
• Interpret statistical results and summarise the results in a statistical report.
• Apply statistical software packages in data analysis.

Assignment 2

Due: 3 June
Weighting: 15%
Covers weeks 7-12

This Assessment Task relates to the following Learning Outcomes:
• Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
• Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
• Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
• Interpret statistical results and summarise the results in a statistical report.
• Apply statistical software packages in data analysis.
Statistics Report

Due: 10 June  
Weighting: 10%

More advanced statistical work.

This Assessment Task relates to the following Learning Outcomes:

- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.
- Be able to describe the types of missing data and simple solutions and their limitations.

Final exam

Due: to be decided  
Weighting: 60%

Content to be advised. Satisfactory performance is required for a pass in the subject.

This Assessment Task relates to the following Learning Outcomes:

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.
- Be able to describe the types of missing data and simple solutions and their limitations.

Delivery and Resources

Textbook

There is no prescribed textbook.

Software

You will be expected to use MINITAB to perform data analyses. We will use Minitab during the tutorials, and you can use the software in the E4B labs when they are not booked for classes. You can find more information on Minitab at their web site: http://www.minitab.com. A free copy is available to Macquarie students. From the student portal http://students.mq.edu.au/home/ go to Software Downloads (top right) and follow the instructions for Minitab.
Additional References

These are available in Reserve.


Ryan, B.F., Joiner, B.L. and Cryer, J.D. (2005) Minitab Handbook (Duxbury)


Online Textbooks

SurfStat at http://surfstat.anu.edu.au/surfstat-home/surfstat.html is a complete introductory statistics course, with a useful section on Statistical Inference with a sub-section on correlation and regression (but no ANOVA).

HyperStat Online at http://davidmlane.com/hyperstat/index.html is at an intermediate level, chapter 12 and first part of 13, and chapter 15 cover the material (with background in chapter 1). Chapter 5 contains the best online table of the normal distribution (see http://davidlane.com/hyperstat/normal_distribution.html - try it!)

StatSoft Electronic Textbook at http://www.statsoft.com/textbook/stathome.html is more advanced, and material is covered in sections called ANOVA/MANOVA and Linear Regression (with Elementary Concepts and Basic Statistics for background).

Unit Schedule

<table>
<thead>
<tr>
<th>Week (begins)</th>
<th>Lectures</th>
<th>Work due</th>
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<tbody>
<tr>
<td>1 (23 Feb)</td>
<td>Review One sample tests + One sided tests</td>
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<tr>
<td>2 (2 March)</td>
<td>Review two sample tests + assumptions; Report writing</td>
<td></td>
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<tr>
<td>3 (9 March)</td>
<td>One way ANOVA</td>
<td></td>
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<tr>
<td>4 (16 March)</td>
<td>One way ANOVA Multiple comparisons</td>
<td></td>
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Unit guide STAT680 Applied Statistics

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 (23 March)</td>
<td>Transformations, and Non-parametrics; Power and Sample Size</td>
</tr>
<tr>
<td>6 (30 March)</td>
<td>Data collection and management</td>
</tr>
<tr>
<td></td>
<td>Midsemester Break</td>
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<tr>
<td>7 (20 April)</td>
<td>Simple linear regression and transformations</td>
</tr>
<tr>
<td>8 (27 April)</td>
<td>Multiple regression</td>
</tr>
<tr>
<td>9 (4 May)</td>
<td>Multiple regression continued; Ethics</td>
</tr>
<tr>
<td>10 (11 May)</td>
<td>Two-way ANOVA</td>
</tr>
<tr>
<td>11 (18 May)</td>
<td>Two-way ANOVA continued and Multiple comparisons</td>
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<tr>
<td>12 (25 May)</td>
<td>ANOVA - Regression connection</td>
</tr>
<tr>
<td>13 (1 June)</td>
<td>Revision</td>
</tr>
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Report due in week beginning 8 June.

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:


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.

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 Enquiry Service
For all student enquiries, visit Student Connect at ask.mq.edu.au

Equity 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.

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.

Late Submission
Late submission of assignments will be only accepted by prior arrangement or in accordance with the special consideration policy. All other late submissions will incur a penalty of 10% per day or part day.

Graduate Capabilities
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**

- Create, interpret and thoroughly analyse appropriate visual displays and numerical
  summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for
  various types of data. Models include one and two way ANOVA, simple and multiple
  regression.
- Have a deep knowledge and understanding of the assumptions underlying the models,
  and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.
- Be able to describe the types of missing data and simple solutions and their limitations.

**Assessment tasks**

- Tutorial Exercises Week 3
- Assignment 1
- Assignment 2
- Statistics Report
- Final exam

**Effective Communication**

We want to develop in our students the ability to communicate and convey their views in forms
effective with different audiences. We want our graduates to take with them the capability to
read, listen, question, gather and evaluate information resources in a variety of formats, assess,
write clearly, speak effectively, and to use visual communication and communication
technologies as appropriate.

This graduate capability is supported by:

**Learning outcome**

- Interpret statistical results and summarise the results in a statistical report.

**Assessment tasks**

- Assignment 1
- Assignment 2
Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

**Learning outcomes**

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.

**Assessment tasks**

- Tutorial Exercises Week 3
- Assignment 1
- Assignment 2
- Statistics Report
- Final exam

**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**

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries
Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.

Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.

Interpret statistical results and summarise the results in a statistical report.

Apply statistical software packages in data analysis.

Be able to describe the types of missing data and simple solutions and their limitations.

Assessment tasks

- Tutorial Exercises Week 3
- Assignment 1
- Assignment 2
- Statistics Report
- Final exam

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

- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.
- Be able to describe the types of missing data and simple solutions and their limitations.

Assessment tasks

- Tutorial Exercises Week 3
- Statistics Report