STAT1371
Statistical Data Analysis
Session 1, Special circumstances 2021
Department of Mathematics and Statistics

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Notice
As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit’s iLearn space or consult your unit convenor.
## General Information

<table>
<thead>
<tr>
<th>Unit convenor and teaching staff</th>
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<tbody>
<tr>
<td><strong>Unit Convenor/Lecturer</strong></td>
<td><strong><a href="mailto:thomas.fung@mq.edu.au">thomas.fung@mq.edu.au</a></strong></td>
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<tr>
<td></td>
<td><strong>12WW 626</strong></td>
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<td></td>
<td>please refer to iLearn</td>
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<tr>
<td><strong>Lecturer</strong></td>
<td><strong><a href="mailto:houying.zhu@mq.edu.au">houying.zhu@mq.edu.au</a></strong></td>
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<td><strong>12WW 705</strong></td>
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**Houying Zhu**  
**houying.zhu@mq.edu.au**

**Credit points**

10

**Prerequisites**

(HSC Mathematics Extension 1 or Extension 2) or (10cp from MATH1000 or MATH1010-MATH1025 or MATH130-MATH136) or admission to BActStud or BActStudBSc or BAppFinBActStud or BActStudBProfPrac or BActStudProfPrac(Hons) or BMathSc

**Corequisites**

**Co-badged status**

**Unit description**

This unit is intended for students with a high level of proficiency in mathematics. The unit provides an introduction to modern statistical principles and practice with special emphasis on data analytical techniques. The aim of the unit is to promote an understanding of the principles involved in statistical analysis of simple data sets using elementary techniques. Data analysis will be carried out using an appropriate statistical package. The unit includes topics such as numeric and visual summaries of sample data; data quality; basic probability and random variables, including the binomial, Poisson, negative binomial, hypergeometric, uniform and normal distributions. Sampling distributions and their important properties are used to investigate estimates and their accuracy. Statistical inference techniques are considered such as tests of means, proportions, categorical data as well as regression and correlation.
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

On successful completion of this unit, you will be able to:

- **ULO1:** explain the difference between populations and samples, and apply appropriate statistical techniques to analyse different types of variables
- **ULO2:** Understand and apply basic probability concepts to both discrete and continuous variables for solving problems
- **ULO3:** evaluate application of the scientific method through estimation and statistical inference for means, proportions, categorical data and linear regression
- **ULO4:** Demonstrate foundational learning skills including active engagement in their learning process.

General Assessment Information

**HURDLES:** Attendance at, and reasonable engagement in, Small Group Teaching Activities (SGTA) and practical classes in this unit is **compulsory**. Attendance and reasonable engagement in the class activities in at least 10 out of 12 of the classes are requirements to pass the unit. This is a hurdle requirement.

**ATTENDANCE and PARTICIPATION:** Please contact the unit convenor as soon as possible if you have difficulty attending and participating in any classes. There may be alternatives available to make up the work. If there are circumstances that mean you will miss a class, you can apply for Special Consideration via [ask.mq.edu.au](http://ask.mq.edu.au).

**WEB QUIZZES:** Further information will be made available via iLearn in due course.

**TESTS:** There will be of one 1 hour online test conducted via iLearn in Week 7. Further information will be supplied in the week prior to the test.

**LATE SUBMISSION OF WORK:** All assessment tasks must be submitted by the official due date and time. In the case of a late submission for a non-timed assessment (e.g. an assignment), if special consideration has NOT been granted, 20% of the earned mark will be deducted for each 24-hour period (or part thereof) that the submission is late for the first 2 days (including weekends and/or public holidays). For example, if an assignment is submitted 25 hours late, its mark will attract a penalty equal to 40% of the earned mark. After 2 days (including weekends and public holidays) a mark of 0% will be awarded. Timed assessment tasks (e.g. tests, examinations) do not fall under these rules.

**FINAL EXAM POLICY:** It is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period. The only
Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
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<tbody>
<tr>
<td>SGTA Participation</td>
<td>0%</td>
<td>Yes</td>
<td>Weekly</td>
</tr>
<tr>
<td>Practical Participation</td>
<td>0%</td>
<td>Yes</td>
<td>Weekly</td>
</tr>
<tr>
<td>Web Quizzes</td>
<td>20%</td>
<td>No</td>
<td>Weekly</td>
</tr>
<tr>
<td>Mid-Semester Test</td>
<td>20%</td>
<td>No</td>
<td>Week 7</td>
</tr>
<tr>
<td>Final Exam</td>
<td>60%</td>
<td>No</td>
<td>Formal Examination Period</td>
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SGTA Participation

Assessment Type 1: Participatory task
Indicative Time on Task 2: 0 hours
Due: Weekly
Weighting: 0%

This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Attendance and reasonable engagement in at least 80% of the SGTA classes is a requirement to pass the unit.

On successful completion you will be able to:

- explain the difference between populations and samples, and apply appropriate statistical techniques to analyse different types of variables
- Understand and apply basic probability concepts to both discrete and continuous
variables for solving problems

• evaluate application of the scientific method through estimation and statistical inference for means, proportions, categorical data and linear regression

• Demonstrate foundational learning skills including active engagement in their learning process.

Practical Participation

Assessment Type 1: Participatory task
Indicative Time on Task 2: 0 hours
Due: Weekly
Weighting: 0%
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Attendance and reasonable engagement in at least 80% of the practical classes is a requirement to pass the unit.

On successful completion you will be able to:

• explain the difference between populations and samples, and apply appropriate statistical techniques to analyse different types of variables

• Understand and apply basic probability concepts to both discrete and continuous variables for solving problems

• evaluate application of the scientific method through estimation and statistical inference for means, proportions, categorical data and linear regression

• Demonstrate foundational learning skills including active engagement in their learning process.

Web Quizzes

Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 11 hours
Due: Weekly
Weighting: 20%

There are eleven quizzes, due at approximately weekly intervals.
On successful completion you will be able to:

• explain the difference between populations and samples, and apply appropriate statistical techniques to analyse different types of variables

• Understand and apply basic probability concepts to both discrete and continuous variables for solving problems

• evaluate application of the scientific method through estimation and statistical inference for means, proportions, categorical data and linear regression

Mid-Semester Test

Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 1 hours
Due: Week 7
Weighting: 20%

Final Exam

Assessment Type 1: Examination
Indicative Time on Task 2: 3 hours
Due: Formal Examination Period
Weighting: 60%

An invigilated examination held during the University’s formal examination period.

On successful completion you will be able to:

• explain the difference between populations and samples, and apply appropriate statistical techniques to analyse different types of variables

• Understand and apply basic probability concepts to both discrete and continuous variables for solving problems
- evaluate application of the scientific method through estimation and statistical inference for means, proportions, categorical data and linear regression
- Demonstrate foundational learning skills including active engagement in their learning process.

1 If you need help with your assignment, please contact:
  - the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
  - the Learning Skills Unit for academic skills support.

2 Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Lectures

All lectures are online. They will be delivered as a combination of live zoom classes and pre-recorded video recordings. Please refer to iLearn for more details.

Small-Group Teaching Activities (SGTAs)

SGTA classes will start in week 2. Students must attend and participate a minimum of at least 80% of the classes that they are registered in to obtain a passing grade. If you are unavailable for your SGTA class in a particular week, you must submit a Special Consideration application (see General Assessment Information for further details).

Practicals

Practical classes will start in week 2. Students must attend and participate a minimum of at least 80% of the classes that they are registered in to obtain a passing grade. If you are unavailable for your practical class in a particular week, you must submit a Special Consideration application (see General Assessment Information for further details).

Maths Background Quiz

This is a set of questions (pdf format) to allow students to assess whether they have sufficient mathematics in their background for STAT1371. Students are to attempt the quiz in their own time and mark it using the supplied solutions. Only students intending to do an Actuarial Studies degree have STAT1371 as a core unit. For all other students, you should do the one of FOSE1015, STAT1170 or STAT1250 based on your degree requirement.

Calculators

Each student will need a small calculator, preferably one that does simple statistical calculations (it should have at least mean and standard deviation capability). You should bring it to all SGTA classes. A calculator will also be needed for the mid-session tests and the final examination. You will not be permitted to use a programmable calculator or one with a full alpha
character set in any examination.

**Recommended text:**


**Other References** (Note that many of the listed books' older editions are also useful references).

Previous editions of the textbook QA276.M425/2009


Devore, Jay L. *Statistics: the exploration and analysis of data* (Ed 5)


Mendenhall, W. & Ott, L., *Understanding Statistics* (Ed 3)

Hamilton, Lawrence C. *Modern Data Analysis: a first course in applied statistics*


Clarke, G.M. & Cooke D. *A Basic Course in Statistics* (Ed 5)

Koopmans L.H., *Introduction to Contemporary Statistical Methods* (Ed 2)

Chatfield, C., *Statistics for technology: a course in applied statistics* (Ed 3)

Huntsberger D.V. & Billingsley, P., *Elements of Statistical Inference*, (Ed 6)

Agresti, A. & Franklin, C. *Statistics: the art and science of learning from data*

**Computing and Software**

**R and RStudio:** These are freely available to download from the Web, and they will be used for data analysis in this unit. See Topic 1 for more info.

**Unit Schedule**

Topics covered:
1. **Sample Descriptives**  
   Visual and numerical summaries for both categorical and measured variables.

2. **Probability**  
   Basic probability concepts and applications: events, sets, joint probability, conditional probability, independence and Bayes’ Theorem.

3. **Discrete random variables**  

4. **Continuous random variables**  
   Evaluation of general expectation and variance (using calculus). Specific distributions covered: uniform, polynomial based probability distributions and the normal distribution.

5. **Sampling distributions**  
   Distributions of sample statistics: the sample total and sample mean. Mean and variance of linear transforms of a random variable. The Central Limit Theorem, including normal approximation for continuous and discrete random variables, with particular applications to the Binomial, Poisson and Negative Binomial distributions (with continuity correction).

6. **Introduction to inference**  
   The scientific method, with particular application to hypothesis testing for a single population mean (one-sample z-test). Type I and Type II errors. Confidence interval, sample size and power.

7. **Inference for one population mean**  
   Application of the one-sample t-test and confidence interval. Investigating normality, particularly normal scores plots.

8. **Inference for two population means**  
   The two-sample t-test (and evaluate confidence intervals) for the difference in two population means. The "modified" two-sample t-test. Basics of experimental design, with particular application to the paired t-test.

9. **Correlation and Regression**  
   Correlation for two measured variables. The difference between correlation and causation. Simple linear regression, including estimation and inference for the coefficients, the mean function and prediction intervals. Assumption diagnostics.

10. **Categorical Data Analysis**  
    Large-sample inference procedures regarding proportions (for one and two populations). Hypothesis testing, confidence intervals and sample size requirements. Inference for categorical data, including goodness of fit tests, independence tests for contingency tables, pooling of variable levels.

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**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:
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/admin/other-resources/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 help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.
Student Enquiry Service
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

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://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.

Changes since First Published

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<th>Date</th>
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<tbody>
<tr>
<td>12/02/2021</td>
<td>Updated General Assessment Section</td>
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