STAT6175

Linear Models

Session 2, In person-scheduled-weekday, North Ryde 2022

School of Mathematical and Physical Sciences

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General Information

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Credit points
10

Prerequisites
((STAT6170 or STAT670) and (BCA802 or STAT8602 or MATH604 or MATH6904)) or (Admission to MDataSc and (STAT6170 or STAT670))

Corequisites
STAT6180 or STAT680 or STAT6183 or STAT683

Co-badged status
STAT3175

Unit description
This unit discusses statistical modelling in general and in particular demonstrates the wide applicability of linear and generalized linear models. Topics include multiple linear regression, logistic regression and Poisson regression. The emphasis is on practical issues in data analysis with some reference to the theoretical background. Statistical packages are used for both model fitting and diagnostic testing.

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:

ULO1: Define relevant terminology and describe the main concepts of linear models and simple generalized linear models.
ULO2: Formulate and solve theoretical problems in linear modelling (using matrix notation when necessary).
ULO3: Fit a linear model to obtain estimates together with their standard errors in applied problems.
ULO4: Analyse the adequacy of a linear model and suggest appropriate modifications when needed.
ULO5: Formulate and solve applied problems using linear modelling.
ULO6: Use standard statistics packages to carry out these analyses.
ULO7: Communicate clearly your knowledge of the subject matter of linear models and their solutions to problems involving linear modelling.

General Assessment Information

HURDLES: No hurdle requirements

ASSIGNMENT SUBMISSION: Assignment submission will be online through the iLearn page.

Submit assignments online via the appropriate assignment link on the iLearn page. A personalised cover sheet is not required with online submissions. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration.

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- Please note the quick guide on how to upload your assignments provided on the iLearn page.
- Please make sure that each page in your uploaded assignment corresponds to only one A4 page (do not upload an A3 page worth of content as an A4 page in landscape). If you are using an app like Clear Scanner, please make sure that the photos you are using are clear and shadow-free.
- It is your responsibility to make sure your assignment submission is legible.
- If there are technical obstructions to your submitting online, please email us to let us know.

You may submit as often as required prior to the due date/time. Please note that each submission will completely replace any previous submissions. It is in your interests to make

frequent submissions of your partially completed work as insurance against technical or other problems near the submission deadline.

Late Assessment Submission Penalty

From 1 July 2022, Students enrolled in Session based units with written assessments will have the following university standard late penalty applied. Please see https://students.mq.edu.au/study/assessment-exams/assessments for more information.

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at **11:55 pm**. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

Assessments where Late Submissions will be accepted

In this unit, late submissions will accepted as follows:

- Assignment 1– YES, Standard Late Penalty applies
- Assignment 2– YES, Standard Late Penalty applies
- Assignment 3 – YES, Standard Late Penalty applies
- Report of activities in SGTA - NO, unless Special Consideration is Granted
- Final Examination - NO, unless Special Consideration is Granted

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	15%	No	Week 4
Assignment 2	15%	No	Week 8
Assignment 3	15%	No	Week 12
Report of activities in SGTA	5%	No	Weeks 2-12
Final examination	50%	No	Formal Examination Period

Assignment 1

Assessment Type [1]: Case study/analysis
Indicative Time on Task [2]: 10 hours
Due: **Week 4**
Weighting: **15%**

Reinforce and apply the concepts covered in lectures and the skills learned in SGTA classes, through data analysis.

On successful completion you will be able to:

- Define relevant terminology and describe the main concepts of linear models and simple generalized linear models.
- Formulate and solve theoretical problems in linear modelling (using matrix notation when necessary).
- Fit a linear model to obtain estimates together with their standard errors in applied problems.
- Analyse the adequacy of a linear model and suggest appropriate modifications when needed.
- Formulate and solve applied problems using linear modelling.
- Use standard statistics packages to carry out these analyses.
- Communicate clearly your knowledge of the subject matter of linear models and their solutions to problems involving linear modelling.

Assignment 2

Assessment Type [1]: Case study/analysis
Indicative Time on Task [2]: 10 hours
Due: **Week 8**
Weighting: **15%**

Reinforce and apply the concepts covered in lectures and the skills learned in SGTA classes, through data analysis.

On successful completion you will be able to:

- Define relevant terminology and describe the main concepts of linear models and simple generalized linear models.
- Formulate and solve theoretical problems in linear modelling (using matrix notation when necessary).
- Fit a linear model to obtain estimates together with their standard errors in applied problems.

- Analyse the adequacy of a linear model and suggest appropriate modifications when needed.
- Formulate and solve applied problems using linear modelling.
- Use standard statistics packages to carry out these analyses.
- Communicate clearly your knowledge of the subject matter of linear models and their solutions to problems involving linear modelling.

Assignment 3

Assessment Type [1]: Case study/analysis
Indicative Time on Task [2]: 10 hours
Due: **Week 12**
Weighting: **15%**

Reinforce and apply the concepts covered in lectures and the skills learned in SGTA classes, through data analysis.

On successful completion you will be able to:

- Define relevant terminology and describe the main concepts of linear models and simple generalized linear models.
- Formulate and solve theoretical problems in linear modelling (using matrix notation when necessary).
- Fit a linear model to obtain estimates together with their standard errors in applied problems.
- Analyse the adequacy of a linear model and suggest appropriate modifications when needed.
- Formulate and solve applied problems using linear modelling.
- Use standard statistics packages to carry out these analyses.
- Communicate clearly your knowledge of the subject matter of linear models and their solutions to problems involving linear modelling.

Report of activities in SGTA

Assessment Type [1]: Report
Indicative Time on Task [2]: 3 hours
Due: **Weeks 2-12**
Weighting: **5%**

Students are required to submit a short report of the activities in the computer laboratory Small Group Teaching Activities (SGTA)

On successful completion you will be able to:

- Fit a linear model to obtain estimates together with their standard errors in applied problems.
- Analyse the adequacy of a linear model and suggest appropriate modifications when needed.
- Formulate and solve applied problems using linear modelling.
- Use standard statistics packages to carry out these analyses.

Final examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 20 hours
Due: **Formal Examination Period**
Weighting: **50%**

Formal invigilated examination testing the learning outcomes of the unit.

On successful completion you will be able to:

- Define relevant terminology and describe the main concepts of linear models and simple generalized linear models.
- Formulate and solve theoretical problems in linear modelling (using matrix notation when necessary).
- Fit a linear model to obtain estimates together with their standard errors in applied problems.
- Analyse the adequacy of a linear model and suggest appropriate modifications when needed.
- Formulate and solve applied problems using linear modelling.
- Use standard statistics packages to carry out these analyses.

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[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 Writing Centre 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

There is one one hour lecture and one two hour SGTA each week. Lectures begin in Week 1 and SGTAs in Week 2. Please consult the timetable for the scheduling of these activities.

In addition to the one hour lecture there are online resources including videos which should be viewed prior to the one hour lecture.

Technologies used and required

Lecture material will be placed on iLearn. The statistical package R will be used.

SGTA

SGTAs are held in computing labs and allow you to practice techniques learnt in lectures and from above mentioned online resources. You will complete worksheets as part of the learning process.

Text book

The recommended text (available from the Co-op Bookshop) is: Chatterjee S & Hadi AS (2012). *Regression Analysis By Example*, 5th Revised edition, Wiley. This is available online from the university library.

Unit Schedule

Week	Topics
1.	Simple linear regression. Multiple linear regression.
2.	The model in matrix form. Diagnostics.
3.	Diagnostics. Transformations
4.	Transformations. Collinearity.
5.	Polynomial regression. Categorical covariates.
6.	Analysis of change. Analysis of covariance (ANCOVA).
7.	Confounding. Interaction.
	TWO WEEK BREAK
8.	Variable selection. Model building.
9.	Introduction to generalized linear models. Logistic regression.
10.	Logistic regression. Poisson regression.
11.	Poisson regression. Negative binomial regression.

Week	Topics
12.	Negative binomial regression. Gamma regression.
13.	Revision.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). 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
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

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

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

The Writing Centre

The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

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

- Subject and Research Guides
- Ask a Librarian

Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues

Student Enquiries

Got a question? Ask us via AskMQ, or contact Service Connect.

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 from Previous Offering

R has replaced SPSS.