



STAT6175

Linear Models

Session 1, In person-scheduled-weekday, North Ryde 2022

School of Mathematical and Physical Sciences

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General Information

Unit convenor and teaching staff

Convener / Lecturer

Hassan Doosti

hassan.doosti@mq.edu.au

Contact via Email

Room 534, 12 Wally's Walk

Please refer to iLearn for Consultation hours.

Convener / Lecturer

Tania Prvan

tania.prvan@mq.edu.au

Contact via Email

Room 629, 12 Wally's Walk

Please refer to iLearn for Consultation hours.

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

This unit is co-badged 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

General Faculty Policy on assessment submission deadlines and late submissions:

- Online quizzes, in-class activities, or scheduled tests and exam must be undertaken at the time indicated in the unit guide. Should these activities be missed due to illness or misadventure, students may apply for Special Consideration.
- All other assessments must be submitted by 5:00 pm on their due date.
- Should these assessments be missed due to illness or misadventure, students should apply for Special Consideration.
- In the case of a late submission for a non-timed assessment (e.g. an assignment), if special consideration has NOT been granted, following consistent penalty will be applied: A 12-hour grace period will be given after which the following deductions will be applied to the awarded assessment mark: 12 to 24 hours late = 10% deduction; for each day thereafter, an additional 10% per day or part thereof will be applied until five days beyond the due date. After this time, a mark of zero (0) will be given. For example, an assessment worth 20% is due 5 pm on 1 January. Student A submits the assessment at 1 pm, 3 January. The assessment received a mark of 15/20. A 20% deduction is then applied to the mark of 15, resulting in the loss of three (3) marks. Student A is then awarded a final mark of 12/20.

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.

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

You should attend the following classes each week:

- one 1 hour lecture
- one 2 hour SGTA class

Check timetables.mq.edu.au or the unit iLearn page for class details.

Lectures begin in Week 1. Lecture notes are available on iLearn prior to the lecture.

SGTA classes begin in week 2 and are based on work from the current week's lecture. SGTA classes are held in computing labs and allow you to practice techniques learnt in lectures. We will mainly use SPSS, but we will supplement this with other statistical software. You will complete worksheets as part of the learning process.

To check the availability of face to face activities for your unit, please go to [timetable viewer](#), before enrolling in eStudent. To check detailed information on unit assessments, visit the [unit iLearn site](#).

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, as well as paper copies.

Software The statistical software SPSS will be used.

- You may access SPSS via AppStream: <https://mq.okta.com/> and then select Appstream - Student Applications
- You may wish to buy a copy of SPSS for home use. The Co-op Bookshop has SPSS Grad Pack, a full version with a one-year licence. You should purchase the Premium or Standard version.

Staff consultation hours Members of the Department of Mathematics and Statistics have consultation hours each week when they are available to help students. These consultation hours are available on iLearn.

Unit Schedule

Week	Topic	Text chapter	Task Due
1	Simple linear regression	1,2	
2	Simple linear regression contd, introduction to multiple linear regression	2	
3	The model in matrix form, hypothesis tests, residuals, residual & partial regression plots	3,4	
4	Diagnostics contd: extreme observations (leverage, DFBETAs, Cook's distances); transformations	4, 6	Assignment 1
5	Transformations contd; collinearity	6, 9	
6	Polynomial regression; categorical covariates	5	
7	Analysis of change		
	Mid-semester break		
8	Interaction and confounding	5	Assignment 2
9	Variable selection, model building	11	
10	Introduction to generalized linear models; Logistic regression	12	
11	Logistic regression ; Poisson regression	12, 13	

Week	Topic	Text chapter	Task Due
12	Poisson regression	13	Assignment 3
13	Revision		

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](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 \(https://students.mq.edu.au/support/study/policies\)](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 \(https://policies.mq.edu.au\)](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.