



SOCI832

Advanced Quantitative Methods

S2 Evening 2019

Dept of Sociology

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General Information

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Credit points

4

Prerequisites

SOC830

Corequisites

Co-badged status

Unit description

This unit provides training in advanced quantitative analysis with an emphasis on social science applications using existing survey data. Lectures will cover the underlying theory and laboratory sessions the application and interpretation of models. This course will cover the following topics: variance analysis, correlation and alternative correlation coefficients, linear and logistic regression, multilevel modelling, factor analysis, and path analysis.

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:

To demonstrate an understanding of the most common methods of quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, factor analysis, and a range of data visualisation techniques.

To demonstrate knowledge of when to apply different methods of quantitative analysis.

To be able to identify what is intellectually curious and socially important about various social science problems and research questions and to be able to apply appropriate quantitative analysis to analyse such problems.

To be able to conduct quantitative analysis in a major statistical package (such as R), and to be able to present and explain this analysis in written and verbal formats.

To develop proficiency in generic skills required to undertake quantitative research. This include: identifying intellectually curious and socially important problems and research questions; relating such problems to social theory and existing academic and policy literature; conceptualising, operationalising, and testing hypotheses; applying significance tests, confidence intervals, and effect sizes; and explaining quantitative methods in written and verbal form to both expert and non-expert audiences.

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Participation in class</u>	25%	No	Weekly
<u>Week 7 Presentation and report</u>	0%	No	In class in Week 7
<u>Week 8 Midterm exam</u>	0%	No	In class in Week 8
<u>Week 13 Presentation & report</u>	50%	No	In class in Week 13
<u>Week 14 Final exam</u>	25%	No	In class in Week 14

Participation in class

Due: **Weekly**

Weighting: **25%**

Marking criteria

Participation will be assessed according to whether student participate in class through

(1) asking questions of the lecturer and other students, (2) demonstrating that you have done readings, (3) listening and responding to comments and questions from the lecturer and other students, (4) undertaking in-class exercises, and (5) doing so in a way that is respectful of other participants in class.

Example grades and students' behaviour that meets marking criteria:

- 55% (Pass) - attends 70%-90% of classes, but does so with little participation beyond completing exercises
- 65% (Credit) - attends 80%-90% of classes, and participates in discussion occasionally.
- 75% (Distinction) - attends 90%-100% of classes, and participates actively and fully
- 85% (High Distinction) - attends 90%-100% of classes, and shows deep engagement with teaching material and with other students. Shows serious preparation before class.

Completes exercises at a very high standard, perhaps extending analysis beyond those immediately taught.

On successful completion you will be able to:

- To demonstrate an understanding of the most common methods of quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, factor analysis, and a range of data visualisation techniques.
- To demonstrate knowledge of when to apply different methods of quantitative analysis.
- To be able to identify what is intellectually curious and socially important about various social science problems and research questions and to be able to apply appropriate quantitative analysis to analyse such problems.
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Week 7 Presentation and report

Due: **In class in Week 7**

Weighting: **0%**

Instructions:

1. **Replicate a published study with public dataset:** Students are to:
 1. **Find an article:** Find a social science (or closely related discipline) study that has been published as a peer-reviewed academic article, and that uses a publically accessible dataset, and
 2. **Replicate in R:** Replicate the analysis presented in the paper using R.
2. **R code should not already exist:** Article and dataset should NOT already have publicly available R code (this would make the exercise pointless).
3. **By Week 7:** By Week 7 students should have identified the article, downloaded the dataset, and conducted preliminary analysis (i.e. univariate and bivariate analysis).
4. **Presentation:** In class in Week 7 students will present for a maximum of 12 minutes, and provide:
 - a brief introduction to the article and the dataset

- their preliminary analysis, including tables and figures.
5. **Report:** In class in Week 7 students will submit their written report (printed out, and also submitted through ilearn), which shall consist of:
- A copy of the article to be replicated
 - A link to the dataset
 - A copy of their R code (script file) with brief annotations to explain what you have done
 - A short report of approximately 600-1000 words with no more than five tables and figures, which present a preliminary analysis of the dataset.
6. **Consultation:** Students are expected to consult with the lecturer (Nick) before class (4pm - 6pm), in class (6pm - 9pm), and outside class (Facebook messenger, WhatsApp) to
1. confirm their choice of article, and
 2. discuss any issues and problems they are having with the analysis.

Marking criteria:

1. **Motivates interest of audience:** Presentation and report should motivate the interest of the audience by identifying both what is **intellectually curious** about the topic, and why it is **substantively important** for the public, policy makers, or other non-academic audiences.
2. **Clear writing style:** Straight-forward, clear, easy to read writing. This means generally using short sentences, having a single coherent and easy to understand argument, and using paragraphs with topic sentences.
3. **Professional Tables and Figures:** Tables and figures should be presented like they would appear in an academic article, which means, at the least, (1) that tables are not just cut and paste from R output, (2) that tables and figures include only the necessary information, (3) that tables and figures include all appropriate information, and (4) they should be able to be interpreted on their own (without the text), and (5) all tables and figures should be referred to by number in the text.
4. **Analysis:** Analysis should be a high quality replication of the analysis in the academic article which it comes from. Analysis may briefly extend on the analysis in the article, if space and time permits.
5. **Explanation:** Explanation of the analysis should be simple, clear, and correctly use terminology. It should also point out the substantive significance of the results in a way

that another person with a Masters Degree, but not in this area of research, could understand.

6. **R code:** R code should be as simple and tidy as possible, with brief annotated comments (after # symbols), which explain the purpose of each section of code. The R code should be in a form which the lecturer can run on their computer and replicate the analysis.

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Week 8 Midterm exam

Due: **In class in Week 8**

Weighting: **0%**

Instructions:

1. **30 minutes:** This will be a short (30 minute) online exam, with multiple choice, fill-in the blank, and short answer questions.
2. **Laptops; Open book:** Exam will be completed on student's laptops and be open book.
3. **Concepts from Weeks 1 to 6:** Exam will test material from Week 1 to 6, with a strong focus on the "Concepts" identified at the beginning of each week's class.
4. **Example questions:** Example questions will be provided in advance of the class for students to familiarise themselves with the format.

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Week 13 Presentation & report

Due: **In class in Week 13**

Weighting: **50%**

Instructions and marking criteria:

1. **Same as Week 7 Presentation & Report, but full analysis:** Instructions and marking criteria are the same as for Week 7 Presentation and Report, except that
 1. **Full analysis:** the full analysis should be presented, and
 2. **Multivariate analysis:** should include some form of multivariate analysis (some form of regression, factor analysis, ANOVA, or similar).

On successful completion you will be able to:

- To demonstrate an understanding of the most common methods of quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, factor analysis, and a range of data visualisation techniques.
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Week 14 Final exam

Due: **In class in Week 14**

Weighting: **25%**

Instructions:

1. **Same as Week 8 Midterm Exam, but 2 hours:** Instructions are the same as for Week 8 Midsemseter exam, except that exam is 2 hours, and will test all material from weeks 1 through 12.

On successful completion you will be able to:

- To demonstrate an understanding of the most common methods of quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, factor analysis, and a range of data visualisation techniques.
- To demonstrate knowledge of when to apply different methods of quantitative analysis.
- To be able to identify what is intellectually curious and socially important about various social science problems and research questions and to be able to apply appropriate quantitative analysis to analyse such problems.
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Delivery and Resources

Laptops

You are required to have a laptop which you bring to class. This is needed for running statistical analysis in R (both in class demonstrations, and at home), and also for presentations and preparation of reports.

Installation of R

You will be required to install R Statistical Package and RStudio on your laptop, so you will need to have administrator privileges for your computer. Instructions will be provided in advance of the class to guide you through self-installation of R and RStudio.

Structure of semester

- **Weeks 1-6 & 9-12: Normal class with lecture, demonstration, and exercises** (Participation 25%)
- **Week 8: Normal class but starting with 30 minute mid-term exam.** (Midterm 5%)
- **Weeks 7 & 13: Student presentations (replication of analysis from an academic paper) + report due in class**(Week 7 Presentation & Report 10%; Week 13 Presentation & Report 40%)
- **Week 14: In-class exam (2 hours: Online, bring laptop. Multiple choice, fill in blank, and short answer)** (Exam worth 20%)

Structure of each class

4pm - 6pm Mondays: Drop in consultations (weeks 1 to 14, not including break weeks; room TBC, but probably the same room as class, or a room near by)

6pm - 9pm Mondays: Class

- **Part 1: Lecture** (45 - 60 min) - powerpoint slides to be provided at beginning of class
- **Part 2: Demonstration in R** (45 - 60 min) - R script to be provided at beginning of class
- **Part 3: Student exercises** (45 - 60 min) - PDF/Word outline of exercise to be provided at beginning of class
- **Part 4: Example exam questions** (handout, no specific time allocated) - PDF/Word document with example exam questions (multiple choice, fill in blanks, short answer).

Unit Schedule

Unless otherwise specified, readings are chapters from:

[Field, A., Miles, J., and Field, Z. \(2012\). *Discovering statistics using R*. Sage publications.](#)

Week 1: Introduction to R

Reading: Chapter 3. **Main concepts:** Install R & RStudio, open dataset, recode variables.

Week 2: Introduction to Research Methods

Reading: Chapter 1. **Main concepts:** Theory, hypotheses, variables, measurement.

Week 3: Introduction to Statistics & Univariate Analysis

Reading: Chapter 2. **Main concepts (statistics):** Descriptive & inferential statistics, sampling, p-value. **Main concepts (univariate analysis):** central tendency, variation, histogram.

Week 4: Bivariate analysis

4.1 Comparison of means

Reading: Chapter 9. **Main concepts:** comparison of mean, paired/independent samples.

4.2 Correlation

Reading: Chapter 6. **Main concepts:** pearsons r, covariance, scatterplot.

4.3 Chi-square

Reading: Chapter 18. **Main concepts:** cross-tabulation, chi-square, degrees of freedom.

Weeks 5: Dimension reduction

5.1 Index creation and testing

Reading: Chapter 17, section 17.8. **Main concepts:** Cronbach alpha, reliability with item deleted.

5.2 Factor analysis

Reading: Chapter 17. **Main concepts:** factors, factor scores, rotation.

Week 6: Linear Regression

Reading: Chapter 7

Week 7: Student Presentations + Report Due (0%)

Week 8: Midterm (30 mins - 0%) + Regression diagnostics

Reading: Chapter 7, section 7.7 onwards

Week 9: Logistic regression & other types of regression

Reading: Chapter 8. **Optional Reading (other types of regression):** Chapters 18 and 19.

Week 10: Mediation, moderation, and path analysis

Reading: [Baron, R. M., & Kenny, D. A. \(1986\). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of personality and social psychology, 51\(6\), 1173.](#)

Week 11: Presenting results & writing a report

Reading: methods101.com

Week 12: Graphs with ggplot

Reading: methods101.com

Week 13: Student Presentations + Report Due (50%)

Week 14: Final exam (2 hours - 25%)

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](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:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway \(https://students.mq.edu.au/support/study/student-policy-gateway\)](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 \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](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/study/getting-started/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 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

If you are a Global MBA student contact globalmba.support@mq.edu.au

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.

Graduate Capabilities

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- To demonstrate knowledge of when to apply different methods of quantitative analysis.
- To be able to identify what is intellectually curious and socially important about various social science problems and research questions and to be able to apply appropriate

quantitative analysis to analyse such problems.

- To be able to conduct quantitative analysis in a major statistical package (such as R), and to be able to present and explain this analysis in written and verbal formats.
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Assessment tasks

- Participation in class
- Week 7 Presentation and report
- Week 13 Presentation & report

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

- To demonstrate an understanding of the most common methods of quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, factor analysis, and a range of data visualisation techniques.
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Assessment tasks

- Participation in class
- Week 7 Presentation and report
- Week 8 Midterm exam
- Week 13 Presentation & report
- Week 14 Final exam

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

- To demonstrate knowledge of when to apply different methods of quantitative analysis.
- To be able to identify what is intellectually curious and socially important about various social science problems and research questions and to be able to apply appropriate quantitative analysis to analyse such problems.
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Assessment tasks

- Participation in class
- Week 7 Presentation and report
- Week 8 Midterm exam
- Week 13 Presentation & report
- Week 14 Final exam

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

- To demonstrate an understanding of the most common methods of quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, factor analysis, and a range of data visualisation techniques.
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- To be able to identify what is intellectually curious and socially important about various social science problems and research questions and to be able to apply appropriate quantitative analysis to analyse such problems.
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Assessment tasks

- Participation in class
- Week 7 Presentation and report
- Week 8 Midterm exam
- Week 13 Presentation & report
- Week 14 Final exam

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

- To be able to conduct quantitative analysis in a major statistical package (such as R), and to be able to present and explain this analysis in written and verbal formats.
- To develop proficiency in generic skills required to undertake quantitative research. This include: identifying intellectually curious and socially important problems and research questions; relating such problems to social theory and existing academic and policy literature; conceptualising, operationalising, and testing hypotheses; applying significance tests, confidence intervals, and effect sizes; and explaining quantitative methods in written and verbal form to both expert and non-expert audiences.

Assessment tasks

- Participation in class
- Week 7 Presentation and report
- Week 13 Presentation & report

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcome

- To develop proficiency in generic skills required to undertake quantitative research. This include: identifying intellectually curious and socially important problems and research questions; relating such problems to social theory and existing academic and policy literature; conceptualising, operationalising, and testing hypotheses; applying significance tests, confidence intervals, and effect sizes; and explaining quantitative methods in written and verbal form to both expert and non-expert audiences.