SOCI832

Advanced Quantitative Methods

S2 Evening 2018

Dept of Sociology

Contents

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 main methods of advanced quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, ANOVA, multilevel modeling, longitudinal and panel data modeling, factor analysis, cluster analysis, structural equation modelling, path analysis, social network analysis, and a range of data visualisation techniques.

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

To be able to identify important social science puzzles, problems, and questions and to be able to apply appropriate advanced quantitative analysis to such problems.
To be able to conduct advanced 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 advanced quantitative research. This include: identifying research puzzles, problems, and 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 advanced quantitative methods in written and verbal form to both expert and non-expert audiences.

General Assessment Information

Rubrics will be provided for all three assessments.

Assessment Tasks

Name	Weighting	Hurdle	Due
Attendance + Weekly Exercises	30%	No	Weekly
First Presentation + Report	20%	No	In class in Week 7
Second Presentation + Report	50%	No	In class in Week 13

Attendance + Weekly Exercises

Due: **Weekly**
Weighting: **30%**

Students are required to attend and participate in weekly classes.

Each week students will be given exercises to complete for the next week's class.

Students are expected to complete these exercises on their own, and then present them in class during 'The Clinic' session - the second half of class where students will share their analysis of their data, application of the techniques they have learnt, and where we will workshop students analysis in preparation for the week 7 and week 13 presentations and reports.

Attendance of weekly classes and completion of these exercises is compulsory.

If students miss class, they can submit a written response (a 'make up assignment) to that week's exercises, including their R-code.

For each week's class that is missed without a make-up assignment, will incur a 20% penalty to attendance and weekly exercise grade.

The rubric for this assessment will be simple. Each week students will be given one of four

grades:

1. No attendance and not completed assignment or make up assignment - 20% penalty overall.
2. Attendance and not completed assignment - 33% marks for that week
3. Attendance and satisfactory completion of assignment - 67% of full marks for that week
4. Attendance and excellent completion of assignment - 100% of full marks for that week

On successful completion you will be able to:

- To demonstrate an understanding of the main methods of advanced quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, ANOVA, multilevel modeling, longitudinal and panel data modeling, factor analysis, cluster analysis, structural equation modelling, path analysis, social network analysis, and a range of data visualisation techniques.
- To demonstrate knowledge of when to apply different methods of advanced quantitative analysis.
- To be able to identify important social science puzzles, problems, and questions and to be able to apply appropriate advanced quantitative analysis to such problems.
- To be able to conduct advanced 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 advanced quantitative research. This include: identifying research puzzles, problems, and 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 advanced quantitative methods in written and verbal form to both expert and non-expert audiences.

First Presentation + Report

Due: **In class in Week 7**
Weighting: **20%**

Students are required to deliver a 10 minute presentation and provide a 2,000 word report (with attached R code) in which they present analysis of their chosen dataset.

Analysis should

1. address an important academic puzzle or policy problem;
2. utilise multiple methods taught in the first six weeks of the course, including (but not limited to) descriptive and bivariate statistical analysis;

3. be used to advance a substantive argument;
4. test one or more hypotheses; and
5. through testing these hypotheses provide evidence for or against one or more academic theories or competing perspectives on a policy issue.

Students should choose their own topic.

Students are free to use their own dataset or use one of the datasets provided by the lecturers for this class.

Students should frame their analysis - justifying their choice of topic, competing theories, and hypotheses - with a brief literature review which makes a plausible - if brief - argument that the analysis is important, worthwhile, and a contribution to the literature.

On successful completion you will be able to:

- To demonstrate an understanding of the main methods of advanced quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, ANOVA, multilevel modeling, longitudinal and panel data modeling, factor analysis, cluster analysis, structural equation modelling, path analysis, social network analysis, and a range of data visualisation techniques.
- To demonstrate knowledge of when to apply different methods of advanced quantitative analysis.
- To be able to identify important social science puzzles, problems, and questions and to be able to apply appropriate advanced quantitative analysis to such problems.
- To be able to conduct advanced 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 advanced quantitative research. This include: identifying research puzzles, problems, and 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 advanced quantitative methods in written and verbal form to both expert and non-expert audiences.

Second Presentation + Report

Due: **In class in Week 13**
Weighting: **50%**

NOTE: The differences between the second presentation and the first are:

1. **The second presentation must use multivariate analysis (multivariate analysis is optional in the first presentation and paper)**

2. **The second presentation must use visualisations in R, either through maps, figures, graphs, or similar.**
3. **The second presentation must be a substantial improvement and/or extension of the work presented in the first presentation and paper. This can either be through extending the analysis of the same dataset, or through analysing a new dataset.**

Students are required to deliver a 10 minute presentation and provide a 2,000 word report (with attached R code) in which they present analysis of their chosen dataset.

Analysis should

1. address an important academic or policy problem or puzzle,
2. utilise multiple methods taught in the **12 weeks of the course**, **including (but not limited to) multivariate statistical analysis;**
3. be used to advance a substantive argument;
4. test one or more hypotheses;
5. through testing these hypotheses provide evidence for or against one or more theories and/or competing perspectives on a policy issue; **and**
6. **utilise visualisations in R to illustrate their findings.**

Students should choose their own topic.

Students are free to use their own dataset or use one of the datasets provided by the lecturers for this class.

Students should frame their analysis - justifying their choice of topic, competing theories, and hypotheses - with a brief literature review which makes a plausible - if brief - argument that the analysis is important, worthwhile, and a contribution to the academic or policy literature.

On successful completion you will be able to:

- To demonstrate an understanding of the main methods of advanced quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, ANOVA, multilevel modeling, longitudinal and panel data modeling, factor analysis, cluster analysis, structural equation modelling, path analysis, social network analysis, and a range of data visualisation techniques.
- To demonstrate knowledge of when to apply different methods of advanced quantitative analysis.
- To be able to identify important social science puzzles, problems, and questions and to be able to apply appropriate advanced quantitative analysis to such problems.
- To be able to conduct advanced 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 advanced quantitative research. This include: identifying research puzzles, problems, and 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 advanced quantitative methods in written and verbal form to both expert and non-expert audiences.

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 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.

Weekly assignment

At the end of each weeks' class you will be given an assignment which will involve using R to conduct the analysis taught that week. Students will generally conduct this analysis on a dataset of their choice, and through these weekly assignments start working on their major project. Students will share their analysis in the second half of class (workshops) each week in the form of a 2-3 minute presentation. Note that workshops will be on the previous week's topic (e.g. At the end of Week 1 students will be provided an assignment on the topic of Week 1, which will be discussed in the second half of class in Week 2).

Structure of class

Each class will be three hours in length, and will be divided into two halves each 1-2 hours in length. The first half of class will be a lecture on that week's topic. The second half of the class will be a workshop where students will present their weekly assignments and we will have discussion about any issues which arise.

Unit Schedule

Lecturers:

- **NH: Nicholas Harrigan**
- **HYL: Hangyoung Lee**

Week 1: Revision of fundamentals of quantitative social science (NH)

Topics covered: Puzzles; theory; causality; conceptualisation; operationalisation; variables and data structure; hypotheses; significance and confidence intervals; correlation; factors/indexes/

clustering; comparison of means; crosstabs; regression (linear and logit); missing data; dummy variables; interaction effects.

Week 2: Linear Regression (NH)

Week 3: Logistic Regression + Probit (NH)

Week 4: ANOVA + Propensity matching (NH)

Week 5: Factor and cluster analysis (NH)

Week 6: Path analysis and Structural Equation Modeling (NH)

Week 7: Student presentations (NH + HYL)

Week 8: Social Network Analysis (NH)

Week 9: Visualisation (HYL)

Week 10: Other types of regression 1: Multinomial and ordinal (HYL)

Week 11: Other types of regression 2: Count models and zero inflated count models (HYL)

Week 12: Longitudinal and panel data: Fixed and random effects, multi-level models, and hierarchical linear models (HYL)

Week 13: Student presentations (NH + HYL)

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:

- 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). 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 (http

s://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 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 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

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 advanced quantitative analysis.
- To be able to identify important social science puzzles, problems, and questions and to be able to apply appropriate advanced quantitative analysis to such problems.
- To be able to conduct advanced 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 advanced quantitative research. This include: identifying research puzzles, problems, and 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 advanced quantitative methods in written and verbal form to both expert and non-expert audiences.

Assessment tasks

- Attendance + Weekly Exercises
- First Presentation + Report
- Second 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 main methods of advanced quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, ANOVA, multilevel modeling, longitudinal and panel data modeling, factor analysis,

cluster analysis, structural equation modelling, path analysis, social network analysis, and a range of data visualisation techniques.
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Assessment tasks

- Attendance + Weekly Exercises
- First Presentation + Report
- Second Presentation + Report

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 advanced quantitative analysis.
- To be able to identify important social science puzzles, problems, and questions and to be able to apply appropriate advanced quantitative analysis to such problems.
- To be able to conduct advanced 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 advanced quantitative research. This include: identifying research puzzles, problems, and 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 advanced quantitative methods in written and verbal form to both expert and non-expert audiences.

Assessment tasks

- Attendance + Weekly Exercises
- First Presentation + Report
- Second Presentation + Report

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 main methods of advanced quantitative analysis used in the social sciences, including: correlation, linear and logistic regression, ANOVA, multilevel modeling, longitudinal and panel data modeling, factor analysis, cluster analysis, structural equation modelling, path analysis, social network analysis, and a range of data visualisation techniques.
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Assessment tasks

- Attendance + Weekly Exercises
- First Presentation + Report

- Second Presentation + Report

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 advanced 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 advanced quantitative research. This include: identifying research puzzles, problems, and 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 advanced quantitative methods in written and verbal form to both expert and non-expert audiences.

Assessment tasks

- Attendance + Weekly Exercises
- First Presentation + Report
- Second 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 advanced quantitative research. This include: identifying research puzzles, problems, and 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 advanced quantitative methods in written and verbal form to both expert and non-expert audiences.

Assessment tasks

- Attendance + Weekly Exercises
- First Presentation + Report
- Second Presentation + Report