

IP309-15 Quantitative Methods: Understanding relationships in data

26/27

Department

Liberal Arts

Level

Undergraduate Level 3

Module leader

Lauren Bird

Credit value

15

Module duration

10 weeks

Assessment

100% coursework

Study location

University of Warwick main campus, Coventry

Description

Introductory description

As individuals and scholars, we are frequently confronted with the claim that A causes B, or the requirement to verify whether a relationship between A and B exists. While anecdotal accounts can help inform our opinion, it is dangerous to rely on one-off observations to verify more general relationships. Equally, even where we believe there may be a relationship, we can be misled by confounding influences which obscure or mislead us.

This is where quantitative approaches can help us untangle the relationships we observe around us, and help us answer question of whether these relationships hold in the wider population. The skills acquired on this module will be invaluable for any student wishing to pursue research which involves large numbers of participants, or which involves the analysis of datasets from official sources.

Module aims

This module uses elements of Problem-Based Learning to teach intermediate quantitative concepts which promotes self-directed and reflective learning. Through tackling multifaceted and complex social issues, students will begin to generate, appreciate and understand broader, underlying, conceptual problems around why quantitative approaches are relevant, and to uncover

the appropriate methodologies. In addition to improved learning outcomes, this approach also aligns learning activities with the processes of independent research — effectively preparing students for independent project work or modules which encourage individual enquiry. Through group discussion and research, students will begin building their knowledge and confidence in plotting and estimating bivariate relationships, uncover the core technical approaches we use for this, and the conditions under which these approaches are appropriate. They will build on existing knowledge of distributions to study the principles of hypothesis testing to understand how we can use results based on a sample to make inferences about the wider population. As the course develops, problems will move toward the requirement to understand more complex multivariate relationships, the importance of control variables in reducing 'noise' in our models, and finally extensions which allow us to use our frameworks to plot non-linear relationships. The combination of discussion and practical work in class will build students' confidence at using statistical computer packages to put into practice the concepts they uncover through their research, and to take their first steps in statistically modelling the relationship between two or more variables. This module builds on the introductory understanding students acquired in IP110 Quantitative Methods for Undergraduate Research though the module is not required if students have other appropriate experience.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

The following outline represents the core knowledge and competency gain associated with the course activities. In order to facilitate the acquisition of knowledge and competency, the course is delivered via Problem-Based Learning which emphasizes student knowledge acquisition via efforts to understand the parameters of, and solutions to, complex real-world situations. Study will encourage engagement in contemporary challenges across themes such as education, deprivation, social statistics, climate and environment, and health and wellbeing.. The course will be based around four key conceptual problems around the use of quantitative research to elicit relationships:

1. Why employ quantitative approaches to relationships, and why not? Which will allow students to develop knowledge and understanding around:
 - Core statistical concepts used to describe relationships
 - Differences between quantitative and qualitative approaches and their respective strengths
 - Why correlation isn't causality
1. How can we model the strength of a relationship? Which will allow students to develop knowledge and understanding around:
 - Core principles of linear regression modelling
 - Estimating straight line relationships using ordinary least squared (OLS) approaches
 - The required assumptions of ordinary least squared modelling and what happens when we ignore them
 - Using regression analysis of data samples to make inferences about the population

1. How can we deal with complex multifaceted relationships? Which will allow students to develop knowledge and understanding around:
 - Control variables, confounding influences, and the usefulness (and shortcomings) of multivariate modelling
 - Estimating linear relationships using OLS when we have many variables
 - The required assumptions of multivariate ordinary least squared modelling and what happens when we ignore them
 - Using multivariate regression analysis of data samples to make inferences about the population
1. What happens when we don't have a linear relationship? Which will allow students to develop knowledge and understanding around:
 - The role of interactions in data
 - Inclusion of data transformations in regression models and what they mean
 - Interpreting binary variables in the context of statistical models

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate an understanding of the key concepts in describing relationships in data, including descriptive and inferential statistics.
- Evaluate linear bivariate relationships in real-world data using regression modelling.
- Apply sound statistical techniques using real-world data.
- Understand issues in data collection, sampling, analysis and interpretation.

Research element

This is an optional module on the Liberal Arts course which aims to facilitate the acquisition by students of a range of methods of enquiry from various disciplines and equip them to deploy those skills in research. Research skills are embedded into the teaching strategy of all of the course's modules which, collaboratively, seek to develop and enhance students' capacity to conduct independently original research into a current problem. Specifically, the approach used in this module serves to align learning activities with the processes of independent research – effectively preparing students for independent project work or modules which encourage individual enquiry.

Interdisciplinary

This is an optional module on the Liberal Arts course which adopts an interdisciplinary approach spanning the arts, humanities, social and natural sciences fields in order to engage with debates on topical, local national and international issues.

International

This is an optional module on the BA in Liberal Arts course which offers a unique transdisciplinary

learning experience allowing students to achieve breadth and depth of knowledge.

Subject specific skills

Skills in data analysis using a range of methods

Transferable skills

Skills in using statistical computer software packages to manage data and perform data analysis tasks

Problem solving

Information technology

Numeracy

Oral and written communication

Digital literacy

Study

Study time

Type	Required
Seminars	10 sessions of 2 hours (13%)
Private study	65 hours (43%)
Assessment	65 hours (43%)
Total	150 hours

Private study description

Research and preparation for classes and assessments

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A3

	Weighting	Study time	Eligible for self-certification
Assessment component			
Methods review draft	15%	10 hours	No
Students will prepare a methods and methodology review as a draft to inform decision making for their group project.			
Reassessment component is the same			
Assessment component			
Group technical report	40%	27 hours	No
Reassessment component			
Individual report			Yes (extension)
Individual data analysis and report.			
Assessment component			
Data analysis and short answer report	45%	28 hours	Yes (extension)
Students will be given a data set to analyse and submit responses to a series of short answer questions.			
Reassessment component is the same			

Feedback on assessment

- Written feedback for written assignments (individual and group) will be provided via Tabula
- Written feedback will be provided for presentations via Tabula in addition to feedback and discussion in class at time of presentation
- Feedback on the exam will be provided individually with written comments via Tabula.

Availability

Courses

This module is Optional for:

- Year 2 of UVCA-LA99 Undergraduate Liberal Arts

This module is Option list G for:

- UVCA-LA99 Undergraduate Liberal Arts
 - Year 2 of LA95 Liberal Arts with English
 - Year 2 of LA97 Liberal Arts with History
 - Year 2 of LA96 Liberal Arts with Philosophy
 - Year 3 of LA95 Liberal Arts with English
 - Year 3 of LA97 Liberal Arts with History
 - Year 3 of LA96 Liberal Arts with Philosophy