

## Module Overview

<b>Module Name:</b>	Introduction to Quantitative Research Methods
<b>Module Code:</b>	PUBL0055
<b>Lecturers:</b>	Dr Jack Blumenau Prof Benjamin Lauderdale
<b>Seminar Leaders:</b>	Roberta Damiani; Constanza Gonzalez Parrao; Thiago Rodrigues Oliveira; Eleanor Iob; Yan Wang
<b>Office Hours:</b>	JB: Monday, 15.00-17.00 BL: Monday, 14.30-16.30
<b>Teaching:</b>	20 hours of lectures, 10 hours of seminars
<b>Credits:</b>	15
<b>Assessment Method:</b>	Midterm coursework (1000 words) and final coursework (3000 words)
<b>Assessment Deadline:</b>	Midterm coursework (6th November 2019) Final coursework (13 <sup>th</sup> January 2020)

### Useful Links

[UCL Timetable](#)

[Extenuating Circumstances](#)

[Essay Extensions](#)

[Penalties for Late Submission](#)

[Penalties for Overlength Essays](#)

[Essay Submission Information](#)

[Examinations](#)

[Plagiarism and TurnItIn](#)

[Plagiarism and Academic Writing - a Guide for Students](#)

## Table of Contents

Module Overview.....	1
Useful Links.....	1
Table of Contents.....	2
Course Description.....	2
Course Format.....	3
Course Assessment.....	3
Class Assignments.....	5
Course Resources.....	5
Week 1 – Introduction to Quantitative Methods (and R).....	8
Week 2 – Causality.....	8
Week 3 – Describing Quantitative Data.....	8
Week 4 – Regression I (Prediction).....	8
Week 5 – Regression II (Model specification).....	9
Week 6 – Regression III (Causality).....	9
Week 7 – Panel Data.....	9
Week 8 – Probability Theory.....	9
Week 9 – Uncertainty.....	10
Week 10 – Summing Up.....	10

## Course Description

This course is designed to introduce you to and help you become familiar with tools of quantitative data analysis for the social sciences. The introductory course has two primary aims. First, students will be introduced to statistical models that researchers and policymakers use in answering social, political and economic questions. Second, the course will equip students to use one or more of the discussed techniques in their MSc dissertation. By the end of the course, students should be able to understand the quantitative tools employed in political, social, and economic research; to perform data analysis using the statistical software *R* and interpret results; and to fruitfully employ introductory quantitative methods in their dissertation research and in subsequent careers.

This module (or the Advanced Quantitative Methods module) is required of all students pursuing an MSc from the School of Public Policy, including degrees in Democracy and Democratization, European Public Policy, Global Governance and Ethics, International Public Policy, Public Policy, and Security Studies.

### **Course Format**

This course will be taught using a combination of lectures and lab sessions. Lectures are two-hours in length, and are designed to introduce students to the topics outlined in the course syllabus and to detail topics covered in the assigned readings. Lab sessions are designed to provide students the opportunity to get 'hands on' experience with the material and the statistical software— R (<http://cran.r-project.org/>). Because the material in the course builds on previous weeks, students should plan on attending seminars from week 1 and attend consistently. Attendance of both lectures and lab sessions are required of all students.

### **Lectures**

There are two lectures for this module, one section taught by Dr Blumenau (PUBL0055B) and the other by Professor Lauderdale (PUBL0055A). The material presented in each of the sections is exactly the same. Students MUST attend the lecture slots they have been assigned.

### **Seminars**

Seminars (lab sessions) are primarily devoted to understanding how to apply the data science techniques discussed in the lecture to specific research and policy problems using *R*. Note that you will be required to use *R* to complete your final exam.

You will automatically be allocated to a seminar group. Attendance of seminars (lab sessions) is mandatory.

### **Course Assessment**

Students must pass this course to successfully complete the MSc degree. The course has two marked components, a midterm coursework (worth 25% of the course mark) and a final coursework (worth 75% of the course mark).

The midterm coursework will review basic theory – testing whether students have done all the required reading and the assignments – and also include a practical component which will require students to complete tasks using *R*. The midterm will be set on Friday 1<sup>st</sup> November at 6pm and will be due on **Wednesday 6<sup>th</sup> November at 2pm**.

The final coursework will also cover both theory and practical questions, and will require students to address specific research or policy questions using real-world datasets. Working from data that we provide, you will be asked conduct various statistical analyses using *R*, and also to produce substantive responses to the questions posed. The final coursework will be set on Friday 13<sup>th</sup> December at 6pm and will be due on **Monday 13<sup>th</sup> January at 2pm**.

### **Essay deadlines**

Department policy requires that penalty points are deducted for essays that are late and does not allow individual lecturers to grant extensions. If you experience any difficulties that mean you are not able to study to the best of your ability and struggle to meet deadlines, then you should speak to your personal tutor for help filling out and submitting an Extenuating Circumstances Form.

### **Essay word limits**

Department policy requires that penalty points are deducted for essays that exceed the maximum word limit.

### **Plagiarism**

You are reminded that it is an academic offence to use the work of others without acknowledgement. You should note that UCL uses a plagiarism detection system (TurnItIn) to scan work for evidence of plagiarism. This system gives access to many sources worldwide, including websites and journals, as well as work previously submitted to the department, UCL and other universities. Students may submit their own work to TurnItIn prior to handing it in to see for themselves whether they have inadvertently breached the rules regarding the appropriate use and citation of sources. You can find more information about [plagiarism and TurnItIn at this link](#).

## **Class Assignments**

Before each class, students are expected to review the material on the course website and attempt to understand and implement the code provided for the in-class exercises. Failing to try to familiarise yourself with the relevant code will mean that the classes progress much more slowly, and you will have fewer opportunities to ask substantive questions of the teaching fellows.

After each class, students are expected to complete the at-home exercises. While these assignments do not count toward the course mark, they will serve as a very good guide to the assessed coursework later in the course. We strongly encourage all students to complete these assignments in advance of the solutions being released each Monday.

## **Course Resources**

### **Readings**

The main textbook for the module is:

- Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction*. Princeton University Press

This book provides a useful mix of quantitative and statistical background and theory with plenty of real-world applied examples. There is also a lot of R code integrated throughout the book which we will refer to frequently. Although there will be a number of copies of this book available in the library, this is a very large module in terms of student numbers and so you may wish to purchase your own.

We may occasionally assign additional readings for certain topics, and these will be made available online through the [course's electronic reading list](#) and through the course webpage. It is expected that students will have read all the required reading prior to coming to lecture and seminar.

## **Moodle**

We will make extensive use of UCL's virtual learning platform, Moodle. Students will be automatically enrolled in Moodle for the course to which they have been assigned.

## **Course website**

All materials for the course will be hosted on a dedicated course website. This site will include lecture slides, class assignments, and homework tasks. Each week we will add new material to the site, and we expect you to review this material before each class.

## **Piazza**

We are using a service called *Piazza* to manage communications for this course. Piazza can be accessed via a link in the "Discussion Forums" section of the course's Moodle page. This is a much more efficient mode of communication than e-mail because it allows you to answer each other's questions, which will be much faster than waiting for a response from us, and for the entire class to see our responses, ensuring that we do not answer the same question multiple times over e-mail. Note that we expect you to use Piazza for both student-to-student and student-to-tutor communication, meaning that you should be attempting to answer each other's questions.

Note that we will not be answering substantive questions over e-mail. If you ask us a substantive question via e-mail, we will simply ask you to post it on Piazza. All questions that are of administrative or technical nature should be addressed to us before or after lecture or during our office hours.

## **R and RStudio**

Every quantitative social scientist needs to know how to operate at least one piece of statistical software. In this course, we will be teaching you how to use *R*. *R* is statistical software that allows one to manipulate data and estimate a wide variety of statistics. It is one of the fastest growing statistical software packages, one of the

most popular data science software packages, and, importantly, it is open source (free!). We will also be using the RStudio user-interface, which makes operating R somewhat easier. You should download and install both R and RStudio on your personal computers before the course starts. The latest version of [RStudio can be downloaded here](#) and [R can be downloaded here](#).

It is important to note that we do not expect any student to have prior programming experience. We will teach you R during the course. That said, we do expect students to try and complete the homework assignments each week, and to at least attempt to work through the class materials before class. This will make the seminars more engaging, as you will spend less time working on trivial technical details, and more time talking about the substantive importance of the statistical results.

## **Week 1 – Introduction to Quantitative Methods (and R)**

Introduction to quantitative methods; description, prediction and causality; research design; R basics.

### **Essential Reading**

Chapter 1, “Introduction”, in Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction*. Princeton University Press

## **Week 2 – Causality**

Observational and experimental studies; the logic of counterfactuals; randomization; confounding; difference-in-differences.

### **Essential Reading**

Chapter 2, “Causality”, in Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction*. Princeton University Press

### **Recommended Reading**

Chapter 1, “Randomized Trials”, in Angrist, Joshua D. & Pischke, Jörn-Steffen. 2015. *Mastering ‘Metrics: The Path from Cause to Effect*. Princeton University Press

## **Week 3 – Describing Quantitative Data**

Descriptive statistics; visualising data; clustering.

### **Essential Reading**

Chapter 3, “Measurement”, in Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction*. Princeton University Press

## **Week 4 – Regression I (Prediction)**

Prediction using quantitative data; simple linear regression; multiple linear regression.

### **Essential Reading**

Chapter 4, “Prediction”, in Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction*. Princeton University Press



## **Week 5 – Regression II (Model specification)**

Modelling non-linear relationships; Interaction terms; Statistics for model fit.

### **Essential Reading**

Chapter 4, “Prediction”, in Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction*. Princeton University Press

## **Week 6 – Regression III (Causality)**

Linear regression as a tool for analysing experiments; regression and confounding; regression-discontinuity-designs; difference-in-differences (again); heterogeneous treatment effects.

### **Essential Reading**

Chapter 4, “Prediction”, in Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction*. Princeton University Press

## **Week 7 – Panel Data**

Data with repeated observations of the same units over time; fixed-effect models.

### **Essential Reading**

Notes prepared by course instructors

Chapter 10, “Regression with Panel Data”, in Stock, James and Watson, Mark. 2015. *Introduction to Econometrics: Updated 3<sup>rd</sup> Edition*. Pearson

## **Week 8 – Probability Theory**

Conditional and joint probability; expectation and variance; the central limit theorem.

### **Essential Reading**

Chapter 6, “Probability”, in Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction*. Princeton University Press

## **Week 9 – Uncertainty**

Unbiasedness and consistency; standard errors; hypothesis tests; confidence intervals; uncertainty with regression models.

### **Essential Reading**

Chapter 7, “Uncertainty”, in Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction*. Princeton University Press

## **Week 10 – Summing Up**

Additional topics in measurement, causality, and generalised linear models. The material for week ten is non-examinable.