

# Introduction

## What is econometrics, and why study it?

Econometrics is the application of statistical methods to the quantification and critical assessment of hypothetical economic relationships using data. It is with the aid of econometrics that we discriminate between competing economic theories and put numerical clothing onto the successful ones. Econometric analysis may be motivated by a simple desire to improve our understanding of how the economy works, at either the microeconomic or macroeconomic level, but more often it is undertaken with a specific objective in mind. In the private sector, the financial benefits that accrue from a sophisticated understanding of relevant markets and an ability to predict change may be the driving factor. In the public sector, the impetus may come from an awareness that evidence-based policy initiatives are likely to have the greatest impact.

It is now generally recognized that nearly all professional economists, not just those actually working with data, should have a basic understanding of econometrics. There are two major benefits. One is that it facilitates communication between econometricians and users of their work. The other is the development of the ability to obtain a perspective on econometric work and to make a critical evaluation of it. Econometric work is more robust in some contexts than in others. Experience with the practice of econometrics and a knowledge of the potential problems that can arise are essential for developing an instinct for judging how much confidence should be placed on the findings of a particular study.

Such is the importance of econometrics that, in common with intermediate macroeconomics and microeconomics, an introductory course forms part of the core of any serious undergraduate degree in economics and is normally a prerequisite for admission to a master's level course in economics or finance.

## Aims of 20 Elements of Econometrics and Economic Statistics

The aim of 20 Elements of Econometrics and Economic Statistics is to give you an opportunity to develop an understanding of econometrics to a standard that will equip you to understand and evaluate most applied analysis of cross-sectional data and to be able to undertake such analysis yourself. The restriction to cross-sectional data (data raised at one moment in time, often through a survey of households, individuals, or enterprises) should be emphasized because the analysis of time series data (observations on a set of variables over a period of time) is much more complex. Chapters 11–13 of the text and this guide are devoted to the analysis of time series data, but the objectives are confined to giving you an understanding of the problems involved and making you aware of the need for a master's level course if you intend to work with such data.

## How to make use of the text

The only reading required for 20 Elements of Econometrics is my text *Introduction to Econometrics* (Oxford: Oxford University Press, third edition 2006, ISBN-13: 978-0-19-928096-4). The syllabus is the same as that for EC220 Introduction to Econometrics, the corresponding internal course at the London School of Economics. The text has been written to cover it with very little added and nothing subtracted.

When writing a text, there is a temptation to include a large amount of non-core material that may potentially be of use or interest to students. There is much to be said for this, since it allows the same text to be used to some extent for reference as well as a vehicle for a taught course. However, my text is stripped down to nearly the bare minimum for two reasons. First, the core material provides quite enough content for an introductory course and I think that students should initially concentrate on gaining a good understanding of it. Second, if the text is focused narrowly on the syllabus, students can read through it as a continuous narrative

with little need for guidance. Obviously, this is particularly important for those who are studying the subject on their own, as is the case for most of those enrolled on 20 Elements of Econometrics.

An examination syllabus is provided as an appendix to this guide, but its function is mostly to indicate the expected depth of understanding of each topic, rather than the selection of the topics themselves.

## How to make use of this guide

The function of this subject guide differs from that of other guides you may be using. Unlike those for other units, this subject guide acts as a supplementary resource, with the text as the main resource. Each chapter forms an extension to a corresponding chapter in the text with the same title. You **must** have a copy of the text to be able to study this unit. The text will give you the information you need to carry out the activities and achieve the learning outcomes in the subject guide.

The main purpose of the guide is to provide opportunities to gain experience with econometrics through practice with exercises. Each chapter of the guide falls into two parts. The first part begins with an overview of the corresponding chapter in the text. Then, in some of the chapters, comes a section headed 'Further material'. This consists of new topics that will be included in the next edition of the text. Finally, there is a checklist of learning outcomes anticipated as a result of studying the chapter in the text, doing the exercises in the guide, and making use of the corresponding resources on the website. The second part of each chapter consists of additional exercises, followed by answers to the starred exercises in the text and answers to the additional exercises.

You should organise your studies in the following way:

- First read this introductory chapter in the subject guide.
- Read the Overview section from the Review chapter of the subject guide.
- Read the Review chapter of the text and do the starred exercises.
- Refer to the subject guide for answers to the starred exercises in the text and for additional exercises.
- Check that you have covered all the items in the learning outcomes section in the subject guide.

You should repeat this process for each of the numbered chapters. Note that the subject guide chapters have the same titles as the chapters in the text. In those chapters where there is a further material section in the subject guide, this should be read after reading the chapter in the text.

## How to make use of the website

You should make full use of the resources available at the website, URL <http://econ.lse.ac.uk/courses/ec220/>. Here you will find PowerPoint slideshows that provide a graphical treatment of the topics covered in the text, data sets for practical work, statistical tables, and a downloadable copy of this guide.

### Slideshows

The lectures for the LSE internal course EC220 Introduction to Econometrics are given entirely in the form of PowerPoint slideshows. My function, as the lecturer, is to explain what is going on as we go through them. The slideshows on the website are identical, except that narrative boxes have been added to provide the explanations that I give in the lectures. Going through the website slideshows is thus just about a perfect substitute for attending lectures. This explains why I can use a 240-seat lecture theatre, despite the fact that about 350 students are enrolled on my course. Most students simply never show up. Most prefer to go through the slideshows at a time of their own choosing and at their own pace.

In principle you will be able to acquire mastery of the subject by studying the text with the support of this guide and doing the exercises conscientiously. However I strongly recommend that you do study all the slideshows as well. Some do not add much to the material in the text, and these you can skim through quickly. Some, however, provide a much more graphical treatment than is possible with print and they should improve

your understanding. Others present and discuss regression results and other hands-on material that could not be included in the text for lack of space, and they likewise should be helpful.

### Data sets

To use the data sets, you must have access to a proper statistics application with facilities for regression analysis, such as Stata or EViews. The student versions of such applications are adequate for doing all, or almost all, the exercises and of course are much cheaper than the professional ones. Product and pricing information can be obtained from the applications' websites, the URL usually being the name of the application sandwiched between 'www.' and '.com'. Incidentally, do not be tempted to try to get by with the regression engines built into some spreadsheet applications. They are not adequate for your needs.

If you do not have access to an application, you will not be able to undertake the hands-on practical exercises that are an important aid to the study of the subject. To be honest, it is not absolutely essential that you do these exercises, but most students find that they help enormously in mastering the material.

There are three major data sets on the website. The most important one, for the purposes of this guide, is the Consumer Expenditure Survey (CES) data set. If you have access to Stata, you should download the data set in this form. If you do not, but instead have access to EViews, download that version instead. Otherwise you should download the text version (comma-delimited ASCII) and import it into the application you are using. You should also download the manual for the data set, which is provided as a Word file. You will find the exercises in this manual reproduced as additional exercises in the chapters of this guide. In addition, if you are using Stata or EViews, you should download a further manual giving details of how to do the exercises using the application. Answers to all the exercises are provided in the relevant chapters of this guide.

The exercises for the CES data set cover Chapters 1–10 of the text. For Chapters 11–13, you should use the Demand Functions data set, another major data set, to do the additional exercises in the corresponding chapters of this guide. Again you should download the data set in appropriate format, together with the main manual describing the data set. For these exercises also answers are provided. You will find further exercises in the Demand Functions manual, but answers are not provided for them.

The third major data set on the website is the Educational Attainment and Earnings Function data set, which provides practical work for the first 10 chapters of the text and Chapter 14. It is also accompanied by manuals prescribing exercises and giving instructions for the use of Stata or EViews. No answers are provided, but many parallel examples will be found in the text.

### Prerequisite for studying this subject

The prerequisite for studying this subject is a solid background in mathematics and elementary statistical theory. The mathematics requirement is a basic understanding of multivariate differential calculus. With regard to statistics, you must have a clear understanding of what is meant by the sampling distribution of an estimator, and of the principles of statistical inference and hypothesis testing. This is absolutely essential. I find that most problems that students have with introductory econometrics are not econometric problems at all but problems with statistics, or rather, a lack of understanding of statistics. That is why students of this subject are required to study Mathematics I and Statistics I or Mathematics for Economists and Elements of Statistics before they can take this unit. There are no short cuts. If you do not have this background, you should put your study of econometrics on hold and study statistics first. Otherwise there will be core parts of the econometrics syllabus that you do not begin to understand.

In addition, it would be helpful if you have some knowledge of economics. However, although the examples and exercises relate to economics, most of them are so straightforward that a previous study of economics is not a requirement.