

Course Guide

Purpose

This is an introductory course for learning to use Gretl to carry out basic statistical and econometric studies. The main purpose of the course is for students to learn to use Gretl econometric software to analyse an economic problem from the descriptive and econometric viewpoints.

Competences

1. To locate, process and prepare the data for conducting a statistical and econometric analysis using Gretl.
2. To obtain the main statistical results from data using Gretl.
3. To interpret the results obtained in a descriptive analysis
4. To estimate regression models in line with the characteristics of variables using Gretl.
5. To interpret the results of an econometric analysis.
6. To validate results using the tools available in Gretl.
7. To summarise, organise and save results obtained using Gretl.

Pre-requisites

Basic knowledge of statistics (distributions & inferences) and mathematics (matrix algebra).

Contents (theoretical and practical)

1) **Gretl** (Gnu Regression, Econometrics and Time-series Library)

Learning objectives

- 1.1) What is Gretl?
- 1.2) Downloading and installing Gretl
- 1.3) Starting up
- 1.4) Gretl resources
- 1.5) Tasks T1.1 and T1.2

2) **What is Econometrics?**

Learning objectives

- 2.1) What is Econometrics about?
- 2.2) The Econometric Model

2.3) Steps in empirical economic analysis

2.4) Data: types and characteristics

2.5) Data sources

2.6) Task T2

3) Data management in Gretl

Learning objectives

3.1) Gretl data files

3.2) What is a Gretl session?

3.3) Modifying Gretl data files

3.4) Analysis of data: descriptive statistics

3.5) Graphics for data analysis in Gretl

3.6) Univariate analysis

3.7) Tasks T3.1, T3.2, T3.3, T3.4 and T3.5

4) The Multiple Regression Model. Specification

Learning objectives

3.1) Econometric approach to model specification

3.2) Graphic analysis and functional form

3.3) Qualitative explanatory variables

3.4) Multiple Regression Model. Specification and assumptions

3.5) Tasks T4.1 and T4.2

5) The Multiple Regression Model. Estimation

Learning objectives

4.1) The Ordinary Least Squares method (OLS)

4.2) Sample Regression Function (SRF)

4.3) Sampling properties of the OLS estimator

4.4) Goodness-of-fit of the model

4.5) The use of non-sample information

4.6) Specification problems: omission of relevant variables and inclusion of irrelevant variables

4.7) Estimation results using Gretl

4.8) Presentation of results

5.8) Tasks T5.1 and T5.2

5.9) Exercises E5.1, E5.2 and E5.3

6) The Multiple Regression Model. Inference

Learning objectives

- 5.1) What is inference?
- 5.2) Sampling distribution of the OLS estimators
- 5.3) Interval estimation
- 5.4) Hypothesis tests
- 5.5) Prediction
- 5.6) Task T6
- 5.7) Exercises E6.1, E6.2 and E6.3

7) Heteroskedasticity and Autocorrelation

Learning objectives

- 6.1) Multiple Regression Model assumptions
- 6.2) Heteroskedasticity: concept, consequences and detection
- 6.3) Autocorrelation: concept, consequences and detection
- 6.4) Inference using the OLS estimator
- 6.5) Task T7
- 6.6) Exercises E7.1, E7.2 and E7.3

Topics**Lesson 1. Gretl** (Gnu Regression, Econometrics and Time-series Library)

The Gretl open-source software program is presented, with its features and limitations. Instructions are given on how to install it, and the various resources available are discussed.

Lesson 2. What is Econometrics?

This topic gives a brief explanation of what econometrics is. The distinction between an economic model and an econometric model is explained, and the main characteristics of the latter are presented. The various stages of the preparation of an econometric model are described, focussing mainly on the early stages: data searching, collection, organisation and management.

Lesson 3. Data management in Gretl

This topic explains in detail how to generate and modify files in Gretl. It also looks briefly at how to carry out a statistical and graphic analysis of data. Basic points are covered to show how to gather information to provide a database and summarise it efficiently.

Lesson 4. The Multiple Regression Model. Specification

This topic introduces notions concerned with the specification of general linear regression models. Models including both quantitative and qualitative explanatory variables are specified based on the information from the data collected and using various graphic analyses.

Lesson 5. The Multiple Regression Model. Estimation

This topic provides the basis for estimating a general linear regression model in a framework limited by certain set basic hypotheses. The ordinary least squares estimator and its properties are obtained. The regression model is also estimated in line with out-of-sample information on coefficients. The usual results of estimations are presented and interpreted.

Lesson 6. The Multiple Regression Model. Inference

This topic begins by explaining the statistical points required to understand hypothesis testing. It then obtains the distributions of the various random terms in the general linear regression model and the tests statistics for linear constraints. Basic mechanisms for prediction by point and by interval of the dependent variable are presented.

Lesson 7. Heteroskedasticity and autocorrelation

In this topic the basic hypotheses for the population moments of the error term of the general linear regression model are relaxed. The consequences of this are analysed and some basic ideas are given on handling the drawbacks that arise at estimation and inference level.

Methods

The teaching method used is self-learning, based on four types of activity:

- Theoretical lessons. Notes are provided, designed to:
 - Show the structure and main commands of the Gretl econometric program.
 - List the main concepts of econometrics so that students can follow the course more easily. The notes provided are introductory, so students who wish to use this material not just for learning to use Gretl in econometric applications but actually as an introduction to econometrics should supplement them by studying at least some of the specialist books listed in the references.
- Guided examples.

- These are written as empirical examples that analyse economic problems of interest.
 - As they are solved, step-by-step instructions on Gretl are provided as necessary, with the help of screen-shots and the relevant outcomes.
 - The examples include the econometric interpretation of the results.
- Set tasks.
- Specific tasks are set for student to resolve.
 - These are accompanied by detailed solutions, with all the necessary Gretl instructions, the resulting outputs and the econometric interpretation of the results.
 - They can be used by students as tools for self-evaluation.
- Set exercises.
- Based on three different datasets, alternative specifications are given for the regression model and students are asked to answer a number of econometric questions using Gretl.
 - Solutions are provided, along with the answers to the questions asked.
 - They can be used by students as tools for self-evaluation.
- Self-assessment tests.
- A set of self-assessment tests is included so that students can monitor their own progress.
 - Students take the tests and their grades are awarded automatically.
 - They have the option to receive the corrected test with the correct results.

The idea is for students to work their way through the topics of the course as follows.
For each topic:

1. Take some time to grasp the theoretical knowledge contained in the technical notes provided, and supplement them via the recommended references.
2. Study the examples that show the practical use of Gretl and how to interpret the econometric results. It is advisable to try and replicate these examples. All the data files required for this are provided.
3. Do the tasks set and compare your results with the solutions provided. All the data files required for this are provided. In some cases these are files containing initial information, and in others they are files from previous tasks. For instance at the outset of Task T3.1 the text file HCBiscay.txt is provided. On completing the task you should have generated a file named cottages.gdt with certain specific characteristics. To ensure that it is always possible to work through Task T4.2.2. properly, a correct version of cottages.gdt is also provided.

4. Solve the exercises set and check your results against the solutions provided. Note that the exercises for the three topics involved (5, 6 & 7) are linked so that at the end you can obtain an overview of the empirical econometric analysis presented for each dataset.
5. Carry out the self-assessment tests.

Schedule

Contents	Duration
Lesson 1: Gretl	1 week
Lesson 2: What is Econometrics?	1 week
Lesson 3: Data management in Gretl	3 weeks
Lesson 4: The Multiple Regression model. Specification	3 weeks
Lesson 5: The Multiple Regression model. Estimation	3 weeks
Lesson 6 : The Multiple Regression model. Inference	2 weeks
Lesson 7: Heteroskedasticity and Autocorrelation	2 weeks

Other points

- Books related to the subject that have websites with access to data and material for study:

Russell, D. and MacKinnon, J. G. (2003). *Econometric Theory and Methods*,
<http://www.econ.queensu.ca/ETM/>

Greene, W. (2008). *Econometric Analysis*,
<http://pages.stern.nyu.edu/~wgreene/Text/econometricanalysis.htm>

Ramanathan, R. (2002). *Introductory Econometrics with Applications*,
<http://weber.ucsd.edu/~rramanat/embook5.htm>

Stock J. H. and Watson, M. W. (2007). *Introduction to Econometrics*,
http://wps.aw.com/aw_stockwatsn_economtrcs_1/

Wooldridge, J. M. (2003). *Introductory Econometrics. A Modern Approach*,
<http://www.swlearning.com/economics/wooldridge/wooldridge2e/wooldridge2e.html>

- Organisations

<http://www.eustat.es> EUSTAT (Basque Statistics Office)

<http://www.ine.es> INE (Spanish Statistics Office)

<http://www.bde.es> Bank of Spain

<http://ec.europa.eu/eurostat> EUROSTAT

<http://www.oecd.org> OECD

<http://www.imf.org> International Monetary Fund

<http://www.worldbank.org> World Bank

<http://www.bolsamadrid.es> Madrid Stock Exchange

➤ Data

http://www.nber.org/data_index.html

<http://www.estadief.minhac.es/>

<http://fisher.osu.edu/fin/osudown.htm>

<http://econ.queensu.ca/jae/>

<http://www.psidonline.isr.umich.edu/data/>

<http://www.census.gov/>

➤ Specialist journals

<http://www.revecap.com> *Revista de Economía Aplicada*

<http://www.revistaestudiosregionales.com> *Revista de Estudios Regionales*

<http://www.funep.es/invecon/sp/sie.asp> *Investigaciones Económicas*

<http://www1.euskadi.net/ekonomiaz> *Ekonomiaz*