

ECON0058 - Time Series Econometrics

Course Syllabus

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Office Hours: Tuesday 3-3:45 at office (229) or right after class in the lecture room

Course Description

The goal of this course is to provide students with an understanding and working knowledge of statistical techniques for the empirical analysis and forecasting of time series in macroeconomics and, to a lesser extent, finance. Although the focus of the course is primarily applied, I will also place some emphasis on the theoretical foundations of the techniques analyzed.

Recommended textbooks

The main drawback of this course is that there isn't an up-to-date textbook on time series that covers all the topics discussed in class. As a result, the lecture notes, the problem sets solutions and the past exams solutions (which are available on Moodle) are your first and best resource for preparing for the exam. I will post the slides before the lecture on Moodle and, after each lecture, I will post the pdf of the annotated slides.

Recommended, but not required books:

Theoretical: Hamilton, J.D. (1994): *Time Series Analysis*, Princeton University Press: highly technical and a bit out-of-date. Only useful to deepen understanding of some topics covered in class but generally too technical relative to the lectures.

Applied: Enders, W. (2003): *Applied Econometric Time Series*, Wiley (2nd ed.). Less technical and easier to understand than the Hamilton book. Can be used to support understanding of most (but not all) topics covered in class.

Problem sets

There will be 4 problem sets, consisting of theoretical and empirical exercises. You should work in groups of maximum 4 people and hand in **one problem set per group (with the names of all participants)** during your practice session (or by email to the TAs). The answers to the problem sets will be posted on Moodle after you hand them in.

Exam

The format of the exam will be similar to the previous year's exams. On Moodle you will find all exam solutions since 2008. These solutions have been written by the TAs over the years so I cannot guarantee that all answers are correct. If you have doubts about the accuracy of some answers, please talk to Javier or to me during office hours and we will do our best to incorporate the corrections. Not all past exams have the same degree of difficulty and the grade distribution varied over the years so you should not attempt to use these exams to make predictions about the type of questions and degree of difficulty of this year's exam.

Email policy

I encourage you to ask me questions in person during office hours, talk to the TAs or use the forum on Moodle. I will generally not reply to emails asking questions about the material.

Course outline

1. Introduction: time series data and examples of empirical questions
2. Regression with time series data
 - 2.1 Asymptotic theory under stationarity and ergodicity assumptions
 - 2.2 OLS estimation
 - 2.3 HAC estimators of standard errors
3. Univariate models
 - 3.1 Models of conditional mean
 - 3.1.1 ARMA models
 - 3.1.2 Estimation and testing of ARMA models
 - 3.2 Models of conditional variance
 - 3.2.1 ARCH/GARCH models
 - 3.2.2 Estimation and testing of ARCH/GARCH models
 - 3.3 Relaxing the assumption of stationarity
 - 3.3.1 Dealing with trends
 - 3.3.2 Tests for structural breaks in parameters
 - 3.3.3 Modelling time variation in parameters
 - 3.4 Model selection
4. Multivariate models
 - 4.1 Stationary data
 - 4.1.1 Vector Autoregressive (VAR) models
 - 4.1.2 Impulse-response analysis
 - 4.1.3 Bootstrap confidence intervals for impulse-responses
 - 4.1.4 Structural VAR models
 - 4.1.5 Granger causality
 - 4.2 Non-stationary data
 - 4.2.1 Unit root testing
 - 4.2.2 Spurious regressions
 - 4.2.3 Cointegration
5. Elements of forecasting
 - 5.1 Forecasting with models
 - 5.2 Forecast evaluation
6. (If time permits) State-space models, Kalman filter, factor models