

Introduction to Time Series Analysis

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COURSE WEBPAGE:

http://mayoral.iae-csic.org/timeseries2021/timeseries_2021.htm

1 Description

This course is an introduction to the theory and application of time series methods in econometrics. Its main objective is to develop the skills needed to do empirical research with time series data sets. Topics covered are univariate and multivariate time series that can be stationary or non-stationary. The course is designed for practitioners who will use time series data in their empirical analyses.

2 Course outline

1. Introduction: Stochastic process; Autocovariance and autocorrelation function; Covariance stationarity; the lag operator; Filters.

2. Models for univariate stationary processes: Wold theorem; ARMA models; Identification: Model Selection and Information criteria; Estimation and Diagnostic checking. Forecasting methodology. Regression with stationary variables;
3. Models for multivariate stationary processes: Vector Autoregressive models (VAR). Estimation. Impulse response functions. Granger Causality. (Time permitting) Forecasting.
4. Models for univariate non-stationary processes: Unit root and trend-stationary models. Unit root tests. ARIMA models. Estimation and inference. Small sample bias.
5. Models for multivariate non-stationary processes: Spurious regressions; Cointegration analysis.

3 Prerequisites

The course assumes familiarity with probability, statistics and econometrics. Good sources for reviewing this material are J. M. Wooldridge “Econometric analysis of cross section and panel data”, 2010 MIT Press, and J. H. Stock and M. Watson “Introduction to Econometrics” 2007, Boston: Pearson/Addison Wesley. Some notions of programming in Matlab will be useful.

4 References

The main reference for this course is:

Hamilton, J. *Time Series Analysis*. Princeton: Princeton University Press, 1994.

An excellent source with up-to-date material can be found in the lectures “What’s New in Econometrics-Time Series” delivered by James H. Stock and Mark W. Watson during the NBER Summer Institute 2008.

<https://www.nber.org/lecture/summer-institute-2008-methods-lectures-whats-new-econ>

Other useful references:

Brockwell., P. and R. Davis. *Time Series: Theory and Methods*. Second edition. New York: Springer-Verlag, 1991. (more advanced treatment)

Stock J. H. and M. W. Watson. *Introduction to Econometrics*. Second Edition. Pearson, Addison Wesley. (Chapters 14 and 15–Undergraduate level)

Hayashi, F. *Econometrics*. Princeton University Press, 2000. (Chapter 6).