

Time Series Analysis

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1. DESCRIPTION

This 20-hour course is an introduction to the theory and application of time series methods in econometrics. The course covers the basic theoretical foundations of time series analysis and also provides tools for empirical work with time series. Topics covered will include univariate stationary and non-stationary models, vector autoregressions and cointegration. The course is mainly designed for students who want to use time series data in empirical analysis.

2. PREREQUISITES

The course assumes familiarity with probability, statistics and introductory econometrics. A good source for reviewing this material is Stock, J. and M. Watson, *Introduction to Econometrics*, Addison- Wesley, 2003. Some notions of programming in Matlab will be useful but not essential.

3. COURSE OUTLINE

- (1) Introduction to time series.
Hamilton, Chapters 1 - 4. Stock and Watson, Chapters 12.1 - 12.5; 13.
- (2) Nonstationary processes and unit roots.
Hamilton, Chapter 15-17 Stock and Watson, Chapters 12.6-12.7, 14.3
- (3) Vector autoregressions (VARs).
Hamilton, Chapters 9, 10.1-10.3 and 11 Stock and Watson, Chapters 14.1 - 14.2
- (4) Unit roots in multiple time series. Cointegration and the error-correction model.
Hamilton, Chapter 18-20 Stock and Watson, Chapters 14.4
- (5) Autoregressive conditional heteroskedasticity.
Hamilton, Chapter 21 Stock and Watson, Chapters 14.5

4. GRADING

The final grades will be based on a course project (50%) and some problem sets (50%).

5. OFFICE HOURS

By appointment. Please email me at laura.mayoral@iae.csic.es

6. SOFTWARE

We will use Matlab, particularly to do simulations. For handling data, we will also use Eviews or Gretl. You could also use STATA. STATA is not a program designed to use time series data although in recent years new commands have been introduced so now it is actually possible to do so. However, there are a few advantages of MATLAB versus STATA when working with time series data. We'll talk about this in class.

7. READINGS

- *Main textbooks*

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

Stock, J. and M. Watson, *Introduction to Econometrics*, Addison- Wesley, 2003.

- *Other textbooks:*

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

Cochrane's time series notes (see the course webpage)

Hayashi, F. *Econometrics*. Princeton University Press, 2000.

Lütkepohl, H., *Introduction to Multiple Time Series Analysis*, New York: Springer-Verlag, 1993.

Wei, W. *Univariate and Multivariate methods*. Addison Wesley, 1990.

- *Readings*

Several applications of the time series techniques will be discussed in class and references to journal articles will be provided.

- *Further readings*

Finance

In these two books you can find references to the classic papers in empirical finance using time-series methods.

Cochrane, John (2001) *Asset Pricing*. Princeton University Press.

Campbell, John, Andrew Lo, and A. Craig MacKinlay (1997) *The Econometrics of Financial Markets*. Princeton University Press.

Marketing

A very useful summary of the papers using these methods is given by:

Dekimpe, Marnik and Dominique Hanssens (2000) Time-series Models in Marketing: Past, Present and Future, *International Journal of Marketing Research*.

Operations management Rajagopalan, S., Arvind Malhotra (2001) Have U.S. Manufacturing Inventories Really Decreased? An Empirical Study. *Manufacturing Service Operations Management*. Volume: 3. Winter 2001, Number: 1

Decision Sciences

Wai Kin Victor Chan, Charles J. Malmborg (2010) Monte Carlo simulation methods for dynamic line layout problems with nonlinear movement costs *European J. of Industrial Engineering* Vol. 4.