

Time Series Analysis

Instructor

- Arnaud Dufays (dufays@essec.edu)

Course Objectives

This course builds on your understanding of probability theory and regression analysis to consider time-series econometrics. Time-series data pose a number of problems over and above cross-section analysis: not only are there correlations between variables at a point in time, but there are also correlations over time. Furthermore, the data may not be stable but the data moments may instead vary over time. Hence, in this course we aim to analyze dynamic and multivariate interactions in stationary processes. We will first focus on univariate linear regressions because they require specific concepts such as stationarity to be properly handled in a time series context. We shall then build on the regression framework to introduce stationary univariate time-series processes then extend the analysis to non-stationary processes, multivariate processes and volatility models. With these statistical tools at your disposal, we shall consider how to model and forecast macroeconomic and financial systems in practice.

Readings

The course will cover multiple chapters from two econometrics books:

- Hayashi (2000), *Econometrics*, Princeton University Press.
- Hamilton (1994), *Time series analysis*. Princeton University Press

These textbooks are not mandatory. They will be helpful to deepen your understanding of the topics covered in class. In addition, slides and links to short videos will be available on the course website.

Course Content

- Linear regressions with cross-sectional data and time series (Hayashi – chapters 1 and 2)
- Moving average and Auto-regressive processes (Hamilton – chapters 3 to 5)
- Multivariate auto-regressive models (Hamilton – chapter 11)
- Univariate and multivariate volatility processes (Hamilton – chapter 21 and extra readings)
- Unit roots and Non-stationary processes (Hamilton – chapter 17)

Grading

- 35% - One homework to do in groups of up to 2. The assignment will be given after the fifth course (February, 9).
- 65% - Final exam given during the last session (March, 30).