

- Faculté des sciences économiques
- www.unine.ch/seco

Time series analysis

Characteristics

- 3 ECTS credits
- Compulsory course for master in statistics
- Spring Semester
- Course : 2 hours
- Evaluation : written exam 2 hours
- Prerequisite : Probability Theory, estimation and basic regression

Teaching team

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Objectives

To understand the basics of time series. Be able to set up a model, analyse the series, and judge the goodness of fit and the performances of the model in terms of prediction.

Time Series are observations of stochastic processes. The course starts with an example, showing how time series can be set up in practice. The link with difference equations is put forward. Then some theory of stochastic processes is given. The core of the course is the study of *ARMA* and *ARIMA* processes with the three steps of identification, estimation and prediction. The course ends with a glimpse on more general processes.

Contents

- 1 Introduction
- 2 Linear difference equations with constant coefficients
 - 2.1 Motivation
 - 2.2 Linear difference equations of order p
- 3 First steps in stochastic processes
 - 3.1 Stationary processes
 - 3.2 Properties of the autocorrelation function
 - 3.3 Backshift (lag) operator
- 4 ARMA process
 - 4.1 Moving average process $MA(q)$
 - 4.2 Autoregressive process $AR(p)$
 - 4.3 $ARMA(p; q)$ process
 - 4.4 Autocovariance generating function
- 5 Estimation, prediction and interpolation
 - 5.1 Estimation
 - 5.2 Prediction
 - 5.3 Interpolation
- 6 Model identification
 - 6.1 Setting up the model and goodness of fit tests
 - 6.2 Seasonal models
 - 6.3 ARIMA models
- 7 Times series regression and Garch models

- 7.1 Regression with autocorrelated errors
- 7.2 Arch and Garch models
- 7.3 Other time series models

Exercices

Textbooks

- Peter J. Brockwell and Richard A. Davis. Time Series Analysis: Theory and Methods. Springer (2nd ed.), 1991.
- W. Wei. Time series Analysis. Univariate and multivariate Methods. Addison-Wesley, 2006.