

# *Forecasting Methods*

## **Objectives:**

To present models that allow for the correlation between observations taken sequentially over time; to learn how these models can be used to forecast a future response.

## **Contents:**

### **1 Basic Statistical Concepts.**

- 1.1. Sampling and Sampling Distributions.
- 1.2. Parametric interval estimation.
- 1.3. Tests of hypotheses.

### **2. Linear regression.**

- 2.1. Introduction and the simple linear regression model.
- 2.2. Correlation
- 2.3. Least squares method.
- 2.4. Confidence interval estimation
- 2.5. Hypothesis testing.
- 2.6. Analysis of variance ANOVA.
- 2.7. Prediction.
- 2.8. Performing linear regression using Excel.

### **3. Introduction to Forecastng.**

- 3.1. Time series.
- 3.2. Stationary processes.
- 3.3. The autocovariance, autocorrelation and parcial autocorrelation functions.
- 3.4. Time series decomposition.
- 3.5. Forecasting methods.
- 3.6. Model selection criteria.

## 4. Decomposition models

- 4.1. Nonseasonal models.
  - 4.1.1. Moving average methods.
  - 4.1.2. Exponential smoothing methods.
- 4.2. Seasonal models.
  - 4.2.1. Moving average methods.
  - 4.2.2. Holt-Winters method.
- 4.3. Prediction intervals.
- 4.4. Use of Excel in the simulation of models.

## Methods:

The theory is introduced providing examples and an explanation of how Excel can be used in problems solving. Homework exercises are suggested and some are solved in class.

## Assessment:

The assessment is based on homeworks, a midterm test, and a final exam.

## References:

Pedrosa, Antonio Carvalho, and Silvio M. Gama, "Introdução Computacional à Probabilidade e Estatística", Porto Editora (2007).

Montgomery, Douglas C., Cheryl L. Jennings, and Murat Kulahci, "Introduction to Time Series Analysis and Forecasting", John Wiley & Sons (2008).

Montgomery, Johnson, "Forecasting and Time Series Analysis", McGraw-Hill (1976).

Wei, William W.S., "Time Series Analysis: Univariate and Multivariate", Addison - Wesley Publishing Company (1990).

## Notes:

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