Forecasting Methods and Applications

Applied Data Analysis School

Lecture 0

Introduction

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Forecasting Methods and Applications

Lecturer:

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Format:

Lectures and lab sessions
Applications

Plan of the course:

1. Introduction to Forecasting
2. Regression Analysis and Forecasting
3. Exponential Smoothing Methods
4. Univariate Time Series Models
5. Trend and Seasonality
6. Forecasting Volatility

Required background in statistics and econometrics:

- Basic calculus
- Probability theory
- Linear regression model: Ordinary least squares estimation (OLS)
- Linear regression model: Inference for linear hypotheses (t and F tests)

Software:

- R

Software: R

- Open source software
- Flexible and object-oriented programming environment
- Superior graphics and extensive methods for data analysis
- Webpage: http://www.R-project.org/
- Download from Comprehensive R Archive Network (CRAN): http://CRAN.R-project.org/
- Great graphical user interface: http://www.rstudio.org/

Software: R

- **Important:** There are many different statistics/econometrics software packages. Some caution is needed when comparing the results of computations. Differences can be due to differences in optimization routines, starting values, etc.
- R is a system for statistical computing with extension packages from CRAN.

Some CRAN packages used in this course:

- **AER** package for "Applied Econometrics with R" http://CRAN.R-project.org/package=AER
- **TSA** package for "Time Series Analysis" http://CRAN.R-project.org/package=TSA

Software: R

Some CRAN packages used in this course (contd.):

- **forecast** package for "Forecasting Functions for Time Series and Linear Models"
  http://CRAN.R-project.org/package=forecast
- **fma** package for data sets from "Forecasting: Methods and Applications" by Makridakis, Wheelwright & Hyndman (1998)
  http://CRAN.R-project.org/package=fma
- **fpp** package for data sets from "Forecasting: Principles and Practice" by Hyndman and Athanasopoulos (2012)
  http://CRAN.R-project.org/package=fpp
- **expsmooth** package for "Forecasting with Exponential Smoothing"
  http://CRAN.R-project.org/package=expsmooth
- **lmtest** package for "Testing Linear Regression Models"
  http://CRAN.R-project.org/package=lmtest

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Main textbooks:

- Brockwell, P. J. and Davis, R. A. (2002), Introduction to Time Series and Forecasting, 2nd edition, Springer-Verlag, New York.
- Diebold, F. X. (2007), Elements of Forecasting, 4th edition, South-Western College Publishing.
- Hyndman, R.J. and Athanasopoulos, G. (2021), Forecasting: principles and practice, 3rd edition, OTexts, Melbourne. Resources: (1) fpp3 R package, (2) GitHub.
- Montgomery, D. C., Jennings, C. L. and Kulahci, M. (2015), Introduction to Time Series Analysis and Forecasting, 2nd edition, Wiley.