STAT 443: Time Series and Forecasting

Course Outline

Contact Information

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Aim of the course

The course aims to provide learners with a toolkit for the understanding and application of a range of key methods in the field of time series. Fundamental ideas in both the time and frequency domain analysis of time series will be described.

Objectives

On completing the course, students should be able to demonstrate an understanding of the techniques and applications of well–known ideas in time series such as autocorrelation, stochastic models (including the ARIMA and GARCH families), popular forecasting methods and spectral analysis for univariate time series.

Teaching methods

In most lecture sessions, an in-class activity followed by peer discussion and canvas quiz questions will replace at least part of the lecture component. The in-class activities created for the course are useful tools to enhance student learning, and, as research shows, are far more effective than even the most polished traditional lectures on the same topics. Weekly labs are designed to provide students with additional insights into time series concepts introduced in class as well as to teach how to implement time series data analyses using open-source software `R`.

Prerequisites

One of MATH 302, MATH 318, STAT 302 and one of STAT 200, ECON 325.

Co-requisite: STAT 305

Textbook

C. Chatfield and H. Xing (2019): *The Analysis of Time Series: An Introduction with R (7th edition)*. Chapman & Hall/CRC.

Assessment

- Written assignments: 20% (4 $\times$ 5% each)
- On-line WeBWorK homework: 10%
- Labs: 5%
- In-class work (canvas quizzes based on in-class activities): 5%
- Mid-term: 20%
- Final exam: 40%

The usual university rules for extenuating circumstances and plagiarism apply.

Course topics

Chapter 1: Exploratory techniques in time series analysis

Chapter 2: Stochastic models for time series

Chapter 3: Estimation and model fitting for time series

Chapter 4: Prediction for time series

Chapter 5: An introduction to the frequency domain

Chapter 6: Inference in the frequency domain

Chapter 7: Models for changing variance: GARCH processes