

STAT 464/864 Time Series Analysis and Spectrum Estimation

Winter 2010

Instructor:

Devon Lin, Jeffery Hall 406, email: cdlin@mast.queensu.ca

Prerequisite:

STAT361 or permission of the instructor

Lecture:

Slot 14, Tuesday 11:30-12:20, Wednesday 1:30-2:20, Friday 12:30-1:20

Office Hours:

TBD or by appointment

Required Textbook:

Introduction to Time Series and Forecasting (Second Edition) *P.J.R. Brockwell and R.A. Davis* Springer, 2002.

Computing:

The course requires you to use the statistical software package, R.

Assignments:

There will be 4 homework assignments. These will be posted on the class web site; no paper copies will be handed out. Solutions to the assignments will be posted on the course web page.

Midterms:

TBD

Grading Scheme:

Assignments 30% Midterm 30% Final 40%

Course Website:

<http://www.mast.queensu.ca/~cdlin/teaching464.htm>

Tentative Outline:

Chapter 1. Introduction

- 1.1 Time series and its features
- 1.2 Objectives of time series analysis
- 1.3 Some simple time series models
- 1.4 Stationary models and the autocorrelation function
- 1.5 Estimation and elimination of trend and seasonal components
- 1.6 Testing the estimated noise sequence

Chapter 2. Stationary Process

- 2.1 Basic Property

- 2.2 Linear Process
- 2.3 Introduction to ARMA process
- 2.4 Properties of the sample mean and autocorrelation function
- 2.5 Forecasting stationary time series

Chapter 3. ARMA Models

- 3.1 ARMA(p,q) processes
- 3.2 The ACF and PACF of an ARMA(p,q) process
- 3.3 Forecasting ARMA processes

Chapter 4. Modeling and Forecasting with ARMA Processes

- 4.1 Preliminary estimation
- 4.2 Maximum likelihood estimation
- 4.3 Diagnostic checking
- 4.4 Forecasting

Chapter 5. Spectral Analysis

- 5.1 Spectral densities
- 5.2 The periodogram
- 5.3 Time-invariant linear filters
- 5.4 The spectral density of an ARMA process

Chapter 6. Further Topics

- 6.1 Nonstationary processes
- 6.2 Nonlinear models
- 6.3 Long-memory models

Academic Integrity:

Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility (see www.academicintegrity.org). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities <http://www.queensu.ca/secretariat/senate/policies/princpri/>)

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments conform to the principles of academic integrity. Information on academic

integrity is available in the Arts and Science Calendar (Regulation 1.), on the Arts and Science website (see http://www.queensu.ca/calendars/artsci/Regulation_1___Academic_Integrity.html), and from the instructor of this course.

Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.