

Carleton University

School of Mathematics and Statistics

STAT 4603-STAT5504 – Time Series and Forecasting/ Stochastic Processes and Time Series Analysis

All classes and Office hours will be live on zoom.

Course Outline

Course: STAT 4603-5504

Term: Fall 2021

Instructor: Dr. Mohamedou Ould-Haye

Office: 5239 Herzberg Laboratories (HP)

Office Hours: By appointment only.

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Important Dates

First day of classes: September 8

Last day of classes: December 10

Fall break. Oct. 25-29.

Course Description

Time series regression. Nonstationary and stationary time series models. Nonseasonal and seasonal time series models. ARIMA (Box-Jenkins) models. Smoothing methods. Parameter estimation, model identification, diagnostic checking. Forecasting techniques. Many real world data will be used.

A statistical software package will be used (mostly R).

- Introduction: Time Series Regression
- Nonseasonal and Seasonal Models
- Exploratory Data Analysis
- Smoothing in the Time Series context
- ARIMA Model Forecasting and Estimation
- Multiplicative Seasonal ARIMA Models
- Transfer Function Modelling
- Forecasting Techniques

Includes: Experiential Learning Activity.

Prerequisite(s): STAT 3553 or STAT 3503, or permission from the School

Reference Books

Required Text: Time series analysis and its applications, with R examples. 4th edition. By Robert H. Shumway and David S. Stoffer.

Other resources will also be used.

Grading

- 3 assignments. (Due Oct. 10, Nov 7, and Dec. 5). Each worth 10%.
- Midterm (2 hours, Time TBA): 20%.
- Project (written project due Dec. 8, 5-min. oral presentation: Dec. 9): 30%
- Final Exam (2 hours. Time will be determined by the University): 20%.

No late assignment/preject/presentation will be accepted. No makeup test will be given. If you miss a test or assignment and provide me with proper documentation, then its weight will be shifted to the final exam.

Below is a tentative timetable

Week	Section	Details
Week 1	1.1, 1.2, 1.3	Characteristics of Time Series, The Nature of Time Series Data, Time Series Statistical Models and Measures of Dependence
Week 2	1.4, 1.5	Stationary Time Series and Estimation of Correlation
Week 3	2.1, 2.2	Classical Regression in the Time Series Context and Exploratory Data Analysis
Week 4	2.3	Smoothing in the Time Series Context
Week 5	3.1, 3.2, 3.3	Autoregressive Moving Average Models, Difference Equations, Autocorrelation and Partial Autocorrelation
Week 6	3.4, 3.5	Forecasting and Estimation Techniques
Week 7	3.6, 3.7	Integrated Models for Nonstationary Data and Building ARIMA Models
Week 8	3.8, 3.9	Regression with Autocorrelated Errors (lag subordinated models) and Multiplicative Seasonal ARIMA Models
Week 9	4.1, 4.2, 4.3	Spectral Analysis and Filtering
Week 10	5.2	Additional Time Domain Topics and Unit Root Testing
Week 11	5.3	GARCH Models, Threshold models
Week 12	5.5	Transfer Function Modelling

Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy/religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details go to the link <https://carleton.ca/edc/teachingresources/administrative-pedagogy/academic-accommodations/>

Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca/pmc) for the deadline to request accommodations for the formally-scheduled exam (if applicable).

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