

STAT 715/ECO 723: Time Series Analysis (Spring 2024)

Professor

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Course description

This course aims to develop a working knowledge of time series analysis and forecasting methods. The emphasis is on modeling methodology (identification, estimation, diagnostics, and updating) and forecasting. Experience is gained in the statistical theory so as to be able to analyze time series data in practice.

Learning outcomes

By the end of this course, students should successfully be able to:

- Understand and use appropriate statistical tools to analyze time series data.
- Define the concepts of stationarity and autocovariance for time series processes.
- Understand the statistical properties of autoregressive moving average processes.
- Derive the equations underlying time series prediction and forecasting.
- Examine whether the assumptions underlying a time series analysis are reasonable.
- Recognize the strengths or weaknesses of various time series inferences.

Lectures

Wed 7.30-9.20pm, in Hunter West 113. Lectures may not be recorded.

Class attendance policy

You are expected to attend all lectures.

Textbook

Required: Brockwell and Davis, Introduction to Time Series and Forecasting (Third Edition), New York: Springer, 2016. Available for download from http://proxy.wexler.hunter.cuny.edu/login?url= https://link.springer.com/book/10.1007/978-3-319-29854-2. I will highlight other useful references as the course progresses.

Necessary software

This class requires you to use the statistical software packages called R (The R Project for Statistical Computing; https://www.r-project.org/) and RStudio (https://posit.co/). These software packages are available as Free Software with versions compatible with current Mac OS and Windows operating systems. More details will be given in lectures.

Grading policy

Attendance	Homework	Midterm	Final project
5%	35%	30%	30%

Grades will be recorded on the class website.

Attendance will be recorded and graded.

Homework will be due at the beginning of class on the day it is due (7.30pm). No late homework will be accepted. You are encouraged to work together on the homework, but do not copy any part of a homework. Each student must produce his/her own homework to be handed in. Feel free to ask me for help after you have tried the questions. All homework must be submitted online in a format specified in the homework instructions.

Midterm: The midterm will be held in class on Wed Apr 3. The midterm will be closed book/closed notes. There is no make-up exam. A basic calculator is allowed – tablets, laptops, cellphones, and other communication devices are not. The midterm covers the material up to and including Wed Mar 27. Further details will be given in advance of the exam.

Final project: You will be responsible for producing a project report on a statistical time series analysis. The report will be due by 7.30pm on Wed May 22 (during finals week). Further details, including a list of possible topics, will be given after the midterm.

Week	Date	Торіс
1	Wed Jan 31	Analyzing time series; Introduction to time series models and stationarity
2	Wed Feb 7	Introduction to time series models and stationarity;
		Estimating the mean, ACVF, and ACF; Q-Q plots
3	Wed Feb 14	Estimating the mean, ACVF, and ACF; Q-Q plots
		Handling trend and seasonality
4	Wed Feb 21	Handling trend and seasonality
5	Wed Feb 28	No lecture (Classes follow Monday schedule)
6	Wed Mar 6	Stationary and linear processes
7	Wed Mar 13	Stationary and linear processes
8	Wed Mar 20	Prediction and forecasting
9	Wed Mar 27	Defining ARMA processes
10	Wed Apr 3	Midterm
11	Wed Apr 10	Modeling ARMA processes
12	Wed Apr 17	Modeling case study
	Wed Apr 24	No lecture (Spring break)
13	Wed May 1	Linear regression with stationary time series errors
14	Wed May 8	Nonlinear time series models
15	Wed May 15	Some interesting topics in time series analysis

Tentative schedule

The final project report is due at 7.30pm, Wed May 22

Hunter College Policy on Academic Integrity

"Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures."

American Disability Act (ADA) Policy

"In compliance with the American Disability Act of 1990 and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical, and/or Learning) consult the Office of AccessABILITY, located in Room E1214B, to secure necessary academic accommodations. For further information and assistance, please call: 212-772-4857 or 212-650-3230."

Hunter College Policy on Sexual Misconduct

"In compliance with the CUNY Policy on Sexual Misconduct, Hunter College reaffirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-based harassment retaliation against students, employees, or visitors, as well as certain intimate relationships. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College.

a. Sexual Violence: Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, or contacting the College's Public Safety Office (212-772-4444).

b. All Other Forms of Sexual Misconduct: Students are also encouraged to contact the College's Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or 212-650-3262) or Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123.

CUNY Policy on Sexual Misconduct Link: https://www.cuny.edu/about/administration/offices/ legal-affairs/policies-resources/reporting-of-alleged-miscounduct/"

Syllabus Change Policy

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice. Official announcements will always be those made in class or on the class website.