Statistics 5550
Introductory Time Series Analysis

Spring 2016 Syllabus

Instructor Information
Dr. Christopher Hans
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Cockins Hall (CH) 327

Grader Information
Yuyang Zhang
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Instructor Office Hours
Mondays 12:30–1:30
Thursdays 2:00–2:55

Grader Office Hours
TBD

Course Meeting Information
Stat 5550 will meet on Mondays, Wednesdays and Fridays from 10:20–11:15 in Cockins Hall (CH) 240 according to the university's class meeting schedule (`http://registrar.osu.edu/staff/bigcal.asp`). Course materials will be made available on Carmen.

Course Description
Stat 5550 introduces the statistical methodology and models required to analyze time series data in practice. The course emphasizes both modeling methodology (model identification, estimation and diagnostics) and the practical implementation of time series modeling using the statistical software `R`. Familiarity with introductory mathematical statistics and probability (random variables and their distributions, covariance and correlation, maximum likelihood estimation, confidence intervals, hypothesis tests, regression modeling) at the level of the prerequisites listed below is assumed. Topics covered include:

1. Introduction to time series data

2. Time series models and stationary processes

3. Exploratory data analysis

4. Methods for estimating and eliminating trend and seasonality

5. Estimating mean, autocovariance, and autocorrelation functions

6. ARIMA models

7. Forecasting and estimation

8. Modeling nonstationary processes

Prerequisites
Stat 4202 and Stat 5302. Stat 5550 builds upon much of the material in these classes; in particular, students should be knowledgable about random variables and their distributions, expectation and variance of random variables, and covariance and correlation between random variables. Students should also be knowledgable about various methods for estimating parameters in statistical models (e.g., method of moments, maximum likelihood and least squares) and should be familiar with the concept of mean squared error. Students should also be able to perform a basic regression analysis, including model building, model checking using numerical and graphical summaries of model fit, and interpreting a fitted regression model. Stat 5550 will use these basic regression techniques in the analysis of time series data.

Text
The course text is *Time Series Analysis and Its Applications, With* R *Examples*, by Robert H. Shumway and David S. Stoffer, Springer. The book is available for free at `http://www.stat.pitt.edu/stoffer/tsa3/`. You will see that there are several versions/editions of the book that are available. For this class we will use the "EZ" (green) version of the text, which can be downloaded directly from `http://www.stat.pitt.edu/stoffer/tsa3/tsa3EZ.pdf`. The "blue" edition is the "full" version of the text and contains more technical details and more topics; feel free to download this edition as a supplement if you want, but all reading and homework will be assigned out of the green "EZ" version.

Computing
The class requires you to use the statistical software package R, which can be downloaded for free at `http://www.r-project.org`. Instructions for using R will be given in class. Many students prefer to use RStudio, an IDE designed for use with R. RStudio is available for free at `http://www.rstudio.com`.

Assignments
Graded homework assignments will be assigned regularly during the semester. The assignments are to be turned in during class on the dates they are due. Students are allowed to consult with each other on the homework, but each student must hand in his or her own work. DO NOT copy any part of another student's homework and DO NOT turn in solutions that you have taken from other sources.

Exams
There will be two in-class midterm exams (tentatively February 17th and March 23rd) and a final exam (Thursday, April 28th).

Project
There will be an end-of-semester project involving the analysis of time series data (details to be provided).

Evaluation

The final course grade will be based on:

>   Assignments..20%
>   Midterm Exams 35%
>   Project 15%
>   Final Exam 30%

Academic Misconduct
Please help maintain an academic environment of mutual respect and fair treatment. You are expected to produce original and independent work on the homework and exams. Although students may consult with each other on homework assignments, all students must submit their own work in their own words. It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term academic misconduct includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). Academic misconduct **will not be tolerated** and will be dealt with procedurally in accordance with university policy, which can be found at `http://oaa.osu.edu/coam.html`. The Code of Student Conduct is available at `http://studentaffairs.osu.edu/csc/`.

Addressing Issues of Differing Abilities
All students who feel they may need accommodations based on the impact of a disability should contact the instructor privately to discuss their specific needs. Students with documented disabilities must also contact the Office of Disability Services (ODS) in 150 Pomerene Hall (phone: 292-3307) to coordinate reasonable accommodations for the course. ODS forms must be given to the instructor as early in the quarter as possible.

Syllabus Version
12/18/15: Original