Statistics 5550
Introductory Time Series Analysis

Spring 2015 Syllabus

Instructor:	Dr. Christopher Hans		**When**:	MWF 10:20-11:15
Email:	hans@stat.osu.edu		**Where**:	CL 135
Office:	327 Cockins Hall		**Office Hours**:	Mondays 12:30-1:30
Website:	Carmen			Thursdays 12:30-1:30

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

9. Advanced models as time allows (e.g., nonlinear processes, models for volatility, state-space models, regression with time-series errors)

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, Third Edition. Two versions of the third edition of the book exist: a "full" version and an "EZ" version. The "EZ" version is a subset of the "full" version, with some of the more technical material left out. The "EZ" version will suffice for this class, and I will follow this version when assigning reading, homework, etc. Feel free to follow along with the "full" version if you want to see some of the more technical details and topics.

Electronic versions of both versions of the book are available for free. The full version is available through the OSU library (`library.osu.edu`). Alternatively, if you are connected to the internet through Ohio State's network you should be able to download pdf files of the book's chapters for free through Springer's web page. After navigating to the textbook's web page (`http://www.stat.pitt.edu/stoffer/tsa3/`), click on the link "Springer's Site for the Text" on the right hand side of the page. This should bring you to a page where you can download the individual chapters. The "EZ" version of the book is available for free (in pdf form) from the book's web page (`http://www.stat.pitt.edu/stoffer/tsa3/`).

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 23rd and April 3rd) and a final exam (Thursday, April 30th).

Project
There will be an end-of-semester project involving the analysis of time series data. Details will be provided during the semester.

Evaluation
The final course grade will be based on:

Assignments 25%
Midterm Exams 30%
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
1/14/15: Updated office hours
12/30/14: Original