STAT 4181-10: Applied Time Series Analysis  
SPRING 2014  
Lectures:  *Tue/Thu, 2:20 – 3:35, 2020 K, Room 23*

**Instructor:** Dr. Jonathan Stroud  
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**Office Hours:** Wednesdays 4:00 – 6:00 PM, or by appointment.

**Course Description** What is the difference between a fortune teller with a crystal ball and a forecaster with knowledge of time series techniques? Find out by learning the basic theory and application of time-series regression models, exponential smoothing, Box-Jenkins autoregressive integrated moving average (ARIMA) models, and forecasting for univariate time series.

The course will begin with a review of regression models, and will then cover Chapters 6 through 11 from the text. Some sections may be omitted within those Chapters and replaced by topics in Financial Time Series (e.g., ARCH and GARCH models). The material will be provided for topics covered outside of the text.

**Overview**  
**Part I:** Applied regression analysis (including simple linear regression, multiple linear regression, model building, residual analysis)

**Part II:** Time Series Regression, Decomposition Methods, Exponential Smoothing, non-seasonal Box-Jenkins Models and Identification. Estimation, diagnostic checking and forecasting, Box-Jenkins Seasonal Modeling. Advanced Box-Jenkins Modeling.

**Learning Outcomes:**
1. Build models for time series data incorporating trends, seasonality and autocorrelation.  
2. Identify and estimate Box-Jenkins ARIMA models.  
3. Generate predictions and prediction intervals using these models.  
4. Implement these models using the SAS statistical software package.

**Course Prerequisites:** Math 2233 (Multivariate calculus) and Stat 4157-4158 or 2118 (Regression). I also assume basic familiarity with SAS.

**Software:** We will be using the SAS statistical package. SAS is available in the university computer labs, or, with my signature, you can pick up a free copy from the Instructional Technology Lab in Gelman B05A. Also, students enrolled in the class will have access to SAS through the Cloud. I will provide more information on this.

**Course Website:** Blackboard.

**Grading Policy**

**Homeworks:** Homeworks will be assigned on a (nearly) weekly basis. They will include problems from the text and SAS programming assignments. Assignments will typically be given on Tuesday and due the following Tuesday at the start of class. The lowest homework score will be dropped.

**Quizzes:** There will be 5 or 6 in-class quizzes. The quizzes will be announced and will cover material from the previous chapter. The lowest quiz score will be dropped.

**Project:** Each student will do an application project on the analysis of time series data and make a class presentation. The project will be assigned around Week 10 or 11, and will be due in the final week of the semester.

**Midterm Exam:** There will be an in-class midterm exam, on **Thursday, February 27**.

**Final Exam:** There will be an in-class final exam during Finals Period, **May 5--May 13**.

**The final grade is computed as follows:**

- Homeworks (20%)
- Quizzes (20%)
- Project (20%)
- Midterm (20%)
- Final Exam (20%)

**Note:** In accord with university policy, the final exam will be given during the final exam week and not the last week of class.

**CLASS POLICIES**

1. **Late homework:** Usually not accepted unless appropriate explanations are given.
2. **Make-up exam/quiz:** Usually not allowed except with certified medical illness.
3. **Laptops:** Students are not allowed to use laptops or other electronic devices during lecture unless asked to.
4. **Incompletes:** A grade of INCOMPLETE will ONLY be given to a student who is passing the course and cannot complete the course due to illness or other (well documented) circumstances beyond his/her control.
5. **University Policy on Religious Holidays:** Students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance;
Faculty should extend to these students the courtesy of absence without penalty on such occasions, including permission to make up examinations;

**ACADEMIC INTEGRITY**
I personally support the GW Code of Academic Integrity. It states: “Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information.” For the remainder of the code, see: [http://www.gwu.edu/~ntegrity/code.html](http://www.gwu.edu/~ntegrity/code.html)

**SUPPORT FOR STUDENTS OUTSIDE THE CLASSROOM**

**DISABILITY SUPPORT SERVICES (DSS)**
Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: [http://gwired.gwu.edu/dss/](http://gwired.gwu.edu/dss/)

**UNIVERSITY COUNSELING CENTER (UCC)** **202-994-5300.**
The University Counseling Center (UCC) offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include:
* crisis and emergency mental health consultations
* confidential assessment, counseling services (individual and small group), and referrals
  [http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices](http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices)

**SECURITY**
In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

**Topics (tentative):**
Week 1 (Jan. 14,16): Introduction, Review for linear regression part I
Week 2 (Jan. 21,22): Review for linear regression part II
Week 3 (Jan. 28,30): Review for linear regression part III & Time Series Regression I
Week 4 (Feb. 4,6): Time Series Regression part II & Decomposition methods
Week 5 (Feb. 11,13): Smoothing techniques
Week 6 (Feb. 18,20): Nonseasonal Box-Jenkins Models I
Week 7 (Feb. 25,27): Nonseasonal Box-Jenkins Models II
Week 8 (Mar. 4,6): Nonseasonal Box-Jenkins Models III & Estimation, Diagnostics
Week 9 (Mar. 18,20): Forecasting for Box-Jenkins Models & summary of Chpt 9 and 10
Week 10 (Mar. 25,27): Box-Jenkins Seasonal Modeling I
Week 11 (Apr. 1,3): Box-Jenkins Seasonal Modeling II
Week 12 (Apr. 8,10): Advanced Box-Jenkins Modeling
Week 13 (Apr. 15,17): Selected Topics (e.g., ARCH/GARCH)
Week 14 (Apr. 22,24): Project presentations & Review for final