

Syllabus for ECO 391-021 Economic and Business Statistics Summer 2013 (6/6/13 – 8/1/13)

Instructor: Rob Hartley
Office location: 335AT Business and Economics Building
Office phone: 859-955-0190
Email: robertpaul.hartley@uky.edu

Prerequisite: STA 291 (Statistical Methods) or equivalent
Classroom: B&E 315
Lectures: MTWRF 11:20 am – 12:20 pm
Office Hours: TWR 12:20 – 1:20 pm
Course Website: <http://elearning.uky.edu> (Blackboard)

Textbook: Jaggia, Sanjiv and Alison Kelly. *Business Statistics: Communicating with Numbers*. McGraw-Hill Irwin, 2013.

Textbook Datasets:

http://highered.mcgraw-hill.com/sites/0073373664/student_view0/data_files.html

1 Teaching Philosophy

Our work matters. Each of you brings values, abilities, and creativity into this study of statistical analysis, and I enjoy my role in guiding you toward applying what we learn together in preparation for your future work. This course is carefully designed to engage you with the real-world outcomes and human stories associated with doing statistical work well. Further, the skills we will develop are foundational for a new fluency of communication in an increasingly data-driven world. If you care about public health, frontier technologies, international policies, economic inequality, or business strategy (and I do want to learn what it is you care most about), then the major changes and decisions you will see in your career will very likely be based on a deep understanding of statistics.

Everything we will do in this class is motivated by the singular goal preparing you to take ownership of your own path, including being successful in this class but also taking that momentum beyond into your career. I teach because I love to teach, so take advantage and ask questions, come prepared, and participate in discussions. You will work together with classmates quite a lot: it is a great way to learn, and it is great preparation for applying class knowledge to future employment opportunities. My goal is to make our class time together interactive and productive; we will do lots of examples. The coursework is designed to support you, give you chances to practice, and evaluate you in what the department and I think matter the most. Your critical thinking will be challenged in this course, we will keep a progressive pace, and yet you have every opportunity to earn a good grade. More importantly, I hope to pass along a bigger picture for the role of statistics in giving your work more clarity, integrity, and insight.

2 Course Goals

We will review some essential foundations in descriptive statistics, basic probability distributions, and hypothesis testing that will support and extend concepts learned in STA 291. The vast majority of the course, however, will focus on statistical techniques of regression analysis so that you are better equipped to understand and produce substantive data analysis. This course surveys such statistical techniques as estimation, hypothesis testing, correlation, modeling, analysis of variance, time series analysis, and forecasting, among various aspects of regression. Overall, you will develop a deeper intuition for modeling complex issues and solving quantitative problems through the application of statistical techniques.

3 Student Learning Outcomes

By the end of this course, students will have the opportunity to achieve the following ten student learning outcomes:

1. Students will learn the intuition behind statistical modeling and sample distributions, and additionally, real-world applications for both.
2. Students will be able to perform regression analysis, including: topic/question selection, model specification, data collection, descriptive statistics, regression evaluation, and both the written and oral presentation of results.
3. Students will be able to interpret regression coefficients in terms of statistical significance as well as comparing the expected sign and magnitude of coefficients with the observed regression results.
4. Students will be able to assess the data set and model, including making determinations of goodness-of-fit, omitted variable bias, or multicollinearity.
5. Students will be able to do analysis of variance (ANOVA) in order to distinguish within-sample and between-sample variation in ANOVA, and will also be able to compare and contrast ANOVA with regression analysis.
6. Students will be able to explain the sampling distribution of an estimator and the properties of unbiasedness, consistency, and efficiency.
7. Students will be able to intuitively explain and perform hypothesis testing using the p-value approach as well as the traditional rejection region approach.
8. Students will be able to distinguish between quantitative and qualitative variables and will be able to construct and use both intercept and slope dummy variables.
9. Students will be able to explain the effect of multicollinearity on regression results, and will be able to compare variables using a correlation matrix, choose proper independent variables, and explain why pair wise correlations do not capture all multicollinearity.
10. Students will be able to understand and explain basic time series models and how to use them in forecasting.

4 Tentative Course Outline

I: Why Regression Analysis?

Freedman, David, Robert Pisani, and Roger Purves. “Chapter 1: Controlled Experiments” and “Chapter 2: Observational Studies, in *Statistics*. New York: W.W. Norton & Company, pp. 3-12 and 21-22.

II: Basic Statistical Ideas

1. Ch. 6: Continuous Probability and Distributions, Sections 6.1 – 6.3, pp.172-192
2. Ch. 7: Sampling and Sampling Distributions, Sections 7.1 & 7.2, pp. 206-218
3. Ch. 8: Estimation and Confidence Intervals, Sections 8.1 – 8.3, pp. 240-255
4. Ch. 9: Hypothesis Testing, Sections 9.1 – 9.3, pp. 270-291

III: Regression Analysis

1. Ch. 14: Regression Analysis
2. Ch. 15: Inference with Regression Models
3. Ch. 17: Regression Models with Dummy Variables (selected sections)
4. Ch. 16: Regression Models with Nonlinear Relationships (selected sections)

IV: Analysis of Variance (ANOVA)

1. Ch. 13: Analysis of Variance (selected sections)

V: Time Series, Forecasting, and Index Numbers

1. Ch. 18: Time Series and Forecasting (selected sections)

VI: Special Topics: Presentations of your own research questions & analysis

5 Expectations for Assignments & Exams (Grading)

Your grade in this course will be based on your performance on three exams (65%), practice problems and participation (5%), and a group regression project (30%). Final percentages will be rounded to the nearest percent, and final grades will be assigned based on the standard scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
E	<60%

Exams

Exams will be given in class and will reflect material covered in lectures, homework assignments, or assigned readings. Expect to be tested over quantitative problems as well as short answer and/or essay questions concerning your intuitive understanding of the material. On exam day, please bring a pen/pencil and a simple calculator (no mobile phones). The final exam will be two hours long assuming no scheduling conflicts. The exams collectively sum up to 65% of your total grade, and each exam's individual percentage of the total grade is shown in parentheses below (Note: exam dates are tentative).

Exam I: Review (10%), Friday, June 14

Exam II: Midterm (25%), Wednesday, July 3

Exam III: Final (30%), Thursday, August 1

Practice Problems & Participation

A small portion of your grade (5%) will come from practice problems and participation. The intention for the practice problems is to give you an extra opportunity to know the material well and get instant feedback on how you are doing. Practice problems will be due once per week, probably on Wednesday, and will be graded based on effort. The problems assigned will be from the book, and only questions for which the answers are in the back of the book. You will still need to show your work to receive credit. You may discuss problems with others as long as everyone turns in her or his own work (please do not turn in identical work). We may discuss these problems in class, especially when students have questions.

Group Regression Project

The purpose of this project is to give you first-hand experience conducting independent research and regression analysis. There are a couple of important reasons for assigning this specifically as a group project. One, working together will help facilitate deeper learning, especially when all contribute: stronger members gain the benefit of explaining concepts and learning the material better, and weaker students have an opportunity to lean on peer help for difficult concepts. And two, this group assignment is great job-market practice working in a team environment where you must learn to collaborate and communicate effectively.

- **Assignment to Groups:** I will assign groups after our first exam, and each group will have an assigned group leader (only if the assigned student is willing to lead) who will coordinate the group's activity. Please let me know before Exam I if you have any strong personal conflict that may preclude you from working with someone in class.
- **Project Grading:** Though the project represents 30% of your total grade, the project itself will be divided into 5 parts (described in more detail below), which will sum to 100 points total. However, the final grade for the project will be a simple average of the group's grade and your individual-contribution grade determined by peer evaluation from your group's members. Peer evaluations will be based on criteria to be detailed on the first day of group formation. **Note:** If your individual-contribution grade is below 80%, then your project grade will become **only** your individual-contribution grade, not the average. For example, if your group's grade is 90% and your individual-contribution grade is 70%, then your grade will be 70%, not $[(90\% + 70\%)/2] = 80\%$.
- **Project Timing:** Starting Friday, June 21, there will be a project component due every Friday with the only exception of July 5. You can expect that the project will become a part of our regular discussions each week, and it is intentionally the focus of this course. Groups will be formed on Monday, June 17, and I will give out more information about the project at that time. At the middle of the semester, I am going to replace one class meeting with mandatory office hours so that each group can spend one hour meeting with me to discuss the group's topic and ensure everyone is ready to move forward completing the project in the second half of the semester. Therefore, class will not meet on July 5, but the mandatory office hours will be scheduled that following week, preferably as early in the week as possible.

Project Components and Dates

Note: Detailed descriptions and requirements will be provided when the groups are formed on Monday, June 17.

1. Project Proposal (15 points), Friday, June 21
2. Summary Statistics (15 points), Friday, June 28
3. Model Specification (20 points), Friday, July 12
4. Regression Results (35 points), Friday, July 19
5. Revisions & Class Presentations (15 points), Friday, July 26

6 Logistical Details

- **Active Participation:** Plan to participate in class and join the discussion. There will be lots of opportunities to talk and interact. Your participation also includes taking responsibility for the content in lectures. There is no formal attendance policy, but your attendance will make a world of difference in your understanding, and certain group project activities may take place during regular class time.
- **Classroom Courtesy:** Arrive early to class and plan to leave once dismissed. If there is a reason you cannot, please communicate this to me in advance. Please avoid private conversations during class, if you have questions, share them aloud since others may also benefit, and then others will at least not be distracted. Also, there is no need for electronic devices or laptops unless the instructor has specified otherwise.
- **Official Communication:** All emails from me will be sent through Blackboard. This includes all announcements, corrections, notes for class and any other pertinent information relating to this course. By default, this will send the email to your UK email address. If you do not check this regularly, have it forwarded to the email address that you use or change your email address on Blackboard. “Not getting” an email because you don’t check your UK account is not a valid excuse for missing assignments, exams, or any other coursework.
- **Excused Absences:** Makeup exams or assignments are only permitted for excused absences, or if the student has obtained my prior approval (otherwise, the student will receive a zero grade). The University defines the following as excused absences: illness of the student or serious illness of a member of the student’s immediate family; death of a member of the student’s immediate family; University sponsored trips; or, major religious holidays. In each foreseen case, prior written verification will be required, and written permission to miss an exam or due date must be secured before the scheduled date. If you miss an exam for an unforeseen reason, you should contact me as soon as possible.
- **Grievance Procedure:** If you believe that a grading error has been made, please bring it to my attention promptly after the material has been returned to you. Anyone feeling that a dispute exists after the grading of course material may submit a written grievance attached to the entire graded material, and identify the item in dispute along with arguments supporting the student’s position. Grievances must be submitted within two class periods following the return of the graded material in question.
- **Cheating:** Cheating is not tolerated at The University of Kentucky. The full penalty of any cheating offense will be determined in consultation with the Chairperson of the Department of Economics. The minimum penalty is an “E” for the course.
- **Accommodations:** If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. To receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (jkarnes@email.uky.edu, or 257-2754).