Statistics for Economists

Fall Term 2014

Instructor
Kory Kantenga
453 McNeil Building
Office Hours: W 15.00-17.00
econstats103@gmail.com

Course
LPS ECON-103-601
Time: W 17.00-20.00
Location: TBA
https://github.com/korykantenga/EconStats

Description
"The course focuses on elementary probability and inferential statistical techniques. The course begins with a survey of basic descriptive statistics and data sources and then covers elementary probability theory, sampling, estimation, hypothesis testing, correlation and regression. The course focuses on practical issues involved in the substantive interpretation of economic data using the techniques of statistical inference. For this reason, empirical case studies that apply the techniques to real-life data are stressed and discussed throughout the course and students are required to perform several statistical analyses of their own."

Prerequisite
Multivariate Calculus (Math 104 followed by 114 or 115) including summations, differentiation, partial differentiation, solving unconstrained optimization problems, integration and comfort with algebra.

Recommended Readings
I will not assign any textbook readings, however this course loosely follow *John E. Freund's Mathematical Statistics with Applications* by Miller and Miller (any edition will do). This text is available in the bookstore. I highly recommend *Statistics and Econometrics: Methods and Applications* by Ashenfelter, Levine and Zimmerman (2003). This text provides the most mathematically and conceptually accessible introduction to statistics and econometrics that I know. It is now out of print, but you may be able to find a used copy online. I will post my own notes on the course website above.

Required Software
This course will require use of a software package with statistical capabilities. You will use R with R Studio, because it is downloadable, open source, free and Professor DiTraglia has useful tutorials available http://www.ditraglia.com/econ103/. Learning R will teach you how to code from basics. You will be required to submit your accompanying code, and I will provide to an introduction to the software mentioned and supplementary material. However, it is your responsibility to read and learn how to perform the required analysis.

Course Policies
This course adheres to the Economics Department's undergraduate policies. Please see http://economics.sas.upenn.edu/undergraduate-program/course-information/guidelines/policies for full details. The particulars for this course are as follows:

- Academic Integrity: Any student found in violation of academic integrity will receive no credit for the assessment in question. It will enter as a '0' in the gradebook.
- Exam Attendance: Attendance is mandatory for all exams. A missed exam will enter as a '0' in the gradebook. Valid exceptions can be found on the department website.
- Course Absence Reporting: This is your responsibility so please read it on the Department site.
- Dropping, Withdrawal and Incompletes: Please read http://www.sas.upenn.edu/lps/about/academic-calendar as you will require my signature.

Attendance
Attendance will enter your mark through participation. Being physically present but disengaged will earn you credit just as well as being physically absent.

Assessment and Marks
The mark for this course will be allocated as follows:
Final Grade = 10% Participation & HW + 15% Quizzes + 15% Project + 30% Midterm + 30% Final

- *Participation & HW:* Based on attendance, contributions in class and submission of posted exercises. A sufficient class contribution for full credit is posing and/or answering a relevant question twice a month. Homework is simply the posted exercises on the course site. Due dates TBA.
- *Quizzes:* Quizzes are *unannounced* and constitute a short ($<$ 30 minutes) in class test based on suggested exercises from *previous material*. You should not expect quizzes to be weekly or biweekly or any particular pattern. I will administer them when I am unsure about the level of understanding in the class, think you need practice or to make clear what you will be expected to know for an exam. It may be one long question, a few short questions or several True/False. It will depend on the topic. It is a diagnostic tool and small part of your grade to incentivise you to do some practice questions and think about the concepts outside of class.
- *Project:* In mid to late October, I will assign a project that will require the use of a statistical software package. For the project, you will take some data and analyse it using tools we learn in class. I will add questions as we cover new topics. It will be due on the last day of class. Details to follow.
- *Midterm:* There will be an in class midterm on **Oct 1 (17.00-19.00)** with no make up exam and an abbreviated lecture afterwards. The notes and practice questions on the website will be helpful in preparation.
- *Final:* TBA. The final will be cumulative but heavily favoured towards post-midterm material. I will adhere to the Department's guidelines.

Due to the Jewish holidays, no quiz will be given **after 18.00** on the following days: **Sep 24** and **Oct 8**. Attendance until sunset is encouraged. No marked quiz will be given on **Oct 15**.

Regrade Requests
Regrade request must be typed and submitted in writing following the Department's guidelines *within one week* of receiving your mark. You must state the exact reason for a regrade either due to a miscalculation adding the points or an alternative but valid solution. "I think I deserve more points for this answer" is not an acceptable request and will not be considered. Using a regrade to obtain more partial credit will be frowned upon, and I will not accept late regrade requests.

Additional Notes
Any administrative issues should be addressed via e-mail (`econstats103@gmail.com`) or office hours. During or after class is not an appropriate time. The syllabus is a live document that I will update and upload onto the course site as we go along. I will post notes and exercises on the course repository site, so you may consider creating a github account and forking the course repository (`https://github.com`).

Course Topics

Week 1: Syllabus, Math Revision, Counting and Combinatorics
Summation Notation, The Fundamental Counting Principle, Binomial Coefficients, Combinations, Permutations

Week 2: Descriptive Statistics
Data types, Measures of Centrality and Dispersion, Other descriptive statistics

Week 3: Probability Theory
Definitions, Rules, Conditional Probability, Independence, Bayes' Rule, Applications

Week 4: Probability Distributions
Distributions, Discrete and Continuous Random Variables, Probability Mass and Density Functions

Week 5: Mathematical Expectations
Expected Value of a Random Variable, Functions of Random Variables, Special Distributions

Week 6: Midterm and Introduction to Statistical Software

Week 7: Multivariate Distributions
Joint, Marginal and Conditional Distributions

Week 8: Sampling and Sampling Distributions

Week 9: Point Estimation

Week 10: Interval Estimation and an Introduction to Hypothesis Testing

Week 11: Hypothesis Testing

Week 12: Univariate Linear Regression

Week 13: Inference in Simple Linear Regression

Week 14: Multivariate Regression, Dummy Variables and Testing Linear Restrictions

Week 15: Revision or Options

Options:
(1) Model Selection
(2) Dummy Dependent Variable Regressions (Logit/Probit)
(3) Violations of Classical Linear Regression Assumptions
(4) Introduction to Bayesian Statistics and Econometrics