Statistics for Economists

Economics 103

Fall 2013

Instructor: Francis DiTraglia
Office: 535 McNeil Building
Office Hours: W 10am-noon

Time and Location: MW 2–3:30pm, COHN G17

Course Website (Canvas): `https://upenn.instructure.com`
Course Email: `econ103@ditraglia.com`

Recitation Instructors:

Chunzan Wu Office: 552 McNeil Building Office Hours: T 10:30am–12:30pm	Section 201: F 9–10am, MCNB 169 Section 202: R 10–11am, WILL 321
Garth Baughman Office: 421 McNeil Building Office Hours: T 1:30–3:30pm	Section 203: F 10–11am, MCNB 169 Section 204: R 12–1pm, MCNB 167-8

Course Description: This course will teach you how to learn from data and understand uncertainty using the ideas of probability theory and statistics. After completing this course you will be able to carry out simple statistical analyses of your own using the computer package R.

Prerequisites: The prerequisite for this course is multivariate calculus (Math 104 followed by 114 or 115). To do well in this course you will need to be comfortable with algebra, manipulating sums, differentiation and partial differentiation, solving unconstrained optimization problems, and integration. To help you gauge your level of mathematical preparation, the RIs will administer a math diagnostic quiz in the first recitation. This will not count towards your grade.

Required Text: The required textbook for this course is *Introductory Statistics for Business and Economics*, 4^{th} Edition by Thomas H. and Ronald J. Wonnacott (WW4). To avoid being fleeced by the Penn bookstore, I suggest you order a used copy from Amazon. I strongly recommend that you do the assigned readings from this text, but my lecture slides are the final authority on course material. These will be posted online after each lecture. You are *not* responsible for material in the textbook *unless* it is also covered in lecture, but you *are* responsible for material from lecture even if it is *not* covered in the textbook.

Required Technology: We will be using the ResponseCard NXT "clicker" for experiments and class participation exercises that make up 5% of your course grade. As such, it is important that you bring your clicker to each lecture. I fully understand, however, that things can go wrong: your clicker might stop working or you might forget to bring it after pulling an all-nighter. For this reason you will *automatically* be excused from clicker participation for four lectures: there is no need to inform us in advance or after the fact. There will, however, be no further exceptions. I will begin keeping track of clicker participation in our second lecture. For more details, see "Participation" below. Because clickers will determine a portion of your grade, their use is subject to the code of academic integrity, as explained below under "Academic Integrity."

Required Software: We will use the statistical package R via a front-end called RStudio throughout the course. Both programs are free and open source. See the last page of this document for instructions on how to configure your computer to run R and RStudio. Both programs are also available in the Undergraduate Data Analysis Lab (UDAL) in McNeil rooms 104 and 108–9. You will be taught to use R primarily through a series of tutorials that I will assign as homework. (See "Homework" below.) Additional R resources are listed at the end of this document.

Recommended Texts: I recommend two supplementary texts for students who feel they may need extra help with the course material. The first is the *Student Workbook to accompany Introductory Statistics for Business and Economics 4th Edition*. Used copies are available on Amazon. The workbook contains full solutions to all odd-numbered problems from the textbook, while the text itself provides answers but no explanations. The workbook also contains extra practice problems with solutions. The second recommended text is *The R Student Companion* by Brian Dennis. This text is intended for those students who are having trouble learning R and prefer a physical book to the free online resources listed at the end of this document.

Lecture Recordings: Audio and screen captures of all lectures will be automatically recorded and posted on Canvas. This is a great way to get caught up if you miss a lecture.

Departmental Course Policies: All Economics Department course policies are in force in Econ 103 even if not explicitly listed on this syllabus. See: `http://economics.sas.upenn.edu/undergraduate-program/course-information/guidelines/policies` for full details.

Academic Integrity: All suspected violations of the code of academic integrity as set forth in the Pennbook will be reported to the Office of Student Conduct. Confirmed violations will result in failure for the course. Because it will be used to determine your class participation grade, operating a clicker on behalf of another student is cheating. If you are discovered using a clicker other than your own or have votes in a class that you did not attend, you will face the penalties described above. We will check identification cards at exams so please be sure to bring yours.

Piazza: We will be using an online discussion forum called Piazza for this course, which you can access directly from Canvas. Piazza is where we will make all course announcements, assign homework and readings, post homework assignments, lecture slides, exam practice problems, and solutions throughout the semester. Piazza is also the best place to ask any question you have about course material or logistics. By asking your question and getting an answer on Piazza, you create a positive externality: other students benefit from your questions and you benefit from theirs. The instructor and RIs will actively moderate Piazza both to answer questions and approve (or correct) answers written by your fellow-students. As an incentive, I will award "free points" worth 5% of your grade for making active use of the forum. (See "Participation.")

Attendance: Regularly attending lectures is the only way to earn clicker participation points. As described above under "Required Technology" you will *automatically* be excused from clicker participation for four lectures, but there will be no further exemptions of any kind. Similarly, regularly attending recitations is the only way to avoid a string of zeros on the quizzes (see "Quizzes" below). I will drop your two lowest quiz grades, including absences.

Email Policy: Email is for personal issues only. Questions about course material or logistics should be reserved for Piazza, lectures, recitations, and office hours. When contacting the instructor or your RI please use the course email address `econ103@ditraglia.com` rather than our personal addresses to ensure that you receive a response.

Assignments and Grading

$$\text{Final Grade} = (5\% \times \text{Clicker Participation}) + (5\% \times \text{Piazza Participation}) + (20\% \times \text{Quizzes}) + (20\% \times \text{Midterm 1}) + (20\% \times \text{Midterm 2}) + (30\% \times \text{Final})$$

If necessary, I will curve final course grades so they fall within Departmental guidelines: 20-30% in the A-range, 40-50% within the B-range, and the bulk of the remaining 20-40% in the C-range. Individual assignments will not be curved. As I will *only* curve in your favor, the most stringent possible grade boundaries are:

A+	= 98-100	B+	= 87-89	C+	= 77-79	D+	= 67-69
A	= 93–97	B	= 83-86	C	= 73-76	D	= 60-66
A-	= 90–92	B-	= 80-82	C-	= 70-72		

Clicker Participation: Each lecture will feature activities in which you can earn participation credit by voting with your clicker. When calculating this portion of your grade, I will *automatically* excuse you from four lectures. This includes absences *and* days when you forget to bring your clicker or it is not working properly. There will be no further exceptions. If you attend at least 20 of the remaining 24 lectures this semester and participate actively, you will receive 100% for clicker participation. Otherwise I will deduct points proportionally.

Piazza Participation: You will earn further participation credit based on the frequency and quality of your contributions to the Piazza discussion board. Contributions include questions, answers, and follow-ups. If you participate actively, you will receive 100% for this portion of the course: these are essentially "free points." You must contribute to earn points, but spamming the boards with clearly unhelpful contributions will not gain you credit.

Homework: Except for days when we have a midterm, I will post a homework assignment each Monday of the semester along with solutions to any problems not answered in the back of the text. Some assignments will include an R component in which case "solutions" will consist of sample code. Homework will neither be collected nor graded but is *extremely important*. Quizzes and exams are designed to assess your understanding of the homework, including R material.

Quizzes: Your RIs will administer 7 short quizzes in recitation over the course of the semester. (See the semester calendar below.) Each quiz will be based mainly on the *current* week's lectures and the *preceding* week's homework. When calculating your overall quiz grade for the course, I will drop your two lowest scores and weight the remaining quizzes evenly. Quizzes will not be returned nor will answers be posted. RIs will go over them in recitation.

Exams: There will be two in-class midterm exams, September 30$^{\text{th}}$ and November 11$^{\text{th}}$, and a final on December 19$^{\text{th}}$. Each midterm is worth 20% and the final is worth 30% of your grade. All exams are comprehensive but will focus on material not covered on previous exams. If you miss a midterm, I will automatically change the weight of your final from 30% to 50% to account for this: there will be no make-up midterms. Requests for an exam regrade must be made in writing within one week of the date when the exam in question was handed back in class. When making your request, please note that the entire exam will be regraded. If you desire a re-grade you may not discuss your answers with an RI or the instructor before submitting your request but are welcome to do so after receiving the regrade. In accordance with Departmental policy, all exams will be photocopied before being returned. You may write in pencil or pen. Scientific calculators are permitted on exams but graphing calculators are not. We will be checking identification cards at each exam, so please bring yours.

Monday	Wednesday
Aug 26th **Summer Vacation – No Class**	28th **1** Introduction Recitation: Math Review
Sep 2nd **Labor Day – No Class**	4th **2** Descriptive Stats. & Graphics I Recitation: R Clinic
9th **3** Descriptive Stats. & Graphics II	11th **4** Regression I *Quiz #1*
16th **5** Basic Probability I	18th **Instructor in Amsterdam – No Class** *Quiz #2*
23rd **6** Basic Probability II	25th **7** Basic Probability III Recitation: Midterm Review
30th **Midterm I** – Material through Sep. 25th	Oct 2nd **8** Discrete RVs I Recitation: R Clinic
7th **9** Discrete RVs II	9th **10** Discrete RVs III, Continuous RVs I *Fall Break: No Recitations This Week*
14th **11** Continuous RVs II	16th **12** Continuous RVs III *Quiz #3*
21st **13** Sampling Dists. & Estimation I	23rd **14** Sampling Dists. & Estimation II *Quiz #4*
28th **15** Confidence Intervals I	30th **16** Confidence Intervals II *Quiz #5*
Nov 4th **17** Confidence Intervals III	6th **18** Confidence Intervals IV Recitation: Midterm Review
11th **Midterm II** – Material through Nov. 6th	13th **19** Hypothesis Testing I Recitation: R Clinic
18th **20** Hypothesis Testing II	20th **21** Hypothesis Testing III *Quiz #6*
25th **22** Hypothesis Testing IV	27th **Go to Thursday Classes Today** *No Recitations This Week*
Dec 2nd **23** Regression II	4th **24** Regression III *Quiz #7*
9th **25** Final Review Session (Attendance Optional)	11th **Reading Day – No Class**

Installing R and RStudio

First, download and install R from `http://cran.r-project.org/`. Second, download and install RStudio by visiting `http://rstudio.org/download/desktop` and clicking the link listed under "Recommended for Your System."

Additional R Resources

While not required, these references may be useful if you need some extra help learning R, or want to go beyond the material covered in the course.

- Contributed Documentation – Comprehensive R Archive Network (CRAN)
  `http://cran.r-project.org/other-docs.html`

  Comprehensive list of freely available reference material for R.

- R Twotorials – Anthony Damico
  `http://www.twotorials.com/`

  Ninety energetic, two-minute video tutorials on statistical programming with R.

- Google Developers R Programming Video Lectures
  `http://www.r-bloggers.com/google-developers-r-programming-video-lectures/`

  R Programming video tutorials from beginning to advanced.

- Econometrics in R – Grant Farnsworth
  `http://cran.r-project.org/doc/contrib/Farnsworth-EconometricsInR.pdf`

  If you'd like to keep using R in Econ 104, this is what you should read.

- Resources to help you learn R – UCLA Academic Technology Services
  `http://www.ats.ucla.edu/stat/R/`

  A wealth of information about R, conveniently arranged in one place. The "R Starter Kit" is particularly helpful.

- R in a Nutshell – Adler
  `http://proquestcombo.safaribooksonline.com/book/programming/r/9781449377502`

  Electronic version of the book of the same name published by O'Reilly (Accessible on the UPenn Network). Provides a comprehensive reference guide to R.

- R-bloggers
  `http://www.r-bloggers.com`

  A blog aggregator for R news and tutorials, with lots of applications.