

STATISTICS FOR ECONOMISTS
ECONOMICS 103
SUMMER 2016

Course Instructor: Rossa O’Keeffe-O’Donovan

Class times: MTWRF 9:00-10:45AM, McNeil room 103

Office Hours: These will be two days a week, 10:45-11:45am, McNeil 430. The days will vary depending on whether there is an exam coming up - see course schedule below or course calendar at <https://sites.google.com/site/rossaokod/teaching> for more details.

Course Materials:

- All course materials will be posted on both the course discussion board, Piazza piazza.com/upenn/summer2016/econ103 and my personal website, <https://sites.google.com/site/rossaokod/teaching>
- You can view your grades and log-on to Piazza via Canvas at <https://canvas.upenn.edu/courses/1320290>.
- This course has been taught by Prof DiTraglia in the last few semesters, and some very useful materials (including past exams) can be found at his website: <http://ditraglia.com/Econ103Public/>.

Course Communication: Please direct all questions concerning course material or logistics to the course discussion board, Piazza. For personal issues, please send private messages using either Piazza or Canvas. Once everyone is setup on Piazza and Canvas, I will not respond to emails sent to my personal email - this makes it much easier for me to keep track of messages related to this course.

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, I will administer a short math diagnostic quiz early in the Course. This will not count towards your grade. It is primarily intended to indicate to you where your mathematical strengths and weaknesses are, and where you need to brush up on your math to do well in this course.

Required Text: The required textbook for this course is *Introductory Statistics for Business and Economics*, 4th Edition by Thomas H. and Ronald J. Wonnacott (WW4), available on Amazon here. This book is ancient, so cheap used copies are plentiful. While I suggest that you complete the assigned readings, my lecture slides, which will be posted online at the start of each week, are the final authority on course material. In particular, 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 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 syllabus 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 on the last page of this syllabus.

Optional Texts: I will not use these explicitly, but in the past instructors have 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.

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. I will check identification cards at exams so please be sure to bring yours.

Assignments and Grading

$$\text{Final Grade} = (20\% \times \text{Quizzes}) + (40\% \times \text{Midterm}) + (40\% \times \text{Final})$$

OR

$$\begin{aligned} \text{Final Grade} = & (10\% \times \text{Participation}) + (10\% \times \text{Homeworks}) + (20\% \times \text{Quizzes}) \\ & + (30\% \times \text{Midterm}) + (30\% \times \text{Final}) \end{aligned}$$

After the first week of class, I will ask each of you whether or not you want to opt out of your participation and homework contributing towards your final grade. In the past, we have had some students state that they would prefer to be judged only on their performance in tests, as their learning style does not favor daily homework assignments and regular participation. However, I encourage you to include your homework and participation grades in your final grade for two reasons. First, these categories will be the easiest ones in which to score close to 100%. Second, to do well in ECON 103 requires consistent work every day, to make sure you are keeping up with the material and are practicing solving questions. By including participation and homeworks in your final grade, you are committing yourself to keeping up with the material, and will likely do better in the quizzes and exams as a result. I will not curve grades in this class.

Piazza: We will be using an online discussion forum called Piazza for this course, which you can access here or through Canvas. Piazza is where I will make course announcements and answer questions about course material and logistics. By asking your question and getting an answer on Piazza, you create a positive externality: other students benefit from your contributions and you benefit from theirs. I will actively moderate Piazza both to answer questions and approve (or correct) answers written by your fellow-students. Posting on Piazza will count towards your

participation score (an optional 10% of the overall grade). See “Participation” below for more details.

Attendance: Attending and participating in class will contribute to your participation score (an optional 10% of overall grade). More importantly, attending the class every day and completing the daily homework assignments is the best way of keeping up with the material, and making sure you get a good score on the weekly quizzes.

Participation: Each lecture will feature activities in which you can earn participation credit through in-class discussion. You will earn further participation credit based on the frequency and quality of your contributions on Piazza, including questions, answers, and follow-ups. If your attendance is high, and you participate actively in class and online, you will receive 100%: these are essentially “free points.” However, spamming Piazza with unhelpful contributions will not gain you credit. Simply *reading* posts on Piazza is not sufficient to earn participation points: you must contribute through questions, answers, and follow-ups.

Homework and R tutorials: There will be a series of short daily homeworks, to make sure you are keeping up with the material and know how to solve problems. I will set a few questions related to the material covered each day (except for Thursday, when you should prepare for the quiz on Friday). We will go through some of these the next day in class, after the lecture. These will be posted on Piazza (with solutions) as the class progresses, and will include problems from the textbook as well as some additional questions.

There will also be weekly R Tutorials (with full solutions and code) posted on Piazza. R material will account for approximately 25% of the points available on each midterm and final, as well as occasional questions on the quizzes. It is therefore very important that you keep up with the R material by completing these tutorials, though I will not collect these assignments.

You can opt for your homeworks (excluding R tutorials) to count for 10% of your final grade, and if you do, you should submit your answers to questions from that week each Thursday. I will not be able to grade these all in detail, so as long as you have made good, honest attempts to solve the majority of questions, you will receive full marks on the homeworks. Regardless of whether you opt for these to count towards your grade, you should aim to complete the homework every day. You may work in groups for these problems, if this helps you. Unless you keep up with the course assignments, it will be impossible for you to do well on the exams and your course grade will suffer. If you work in groups and use the solution keys, do so responsibly: you gain nothing by simply copying others or reading the solutions before you have made a good attempt at the problem.

Quizzes: There will be 5 weekly quizzes, administered at the beginning of class every Friday. Each quiz will cover basic material from the classes that week, since the last quiz. When calculating your quiz average, I will drop your lowest score and weight the remaining quizzes evenly. No makeup quizzes will be given. Quizzes will not be returned and answers will not be posted but I will go over the solutions in class.

Exams: There will be one 90-minute in-class midterm and a 90 minute final in the last class. Dates for these can be found in the course calendar below. The midterm and final are weighted equally for your final grade. The midterm covers material up to Lecture 9, but the final is comprehensive: it will focus on the second half of the course but include several questions on earlier material. To give you a sense of the style and level of difficulty to expect, past exams with full solutions will be posted on Piazza, and can be found at <http://ditraglia.com/Econ103Public/>. Attendance at all exams is *mandatory*. In exceptional circumstances, e.g. a death in the family or a documented

illness, please contact me in advance, using a private message in Piazza or Canvas. Exam regrade requests must be made within three days of receiving your graded exam. As I re-grade the entire exam, your score could rise or fall. Exams will be photocopied before being returned and you may write in pencil or pen. Scientific calculators are permitted, graphing calculators are not.

Course schedule

The course schedule is below. You can also find the course calendar on my website at <https://sites.google.com/site/rossaokod/teaching>. This Google Calendar will be updated with any changes, and you can add this calendar to your own calendar if you like.

Day	Date	Lecture	OH	Quiz	Exam	R tutorial
Mon	23-May	1: Descriptive stats & graphics I				
Tue	24-May	2: Descriptive stats & graphics II				Try R
Wed	25-May	3: Regression I	yes			
Thu	26-May	4: Basic Probability I	yes			1
Fri	27-May	5: Basic Probability II		Quiz 1 (L1-4)		
Mon	30-May	No class (Memorial Day)				
Tue	31-May	6: Basic Probability III				
Wed	1-Jun	7: Discrete Random Variables I				
Thu	2-Jun	8: Discrete Random Variables II	yes			
Fri	3-Jun	9: Discrete Random Variables III	yes	Quiz 2 (L5-8)		2
Mon	6-Jun				Midterm	
Tue	7-Jun	10: Continuous Random Vars I				
Wed	8-Jun	11: Continuous Random Vars II	yes			
Thu	9-Jun	12: Sampling Distributions I	yes			
Fri	10-Jun	13: Sampling Distributions II		Quiz 3 (L9-12)		3
Mon	13-Jun	14: Confidence Intervals I				
Tue	14-Jun	15: Confidence Intervals II				
Wed	15-Jun	16: Confidence Intervals III	yes			
Thu	16-Jun	No class				
Fri	17-Jun	17: Confidence Intervals IV	yes	Quiz 4 (L13-16)		4
Mon	20-Jun	18: Hypothesis Testing I				
Tue	21-Jun	19: Hypothesis Testing II				
Wed	22-Jun	20: Hypothesis Testing III	yes			
Thu	23-Jun	21: Hypothesis Testing IV	yes			
Fri	24-Jun	22: Regression II		Quiz 5 (L17-21)		5
Mon	27-Jun	23: Regression III	yes			
Tue	28-Jun	Review	yes			
Wed	29-Jun				Final	

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 Twotutorials – Anthony Damico
<http://www.twotutorials.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.

- 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.