ECO 266
Principles of Economic Data Analysis (with R)
Fall 2022

Instructor: Tim Waring (timothy.waring@maine.edu)
University of Maine, School of Economics
Mode: In person. Room: Rogers 206
Tues and Thurs, 8:00 – 9:15 am
Office Hours till 10am

Course Overview

The ability to analyze and understand data is one of the most important and valuable skills for any professional. For economists, scientists and analysts of any profession, quantitative data analysis is crucial. Economists use data to study the behavior of individuals, businesses and governments, to test hypotheses, to distinguish causality from correlation, and to make precise predictions and forecasts. This course will help you develop core skills in statistics and data analysis which you can take as far as want.

This course covers fundamental empirical tools of statistical analysis, including descriptive statistics, probability, distributions, hypothesis tests, and simple linear regression. Analytical techniques will be illustrated using data from economics and business topics. In addition, you will learn to use the **R statistical programming language** to analyze and visualize data. Concepts and methods are introduced and explained in lecture and textbook readings and reinforced through practice in homework assignments and exams.

Learning Objectives

Successful students will learn to:

- Describe the statistical properties of a single variable
- Understand and apply basic laws of probability
- Measure the statistical certainty of various analyses
- Conduct hypothesis tests
- Analyze the relationship between two variables
- Interpret the results of a basic regression analysis
- Use the **R** statistical programming language
- Conduct statistical analysis in **R**
- Create simple data visualizations in **R**

Course Structure

- Assignments & Grading
  - Participation (*helping others*) 10%
  - Weekly homework 20%
  - Two R courses in DataCamp 10%
  - 3 Tests 25%
  - Final project 35%
  - Extra credit: third R course +5%

- Course Rules
  - Lectures are supplemental to textbook chapter readings. Reading comes first.
  - Tests are cumulative - covering textbook and lecture material to date.
  - I will keep course demands reasonable.
  - Extensions are available, but require pre-approval. Be careful, homework extensions usually just lets you slide even further behind!

- Weekly Flow
  - Read the textbook chapter/s – *over the weekend*
  - Watch the recorded lecture/s – *over the weekend*
    - **Tues** - R demo and workshop, ask questions
    - **Thurs** - Work on homework in R, help peers
  - Compete the homework – *due Friday*
  - Do some DataCamp – *every week*

- Textbook
  - *Introductory Statistics*. Illowsky, and Dean. OpenStax, Rice University, 2017
  - **Free:** use online, download a PDF, or buy a paper copy:
  - https://openstax.org/details/books/introductory-statistics

- Video Lectures
  - Supplementary video lectures with R demos on each chapter:
  - www.youtube.com/playlist?list=PLxdDmPeA5NKkqQKwo4hUZeMaoJzmdOddr

- Homework Assistance
  - *The economics help table or "econ lab" is available to help with statistics problems. See their hours.*

Tentative Schedule

- Complete 1 or 2 chapters per week
- Midterm exam: Oct 28, online, asynchronous
- Final exam: Dec 16, online, asynchronous

Week	Mon	Note	Chapter/Topic
1	29-Aug		R BootCamp
2	5-Sep		1 & 2 Sampling & Descriptive Statistics
3	12-Sep	*** R Test ***	3 Probability Topics
4	19-Sep	Waring Travel	4 & 5 Random Variables
5	26-Sep	Waring Travel	6 The Normal Distribution
6	3-Oct		7 The Central Limit Theorem
7	10-Oct	*** Test 2 ***	*Tues: no class*
8	17-Oct		8 Confidence Intervals
9	24-Oct		9 & 10 Hypothesis Testing
10	31-Oct		11 The Chi-Square Distribution
11	7-Nov		12 F Distribution and One-Way ANOVA
12	14-Nov		13 Linear Regression and Correlation
13	21-Nov	*** Test 3 ***	*Thurs: no class*
14	28-Nov		Project work
15	5-Dec		Project work
16	12-Dec	**** Project Due ****	*Exam week*

#1 - Google Classroom (for communication)

- Google Classroom is the course home page. I will use it to share announcements and material with you. You can also use it to communicate with me and with peers.
- Signup at classroom.google.com with your maine.edu email, and code: **4woukpb** or click: https://classroom.google.com/c/NTQ0Mjk3MzM4Nzkx?cjc=4woukpb

#2 - WebAssign (for stats homework and tests)

- We will use WebAssign by Cengage. It **costs $38** for the semester.
- Signup at getenrolled.com with your maine.edu email, and key: **umaine 7034 1810**

#3 - R (for statistical programming)

- **R** is a world-class, free and open-source statistical programming language you will learn this semester.
- Download **R** (the programming language itself) at CRAN: cran.r-project.org
- Download the free **RStudio** IDE ("integrated development environment") at rstudio.com/products/rstudio/download.

#4 - DataCamp (for learning R and more)

- DataCamp is a website to learn programming and data science. It allows for self-paced learning. We will use it to supplement your statistics education.
- Sign up with your maine.edu email with this link: https://www.datacamp.com/groups/shared_links/5eb139cf09e238c30452d51e13d27413f1a1b84b78b7f51d6209ac053bc8fb3c
- You will complete 2 short courses over the semester at your own pace. A third course is extra 5% credit!
    - First required course: **Introduction to R**, 4hrs
    - Second required course: *An R-based course of your choice. I recommend:*
        - Intermediate R
        - Introduction to Importing Data in R
        - Intro to Data in R
        - Writing Functions in R
        - Data Viz in Base R
        - Data Manipulation with dplyr
        - Introduction to ggplot2
        - Exploratory Data analysis in R
        - Correlation and Regression
        - Foundations of Inference

Free R reference book:

- Peng (2019) *R Programming for Data Science* bookdown.org/rdpeng/rprogdatascience

Also good but advanced:

- Wickham and Grolemund (2016) *R for data science* r4ds.had.co.nz
- Baumer, Kaplan, and Horton's (2021), *Modern Data Science with* R mdsr-book.github.io/mdsr2e/
- Healy (2018) *Data Visualization: A Practical Introduction*. https://socviz.co

University Policies

- **Academic Honesty Statement:** Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University. Please see the University of Maine System's Academic Integrity Policy listed in the Board Policy Manual as Policy 314 (***Date Issued:** September 1, 2020): https://www.maine.edu/board-of-trustees/policy-manual/section-314/

- **Students Accessibility Services Statement [This should be customized to include the instructor's name]:** If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services, 121 East Annex, 581.2319, as early as possible in the term. Students who have already been approved for accommodations by SAS and have a current accommodation letter should meet with me (the instructor of the course) privately as soon as possible.

- **Course Schedule Disclaimer (Disruption Clause):** In the event of an extended disruption of normal classroom activities (due to COVID-19 or other long-term disruptions), the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

- **Observance of Religious Holidays/Events:** The University of Maine recognizes that when students are observing significant religious holidays, some may be unable to attend classes or labs, study, take tests, or work on other assignments. If they provide adequate notice (at least one week and longer if at all possible), these students are allowed to make up course requirements as long as this effort does not create an unreasonable burden upon the instructor, department or University. At the discretion of the instructor, such coursework could be due before or after the examination or assignment. No adverse or prejudicial effects shall result to a student's grade for the examination, study, or course requirement on the day of religious observance. The student shall not be marked absent from the class due to observing a significant religious holiday. In the case of an internship or clinical, students should refer to the applicable policy in place by the employer or site.

- **Sexual Discrimination**

  The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of **sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or any form of gender discrimination** involving members of the campus, **your teacher is required to report** this information to Title IX Student Services or the Office of Equal Opportunity.

  If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

  For *confidential resources on campus*: **Counseling Center: 207-581-1392** or **Cutler Health Center: at 207-581-4000**.

  For *confidential resources off campus*: **Rape Response Services:** 1-800-871-7741 or **Partners for Peace**: 1-800-863-9909.

  Other resources: The resources listed below can offer support but may have to report the incident to others who can help:

  For *support services on campus*: **Title IX Student Services: 207-581-1406**, **Office of Community Standards: 207-581-1409**, **University of Maine Police: 207-581-4040 or 911**. Or see the OSAVP website for a complete list of services.