Statistics: Measurement in Economics
Econ 310 (4 Credits), Summer 2025
University of Wisconsin-Madison

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Course Overview

This six-week online course provides an introduction to statistics. We will tackle three main topics. We begin with an overview of descriptive statistics and statistical terminology. Next we turn to probability, a branch of mathematics which provides us with the methods necessary to reason about uncertain environments. Finally, we turn to the bread and butter of statistics: estimation and inference. Particular attention will be paid to the application of these tools to the analysis of economic data.

Prerequisites

Prerequisites for this class include (a) an introductory economics course and (b) Math 211 or Math 221.

Course Webpage

Begin the course on Monday, May 19 by going to our course website on Canvas: https://canvas.wisc.edu/courses/455778

Class Meetings and Office Hours

This is an online course. There is no need for you to be physically present in Madison at any point during the six week term. However, you must have access to a reliable internet connection for the duration of the course (May 19 - June 27).

I will be holding online office hours throughout the semester. A schedule of office hours along with instructions on how to attend will be available via the course website.

Textbook and Required Material

Our textbook is: Statistics for Management and Economics by Gerald Keller, Eleventh Edition. We will also be using MindTap (aka Aplia) for our problem sets. As noted in the Course Guide, there is no need for you to purchase either the textbook or MindTap, as the cost is bundled into your tuition bill via the **Engage eText** program. For more information, including opt-out instructions, see the Engage eText Frequently Asked Questions.   Because you must access MindTap to complete the problem sets, it is essential that you do not opt-out of the Engage eText program unless you have access to MindTap via other channels (e.g., through Cengage Unlimited).

This course requires frequent use of a **computer** (Mac or Windows) with a **reliable internet connection**. While completing the problem sets, quizzes, and final exam, you will need a **calculator** with the following functions: x^y, $x!$, and e^x.

Evaluation

Your overall grade for the course will be based on five components:

- Aplia Problem Sets: Each Monday through Thursday, Aplia problem sets will be due daily by 11pm Central Time (UTC−5:00). The Aplia problem sets are worth 25% of your overall grade for the course, so completing them will be critical to your success. **Late problem sets will not be accepted for any reason, but your lowest three Aplia problem set scores will be automatically dropped.** To give everyone a bit of scheduling flexibility, it will be possible to work several days ahead, if you so desire.

- Stata Logs: At two points in the term, I will ask you to perform computer work in Stata and upload the resulting log file. To give everyone a bit of scheduling flexibility, it will be possible to submit your log file several days in advance, if you so desire. Log files will be graded and are worth 5% of your overall grade for the course.

- Participation: You may wonder how participation, which is worth 10% of your overall grade, is assessed in an asynchronous online class. For each day of the course, read the lecture notes, watch all the videos, and attempt the practice problems that I provide (on your own <u>before</u> proceeding to the solutions to check your answers). During the weekly quizzes and the final exam, never use artificial intelligence or any other form of electronic assistance (e.g., writing assistants, translators, or grammar checkers), never copy & paste in responses, and never access the internet for help on a question (e.g., Google, Chegg, Discord, etc.). Finally, I encourage you to set up appointments during office hours to ask any substantive questions you have about the material, being sure to show up on-time for the meetings you schedule and avoiding any same-day cancellations.

- Weekly Quizzes: Each Friday for the first 5 weeks, there will be an open-book, open-note quiz covering that week's material. These quizzes will be time constrained and must be completed at some point in the 24 hour period corresponding to Friday in the Central Time Zone (UTC−5:00). Together the quizzes will make up 44.44% of your overall grade for the course. **Quizzes will not be rescheduled for any reason.** On a case by case basis, in the event of a truly unavoidable circumstance, I may elect to shift the weight of one missed quiz to other quizzes or the final exam. In order to quality, you must notify me in advance of the quiz, the circumstance must make completion of the quiz impossible, and must be fully documented.

- Final Exam: On the final Friday of the term (June 27), there will be an open-book, open-note cumulative final exam. As with the quizzes, the final exam will be time constrained and must be completed at some point in the 24 hour period corresponding to Friday in the Central Time Zone (UTC−5:00). The final exam is worth 15.56% of your overall grade for the course.

The quizzes and the final exam are open-book, meaning that it is fine to reference the textbook, your notes, and any material posted on our Canvas website However, you must work alone and everything you submit must be your own work, meaning that you are <u>not</u> permitted to receive outside help of any kind.

Your overall grade for this class will be curved. This curve can help your grade, but cannot hurt it. I achieve this by computing your grade using two different methods. First, I assign grades according to a percentage scale, where A = [92,100], AB = [88,92), B = [82,88), BC = [78,82), C = [70,78), D = [60,70), F = [0,60). (In other words, if you receive a grade in the class of 92% or better, then you'll receive an A.) Second, I assign grades according to a percentile scale, where A = [83,100], AB = [65,83), B = [45,65), BC = [25,45), C = [6,25), D = [3,6), F = [0,3). (In other words, if you perform better than 83% of the class, then you'll receive an A.) Your overall grade in the class is the higher of these two grades.

If you are unhappy with the way a problem has been graded, I encourage you to discuss it with me, but you must bring the concern to me within 7 days of when you were first able to view the graded problem set or quiz.

Learning Outcomes

Following the completion of this course, students will be able to:

- Interpret tables, graphs, and statistics used to summarize data (QRB-3)

- Apply probability theory to model the likelihood of uncertain events (QRB-1)

- Estimate the true value of unknown parameters using point and interval estimators (QRB-2)

- Critically evaluate interpretations of statistical estimates and resulting inferences (QRB-2 & QRB-3)

- Test theories by determining an appropriate test statistic, implementing a formal hypothesis test, and interpreting the outcome (QRB-2)

- Use software to apply statistical techniques to the analysis of economic data (QRB-1)

Course Outline

This course covers the following topics (readings from Keller in parentheses):

- Day 1: Overview (Chapter 1)
- Day 2: Descriptive Statistics (Chapter 4)
- Day 3: Data Collection, Sampling Plans (Chapter 5)
- Day 4: Rules of Probability Theory (Chapter 6)
- Day 5: Quiz 1
- Day 6: Bayes Law, Advanced Applications of Probability Theory (Chapter 6)
- Day 7: Expected Value and Variance for Discrete Random Variables (Chapter 7)
- Day 8: Covariance, Independence, Conditional Expected Values (Chapter 7)
- Day 9: PMF's, CDFs, Binomial Distribution, Poison Distribution (Chapter 7)
- Day 10: Quiz 2
- Day 11: Continuous Distributions, PDF's, CDF's, Uniform Distribution (Chapter 8)
- Day 12: Normal Distribution (Chapter 8)
- Day 13: Exponential Distribution, Additional Continuous Distributions (Chapter 8)
- Day 14: Distribution of the Sample Mean, Finite Population Correction (Chapter 9)
- Day 15: Quiz 3
- Day 16: Distribution of Sample Proportion and Differences in Means (Chapter 9)
- Day 17: Point Estimation (Chapter 10)
- Day 18: Interval Estimation (Chapter 10)
- Day 19: Hypothesis Testing (Chapter 11)
- Day 20: Quiz 4
- Day 21: P-values, Calculating Type II Error for a Simple Test (Chapter 11)
- Day 22: Inference with an Unknown Variance (Chapter 12)
- Day 23: Tests Involving an Unknown Variance or Proportion (Chapter 12)
- Day 24: Tests Involving Two Populations (Chapter 13)
- Day 25: Quiz 5
- Day 26: Tests Using Matched-Pairs Data (Chapter 13)
- Day 27: One-Way ANOVA, Introduction to Linear Regression (Chapter 14 & 16)
- Day 28: Estimation, Fit, and Inference with Linear Regression (Chapter 16)
- Day 29: Catch-Up Day
- Day 30: Final Exam

Credits

The credit standard for this course is met by an expectation of a total of 180 hours of student engagement with the course learning activities (at least 45 hours per credit), which includes watching video lectures, completing problem sets, working on practice problems, taking exams, and other student work as described in the syllabus.

Students with Disabilities

If you have approval from the McBurney Center for disability-related accommodations, please contact me to discuss how these accommodations will be implemented for this course. This should be done as soon as possible, and no later than two days before the first weekly quiz.

Grievance Procedure

The Department of Economics has developed a grievance procedure through which you may register comments or complaints about a course, an instructor, or a teaching assistant. The Department continues to provide a course evaluation each semester in every class. If you wish to make anonymous complaints to an instructor or teaching assistant, the appropriate vehicle is the course evaluation. If you have a disagreement with an instructor or a teaching assistant, we strongly encourage you to try to resolve the dispute with him or her directly. The grievance procedure is designed for situations where neither of these channels is appropriate.

If you wish to file a grievance, you should go to room 7238 Social Science and request a Course Comment Sheet. When completing the comment sheet, you will need to provide a detailed statement that describes what aspects of the course you find unsatisfactory. You will need to sign the sheet and provide your student identification number, your address, and a phone where you can be reached. The Department plans to investigate comments fully and will respond in writing to complaints.

Your name, address, phone number, and student ID number will not be revealed to the instructor or teaching assistant involved and will be treated as confidential. The Department needs this information, because it may become necessary for a commenting student to have a meeting with the department chair or a nominee to gather additional information. A name and address are necessary for providing a written response.

Misconduct Statement

Academic integrity is critical to maintaining fair and knowledge based learning at UW-Madison. Academic dishonesty is a serious violation: it undermines the bonds of trust and honesty between members of our academic community, degrades the value of your degree, and defrauds those who may eventually depend upon your knowledge and integrity.

Examples of academic misconduct include, but are not limited to: cheating on an examination (copying from another student's paper, referring to materials on the exam other than those explicitly permitted, continuing to work on an exam after the time has expired, turning in an exam for regrading after making changes to the exam), copying the homework of someone else, submitting for credit work done by someone else, stealing examinations or course materials, tampering with the grade records or with another student's work, or knowingly and intentionally assisting another student in any of the above. Students are reminded that online sources, including anonymous or unattributed ones like Wikipedia, still need to be cited like any other source; and copying from any source without attribution is considered plagiarism.

The Dept. of Economics will deal with these offenses harshly following UWS14 procedures (http://students.wisc.edu/saja/misconduct/UWS14.html):

1. The penalty for misconduct in most cases will be removal from the course and a failing grade,

2. The department will inform the Dean of Students as required and additional sanctions may be applied.

3. The department will keep an internal record of misconduct incidents. This information will be made available to teaching faculty writing recommendation letters and to admission offices of the School of Business and Engineering.

 If you think you see incidents of misconduct, you should tell your instructor about them, in which case they will take appropriate action and protect your identity. You could also choose to contact our administrator (Tammy Herbst-Koel: therbst@wisc.edu) and your identity will be kept confidential.