

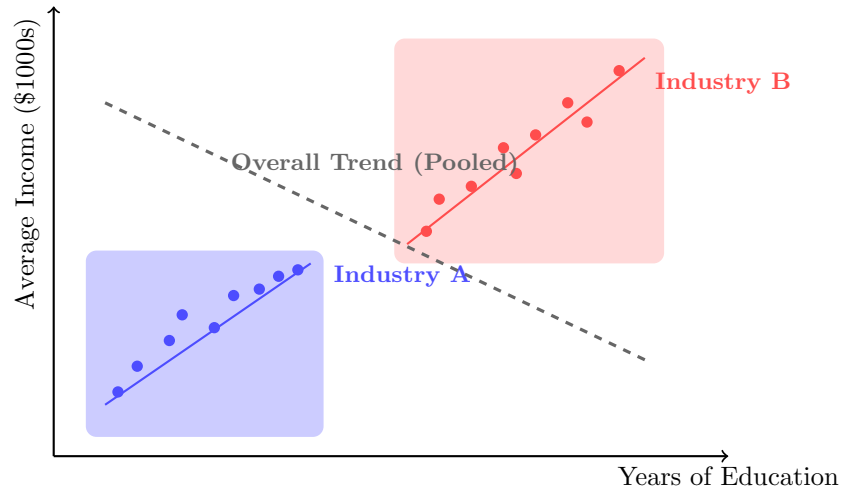
ECON 83a: Statistics for Economic Analysis

Summer 2026 · Brandeis University

Session 2: July 6 – August 6, 2026 | 15 Classes

Monday / Tuesday / Thursday 8:30 – 11:00 AM (EST)

Internship-friendly: Classes end by 11 AM — plenty of time for your summer job or internship. All lectures are recorded so you never fall behind.



Simpson's Paradox: Within each industry, more education is associated with higher income. But pooling the data *reverses* the relationship! Why does this happen? That's what statistics helps you figure out.

Why This Course Matters

From election forecasting to algorithmic trading, from A/B testing at tech companies to how ChatGPT learns from data—statistics is the engine behind modern decision-making. This course gives you the toolkit to move from “*I think*” to “*the data shows*.” Whether you’re heading into finance, consulting, tech, public policy, or graduate school, statistical literacy is no longer optional—it’s essential.

In our very first class, we will discuss how AI and Large Language Models (LLMs) like ChatGPT rely on core statistical concepts—probability distributions, estimation, and regression—that you will learn in this course. Understanding these foundations will help you reason about AI not as a black box, but as a system built on the same tools you’ll master this summer.

Course Description

This is the first course in probability and statistics for students in economics and business. Topics include:

- Descriptive statistics and data visualization
- Probability, conditional probability, and Bayes' theorem
- Probability distributions (binomial, normal) and expectation
- Sampling distributions and the Central Limit Theorem
- Point estimation and properties of estimators
- Confidence intervals and hypothesis testing
- Simple linear regression
- **Spotlight:** How statistics powers AI, machine learning, and LLMs

Lecture Outline

Lectures	Topic
Lecture 1	Introduction, Descriptive Statistics, and Statistics in the Age of AI
Lecture 2	Probability
Lecture 3	Probability Distributions
Lecture 4	Sampling and Sampling Distributions
Lecture 5	Interval Estimation
Lecture 6	Hypothesis Testing
Lecture 7	Linear Regression

Instructor

Ketian Guan

Email: ketianguan@brandeis.edu

Office Hours: Tuesday, Wednesday, Thursday 11:00 AM – 12:00 PM, or by appointment.

Prerequisites

ECON 2a or 10a. You must earn C– or higher in MATH 10a (or otherwise satisfy the calculus requirement) to enroll. Upon successful completion, you will be able to calculate and interpret descriptive statistics; understand probability distributions, expected values, and cumulative distributions; construct confidence intervals; and perform hypothesis testing.

Recommended Textbooks

- Anderson, Sweeney, Williams, Camm, and Cochran, *Statistics for Business & Economics* (13th ed.)
 - Newbold, Carlson, and Thorne, *Statistics for Business and Economics* (8th ed., Pearson, 2013).
- Other introductory statistics textbooks and online resources are also helpful for alternative explanations and extra practice.

Evaluation

Component	Weight
Pop Quizzes (4 × 10%)	40%
Midterm Exam (Open-Book)	20%
Problem Sets (2)	20%
Final Project & Presentation	20%

Pop Quizzes

There will be **4 unannounced pop quizzes** during the course. Each quiz consists of **1–2 short questions** drawn from recent lecture material and takes approximately **20 minutes**. Pop quizzes are designed to reward consistent attendance and engagement—not to trick you. There are no make-up quizzes. If you attend class regularly and keep up with the material, you will do well.

Midterm Exam

The midterm will be held on **July 23, 2026** during class hours. The exam is **open-book and open-notes**: you may bring any printed or handwritten materials. **No electronic devices or AI-based tools are permitted** during the exam.

Final Project

For the final project, you will apply the statistical methods learned in this course—descriptive statistics, hypothesis testing, confidence intervals, and/or regression—to analyze a **real-world dataset** of your choice. You will present your findings on **August 6, 2026**, followed by a class discussion on how statistical reasoning applies to real problems. This is your chance to show what you’ve learned and to practice communicating data-driven insights—a skill valued in every career path. Further details and dataset suggestions will be provided during the course.

Problem Sets

There will be 2 problem sets. Problem sets are required and serve as practice for exams—expect some exam questions to closely resemble problem-set questions. **All R questions are optional.**

Assignment	Due Date
Problem Set 1	July 20, 2026 (11:59 PM EST)
Problem Set 2	August 3, 2026 (11:59 PM EST)

Problem sets will be submitted and graded on **Gradescope** (entry code will be provided). You are encouraged to discuss problems with classmates, but you must write up your own solutions independently.

Tips for getting the most out of problem sets:

1. Try all problems on your own first. If you’re stuck for more than 30 minutes, move on.
2. Compare solutions with classmates. Help each other with skipped problems.
3. Put away all notes and redo each problem from scratch. If you can’t reproduce a solution, you have more to learn.
4. Write up clear, independent solutions and submit for credit.

AI and Technology Policy

AI tools (e.g., ChatGPT, Claude, Copilot) can be powerful learning aids. You are welcome to use them to *explore concepts, check intuition, and deepen understanding*. However:

- **Exams and quizzes:** No AI tools or electronic devices are permitted.
- **Problem sets:** You may use AI to help understand concepts, but your final write-up must be your own work in your own words. Copying AI-generated answers undermines your learning and violates academic integrity.
- We will discuss the intersection of statistics and AI throughout the course so you can appreciate both the power and the limitations of these tools.

Software

You will use the statistical software **R** (<https://cran.r-project.org/>) with the IDE **RStudio** (<https://posit.co/download/rstudio-desktop/>). Please install both as soon as possible.

Helpful resources:

- Prof. Scott Redenius's R guide: <https://people.brandeis.edu/~redenius/Guides/R/>
- Brandeis Library R resources: <https://guides.library.brandeis.edu/c.php?g=302090&p=2013481>

Workload Expectations

Success in this four-credit course is based on the expectation that students will contribute at least **9 hours of study time per week** outside of class. Here is one way to structure that time:

- **~3 hours:** Review and consolidate lecture notes after each class. Practice derivations on your own; make a list of questions for office hours.
- **~3 hours:** Read relevant textbook chapters before class. Take handwritten notes on definitions, formulas, and key ideas.
- **~3 hours:** Work on problem sets and practice problems.

Moodle

The course home page is on **Moodle**. Announcements, problem sets, and handouts will be posted there. Please check it regularly.

Course Policies

- **Late work:** Late assignments will **not** be accepted. Once solutions are posted, a grade of zero will be given. If you anticipate submission issues, please email me in advance.
- **No make-ups:** There are no make-up exams, quizzes, or problem sets. If circumstances arise, please contact me in advance so we can find a solution.
- **Absences:** If you must miss a class, please email me and obtain notes from a classmate. Come to office hours with any questions.

- **Participation & Recording:** Students are expected to attend all classes and participate actively. **All lectures will be recorded** and posted on Moodle, so if your internship or work schedule occasionally conflicts, you can catch up without missing a beat.

Special Accommodations

Any student who feels the need for accommodation based on the impact of a disability should contact the Student Accessibility Support office (781-736-3470, access@brandeis.edu). This office will provide registered students with a letter describing appropriate accommodations. Please share this letter with the instructor to facilitate the accommodation process. Everyone should note that some Brandeis students have the right to make audio recordings of classes as an accommodation for disability. While the instructor does not record classes, it is possible that one or more students with such an accommodation may be recording in the classroom at any time.

Brandeis seeks to create a learning environment that is welcoming and inclusive of all students, and I want to support you in your learning. If you think you may require disability accommodations, you will need to work with Student Accessibility Support (SAS). You can contact them at 781-736-3537, email them at access@brandeis.edu, or visit the Student Accessibility Support home page. You can find helpful student FAQs and other resources on the SAS website, including guidance on how to know whether you might be eligible for support from SAS. If you already have an accommodation letter from SAS, please provide me with a copy as soon as you can so that I can ensure effective implementation of accommodations for this class. In order to coordinate exam accommodations, ideally you should provide the accommodation letter at least 48 hours before an exam.

Academic Honesty

You are expected to be familiar with, and to follow, the University's policies on academic integrity. You are expected to be honest in all of your academic work. Please consult Brandeis University Rights and Responsibilities for all policies and procedures related to academic integrity. Allegations of alleged academic dishonesty will be forwarded to Student Rights and Community Standards. Sanctions for academic dishonesty can include failing grades and/or suspension from the university. Citation and research assistance can be found on the university library website.