

Duke University
Department of Economics
Econ 104 - Summer Term 1 2022
Statistical Foundation of Econometrics
and Data Science

May 16, 2022

1 Contact Information and Course Website

Instructor: Sung-Ju Wu (fourth-year PhD student in economics)

- Email: sungju.wu@duke.edu
- Office hours: Wed 11 AM -1 PM in Social Science DFE Conference Room (Room 228A)

Teaching Assistant: Chi-Bo Lin (first-year MA student in economics)

- Email: chibo.lin@duke.edu
- Office hours: Mon 3-5 PM in Social Science DFE Conference Room (Room 228A)

Course website on Sakai: <https://sakai.duke.edu/x/UZfBKK>

2 Class Time and Place

- Lectures: Mon-Fri 9:30 AM - 10:45 AM in Social Science Room 119
- TA session: Wed 6:00 PM - 8:05 PM in Social Science Room 124

Table 1: Important Dates

Date	Event
Wednesday, May 11	First day of class.
Friday, May 13	Drop/Add ends at 11:59 PM.
Monday, May 30	Memorial Day. No classes are held.
Wednesday, June 8	Last day to withdraw with “W” from Term 1 classes. Last day for students to request S/U grading basis.
Friday, June 17	Last day of class.
Monday, June 20	Juneteenth holiday. No classes are held.
Thursday, June 23	Final exams (9:00 AM - 12:00 PM) in Social Science Room 119.

3 Course Description

This course provides a rigorous introduction to statistical concepts that underpin econometrics. It emphasizes conceptual understanding, uses mathematics to illustrate ideas, and applies ideas to examples from economics broadly construed. The topics include modern approaches to summarizing data; random variables, probability, expectations, density and distribution functions; sampling; estimation; inference and hypothesis testing; introduction to linear regression. A basic understanding of simple calculus (including integration) will be required.

4 Textbooks

Main textbook:

- [Schervish and DeGroot \(2014\)](#)

Other references:

- [Stock et al. \(2011\)](#)
- [Wooldridge \(2015\)](#)
- [Angrist and Pischke \(2014\)](#)

5 Grading Policy

- The course grades will be the result of five weekly problem sets (5*10%) and a comprehensive final exam (50%).
- Each problem set will be issued on the course website on Friday and it will be due **before** the TA session on Wednesday in the following week. You have to submit your answer using Sakai, and no submission will be accepted after the deadline. The answer to the problem set will be uploaded on Sakai after the TA session.
- Final exam will take place on **June 23rd (Thu) 9:00 AM - 12:00 PM** in Social Science Room 119.
- If you cannot attend the final exam, a proper excuse in line with [the school policy](#) will need to be provided **before** the end of the final exam date in order to schedule a make-up exam.
- **Cheating will not be tolerated and will be directly reported to the department.** Students should uphold the Duke Community Standards:
 - I will not lie, cheat, or steal in my academic endeavors;
 - I will conduct myself honorably in all my endeavors; and
 - I will act if the Standard is compromised

6 Week-by-week Overview

Week 1 (May 9th - May 13th): Intro to Probability

- Logistics: Class begins on Wednesday (May 11th). No TA session this week.
- Topics: class overview, definition of probability, set theory, conditional probability, independence
- Reference: [Schervish and DeGroot \(2014\)](#) Ch1-2

Week 2 (May 16th - May 20th): Random Variables & Distributions

- Logistics: Problem Set 1 due on Wednesday before the TA session.
- Topics: definition of random variables, pmf/pdf/cdf, quantiles/percentiles, expectation and other moments
- Reference: [Schervish and DeGroot \(2014\)](#) Ch3-5; [Stock et al. \(2011\)](#) Ch2.1-2.3

Week 3 (May 23th - May 27th): Intro to Statistical Inference

- Logistics: Problem Set 2 due on Wednesday before the TA session.
- Topics: definition of statistical inference, asymptotic results (law of large number, central limit theorem)
- Reference: [Schervish and DeGroot \(2014\)](#) Ch7.1, Ch8.14; [Stock et al. \(2011\)](#) Ch2.6

Week 4 (May 30th - June 3rd): Asymptotic Results & Estimators

- Logistics: No class on Memorial Day (30th May). Problem Set 3 due on Wednesday before the TA session.
- Topics: asymptotic results (law of large number, central limit theorem), estimators and their properties
- Reference: [Schervish and DeGroot \(2014\)](#) Ch6; [Stock et al. \(2011\)](#) Ch2.6

Week 5 (June 6th - June 10th): Hypothesis Testing & Estimation

- Logistics: Problem Set 4 due on Wednesday before the TA session.
- Topics: null and alternative hypotheses, method of moments, maximum likelihood estimation
- Reference: [Schervish and DeGroot \(2014\)](#) Ch7.5-7.6, Ch8.1, Ch8.5, Ch9; [Stock et al. \(2011\)](#) Ch3.1-3.2

Week 6 (June 13th - June 17th): Intro to Regressions & Review

- Logistics: Problem Set 5 due on Wednesday before the TA session.
- Topics: linear regression, multiple regression, causal inference, overall review
- Reference: [Schervish and DeGroot \(2014\)](#) Ch11.1-11.3, [Wooldridge \(2015\)](#) Ch2-3, [Stock et al. \(2011\)](#) Ch4-7

References

- Angrist, J. D. and Pischke, J.-S. (2014). *Mastering'metrics: The path from cause to effect*. Princeton university press.
- Schervish, M. J. and DeGroot, M. H. (2014). *Probability and statistics (Fourth Ed.)*. Pearson Education London, UK.
- Stock, J. H., Watson, M. W., et al. (2011). *Introduction to econometrics (Third Ed.)*. Addison Wesley Boston.
- Wooldridge, J. M. (2015). *Introductory econometrics: A modern approach*. Cengage learning.