

ECON 817, Spring 2024

Advanced Econometrics I

Instructor Contact Information

Instructor Name and Preferred Title: Zongwu Cai, Professor
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Office: Snow Hall, Room 352
Office Hours: MW 10:30 am – 12:00 pm, or by appointment
Teaching Assistant: Mr. Jingwei JIN (j786j574@ku.edu)

Class Time and Location

Class Time: MW 12:30 pm – 13:45 pm
Class Location: Snow 452
Semester: Spring 2024

Course Hours and Instructional Methods

This is an in-person course that fulfills 3 credit hours. Consistent with KU policy and the federal definition of a credit hour, this means you should expect to spend at least 9 hours a week on this course over the 15-week semester. Most weeks 2.5 hours will be instructional time in the classroom (i.e., class meetings) and the remaining time will involve out-of-class work. The instructional mode will be lecture only, but often conducted as a seminar with in-class discussion and possible collaboration on research.

Course Description

This is one of the core courses required for the Ph.D. program in economics and it is about the study of estimation and hypothesis testing within the context of the stochastic simultaneous equation models, such as, for linear and nonlinear parametric regression models, which can be applied in microeconomics and macroeconomics as well as finance, of course, data science research. It emphasizes on theory and methodologies as well as applications. Inference with those models will be by linear and nonlinear parametric models, including errors in variable issues and endogenous problems. Prerequisite: [ECON816](#) or [MATH628](#).

Learning Outcomes

After successful completion of this course, you will be able to:

1. Conduct state of the art publishable research on advanced econometrics.
2. Participate actively in international conferences using financial, microeconomic, and macroeconomic theory empirically.
3. Be identified internationally as an authority on advanced econometrics.
4. Contribute to governmental research and policy using advanced econometrics.
5. Carry on your own research in a manner identifying you within the profession as affiliated with others having expertise in your own research.
6. More importantly, learn R (coding techniques) for doing real data analysis and conducting Monte Carlo simulation studies.

Course Materials

The main textbook is ***“Econometric Theory and Methods”*** by R. Davidson and J.G. MacKinnon (2004) [Oxford University Press, New York]. The topics include Chapters 1-8 if possible. In addition to the textbook, other materials or handouts, such as some advanced materials about matrix theory, Bootstrap methods, modern model selection and variable selection approaches such as LASSO, empirical likelihood, and HC-HAC consistent estimation of covariance matrix, will be provided when they are needed and indeed, they can be downloaded from [the course website](#).

Course Assignments and Requirements

Reading assignments for each class will depend upon the speed with which the class progresses through the relevant material as well as the research interests of the class. Problems for Homework will be assigned at class meetings. No late homework will be accepted. Missed homework will receive a grade of zero. The homework will be collected at the end of each chapter (the due date will be announced later) and graded. You are allowed to work with other students on the computer coding for some homework problems, however, verbatim copying of homework is absolutely forbidden. Therefore, each of you must ultimately produce your own homework to be handed in and graded. Homework assignments are long and painful and require a lot of effort on your part, but you will not be able to do well on exams without doing homework assignments. When you submit your HW, please use your name as the file name, for example, Cai_HW#1.pdf, in the PDF format, and also send it to my TA (Mr. JIN).

Exams: There are two exams which will be on **March 18 (12:30 – 13:45, the first Monday after the Spring Break) and May 8 (10:30am – 13:00pm, Wednesday, as scheduled)**, respectively. The exam is closed book. However, you may choose to prepare a formula sheet for reference for the exam. No missed exam can be made up for any reason.

General Assignment Information

- Unsolved problems in the relevant literature will be emphasized in class along with the kinds of expertise needed to solve the problems.

- Students interested in contributing to this literature by solving those unsolved problems will be encouraged to do so.
- Students wishing to apply but not extend the methodology covered in the course will be encouraged to do so, if focused on a new application not previously published.

Evaluation Criteria and Grading Scale

Student Survey of Teaching

You will have multiple opportunities to provide feedback on your experience in this course. Suggestions and constructive criticism are encouraged throughout the course and may be particularly valuable early in the semester. You will also be asked to complete an end-of-semester, online Student Survey of Teaching, which could inform modifications to this course (and other courses that I teach) in the future.

Grading

Students taking the course for a grade are required to complete all the homework assignments and the exams, which will include some applications of the methods that you have learned in the course. **Exam makes up 2/3 and homework counts 1/3 of the course grade.**

Grading Scale

89.5% - 100% = A
 84.5% - 89.4% = B+
 79.5% - 84.4% = B
 74.5% - 79.4% = C+
 69.5% - 74.4% = C
 64.5% - 69.4% = D+
 59.5% - 64.4% = D
 <59.4% = F

Incomplete Grades

You may be assigned an 'I' (Incomplete) grade if you are unable to complete some portion of the assigned course work because of an unanticipated illness, accident, work-related responsibility, family hardship, or verified learning disability. An Incomplete grade is not intended to give you additional time to complete course assignments or extra credit unless there is indication that the specified circumstances prevented you from completing course assignments on time.

Attendance Policy

The attendance policy is consistent with the [University Excused Absences](#) policy (USRR 2.2.1-2.2.6).

Academic Success

In addition to any policies and resources noted above, the [KU Academic Success Student Resources](#) website provides links to KU Policies and Resources pertaining to academic misconduct, grading policies, harassment and discrimination, diversity and inclusion, mandatory reporting, equal opportunity and affirmative action, and student rights and responsibilities. Please visit the site to familiarize yourself with these policies and resources. If you have questions or concerns about any of these policies, statements, or resources, please let me know, or contact Student Affairs directly.

Course Schedule

| Week | Date | Topic | Assignment | Due Today |
|------|--------------|---|--------------------------------|-----------|
| | | | | |
| 1 | 01/17/2024 | Chapter 1: Regression Models | Read Matrix Theory | |
| 2 | 01/22, 24/24 | Chapter 2: Geometry of Linear Regression | Read Linear Algebra | HW#1 |
| 3 | 01/29, 31/24 | Chapter 2: Geometry of Linear Regression | Read Model Selection and LASSO | |
| 4 | 02/05, 07/24 | Chapter 3: Statistical Properties of OLS | Read HC-HAC Estimation | HW#2 |
| 5 | 02/12, 14/24 | Chapter 3: Statistical Properties of OLS | Read Bootstrap | |
| 6 | 02/19, 21/24 | Chapter 4: Hypothesis Testing in Linear Regression Models | Read Empirical Likelihood | |
| 7 | 02/26, 28/24 | Chapter 4: Hypothesis Testing in Linear Regression Models | | HW#3 |
| 8 | 03/04, 07/24 | Chapter 4: Hypothesis Testing in Linear Regression Models | | |

| Week | Date | Topic | Assignment | Due Today |
|-----------|----------------------|---|--|--------------|
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| 9 | 03/11-03/16 | SPRING BREAK | | |
| 10 | 03/18/24 03/20/24 | EXAM 1 is on March 18 (Monday) Chapter 5: Confidence Intervals | 12:30 – 14:00 | HW#4 |
| 11 | 03/25, 27/24 | Chapter5: Confidence Intervals | Review Empirical Likelihood | |
| 12 | 04/01, 03/24 | Chapter 5: Confidence Intervals | | |
| 13 | 04/08, 10/24 | Chapter 6: Nonlinear Regression | | HW#5 |
| 14 | 04/15, 17/24 | Chapter 7: GLS | | HW#6 |
| 15 | 04/22, 24/24 | Chapter 8: IV Regression | | HW#7 |
| 16 | 04/29, 05/01 | Chapter 8: IV Regression | | |
| 17 | 05/06-05/10 | Finals Week | EXAM 2 is on May 8 (Wednesday, 10:10am to 13:00pm, as scheduled) | HW#8 (May 8) |