ECON 817, Spring 2025

Advanced Econometrics I

Instructor Contact Information

Instructor Name and Preferred Title: Zongwu Cai, Professor
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Class Time and Location

Class Time: MW 12:30 pm – 13:45 pm
Class Location: Snow Hall, Room 301
Semester: Spring 2025

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-or-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

According to the KU Catalogue, this course provides an intensive study of the general linear model and distribution theory associated with the multivariate normal; stochastic difference equation; autocorrelation; errors in variables, and so on. In other words, 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 areas 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 or Python (coding techniques) for doing real data analysis and conducting Monte Carlo simulation studies. Here, I encourage you to learn the software R first, which is close to C++ language.

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 materials from 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. Please send it to me and my GRA, Mr. Si Chen (chensi@ku.edu) via e-mail. If your HW is based on your handwriting, please scan it to be PDF format. For some excises for real data analysis, I only need your results and interpretations. Please do not include the computer codes.

Exams: There are two exams which will be on March 24 (12:30 – 13:45, the first Monday after the Spring Break) and May 16 (10:30am – 13:00pm, Friday, as scheduled by KU), 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 polices and resources noted above, the KU Academic Success Student Resources website provides links to KU Policies and Resources pertaining to academic misconduct, grading polices, 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	Jan. 22	Chapter 1: Regression Models	Read Matrix Theory	
2	Jan. 27 and 29	Chapter 2: Geometry of Linear Regression	Read Linear Algebra	HW#1
3	Feb. 3 and 5	Chapter 2: Geometry of Linear Regression	Read Model Selection and LASSO	
4	Feb. 10 and 12	Chapter 3: Statistical Properties of OLS	Read HC-HAC Estimation	HW#2
5	Feb. 17 and 19	Chapter 3: Statistical Properties of OLS	Read Bootstrap	
6	Feb. 24 and 26	Chapter 4: Hypothesis Testing in Linear Regression Models	Read Empirical Likelihood	
7	March 3 and 5	Chapter 4: Hypothesis Testing in Linear Regression Models		HW#3

Week	Date	Topic	Assignment	Due Today
8	March 10 and 12	Chapter 4: Hypothesis Testing in Linear Regression Models		
9	March 17 to 23	SPRING BREAK		
10	March 24 March 26	EXAM 1 is on March 24 (Monday) Chapter 5: Confidence Intervals	12:30 – 14:00	HW#4
11	March 31 & April 2	Chapter5: Confidence Intervals	Review Empirical Likelihood	
12	April 7 and 9	Chapter 5: Confidence Intervals		
13	April 14 and 16	Chapter 6: Nonlinear Regression		HW#5
14	April 21 and 23	Chapter 7: GLS		HW#6
15	April 28 and 30	Chapter 8: IV Regression		HW#7
16	May 5 and 7	Chapter 8: IV Regression		
17	May 12 to 16	Finals Week	EXAM 2 is on May 16 (Friday, 10:30am to 13:00pm, as scheduled)	HW#8 (May 14)