Course Code
Advanced Econometrics I (PhD)
Module 4, 2025-2026

Course Information

Instructor: Liang Chen
Office: PHBS Building, Room 608
Phone: 86-755-2603-7541
Email: chenliang@phbs.pku.edu.cn
Office Hour: Wednesday & Thursday 15:30-16:30

Teaching Assistant: Chongyu Fang
Phone:
Email:

Classes:
Lectures: Monday and Thursday, 10:30-12:20
Venue: PHBS Building

1. Course Description

1.1 Context

Course overview: This course introduces basic concepts and models for cross-sectional data, with main emphasis on the theoretical properties of various estimators for different models. We start with a general framework that defines a broad class of estimators called "M Estimators", and then study several examples of this type of estimators, including the least squares estimator, the instrumental variable estimator, the GMM estimator, and the maximum likelihood estimator. This course will also cover some other popular topics, including estimators of treatment effects, nonparametric estimators.

Prerequisites: Probability, statistics, linear algebra, calculus.

1.2 Textbooks and Reading Materials

The textbook for this course is:
A Premier in Econometric Theory, by John Stachurski, 2016, MIT Press.

Other reading materials will be distributed during class.

2. Learning Outcomes

2.1 Intended Learning Outcomes

Learning Goals	Objectives	Assessment (YES with details or NO)

1. Our graduates will be effective communicators.	1.1. Our students will produce quality business and research-oriented documents.	YES
	1.2. Students are able to professionally present their ideas and also logically explain and defend their argument.	YES
2. Our graduates will be skilled in team work and leadership.	2.1. Students will be able to lead and participate in group for projects, discussion, and presentation.	YES
	2.2. Students will be able to apply leadership theories and related skills.	YES
3. Our graduates will be trained in ethics.	3.1. In a case setting, students will use appropriate techniques to analyze business problems and identify the ethical aspects, provide a solution and defend it.	YES
	3.2. Our students will practice ethics in the duration of the program.	YES
4. Our graduates will have a global perspective.	4.1. Students will have an international exposure.	YES
5. Our graduates will be skilled in problem-solving and critical thinking.	5.1. Our students will have a good understanding of fundamental theories in their fields.	YES
	5.2. Our students will be prepared to face problems in various business settings and find solutions.	YES
	5.3. Our students will demonstrate competency in critical thinking.	YES

2.2 Course specific objectives

The students are expected to have a solid and deep understanding of the most popular methods of modern econometrics for cross-sectional data. They should be able to derive the asymptotic properties of the estimators and test statistics, and compare different methods.

2.3 Assessment/Grading Details

Grading policy:
Homework and Class Performance: 10%
Midterm Exam: 30%
Final Exam: 60%

2.4 Academic Honesty and Plagiarism

It is important for a student's effort and credit to be recognized through class assessment. Credits earned for a student work due to efforts done by others are clearly unfair. Deliberate dishonesty is considered academic misconducts, which include plagiarism; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; or altering, forging, or misusing a University academic record; or fabricating or falsifying of data, research procedures, or data analysis.

All assessments are subject to academic misconduct check. Misconduct check may include reproducing the assessment, providing a copy to another member of faculty, and/or communicate a copy of this assignment to the PHBS Discipline Committee. A suspected

plagiarized document/assignment submitted to a plagiarism checking service may be kept in its database for future reference purpose.

Where violation is suspected, penalties will be implemented. The penalties for academic misconduct may include: deduction of honour points, a mark of zero on the assessment, a fail grade for the whole course, and reference of the matter to the Peking University Registrar.

AI tools requirements：
Using AI tools to complete assignments or assessments without the approval of the course instructor will be regarded as an act of academic dishonesty. Depending on the severity of the situation, penalties will be implemented in accordance with the provisions of the Peking University Graduate Student Handbook.

For more information of plagiarism, please refer to *PHBS Student Handbook*.

3. Topics, Teaching and Assessment Schedule

Week 1: Mathematical Background

- Probability
- Statistics
- Matrix

Week 2: The Problem of Estimation

- Models, parameters, and a general estimation framework

Week 3: Least Squares Estimator

- Definition of OLS
- Finite sample and large sample properties of OLS
- Geometric interpretation of OLS

Week 4: General Method of Moments: I

- Definition, motivation, and general theory

Week 5: General Method of Moments: II

- IV, 2SLS, and 3SLS

Week 6: Maximum Likelihood Estimator

- General theory of MLE, Probit and Logit models

Week 7: Estimator with Nonsmooth Object Functions

- Quantile regression, maximum score estimator

Week 8: Causal Inference and Treatment Effects

- Potential outcome, average treatment effects, propensity score matching
- regression discontinuity design, difference-in-difference

Week 9: Nonparametric estimation methods

- Kernel methods
- Local polynomial methods

4. Miscellaneous