Econometrics (ECON 5300, Spring 2026)

Department of Economics, HKUST

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Lecture schedule and location: Tuesday & Thursday 15:00 - 16:50. (Rm 1010, LSK Bldg)

Course Description:

This 4-credit Ph.D.-level course will introduce students to econometrics with rigorous mathematical treatment. It will help students to understand advanced econometric techniques and to conduct state-of-the-art empirical studies. A unified approach will be provided for analyzing linear regression models, simultaneous equation models, panel data models, and time series models.

Prerequisites:

Introductory econometrics, linear algebra, calculus, probability and statistics, or consent of instructor.

Course Web Site: http://canvas.ust.hk

The course is based on lecture notes. All teaching materials and problem sets will be posted on Canvas. You should check the course website at least **twice a week** for important announcement such as the homework information.

Computer Software

Students are required to write codes to conduct statistical inference using real data and to conduct Monte Carlo simulations. The teaching will be based on Matlab/Stata/R.

Grading Rubics

Homework (40%): The course is topic-based. Homework will be assigned for every topic. Students are encouraged to form small study groups. However, each student must submit his/her own solution in their **own writing**. Do not copy other people's work, even if they come from your study group. Students must submit their solutions through **Canvas** before the due dates. Late submission including uploading failure will not be accepted without justification. Submission that occurs after the answer is posted will receive no grade.

Class discussion (10%): We will occasionally ask students to conduct short presentations. The content can be homework solutions, a journal article, a research idea, etc.

Final exam (50%): Time and format to be announced.

Class Attendance:

We will not take record of attendance, but you are strongly encouraged to attend every lecture.

Exam Policy:

The exam is closed-book. However, you may prepare **three pages** of double-sided cheat sheets and use them during the exam. There is zero tolerance of cheating. The case of cheating will be reported to the school. We will check your **school ID cards** during exams.

Re-grading Policy:

Contact your TA regarding any grading issue within one week from the time the grade is released.

Academic Integrity and Honesty:

Students are required to comply with the university policy on academic integrity as detailed at https://registry.hkust.edu.hk/resource-library/academic-honor-code-and-academic-integrity

The case of **plagiarism** and **copying** will be reported to the school.

Program Intended Learning Goals (PILG): PG, MPhil, PhD

1. Students will have up-to-date and in-depth knowledge in Economics, leading to independent substantive scholarly research.
    1. Demonstrate a sound grasp of the literature in Economics.
    2. Apply their knowledge in Economics to solve related business problems in an innovative fashion.
2. Students will have an in-depth understanding of contemporary business and organizational issues, within the field of Economics.
    1. Demonstrate a broad based knowledge of core business functions.
    2. Integrate functional knowledge to solve business problems within the field of Economics.
3. Students will be equipped to perform all aspects of the role of faculty in academia, including pedagogical skills.
    1. Teach independent courses or lead lab/tutorial sessions effectively.
    2. Present their discipline knowledge clearly to layman.

Course Intended Learning Outcomes: Upon completion of the course, you will be able to:

1. Weight the significance of key assumptions used in different econometric models, and explain the relationship between those assumptions and properties of estimators. (PILO 1)
2. Design an identification strategy. (PILO 1, 2)
3. Derive statistical properties of an estimator. (PILO 1)
4. Use Matlab or R to conduct Monte Carlo simulations to analyze properties of estimators. (PILO 1)
5. Construct an appropriate econometric model and use Matlab/Stata/R to analyze a given economic dataset, and then conduct statistical inference and interpret the results. (PILO 1,2,3)

Reference Textbooks:

Hayashi, Fumio (2000): "Econometrics." Princeton University Press

Greene, William: "Econometric Analysis." Prentice Hall, any edition.

Wooldridge, Jeffrey M.: "Econometric Analysis of Cross Section and Panel Data," The MIT Press. (The 1st edition is downloadable from HKUST library)

Hansen, Bruce. (2022): "Econometrics." Princeton University Press.

Course Outline:

- Introduction to causal analysis vs. prediction (1 week)
- Finite sample theory of OLS (1 week)
- Large sample theory (1 week)
- Large sample theory of OLS (1 week)
- From regression to causal analysis (1 week)
- Instrumental variables (2 weeks)
  - Two-stage least squares (2SLS)
  - Generalized method of moments (GMM): over-identification test
  - Application to quasi-experiments/natural experiments
  - Local average treatment effects (LATE)
- Difference-in-differences: the parallel trend assumption (1 week)
- Regression discontinuity design: The quasi- or natural experiment (1 week)
- Synthetic control: extensions to the idea of difference-in-differences (1 week)
- Panel data methods (2 weeks)
  - Fixed effects
  - Dynamic panel: system and difference GMM
- Limited dependent variable models (1 week)
  - Linear probability model
  - Maximum likelihood: Probit, Logit, Tobit.