

ECON5120
Econometric Theory and Applications
計量經濟理論及應用
Department of Economics
Chinese University of Hong Kong
Fall 2024

Instructor Information

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 - Office hours: Wednesday 2:00~3:00pm

Class Time

- Wednesday 9:30~12:15

Teaching Assistant Information

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 - Office hours: Thursday, 2:00~3:00pm

Course Description and Learning Outcomes

The goal of ECON5120 is in obtaining the popular skills for writing empirical research papers. We attempt to achieve this by getting familiar with the well-known econometric analyses and linking this to the knowledge of the numerical outputs generated by standard statistical packages. Another goal is to bridge the current course topics to the upper-level econometrics courses, which are devoted to mainly frontier econometrics research. More weight will be given to the first goal of this course.

In attaining these goals, our interests will be focused more on cross-sectional data and their slight extensions. There are two reasons for this focus. First, the analysis of cross-sectional data is a building block for the analysis of many other data sets. For example, stationary time-series data can be analyzed in a parallel manner to the analyses of cross-sectional data if their own inherent dependence features of observations can be removed. Thus, it becomes necessary to understand cross-sectional data analyses before examining time-series data. Other data sets can be analyzed similarly to stationary time-series data. Second, the cross-sectional data analysis is easier than other data sets as they do not involve too much complication from the variation

assumptions. Eventually, by these, studying cross-sectional data becomes a good starting point for achieving the specified objectives, even though their applicability is not so limited.

After completing ECON5120, average students are expected to be able to conduct the following:

- Applying suitable and popular econometric analyses for cross-sectional data;
- Understanding the implicit assumptions behind economic data analysis;
- Interpreting the numerical outputs generated by standard statistical packages.

Prerequisites

Knowledge of the undergraduate level of multivariate calculus, linear algebra, mathematical statistics, and econometrics/regression analysis is a prerequisite.

Textbook

Required:

- Jin Seo Cho, [A First Course in Econometrics](#), 2023

Recommended:

- Bruce Hansen, [Econometrics](#), 2021

Course Webpage

We will distribute materials for this class through Blackboard, so please make sure to check Blackboard at least twice per week for announcements and postings. The url of the course webpage is as follows:

<https://blackboard.cuhk.edu.hk/>

Teaching Modes and Learning Activities

This course is a face-to-face class. Some lecture materials discussed in class are hard to find from the reading lists. Therefore, students are highly recommended to take the course regularly without missing any classes. I also plan to distribute the video lectures recorded for online classes. This distribution is to complement the class and for the purpose of student's self-studying. We will also discuss programming statistical codes using GAUSS via the online discussions. For students' evaluation, I will take into account of only face-to-face lectures. See below for more information.

Teaching Modes and Learning Activities	
On-site face-to-face	Percentage of time
<i>Lectures</i>	40%
Online asynchronous	
<i>Lecture recordings</i>	40%
<i>Online exercises</i>	10%
<i>Discussion forum</i>	10%

Problem Sets

There will be two problem sets, each of which will contain the old mid-term and final exams. Students can solve the problem sets themselves and discuss difficult problems with me and TA during the office hours.

Computational Demonstration and Statistical Package

After discussing each session, we will discuss a computational example for demonstrations, and for this purpose, we will use GAUSS LIGHT software whose most recent version is freely available at the following URL:

<https://www.aptech.com/industry-solutions/gauss-in-education/students/>

Although this version is not a full version of GAUSS, there is no any problem for our class purpose.

Examinations

There will be one mid-term exam and one final exam. The mid-term carries a weight of 45%. The final exam will have 40% weight. The final will be cumulative and cover all the course materials.

All exams will be closed book/note. Please bring a basic scientific calculator (non-programmable) to the exams. There will be no make-up exams. If you miss a midterm, you will receive a zero. The only exception is a verifiable medical reason, in which case the weight of the missed mid-term will be shifted to the final exam.

Finally, if you are caught cheating during an exam, you will receive a zero on the exam, may fail the course, and may be subject to further disciplinary action by CUHK.

Performance Evaluation

Students are evaluated by three components: Attendance, Mid-term Exam, and Final Exam. The grades in this course will be based on the following:

Assessment Activities	Weights
Attendance	15%
Mid-term exam	40%
Final exam	45%

Attendance is measured only by students' participation in the face-to-face lectures. The online video lectures are provided for the purpose of students' self-studying. I plan to check students attendance every class to measure class participation. For example, if there are total 30 lecture hours for the class in this term and a student does not participate in the lectures for 10 hours, 5% ($=10 \text{ hours} / 30 \text{ hours}$ of 15%) is going to be deducted from the student's total mark.

Feedback for Evaluation and Re-grading Policy

All grading problems must be rectified within one week from the time an exam is returned. Re-grading of exams may not be allowed if they were written in pencil. Please talk to the TA first regarding the re-grading. If there are some further issues, you can contact the instructor.

Course Schedule

Please note here that the schedule below is tentative, meaning that we may need to change things as the session progresses. Note that the tentative mid-term exam date is **October 16th**.

We have the following course plans for ECON5120:

- Classical Linear Models
 - Ordinary Least Squares (OLS) estimation
 - Best Linear Unbiased Estimator (BLUE)
 - t -statistic
 - Wald statistic
 - Computational demonstration
- Tools for Asymptotic Analysis
 - Law of Large Numbers (LLN)
 - Central Limit Theorem (CLT)
 - Computational demonstration
- Standard Linear Models without Classical Linear Model Conditions
 - OLS estimation
 - Consistence
 - Asymptotic distribution
 - Wald statistic
 - Computational demonstration
- Linear Models with Conditional Heteroskedasticity
 - OLS estimation
 - Consistence
 - Asymptotic distribution
 - Wald statistic
 - Computational demonstration
- Midterm is scheduled on October 16th.
- Linear Models with Endogenous Errors
 - IV and TSLS estimations
 - consistence
 - asymptotic distribution
 - Wald statistic
 - Computational demonstration
- Linear Models with Endogenous Errors

- GMM estimation
- consistence
- asymptotic distribution
- Wald statistic
- Computational demonstration
- Nonlinear Models with Conditional Heteroskedasticity (if time permits)
 - NLS estimation
 - Uniform Law of Large Numbers (ULLN)
 - Consistence
 - Asymptotic distribution
 - Wald statistic
 - LM statistic
 - QLR statistic
 - Computational demonstration
- Final Exam is scheduled on the day TBA.

Academic Honesty and Plagiarism

Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details may be found at

<http://www.cuhk.edu.hk/policy/academichonesty/>.

Use of Generative AI Tools

Use of any AI tools is allowed with not acknowledgement. For self-studying purpose, students can freely use AI tools. However, all exams are closed book or note tests.