北京大学 汇丰商学院
Peking University HSBC Business School

ECON530 / FIN510
Advanced Econometrics I
Module 2, Year 2018-2019

Course Information

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Office Hour: Mondays 3-4pm, Tuesdays 10-11am

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Classes:
Lectures: Tuesdays and Fridays 1:30-3:20pm
Venue: PHBS Building, Room TBA

1. Course Description

1.1 Context

Course overview: This is a graduate level course in econometrics. Econometrics is statistical analysis of economic and financial data. It is widely applied to estimate economic relationship, test economic theory and evaluate government and business policies. It has also been applied to management, marketing, sociology, etc.

The course begins with brief reviews of probability distributions and limit theorems. Then, it studies the classical linear regression model (CLRM) focusing on the least squares estimator. The course further studies the cases in which main assumptions in the CLRM are violated (Heteroskedasticity, autocorrelation, multicollinearity, and non-normal error). The course also covers an alternative estimation method (maximum likelihood estimator), and three hypothesis tests (Wald, likelihood ratio, and Lagrange multiplier tests) are examined and compared. Finally, basic time series models are analysed. The course emphasis is rather theoretical than empirical.

Prerequisites: You are assumed to have already taken Mathematics (GEN500) and to be familiar with the linear algebra and calculus.

1.2 Textbooks and Reading Materials

There is no designated textbook for the course, but the following book could be useful (you are not required to buy/read it):

Reference books:
Jeffrey Wooldridge (2012), *Introductory Econometrics: A Modern Approach (5th edition)*, Cengage Learning
William H. Greene (2012), *Econometric Analysis (7th edition)*, Pearson
James D. Hamilton (1994), *Time Series Analysis (1st edition)*, Princeton University Press

2. Learning Outcomes

2.1 Intended Learning Outcomes

Learning Goals	Objectives	Assessment
1. Our graduates will be effective communicators.	1.1. Our students will produce quality business and research-oriented documents.	
	1.2. Students are able to professionally present their ideas and also logically explain and defend their argument.	V
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.	
	2.2. Students will be able to apply leadership theories and related skills.	
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.	
	3.2. Our students will practice ethics in the duration of the program.	V
4. Our graduates will have a global perspective.	4.1. Students will have an international exposure.	
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.	V
	5.2. Our students will be prepared to face problems in various business settings and find solutions.	
	5.3. Our students will demonstrate competency in critical thinking.	V

2.2 Course specific objectives

This course helps students use and understand regression analysis, introduces widely used econometric models, and explores underlying economic intuition. At the end of the course, students are expected to be equipped with essential theoretical foundations of econometrics and to be ready for empirical analyses.

2.3 Assessment/Grading Details/Lecture Reschedule

Requirements for the course include attending lectures, several problem sets, a midterm exam and a final exam. Since the course is cumulative in the sense that each lecture builds on previous ones, full attendance is required. I take roll several times randomly throughout the module. Each time you're absent, your course score will be deducted by 1 point unless you obtain my pre-approval. As for problem sets, you are encouraged to work in groups. However, you must turn in an individual solution. Plagiarism is strictly punished. Late submission is unacceptable and will not be graded. Some problem sets may contain computational exercises.
The grading of the course can be broken down to the following:

Class attendance and homework	30%	
Midterm exam	30%	Dec 14 (F), 130-320pm, location TBA
Final exam	40%	Jan 18 (F), 1-3pm, location TBA

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.

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

3. Topics, Teaching and Assessment Schedule

The schedule of topics could be updated as the course evolves.

Lecture 1

1. Probability distributions (Wooldridge: Appendix B.5)
1.1. Normal distribution
1.2. Chi-squared (χ^2) distribution
1.3. *t* & *F* distributions

Lecture 2-3

2. Limit theorems (Wooldridge: Appendix C.3, Greene: Appendix D.2)
2.1. Convergence
2.2. Law of large number (LLN)
2.3. Central limit theorem (CLT)
2.4. Slutsky's theorem
2.5. Delta method

Lecture 4-5

3. Classical linear regression model: Simple regression (Wooldridge: Ch. 2)
3.1. Standard assumptions of classical linear regression model
3.2. Least squares estimator (LSE)
3.3. Interpretation of regression coefficients
3.4. Inference in simple regression
3.4. Goodness-of-fit

Lecture 6-8

4. Classical linear regression model: Multiple regression (Wooldridge: Ch. 3, 4)
4.1. Standard assumptions of classical linear regression model
4.2. Least squares estimator (LSE)
4.3. Properties of OLS estimator
4.4. Gauss-Markov theorem
4.5. Estimator of σ^2
4.6. Distribution of OLS estimator

4.7. Goodness of fit (Wooldridge: Ch. 6.3)
4.8. Hypothesis test
4.9. Confidence interval
4.10. Prediction interval (Wooldridge: Ch. 6.4)

Lecture 9: Midterm Exam

Lecture 10-12
5. Departure from assumptions in classical linear regression model
5.1. Non-normal error term (Wooldridge: Ch. 5)
  5.1.1. Large sample properties of OLS estimators
  5.1.2. Large sample properties of *t*-statistic and *F*-statistic
5.2. Heteroskedasticity (Wooldridge: Ch. 8)
  5.2.1. Introduction
  5.2.2. Generalized least squares (GLS) estimator
  5.2.3. Feasible generalized least squares (FGLS) estimator
  5.2.4. Heteroskedasticity-robust estimator
5.2. Serial correlation (Wooldridge: Ch. 12)
  5.2.1. Introduction
  5.2.2. Estimation (GLS and FGLS)
  5.2.3. Heteroskedasticity-Autocorrelation-robust estimator
5.4. Multicollinearity (Wooldridge: Ch. 3.4)

Lecture 13-15
6. Maximum likelihood estimator (MLE) (Wooldridge: Appendix C.4; Greene: Ch. 14)
6.1. Likelihood function and MLE
6.2. Some statistics about likelihood function
6.3. Properties of MLE
6.4. Statistical inference (hypothesis test)
  6.4.1. Wald test
  6.4.2. Likelihood ratio test
  6.4.3. Lagrange multiplier test
  6.4.4. Example

Lecture 16-18
7. Time series analysis (Hamilton: Ch. 2, 3)
7.1. Basics
7.2. ARMA processes
  7.2.1. Moving average (MA) processes and invertibility
  7.2.2. Autoregression (AR) processes and stationarity
  7.2.3. Autoregression moving average (ARMA) processes
7.3. Model selection
  7.3.1. Transformation
  7.3.2. Identification
7.4. Estimation (Hamilton: Ch. 5.1, 5.2. 5.3)
  7.4.1. Gaussian AR(1) process
  7.4.2. Gaussian AR(p) process
7.5. Vector processes
7.6. Forecasting

4. Miscellaneous

I strongly encourage you to ask questions during lectures and office hours. If you have special needs to reach me outside the lectures or office hours, however, you may email me. I will try to respond to your email in two business days. If you don't get my response within two business days, please send me a reminder email. When you email me, please prefix the subject header of course code [AE] in order to make your email too conspicuous to miss it. Finally, please send me a brief self-introduction with a photo to me thru email by the end of November.