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

Advanced Econometrics I

Fall 2014

Location/Time: Room 319, Tuesday-Friday 8:30-10:20

Professor: Domenico TARZIA

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Office: Room 654 **Office Hours:** Wednesday 14:00 – 16:00 or by appointment.

Teaching Assistant: TBA

Course Description:

This is a graduate level course in econometrics. Econometrics is the application of mathematics, statistical methods and more recently, computer science, to economic and financial data and is described as the branch of economics that aims to give empirical content to economic relations. Econometrics is the intersection of economics, mathematics, and statistics. Econometrics adds empirical content to economic theory allowing theories to be tested and used for forecasting and policy evaluation. It has also been applied to management, marketing, sociology, etc. The course aims to help students use and understand regression analysis, introduces widely used econometric models, and explores underlying economic and intuition. The intent is to teach students technical econometric techniques and ideas that are important in quantitative research in finance and economics. 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 departs from the standard Gauss-Markov assumptions to include heteroskedasticity, serial correlation, and errors in variables. Advanced topics include instrumental variables, qualitative variable models, and panel data. If time permits, other estimation methods such as the maximum likelihood and the generalized method of moments could be covered. The course emphasis is rather theoretical than empirical, even if some economic applications will be discussed throughout the course.

Objectives:

The objective of this course is to give students tools to:

- Comprehend the theoretical framework underlying estimation results in the classical linear regressions and its main departures.
- Relate economic questions to empirical observation and try to deal with those using econometric models based on sound hypotheses.
- Understand quantitative analyses used in more complex studies, and perform such analyses on their own by providing proofs rather than assuming certain results as given.

Prerequisites:

Students are assumed to have already taken Mathematics (GEN500) and should have a working knowledge of basic linear algebra and calculus.

Course Materials:

Required textbook: Wooldridge, Jeffrey, *"Introductory Econometrics: A Modern Approach"*, Cengage Learning, 5th edition, 2012. ISBN-13: 978-1111531041 (W).

Recommended textbooks: Angrist, Joshua David, and Jörn-Steffen Pischke, *"Mostly Harmless Econometrics"*, Princeton University Press; 1st edition, 2009. ISBN-13: 978-0691120355 (AP).

Greene, William, *"Econometric Analysis"*, Prentice Hall; 7th edition, 2011. ISBN-13: 978-0273753568 (G).

Additional readings and material: The instructor will post additional readings and material on the course management system (CMS). The course name is "Advanced Econometrics I", the code is "ADEC2014".

Grading:

Econometrics is cumulative. Each topic builds on the previous one. It is therefore important that students are regular in class attendance and in submitting problem sets. Fully attendance is required and everyone is expected to actively participate in the class discussions. Problem sets will help students to make incremental progress toward the goal of judging the validity of economic theories. Weightings on the various components of the Final grade are as follows:

Class attendance and participation	10%
Problem sets	20%
Midterm exam	30%
Final exam	40%

Problem sets:

Students are encouraged to work in groups. However, they 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. Instructions and deadlines about the problem sets will be given later on by instructor and available on the course management system.

Midterm and final exam:

Midterm and final exam will be closed book. Calculators are permitted, except those with word processing capabilities. Cell phones are not allowed as calculators. No formulas will be provided and no cheat sheet is allowed in the final exam.

The exam schedule will be:

- Midterm exam: December 12, 2014 (Friday).
- Final exam: January 15, 2015 (Thursday) or January 16, 2015 (Friday).

Preliminary Course Schedule:

Week	Topic	Text	Note
Nov 14, 2014	Introduction to the class The nature of econometrics and economic data • Introduction • The experimental ideal Brief review of probabilities theories • Probability space • Probability measures	Chapter 1 (W) Appendix B (W)	Chapter 1 (AP) Chapter 2 (AP)
Nov 18, 2014	Brief review of probabilities theories • Random variables • Discrete distributions • Continuous distributions (Normal, Chi-squared, Student's t-distribution, F-distribution)	Appendix B (W)	
Nov 21, 2014	Estimation and inference Theory • Descriptive statistics • Point estimation • Interval estimation • Hypothesis testing	Appendix C (W)	Appendix C (G)
Nov 25, 2014	Limit theories • Convergence • Law of large number (LLN) • Central limit theorem (CLT) • Slutsky's theorem • Delta method	Appendix C (W)	
Nov 28, 2014	Classical linear regression model: simple regression • Standard assumptions of classical linear regression model • Least squares estimator (LSE)	Chapter 2 (W)	Chapter 2 (AP)
Dec 1, 2014	Classical linear regression model: simple regression • Properties of OLS estimator • Estimator of σ^2 • Application	Chapter 2 (W)	Chapter 2 (AP) **Problem Set 1**

Dec 5, 2014	Classical linear regression model: multiple regression • Standard assumptions of classical linear regression model • Least squares estimator (LSE) • Properties of OLS estimator • Gauss-Markov theorem • Estimator of σ^2	Chapter 3 (W) Chapter 4 (W) Appendix D (W) Appendix E (W)	Chapter 3 (AP)
Dec 9, 2014	Classical linear regression model: multiple regression • Distribution of β and σ^2 • Wald test • Goodness of fit • Confidence interval of β • Prediction interval of y	Chapter 3 (W) Chapter 4 (W) Appendix D (W) Appendix E (W)	Chapter 3 (AP) **Problem Set 2**
Dec 12, 2014	**Midterm Exam**		
Dec 16, 2014	Departures from assumption in classical linear regression model: heteroskedasticity • Generalized least squares (GLS) estimator • Feasible generalized least squares (FGLS) estimator	Chapter 8 (W)	
Dec 19, 2014	Departures from assumption in classical linear regression model: serial correlation • Introduction • Estimation • Heteroskedasticity-Autocorrelation consistent (HAC) estimator	Chapter 12 (W)	
Dec 23, 2014	Departures from assumption in classical linear regression model • Multicollinearity • Large sample properties of OLS estimators • Large sample properties of t-statistic and F-statistics	Chapter 3 (W) Chapter 4 (W) Chapter 5 (W)	**Problem Set 3**
Dec 26, 2014	Qualitative (dummy) variable • Dummy independent variable • Dummy dependent variable	Chapter 7 (W) Chapter 17.1 (W)	Chapter 6 (AP)
Dec 30, 2014	Specification error • Inclusion of irrelevant variables • Exclusion of relevant variables (omitted variable)	Chapter 3.3 (W) Chapter 3.4 (W) Chapter 9.4 (W)	

	Measurement error • Measurement error in a dependent variable • Measurement error in independent variable		
Jan 2, 2015	Instrumental variables • Endogeneity problem • Estimation: just-identified case • Estimation: over-identified case	Chapter 15 (W)	Chapter 4 (AP) **Problem set 4**
Jan 6, 2015	Panel data • Unobserved heterogeneity: fixed effect (PE) model • Difference-in-difference estimation • Seemingly unrelated regressions (SUR)	Chapter 13.3 (W) Chapter 13.4 (W) Chapter 14.1 (W)	Chapter 5(AP)
Jan 9, 2015	Maximum likelihood estimator (MLE) • Likelihood function and MLE • Some statistics about likelihood functions • Properties of MLE		Chapter 14 (G)
Jan 13, 2015	Generalized method of moment estimator (GMME) • Methods of moments • Generalized methods of moments • Properties of GMME		Chapter 13 (G)
	Final Exam		