

# Econometrics II

## Fudan University

Department: School of Economics

<b>Course Code</b>	ECON130241		
<b>Course Title</b>	Econometrics II		
<b>Credit</b>	5	<b>Credit Hours</b>	90
<b>Course Nature</b>	<input type="checkbox"/> Specific General Education Courses <input type="checkbox"/> Core Courses <input type="checkbox"/> General Education Elective Courses <input type="checkbox"/> Basic Courses in General Discipline <input checked="" type="checkbox"/> Professional Compulsory Courses <input type="checkbox"/> Professional Elective Courses <input type="checkbox"/> Others		
<b>Course Objectives</b>	<b>Course Objectives:</b> After you finish the course, you are supposed to be able to estimation and inference using both cross section and panel data		
<b>Course Description</b>	The content can be divided into four major parts. In the first part, we will introduce some estimating methods such as the GLS, GMM and MLE. In the second part, we will discuss models in Microeconometrics such as the Logit and Probit, in both the binary and multinomial cases. In the third part, different models for panel data will be introduced, including the widely used fixed and random effects models and their extensions, along with the dynamic panel models. In the fourth part, the Bayesian perspective of Econometrics will be introduced, as it is becoming increasingly popular amongst economists.		
<b>Course Requirements:</b> <b>Prerequisites:</b> Introductory courses in Calculus, Linear Algebra, Probabilities and Statistics, as well as Econometrics. Some basic models and methods will be recapitulated in the course, albeit only to a brief extent.			
<b>Teaching Methods:</b> Lecture, discussion, homework, etc.			

**Instructor's Academic Background:**

Wu Ruochen, Assistant Professor, School of Economics, Fudan University. He finished his Ph.D. in Economics, University of Cambridge (2018), Master of Applied Economics, University of Bonn (2013), Bachelor of Computer Science and Technology, Fudan University (2011). His main research interests are semi-parametric Bayesian econometric theory and application, and applied microeconomics.

**Members of Teaching Team**

Name	Gender	Professional Title	Department	Responsibility
Wu Ruochen	Male	Lecturer		

**Course Schedule**

We will examine a selection of the following topics (1 - 18), which may be subject to adjustment according to the progress during the term.

**Topic 1: Introduction**

Hours: 4+1 tutorial hour

- (a) Structure of cross-section and panel data
- (b) Frequentist and Bayesian Econometric methods
- (c) Plan of the course

**Topic 2: Generalized Least Square**

Hours: 4+1 tutorial hour

- (a) A revisit to the OLS and the Gauss-Markov Assumptions
- (b) Heteroskedasticity: WLS
- (c) More general cases: GLS
- (d) Seemingly Unrelated Regression as a special case

**Topic 3: Non-normality and Endogeneity**

Hours: 4+1 tutorial hour

- (a) Non-normality of the data
- (b) Outliers
- (c) Leverage and discrepancies
- (d) Least Absolute Deviation estimator
- (e) Revisit to the Instrument Variable, 2SLS and its properties

**Topic 4: Generalized Method of Moments 1**

Hours: 4+1 tutorial hour

- (a) OLS as a Method of Moments
- (b) IV estimator as MoM
- (c) Just identified vs. Over-identified

**Topic 5: Generalized Method of Moments 2**

Hours: 4+1 tutorial hour

- (a) Proper weight for the over-identified case
- (b) IV estimator as GMM when over-identified
- (c) Tests for the over-identified case

**Topic 6: Tests**

Hours: 4+1 tutorial hour

- (a) Functional form
- (b) Selection for regressors
- (c) Power of tests

**Topic 7: Maximum Likelihood Estimator**

Hours: 4+1 tutorial hour

- (a) Likelihood function
- (b) MLE estimator
- (c) MLE and OLS
- (d) Score and information

**Topic 8: Binary Choice Models**

Hours: 4+1 tutorial hour

- (a) Linear Probability Model
- (b) Probit and Logit Models
- (c) Estimation

**Topic 9: Multinomial Choice Models**

Hours: 4+1 tutorial hour

- (a) Curse of dimensionality
- (b) Multinomial Logit
- (c) Mixed Logit

**Topic 10: Panel Data 1**

Hours: 4+1 tutorial hour

- (a) Introduction to panel data models
- (b) Pooled OLS
- (c) Fixed effects model
- (d) Random effects model as a GLS

- (e) Correlated random effects model
- (f) Hausman test

**Topic 11: Panel Data 2**

Hours: 4+1 tutorial hour

- (a) Dynamic panel
- (b) Fixed Effects Logit and Random Effects Probit
- (c) Dynamic Panel Binary Response Models

**Topic 12: Selection Bias 1**

Hours: 4+1 tutorial hour

- (a) Treatment effects
- (b) Selection bias with homogeneous and heterogeneous TE
- (c) Random experiments

**Topic 13: Selection Bias 2**

Hours: 4+1 tutorial hour

- (a) Selection bias on observables
- (b) Conditional Independence Assumption
- (c) Propensity Score Matching

**Topic 14: Selection Bias 3**

Hours: 4+1 tutorial hour

- (a) Selection bias on unobservables
- (b) Difference in Difference
- (c) Regression Discontinuity
- (d) Local Average Treatment Effect

**Topic 15: Fundamentals of Bayesian Inference**

Hours: 4+1 tutorial hour

- (a) Bayesian inference
- (b) Conjugate priors
- (b) Parameter uncertainty
- (c) Model uncertainty
- (d) Bayesian regression

**Topic 16: Bayesian Models for Cross-Section and Panel Data**

Hours: 4+1 tutorial hour

- (a) Heteroskedasticity with Bayesian methods
- (b) t-distributed errors
- (c) Bayesian SUR
- (d) Hierarchical priors

(e) Bayesian fixed and random effects models

**Topic 17: Bayesian Discrete Choice Models**

Hours: 4+1 tutorial hour

- (a) The EM algorithm
- (b) Data augmentation
- (c) Bayesian inference for discrete choice models
- (d) Bayesian inference for the mixed Logit model

**Topic 18: Bayesian Semi-parametric Methods**

Hours: 4+1 tutorial hour

- (a) Monte Carlo Integration
- (b) Bootstrapped Bayesian Multivariate Regression
- (c) Dirichlet distribution and Dirichlet Process

**Final Exam**

**Grading & Evaluation:**

- 1. Assignments (5 problem sets): 15%
- 2. Midterm: 35%
- 3. Final: 50%

**Teaching Materials & References:**

Textbooks:

Notes will be presented on the whiteboard during the course. The following books will be helpful for the students to better understand the materials:

- 1. Cameron, A. C. and Trivedi, P. K. (2005). *Microeconometrics: Methods and Applications*. Cambridge University Press.
- 2. Wooldridge, J. (2010). *Econometric Analysis of Cross-Section and Panel Data*. MIT.
- 3. Koop, G. (2003). *Bayesian Econometrics*. Wiley.