

Fulbright School of Public Policy and Management

Academic Year 2018 - 2020

Fall semester

(15/10/2018 - 24/01/2019)

Quantitative Methods

Teaching team

Instructors:	Cao Hao Thi	(email: thi.caohao@stu.edu.vn)
	Le Viet Phu	(email: phu.le@fuv.edu.vn)
Tutor:	Hoang Van Thang	(email: thang.hoang@fulbright.edu.vn)

Class Meeting Time

Tuesday & Thursday	08:30 to 10:00
Friday	13:30 to 15:00

Office hours

Cao Hao Thi:	Monday 16:45 – 18:00 or email for appointment
Le Viet Phu:	Thursday 15:00 – 17:00 or email for appointment
Hoang Van Thang:	Tuesday and Friday 15:00 – 16:30 or email for appointment

Office hours are for groups or individual to exchange ideas and discuss the course material or to need more help. The timings of the office hours are sometimes changed to help the students before the exams and before the assignments due date.

If the timings of the office hours are not convenient, please feel free to make appointments at other times during the week to meet with members of the Teaching Team via email or faculty Dropbox.

Objectives

The Quantitative Methods course is designed with two objectives. The first is to provide participants with the ability to analyze critically quantitative and empirical analysis done by others and to use that analysis in the design of public policy. The second is to provide students with the skills necessary to perform quantitative policy analysis on their own.

Students are expected to be able to:

- Read and understand statistical formulas;
- Analyze and critique statistical reports presented in public media, research papers, and scientific workshops;
- Understanding of the role of econometric models in economic analysis;
- Step by step to construct an econometric model which addresses alternative assumptions to ensure a reliable result;
- Familiarize with several conventional statistical tools to analyze and present statistical data.

Course Description

The course includes two main parts:

- Applied statistics
- Econometrics

The applied statistics module will review fundamental concepts of statistics, including descriptive statistics, basic probability, probability distributions, sampling and sample distribution, estimation and hypothesis testing. This module provides the foundation for participants to study econometric analysis.

The second half of the course is devoted to the teaching of fundamental tools of econometrics. The module introduces the standard methods for estimating relationships among observed social and economic variables and for testing hypotheses about their relationships. Participants will learn how to use models, data, and appropriate analysis to describe the real world and to contribute to policy discussions. Participants will be introduced to the power of econometric methods while also noted about their limitations. The focus will be on formulation, estimation, testing of econometric models, and discussing policy implications from econometric findings. In addition, participants will also learn how to carry out an empirical study through a term project. The course will require the use of specialized software packages such as Eviews, Stata, and R.

The final section introduces the application of statistics and econometric models in data science to help make business decisions, visualize data, and analyze socio-economic problems. Students will familiarize with the principles of data science, from collecting, organizing, exploring and using data. Students will practice basic applications with the R software.

Given its technical nature, the Quantitative Methods course is a very challenging subject for participants. It is absolutely critical that participants have to maintain a steady pace of study. Simple memorization, and last-minute studying will not help to understand well the application to the real world. Therefore, if participants encounter any problems or have any questions, make sure to seek help from the teaching team as early as possible. It is important to understand concepts and develop the ability to apply them to the solutions of various problems. This takes practice. The lectures, textbooks, handouts, problem sets, and the term project are all designed to help our participants develop these skills.

Course Requirements

Participants are required to read the assigned readings before the class. During the course participants will have to complete problem sets, a term project, and a midterm test in applied statistics module.

The term project must be done by groups of maximum five participants. A one-page project proposal must be submitted to the teaching team for approval on **03 January 2019**. A draft project report must be submitted on **17 January 2019** and the final report on **24 January 2019**. Participants are encouraged to form study groups on their own to discuss the lessons, problem sets and reviews together. However, each student has to complete his/her assignments using his/her own writings.

Grading

Applied statistics:	40%
Problem sets:	15%
Midterm:	25%
Econometrics:	60%
Problem sets:	20%
Term project:	40%

Readings

❖ *Statistics*

1. Mendenhall, Beaver, and Beaver, *A Brief Course in Business Statistics*, 2nd Edition, Thompson South-Western, 2001. [**Abbreviation: MBB2**]
2. Cao Hao Thi, *Thống Kê Ứng Dụng trong Kinh Doanh (Applied Statistics in Business)*, 1998.

❖ *Econometrics*

➤ **Required readings**

Main Textbooks. Lectures will be drawn mostly from two textbooks. Specific chapter references are given in the course outline. Additional material will be distributed at appropriate times. This material will also be part of required readings.

3. *Introductory Econometrics: A Modern Approach*, 2nd edition by Jeffrey M. Wooldridge, South-Western, 2002 (Chapter 1-9, 17). [**Abbreviation: JW**]
Students can refer to STATA code to simulate for the results in the book at:
<http://fmwww.bc.edu/gstat/examples/wooldridge/wooldridge.html>.
4. *Practical Data Science with R*, Nina Zumel and John Mount, 2014. Manning Publications.

Exercises: Several exercises and illustrative examples will be assigned and/or discussed in class at appropriate times. The purpose is to familiarize you with the various ways in which econometric techniques have been used to investigate “real world” problems and policy issues. These exercises will be drawn from the two main textbooks plus some case studies developed from the real context of Vietnam.

Software

Eviews by Quantitative Micro Systems.

STATA by StataCorp LP, 11th or later edition.

Open-source *R* software from the R Project for Statistical Computing, downloadable at <https://www.r-project.org/>.

Schedule

PART 1: APPLIED STATISTICS

Week 1

□ Orientation

Week 2

□ Tuesday 23/10/2018

Cao Hao Thi

Descriptive Statistics

Measures of central tendency: mean, median, and mode

- MBB2, Chapter 2

Problem Set 1 Distributed

□ Thursday 25/10/2018

Cao Hao Thi

Descriptive Statistics

Measures of variability and correlation: variance, standard deviation, covariance and correlation

- MBB2, Chapter 2

□ Friday 26/10/2018

Cao Hao Thi/Hoang Van Thang

Review

Week 3

□ Tuesday 30/10/2018

Cao Hao Thi

Basic Probability

Probability concepts

Probability properties

- MBB2, Chapter 3, Sections 3.1-3.3

□ Thursday 1/11/2018

Cao Hao Thi

Conditional Probability

Conditional probability

Bayes' rule

- MBB2, Chapter 3, Sections 3.4-3.5

□ Friday 2/11/2018

Cao Hao Thi

Probability Distributions: Discrete Distributions

Binomial distribution

Poisson distribution

- MBB2, Chapter 3, Sections 3.6
- MBB2, Chapter 4

Week 4

☐ **Tuesday 06/11/2018**

Cao Hao Thi

Probability Distributions: Continuous Distributions

Uniform distribution

Normal distribution

- MBB2, Chapter 5

Problem set 1 Due; Problem set 2 Distributed

☐ **Thursday 08/11/2018**

Cao Hao Thi

Sampling

Sampling distribution

The central limit theorem

- MBB2, Chapter 6

☐ **Friday 09/11/2018**

Cao Hao Thi /Hoang Van Thang

Review

Week 5

☐ **Tuesday 13/11/2018**

Cao Hao Thi

Statistical Estimation

Point Estimation

Confidence Intervals

- MBB2, Chapter 7

☐ **Thursday 15/11/2018**

Cao Hao Thi

Hypothesis Testing

Tests of Hypotheses for Population Means

Tests of Hypotheses for the Difference between Two Population Means

- MBB2, Chapter 8, Sections 8.1-8.5

☐ **Friday 16/11/2018**

Cao Hao Thi

Hypothesis Testing

Tests of Hypotheses for Population Proportions

Tests of Hypotheses for the Difference between Two Population Proportions

- MBB2, Chapter 8, Sections 8.7-8.8

Week 6

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|--|-----------------------------|
| <input type="checkbox"/> Tuesday 20/11/2018 | Cao Hao Thi/Hoang Van Thang |
| Review | |
| <i>Problem set 2 Due</i> | |
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| <input type="checkbox"/> Thursday 22/11/2018 | Cao Hao Thi/Hoang Van Thang |
| Review | |
| <hr/> | |
| <input type="checkbox"/> Friday 23/11/2018 | Cao Hao Thi/Hoang Van Thang |
| Review | |

Week 7

- | | |
|--|---|
| <input type="checkbox"/> Tuesday 27/11/2018 | Cao Hao Thi/Le Viet Phu/Hoang Van Thang |
| Midterm exam (Morning) | |
| <hr/> | |
| <input type="checkbox"/> Thursday 29/11/2018 | Le Viet Phu |
| Introduction to Econometrics | |
| o JW, Chapter 1 | |
| <hr/> | |
| <input type="checkbox"/> Friday 30/11/2018 | Cao Hao Thi |
| Introduction to econometric projects | |

Week 8

- | |
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| <input type="checkbox"/> Midterm exam period |
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PART 2: ECONOMETRICS

Week 9

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|--|-----------------------------|
| <input type="checkbox"/> Tuesday 11/12/2018 | Le Viet Phu |
| Univariate regressions | |
| o JW, Chapter 2 | |
| <i>Problem set 3 distributed</i> | |
| <hr/> | |
| <input type="checkbox"/> Thursday 13/12/2018 | Le Viet Phu |
| Multivariate regressions | |
| o JW, Chapter 3 | |
| <hr/> | |
| <input type="checkbox"/> Friday 14/12/2018 | Le Viet Phu/Hoang Van Thang |

Review

Week 10

Tuesday 18/12/2018 Le Viet Phu

Lab Practice: Using Stata and socioeconomic dataset - 1

Thursday 20/12/2018 Le Viet Phu

Lab Practice: Using Stata and socioeconomic dataset - 2

Friday 21/12/2018 Le Viet Phu/Hoang Van Thang

Review

Week 11

Thursday 27/12/2018 Le Viet Phu

Simple Regression: Hypothesis Tests

- JW, Chapter 4

Problem set 3 distributed/Problem set 4 distributed

Friday 28/12/2018 Le Viet Phu

Multivariate regressions: functional forms and model selection

- JW, Chapter 6

Week 12

Thursday 03/01/2019 Le Viet Phu

Regression with qualitative variables

- JW, Chapter 7

Econometric Project Proposal Due

Friday 04/01/2019 Le Viet Phu/Hoang Van Thang

Review

Week 13

Tuesday 08/01/2019 Le Viet Phu

Heteroskedasticity and autocorrelation

- JW, Chapter 8

Thursday 10/01/2019 Le Viet Phu

Regression diagnostics, model specifications, and problematic data

- JW, Chapter 9

<input type="checkbox"/> Friday 11/01/2019	Le Viet Phu/Hoang Van Thang
Review	

Week 14

<input type="checkbox"/> Tuesday 15/01/2019	Le Viet Phu
Introduction to data science and applications	
<i>Problem set 4 Due</i>	

<input type="checkbox"/> Thursday 17/01/2019	Le Viet Phu
Introduction to data science and applications	
<i>First Draft of Econometric Project Due</i>	

<input type="checkbox"/> Friday 18/01/2019	Le Viet Phu
Introduction to data science and applications	

Week 15

<input type="checkbox"/> Thursday 24/01/2019	
<i>Final Draft of Econometric Project Due</i>	
