Instructor: Nam T. Hoang
Office: 209 Roper Hall
Office Hours: Tuesday & Friday: 1:30 pm -3:00 pm and by appointment.
Lectures: Wednesday 8:10pm - 10:40 pm, WARD 305
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Prerequisites:
You must have taken STAT 202

Course description and objectives:
This course is an introduction to Econometrics at the masters level with emphasis on empirical econometric modeling. It is designed to provide the necessary concepts, tools and techniques for analyzing and modeling economic data and drawing conclusions from such data.

In this course we will provide a detailed introduction to the Classical Linear Regression model. We will focus on its assumptions and optimality properties. We will learn how to use misspecification testing to examine the validity of the underlying assumptions and develop better models. A major feature of the course are the computer-based exercises which will enable students to obtain considerable practical experience in analyzing real economic data and a wide variety of econometric problems.

Required Texts:


Software:
We will be using STATA for all the applied homework assignments. STATA is an interactive user-friendly statistical package and is available in several campus computer labs.
Homework:
There will be roughly 4 homework sets. These will be posted on the class web page or distributed in the class and will be due in approximately one week. The assignments will be due at the beginning of the class. **No late homework will be accepted.** The homework average will be 40% of your final grade. You are allowed to discuss homework problems with other students, however you need to present your own work.

Exams, Grades and Attendance:
There will be a midterm and a final exam. Each one will worth 30%. Exams and homework will count towards your grade as follows:

- Homework: 40%
- Midterm: 30%
- Final exam: 30%

For exams you will need to be able to use the concepts, models and tools not just memorize them. Exams may include material from reading assignments, lectures and practice problems. Final exam is not cumulative.

Consistent class attendance and participation will greatly increase your chances for success, as well as lightening your outside of class workload.

**Makeup exams will not be given.** All the exams will be administered in strict observance of the University Honor Code, without compromise or exception.

Course webpage: AU Blackboard

The class web page will be used to post announcements, assignments, homework problems, practice problems, exam results and other class related items. You are responsible for checking it on a regular basis, and completing any assignments posted there.

Tentative Course Outline:

- Introduction to Empirical Modeling (Week 1, Aug 27)
  The Nature of Econometrics and Economic Data
  A. What is Econometrics?
  B. Nature of Economic Data
  C. Statistical vs Theory information
  D. Experimental vs Observational data
  E. Descriptive Statistics

  Reference: Chapter 1, Wooldridge, + Lecture Notes + Chapter 1 & 2, Stock and Watson
Review of Statistics (Week 2, Sept 3)
Review of Basic Probability Theory
   A. Random Variables
   B. Discrete and Continuous Probability Distributions
   C. Joint /Conditional /Marginal Distributions
   D. Conditional Means (E(Y/X))
Reference: Appendices A-B, Wooldridge, + Lecture Notes +Chapter 2, Stock and Watson

Review of Statistics (Week 3, Sept 10)
Review of Basic Statistical Inference
   A. Estimators
   B. Properties of estimators
   C. Hypothesis Testing
      - Misspecification testing
      - Specification testing

Computer Lab on Introduction to Stata
Reference: Appendix C, Wooldridge, + Lecture Notes +Chapter 3, Stock and Watson

Linear (Normal) Regression Model (Week 4,5,6 Sept 17- Oct 1)
Simple Regression Analysis
   A. The Two-Variable Case
   B. OLS estimation
   C. Properties of OLS estimators
Reference: Chapters 2 Wooldridge + Lecture Notes + Chapter 4, 5 Stock and Watson

Computer Lab on Linear Regression (Week 5)
Multiple Regression Analysis
   A. Multiple Regression in Matrix form
   B. Gauss Markov Theorem (BLUE)
   C. T-statistics and Confidence Intervals for Coefficient estimates
   D. Joint tests of hypotheses
   E. OLS asymptotic
Reference: Chapters 3,4,5 Wooldridge + Lecture Notes + Chapter 6, 7 Stock and Watson

Linear (Normal) Regression Model (Week 7, Oct 8)
Choice of Functional Form for the Regression
Multiple Regression Analysis with Qualitative Explanatory Variables
   A. Uses of Dummy variables
B. Chow test for structural difference

Nonlinear Regression Functions
A. Polynomials
B. Log-Log /Log-Linear/Linear-Log
C. Interaction terms

Reference: Chapters 6, 7 Wooldridge + Lecture Notes + Chapters 8 Stock and Watson

MIDTERM EXAM: WEDNESDAY, OCTOBER 15 (WEEK 8)

Model Misspecification (Week 9, Oct 22)
Misspecification (Diagnostic) Testing
A. Normality
B. Heteroscedasticity
C. Linearity

Heteroscedasticity
A. Nature of Heteroscedasticity
B. Consequences of Heteroscedasticity
C. Tests for Heteroscedasticity

Reference: Chapters 8, 9, Wooldridge + Lecture Notes on Misspecification Testing

Internal and External Validity (Week 10, Oct 29)
Threats to Internal Validity
A. Omitted Variables
B. Functional Form Misspecification
C. Measurement Error
D. Sample Selection
E. Simultaneous Causality

Computer Lab on Model Misspecification
Reference: Chapters 9 Stock and Watson + Lecture Notes

Binary Choice Models (Week 11, Nov 5)
A. Linear Probability Model
B. Probit and Logit Model

Computer Lab on Binary Choice Models
Reference: Chapter 11 Stock and Watson + Lecture Notes

Instrumental Variables (IV) Regression (Week 12, Nov 12)
A. Instrument Relevance
B. Instrument Exogeneity
C. Two-Stage Least Squares Estimators

Reference: Chapter 12 Stock and Watson + Lecture Notes

Experiments and Quasi-Experiments (Week 13, Nov 19)

A. Idealized Experiments and Causal Effects
B. Difference Estimator
C. Potential Problems with Experiments in Practice
D. The Differences-in Differences Estimator
E. Quasi-Experiments/Natural Experiments

Reference: Chapter 13 Stock and Watson + Lecture Notes

FINAL EXAM: WEDNESDAY, DECEMBER 3 (WEEK 15)