Quantitative Statistical Methods II
Outline of the Course

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Chapter 1. Potential Outcomes and Causality: Treatment Effects

I. Introduction

II. Potential Outcomes, Selection Bias, and Treatment Effects

III. Identification of Treatment Effects under Different Assumptions

IV. Linear Regression and Treatment Effects

- A. Conditional independence
- B. Omitted variable bias
- C. Treatment variables that take more than two values
- D. Endogenous controls

Chapter 2: Social Experiments

I. Randomized Control Trials and Natural Experiments

II. Random Assignment and Treatment Effects

III. Standard Errors and Inference

IV. Introduction of Additional Regressors

V. Warnings: Imperfect Compliance and Effects on Intermediate Outcomes

- A. Partial or Imperfect Compliance and Intention-to-Treat Analysis
- B. Longer Run Interaction of Treatment and Intermediate Outcomes

Chapter 3. Selection on Observables. Matching

I. Selection Based on Observables and (Exact) Matching

II. The Common Support Condition

III. Propensity Score Matching

IV. Estimation methods

V. Matching versus Regression

VI. Inference: Bootstrap Standard Errors

Chapter 4. Instrumental Variables

I. Identification of causal effects in IV settings

- A. Homogeneous treatment effects
- B. Heterogeneous treatment effects

II. Imperfect Compliance and IV

III. Local Average Treatment Effects (LATE)

IV. Conditional Estimation with Instrumental Variables

V. Continuous Instruments: Marginal Treatment Effects (MTE)

VI. Some Remarks about Unobserved Heterogeneity in IV Settings

VII. Weak Instruments

Chapter 5. Regression Discontinuity

I. The fundamental RD assumption

II. Homogeneous Treatment Effects

III. Heterogeneous Treatment Effects

A. Sharp design

B. Fuzzy design

IV. Estimation Strategies

V. Conditioning on Covariates

Chapter 6. Panel Data

I. Introduction

II. Static Models

A. The Fixed Effects Model. Within Groups Estimation

B. The Random Effects Model. Error Components

C. Testing for Correlated Individual Effects

III. Dynamic Models

A. Autoregressive Models with Individual Effects

B. A small digression: quick review of Generalized Method of Moments (GMM)

C. Difference GMM Estimation

D. System GMM Estimation

E. Specification Tests

Chapter 7. Difference in differences

I. Difference in Differences Setup

II. Difference in Differences in the Regression Context

III. Triple Differences

IV. Synthetic Control Methods

Chapter 8. Quantile Regression and Quantile Treatment Effects

I. Introduction

A. Motivation

B. Unconditional quantiles

C. Nonparametric conditional quantiles

II. Quantile Regression

A. Conditional Quantiles (revisited)

B. The Quantile Regression Model

C. Estimation

D. Quantile Regression with Censoring

III. Quantile Treatment Effects (QTE)

A. What We Do (and What We Do Not Do)

B. The QTE Estimator

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