Final Review

Introduction to Econometrics,Spring 2025

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Information

- **Final Exam Date and Time**: Thursday, June 12, 16:30-18:30AM
- **Location**: Xian I Building, Room 207

Important Guidelines

1. **Books and notes** are not permitted.
2. All electronic devices are **prohibited**. Only **paper dictionaries** are allowed.
3. **All questions are in English. You may answer in Chinese, English, or both**. Writing in English will earn a bonus of 5-10 points.
4. **Time Management** is crucial. Avoid spending excessive time on any single question.
5. **Conduct**: Maintain academic integrity. **Cheating or any form of misconduct will result in disciplinary action**.

Review Lecture 0

- What is econometrics?
  - Main missions: **Causality** v.s. **Forecasting**
- The Axioms of Data Analysis
- Data Structure:
  - **Cross section**
  - **Times series**
  - **Pool-Cross sections**
  - **Panel Data**
- *Micro-Econometrics* v.s *Macro-Econometrics*

Review Lecture 1

- The Central Question of Causality
  - **Rubin Causal Model**: Potential Outcome Framework
  - Experimental Design as a Benchmark
  - What is the RCT?
  - RCT does not work in reality?
- Basic Probability and Statistics
  - LLW and CLT
  - Statistical Inference
  - Point estimation: Estimator and Estimate
  - Three Characteristics of an Estimator
  - Properties of the sample mean and the sample variance
  - Hypothesis Testing and P-Value
  - Confidence Interval and significance level
- Estimate and Hypothesis Tests for the Difference Between Two Means

Review Lecture 2

- From Randomized Control Trials to Observational Studies
  - Unconditional Independence to CIA
- Simple OLS:
  - The Ordinary Least Squares Estimator(β)
  - R squares/the coefficient of determination
- The Least Squares Assumptions:
  - Assumption 1
  - Assumption 2
  - Assumption 3
- Properties of the OLS estimator
  - The OLS estimator is unbiased, consistent and has asymptotically normal sampling distribution.

Review Lecture 3

- Multiple OLS Regression: Estimation
  - OVB Bias
  - Perfect multicollinearity: Assumption 4
  - Interpretation of coefficients
  - Partitioned regression: proof unbiasedness and consistence
  - Adjusted R-Squres
  - Categorical variables as X

Review Lecture 4

- Statistical Inference of β
  - *Standard error* of β
  - Hypothesis concerning β
  - Confidence interval
- Multiple Regression: Hypotheses tests
  - Heteroskedasticity & homoskedasticity
  - Testing hypothesis on 2 or more coefficients: F-test

Review Lecture 5: Nonlinear Regression

- Polynomials, Logarithmic transformations and Interactions
  - How to explain these estimate coefficients?

Review Lecture 6: Binary and Multiple Choice Dependent Variables

- LPM,Logit,Probit and Mul-logit
  - Coefficient interpretation
  - Marginal effects
  - Pseudo-R^2

Review Lecture 7 Assessing Regression Studies(I)

- Internal validity v.s External validity
- Threats to internal validity
  1. **Omitted variables bias**
     - **Control variables**
       - Irrelevant variables
       - Relevant variables
       - Highly correlated variables
       - Bad Controls
     - **DAGs and Causal Diagrams**
  2. **Measurement error**
     - Y
     - X

Review Lecture 8 Assessing Regression Studies(II)

- Threats to internal validity
  - 3. Function form misspecification
  - 4. Simultaneous causality
  - 5. Missing Data and Sample Selection
    - Missing Data: X and Y
    - Limited Dependent Variable: Truncated/Censored/Sample Selection
  - 6. Heteroskedasticity and/or correlated error terms
  - 7. Economic significant

Review Lecture 9: Matching Methods

- Matching: basic idea and assumption
- Propensity Score Matching
- Matching v.s OLS

Review Lecture 10: Instrumental Variables

- Two assumptions:
- Statistical properties of 2SLS estimator
- Checking Instrument Validity
  - first stage: weak instrument
  - institutional backgroud to argue
  - reduced form: exclusive restricion
  - more IVs: overidentification test
- Heterogeneous effect and LATE

Review Lecture 11: Regression Discontinuity Design

- RDD: Basic Ideas and Types
- Basic assumptions
- Check Validity of RDD

Review Lecture 12: Fixed Effects Model

- Fixed effect: assumption and estimation
- Fixed effect model meets measurement Error
- IV in FE model

Review Lecture 13: DID: basic and extensions

- DID: basic idea and assumption
- TWFE variations and DID specifications.
- SCM: basic idea and assumptions
- Extensions: DID+Matching,DID+IV,DID+RDD,DDD,Staggered DID...

Closing Words


KEEP
CALM
AND
GOOD
LUCK