Econometrics I
Lecture 0: Course Brief

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44716
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Outline

What is Econometrics?

Structure of economic data

Causality vs. correlation

What is this course about?
What is Econometrics?

- Econometrics is the statistical methods used for estimating economic relationships, testing economic theories, and evaluating government and business policies.
- Examples:
  - Economics of crime
  - Evaluate subsidy reform
  - Permenant income hypothesis
- Steps:
  Economic model of behavior $\rightarrow$ econometric specification $\rightarrow$ estimation
Example 1: Crime

- Economics of crime
- From theory to econometric specification
  - Theory suggests criminal activity depends on costs and benefits:
  - Income from crime, income from other sources, chances of getting caught and convicted, expected punishment, ...
  - \( y = f(x_1, x_2, ...) \)
- Econometric (empirical) specification
  - Observability
  - Functional form
    \[ y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + u \]
  - What is \( u \)?
  - What are the assumptions we made to arrive at the specification?
Example 2: Subsidy reform

• Suppose you are asked to evaluate whether the Subsidy Reform was successful in reducing consumption.
  ■ How would you approach this question?
  ■ What type of data would you look for?
  ■ What are the methods?
Example 3: PIH

- Permanent income hypothesis
  - Theory suggests consumers should consider lifetime income and smooth out transitory income shocks
  - How would you test this?
  - What variables might be relevant here?
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Data

- Observational vs. experimental data
- Administrative vs. survey data
- Data formats: cross-sectional, time series, panel, etc.
Cross-sectional data

- sample of individuals, firms, cities, ... at a point in time.
  - Household expenditure survey (HES)
  - Survey of industry

- random vs. non-random sampling
Time series data

- follow one unit (often a country) over time.
  - inflation, GDP growth, unemployment
- hard to assume observations are independent over time (serial correlation)
- frequency of the data and seasonal variation
Other data forms

- Pooled cross sections
  - combine cross-sectional data collected at different points in time
  - each sample is drawn independent of the other
- Panel or longitudinal data
  - follow a sample of individuals, firms, ... over a given time period
  - same units observed over time
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What is this course about?
Correlation

Positive correlation

Negative correlation
Question of causality

- As economists we are interested in knowing whether one/several variables affect certain outcomes
  - This is a question about causal relationships.
- Statistical methods, however, rely on observed correlations in the data.
  - Being correlated does NOT necessarily imply a causal relationship.
- Ceteris Paribus
Back to examples

- **Ex1 (Crime):** using a cross-section of cities we found
  - “crime rates are higher in cities with a higher number of police officers”
  - What is wrong with these?

- **Ex2 (Subsidy reform):** using two cross-sections of HEIS from before and after the subsidy reform we found
  - “average consumption of subsidized commodities is lower in the post reform period”
  - What does this really say?
Correlation vs. causation

I used to think correlation implied causation.

Then I took a statistics class. Now I don’t.

Sounds like the class helped.

Well, maybe.
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What is this course about?
Our goals

- to explain the basics of linear regression
- to discuss the assumptions required for validity of the estimators
- to introduce more advanced tools to deal with failures of simple linear regression
List of topics

- Review of probability and statistical theory
- Linear Regression Model
  - Simple and Multiple regression models: estimation and inference
  - Further issues: qualitative information, heteroskedasticity, specification problems
- Carrying out an empirical project
- Instrumental variables
- Introduction to Panel Data Models
- Difference-in-differences
- Tentative: Overview of other Methods of Estimation
  - Maximum Likelihood Estimation
  - Method of Moments
Administrative issues

• Lectures:
  ■ deliver the content, flag important concepts, raise discussion
  ■ Saturday and Monday 8-10, Class 2.
  ■ Office hours: Saturday 10-11 or by appointment.
  ■ Contact: m.vesal AT sharif DOT edu

• Classes:
  ■ for *discussion* of weekly assignments, starts week 2
  ■ teachers responsible: Kiarash Hosseini, Navid Neshat, Seyed Mahyar Rezazadeh..
  ■ Time and location: TBA.
Evaluation

- Midterm exam (30%): 10 Aban 1396 at 9:00 AM.
- Final exam (30%): 26 Dey 1396 at 9:00 AM.
- Assignments (10%): ~13 assignments.
- Essay (5%): two essays, maximum will be counted.
- Quizzes (10%): 5 Quizzes during the term, lowest grade will be eliminated.
- Project (15%): TBC, Submission deadline: Wednesday 11 Bahman 1396 at 5:00 PM.
- Class participation (5%).