ECONOMICS 464: APPLIED ECONOMETRICS (I)

Instructor: Muzhe Yang

Course Time: Tuesday and Thursday, 1:10–2:25 PM

Course Location: Lewis Lab 512

Course Website: Course Site (https://coursesite.lehigh.edu/)

Contact Information: muzheyang@lehigh.edu, (610) 758-4962

Office Hours: Tuesday and Thursday 3:00–4:30 PM, at RBC 456

Course Readings:


(3) References in addition to (1) and (2).

Course Prerequisite: ECO 416 or equivalent.

Course Requirements: Students are expected to read assigned readings and attend all lectures because some class materials will not be in the readings. There will be 10 problem sets, most of which require using Stata. Feel free to work cooperatively. However, each student must turn in his or her own problem set using his or her own words and interpretation of the results. Late problem sets will not be accepted.

Course Grading: (1) problem sets: 75%; (2) class participation: 5%; and (3) final exam (take-home): 20%. Problem sets will be graded using a 0–5 ordinal scale: 5 = excellent; 1 = poor; and 0 = not handed in.

Course Overview and Objectives

In most of economics we are interested in causal, rather than correlative, relations among variables. For example, it is not the correlation between earnings and years of schooling that is of interest, but the effect of increasing someone’s schooling by one year on that same person’s earnings. Microeconometrics focuses on identifying such a causal relationship using cross-sectional or short panel data. It is very often that the heterogeneity of economic relations across individuals, firms and industries confounds correlations with causal relations. This course aims to: (1) familiarize students with conditions which are required for credible inference for causal effects; and (2) enable students to select
appropriate econometric tools for empirical economics problems and policy research. Topics include robust inference, numerical optimization, instrumental variables, nonparametric regression methods, treatment effect analysis, and panel data.

By the end of the course, students should (1) be able to model the source of heterogeneities according to the characteristics of micro-level data; (2) be familiar with approaches to causal inference using the potential outcomes framework; and (3) have a firm grasp of types of research designs that enable researchers to evaluate the credibility of the empirical evidence used for testing theories and for evaluating policies.

**Course Outline and Readings**

**Part I: Basics of Microeconometrics and Causal Inference**

- **Overview of microeconometrics**
  - MHE 1; Handout

- **Overview of health econometrics**
  - Handout

- **Basics of treatment effect analysis**
  - MHE 2; MMA 25.1–25.2; Handout

- **Regression analysis**
  - MHE 3; MMA 4.1–4.5, 4.7, 11, 24.5; Handout


- **Nonparametric regression**
  - MMA 9; MUS 2.6; Handout

- **Simulation**
  - MUS 4

- **Numerical optimization**
  - MMA 10; MUS 11; Handout

**Part II: Selection on Observables**

- **Inverse probability weighting**
  - Handout

- **Propensity score matching**
  - MMA 25.4; Handout

**Part III: Selection on Unobservables**
• Instrumental variables
  
  - MHE 4; MMA 4.8-4.9, 25.7; MUS 6; Handout
  
  
  
  
  
  
• Regression discontinuity design

  - MHE 6; MMA 25.6; Handout


• Difference-in-differences

  - MHE 5; MMA 25.5


• Linear panel models
  — MHE 5; MMA 21

• Linear panel models: extensions
  — MMA 22; MUS 9

• Quantile regression
  — MHE 7; MMA 4.6; MUS 7.1-7.3

• Control function approaches


• Estimation of treatment effects


• Con out of economics


**Accommodations for Students with Disabilities**

“If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, Williams Hall, Suite 301 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.” The Office of Academic Support Services in the Dean of Students office addresses requests for accommodations for learning and/or physical disabilities for undergraduate and graduate students. For more information, I encourage you to visit the web site at [http://studentaffairs.lehigh.edu/disabilities](http://studentaffairs.lehigh.edu/disabilities).

**The Principles of Our Equitable Community**

“Lehigh University endorses The Principles of Our Equitable Community [http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf](http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf). We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.”
<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Readings</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Basics of treatment effect analysis</td>
<td>MHE 1, Handout</td>
<td></td>
</tr>
<tr>
<td>8/29</td>
<td>Microeconometrics overview</td>
<td>MMA 25.1-25.2, Handout</td>
<td>PS#1 due 9/5</td>
</tr>
<tr>
<td>8/31</td>
<td>Basics</td>
<td>MHE 2</td>
<td>PS#2 due 9/12</td>
</tr>
<tr>
<td>Week 2</td>
<td>Basics of treatment effect analysis</td>
<td>MMA 25.1-25.2, Handout</td>
<td></td>
</tr>
<tr>
<td>9/5</td>
<td>Student presentation on PS#1</td>
<td>MHE 2</td>
<td></td>
</tr>
<tr>
<td>9/7</td>
<td>The experimental ideal</td>
<td>MMA 9, Handout</td>
<td>PS#5 due 10/5</td>
</tr>
<tr>
<td>Week 3</td>
<td>Regression analysis</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>9/12</td>
<td>Student presentation on PS#2</td>
<td>MMA 4.7, Handout</td>
<td>PS#4 due 9/28</td>
</tr>
<tr>
<td>9/14</td>
<td>Fundamentals</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 4</td>
<td>Regression analysis</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>9/19</td>
<td>Regression details</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>9/21</td>
<td>Omitted variables and measurement errors</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 5</td>
<td>Nonparametric regression</td>
<td>MMA 9, Handout</td>
<td></td>
</tr>
<tr>
<td>9/26</td>
<td>Basics</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>9/28</td>
<td>Basics</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 6</td>
<td>Simulation and numerical optimization</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>10/3</td>
<td>Simulation</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>10/5</td>
<td>Numerical optimization</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 7</td>
<td>Simulation and numerical optimization</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>10/10</td>
<td>Numerical optimization</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>10/12</td>
<td>Student presentation on PS#6</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 8</td>
<td>Selection on observables</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>10/17</td>
<td>Pacing break</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>10/19</td>
<td>Inverse probability weighting</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 9</td>
<td>Selection on observables</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>10/24</td>
<td>Propensity score matching</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>10/26</td>
<td>Propensity score matching</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 10</td>
<td>Instrumental variables</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>10/31</td>
<td>Local average treatment effects</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>11/2</td>
<td>Local average treatment effects</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 11</td>
<td>Regression discontinuity (RD) design</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>11/7</td>
<td>Student presentation on PS#8</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>11/9</td>
<td>RD Basics</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 12</td>
<td>Difference-in-differences</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>11/14</td>
<td>RD Basics</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>11/16</td>
<td>Difference-in-differences</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 13</td>
<td>Linear panel models: extensions</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>11/21</td>
<td>Fixed effect vs. lagged dependent variables</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>11/23</td>
<td>Thanksgiving break</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 14</td>
<td>Linear panel models: extensions</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>11/28</td>
<td>Panel IV estimation</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>11/30</td>
<td>Hausman-Taylor, Arellano-Bond estimators</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>Week 15</td>
<td>Review</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>12/5</td>
<td>To be determined</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
<tr>
<td>12/7</td>
<td>To be determined</td>
<td>MMA 4.7, Handout</td>
<td></td>
</tr>
</tbody>
</table>