Applied Econometrics of Resource and Energy Demand

AAE 772 (4 credits)
Spring 2019
UW-Madison

Instructor:
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Class Meetings: Lectures T Th 1-2:15, Discussion F 10:30-11:20, M 1:30-2:20.

COURSE DESCRIPTION

The primary goal of this course is to provide students with the skills necessary to apply econometric analysis to issues in resource and energy demand, including:

- Econometric analysis of the impacts of demand-side resource/energy programs, with an emphasis on advances in experimental and quasi-experimental methods;
- Forecasting resource and energy demand;
- The application of discrete choice econometrics to discrete choice experiments (conjoint analysis, contingent valuation) and program participation data;

The large majority of the course focuses on panel data methods, because panel data is commonly available in demand-side energy/resource analysis. Moreover, lectures and problem sets focus on program/policy evaluation, which is arguably the most common purpose of econometric analysis in both the current academic literature and professional work. A strong understanding of this type of analysis fosters a style of thinking about econometric analysis that is broadly useful.

All material in the course is posted on the course Canvas page. I expect to post lecture notes the evening before lecture, and problem sets the evening before they are assigned. You must upload all problem set material to the Canvas page by the due date. **All written material must be typed. This includes equations; get to know how to use your equation editor. All problem set material must be uploaded as R code, R markdown, or MS-Word files.**

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Estimate linear regression models and interpret the results,
2. Estimate discrete choice models and interpret the results,
3. Evaluate forecasting models,
4. Select the experimental or quasi-experimental method appropriate for the analysis at hand.

READINGS

The course will draw primarily on material from the following textbooks. There is no required reading, but you might want to consult these texts to supplement the material covered in lecture.

Angrist, J.D. and J.S. Pischke. 2009. *Mostly Harmless Econometrics: An Empiricist's Companion.* Princeton University Press. 373p.

Imbens, G.W. and D.B. Rubin. 2015. *Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction*. Cambridge University Press. 625p.

Wooldridge, J.M. 2013 *Introductory Econometrics: A Modern Approach*. South-Western Cengage Learning. 881p.

GRADING

Grades will be based on problem sets (50%), and three exams (50%).

This is an intensive course and you must keep up with the work to do well. We meet for 4 hours per week (including lectures and discussions). Students are expected to complete problem sets, study for exams, and prepare for lecture in addition to attending class.

Targeted grade distribution:

$\geq 93\%$	A
$< 93\% \ \& \geq 88\%$	AB
$< 88\% \ \& \geq 83\%$	B
$< 83\% \ \& \geq 78\%$	BC
$< 78\% \ \& \geq 70\%$	C
$< 70\% \ \& \geq 60\%$	D
$< 59\%$	F

TOPICS SCHEDULE

Week 1: Review, selection bias, randomized controlled trials (RCTs) in program evaluation

Week 2: Basic models for estimating treatment effects in RCTs

Week 3: Fixed effects and lagged dependent variable models in the context of RCTs

Week 4: Treatment effect heterogeneity, bad controls, and other issues in program evaluation

Week 5: Nonspherical disturbances

Week 6: Program evaluation in the context of non-RCTs

Week 7: Matching with regression analysis I

Week 8: Matching with regression analysis II

Week 9: Matching with regression analysis III

Week 10: Instrumental variable methods I

Week 11: Instrumental variable methods II

Week 12: Forecasting using econometric models I

Week 13: Forecasting using econometric models II

Week 14: Discrete choice analysis (extending AAE 777 econometric analysis)

Quiz SCHEDULE

Feb 22: Quiz 1 covers material in weeks 1-4, first 2 problem sets
Apr 5: Quiz 2 covers material in weeks 5-9, problem sets 3-5
May 6: Quiz 3 covers material in weeks 10-14, problem sets 6-9

ASSIGNMENTS

Assignments will be posted on Wednesdays and due the following **Wednesday at NOON**. Discussion sections on Fridays and Mondays will provide an opportunity to get help/advice from Pukitta. All econometric work must be done in R. We expect that Friday discussion sections will review lecture material and provide you with a few R coding tips to help you with the week's problem set. The second discussion section will provide Pukitta time to respond to questions you have about the homework (email her **before** discussion to help her understand what material to cover!).

All written material must be typed, not handwritten. This includes equations; get to know how to use the equation editor in MS-Word. All problem set material must be uploaded as MS-Word files, Excel files, or pdfs.

Problem set schedule:

Exercise		Problem set topic	Problem set posted	Problem set discussed in section	Problem set due
	Week 1				
1	Week 2	RCT Consistency/Diff estimator/DID estimator	Jan 30	Feb 1, Feb 4	Feb 6
2	Week 3	RCT Consistency/2-way fixed effects/LDV	Feb 6	Feb 8, Feb 11	Feb 13
	Week 4				
	Week 5	**Quiz covering weeks 1-4; review in discussion Feb 18, quiz in discussion on Feb 22**			
3	Week 6	Nonspherical errors	Feb 27	Mar 1, Mar 4	6-Mar
4	Week 7	Estimating Non-RCT models	Mar 6	Mar 8, Mar 11	13-Mar
5	Week 8	Matching using RCT data	Mar 13	Mar 15, Mar 25	Mar 27
6	Week 9	Matching using non-RCT data	Mar 27	Mar 29	Apr 3
	Week 10	**Quiz covering weeks 5-9, review in discussion Apr 1, quiz in discussion on April 5**			
7	Week 11	IV using the Week 9 data	Apr 10	Apr 12, Apr 15	Apr 17
8	Week 12	Forecasting	Apr 17	Apr 19, Apr 22	Apr 24
9	Week 13	Discrete Choice	Apr 24	Apr 26, Apr 29	1-May
	Week 14				
	Week 15	**Quiz covering weeks 10-14, review discussion May 3; quiz during discussion time May 6**			