Course Description

This course is designed for first year Economics Ph.D. students who have taken undergraduate level econometrics courses. The basic methods of modern econometric theory and their relevant empirical topics are covered. The main goal of this course is to provide a theoretical foundation for applied research in economics.

The arrangement of the course is as follows. In the first part, the linear multiple regression model and its identification, estimation, and inference with the linear least squares method are analyzed. The resampling method including parametric/nonparametric bootstrap is introduced for hypothesis testing of the linear multiple regression models. In the second part, some major extensions of the regression model are presented. Instrumental variables estimation is developed to resolve endogeneity problem, and Generalized Method of Moments (GMM) estimator is presented as the leading application of nonlinear regression models or semiparametric/nonparametric approach. Lastly, the course reviews Machine Learning methods and their applications for econometrics. Time series analysis will be briefly introduced in the context of macroeconomic applications if time allows.

Course Requirements

1. Midterm (30%): Wednesday, March 11
2. Final (50%): Wednesday, May 6
3. Problem sets (20%): No late submission will be accepted
   (a) Assignment 1 (10%), due March 4, before the class begins
   (b) Assignment 2 (10%), due April 29, before the class begins

The assignment is required to be submitted in hard copy or electronic copy (to the instructor’s email: yoon22@uwm.edu). Using LaTeX to write up your assignment is highly recommended but not mandatory.
Computer Programs

Problem sets will occasionally involve simulation or application of the methods using actual dataset. You may choose a programming language that you feel comfortable with. The commonly used programs are MATLAB, STATA, Julia, R, Python, GAUSS, SAS or even Fortran and C. You are expected to learn at least one of those programs/languages by yourself or with the help of the computer lab staff. Some exemplary MATLAB, STATA, or R codes will be uploaded on our course webpage.

Readings

The lecture will be based on Bruce Hansen’s Econometrics textbook. The manuscript is downloadable at https://www.ssc.wisc.edu/~bhansen/econometrics/. To supplement the main text, the following textbooks will be helpful as well.


Course Outline

1. Least Squares Regression
   - Main Text
     - Hansen (2019), Ch 1 ~ Ch 5
   - Supplementary Material
     - Greene (2017), Ch 2 ~ Ch 4
     - Wooldridge (2010), Ch 1 ~ Ch 4

2. Asymptotic Theory for Least Squares and Hypothesis Testing
   - Main Text
     - Hansen (2019), Ch 6 ~ Ch 9, Ch 11
   - Supplementary Material
     - Greene (2017), Ch 5, Ch 10
     - Wooldridge (2010), Ch 3 ~ Ch 7
3. Bootstrap

- Main Text
  - Hansen (2019), Ch 10
- Supplementary Material
  - Greene (2017), Ch 15

4. Instrumental Variables

- Main Text
  - Hansen (2019), Ch 12
- Supplementary Material
  - Greene (2017), Ch 8
  - Wooldridge (2010), Ch 5 and Ch 8

5. Generalized Method of Moments

- Main Text
  - Hansen (2019), Ch 13
- Supplementary Material
  - Greene (2017), Ch 12 – Ch 13

6. Machine Learning

- Main Text
  - Hansen (2019), Ch 24
- Supplementary Material
7. Time Series

- Main Text
  - Hansen (2019), Ch 14 ~ Ch 16
- Supplementary Material
  - Greene (2017), Ch 20 ~ Ch 21

Note

For information on the University’s policies for religious observances, incompletes, academic misconduct, grade appeal procedures, final examination policy, students called to military service, discriminatory conduct, and complaint procedures, please access the following link:
http://www4.uwm.edu/secu/SyllabusLinks.pdf

Participation by Students with Disabilities

The University of Wisconsin Milwaukee supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty will work either directly with the student or in coordination with the Accessibility Resource Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student’s educational record, is confidential and protected under FERPA.

Academic Misconduct

The university has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others’ academic endeavors. Student academic misconduct information can be found at:
http://www4.uwm.edu/acad_aff/policy/academicmisconduct.cfm

Workload Statement
This class meets twice weekly for 75 minutes, for a total of 37.5 hours of required lecture time. You should expect to take at least 67.5 hours over the course of the semester reading the textbook and other required texts. There are also 2 homework assignments which you should expect to require at least 10 hours each. You should reserve at least 10 hours to study for and take the midterm/final exam. All told, this class is likely to take 145 hours of your time.