Syllabus: Econometrics II

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Summary:

The first part of this course covers core principles of estimation and inference, moving up in (mathematical) generality from OLS to IV to GMM to extremum estimation, and down again to maximum likelihood. Most of this part closely follows Hayashi's textbook, specifically chapters 1-3 and 7-8. The last lectures will be devoted to a formal introduction to the Bootstrap.

Assessment:

There will be about eight homework exercises (30%), a prelim (on March 15th; 30%), and a final (TBA; 40%). The final will emphasize material from later in the semester, but the material is inherently extremely cumulative.

The homework will mix theoretical and practical exercises. You may use any software that does the job, e.g. Stata, R, or Matlab. Teamwork is encouraged but homework write-ups must be handed in separately. Your weakest homework will be dropped from consideration.

Blackboard:

Will be used extensively. Please make sure you are enrolled in this course's blackboard site.

Course Outline:

Part 1: Ordinary Least Squares

1. OLS: definition and finite sample properties.
(Hayashi ch. 1)

2. OLS: Large sample properties in rather general setting. Robust test statistics.
(Hayashi ch. 2)

Part 2: Generalized Method of Moments

3. GMM: overview, linear single-equation GMM. OLS and IV as special cases.
(Hayashi ch. 3)

4. GMM: linear single equation. Hypothesis and specification tests, 2SLS as special case.
(Hayashi ch. 3, Wooldridge article)

5. GMM: multiple-equation GMM. SUR, FIVE, and RE as special cases.
(Hayashi ch. 4)

6. Panel data: a GMM perspective. FE, RE, first-difference as special cases.
(Hayashi ch. 5, Wooldridge ch. 10-11)

Part 3: Extremum Estimators

7. Identification: A more formal approach.
(Matzkin)

8. Extremum estimators. Overview, consistency, asymptotic normality.
(Hayashi ch. 7; Newey/McFadden)

9. Hypothesis testing: the trinity.
(Hayashi ch. 7; Newey/McFadden)

10. Maximum likelihood: some applications. (Linear regression, Tobit type II/Heckit.)
(Hayashi ch. 8; lecture notes)

Part 4: The Bootstrap

11. What is the bootstrap? When does it work? When does it improve on asymptotic approximation? Bootstrap confidence regions and bootstrap bias correction.
(Horowitz handbook chapter, Politis/Romano/Wolf book chapter.)

Readings:

In addition to the readings, I will provide detailed lecture notes. All papers listed below will be made available on Blackboard.

Main textbook

Hayashi, F. (2000): *Econometrics.* Princeton University Press.

Other recommended textbooks for this lecture

Amemiya, T. (1985): *Advanced Econometrics*. Harvard University Press. (Classic textbook, slightly outdated insofar as it precedes GMM but very clear.)

Hansen, B. (2015): *Econometrics*. Bruce's lecture notes are available on his webpage and are very good.

Wooldridge, J. (2002): *Econometric Analysis of Cross Section and Panel Data.* MIT Press. (A highly regarded textbook, good for panel data.)

Other readings that will be used

Matzkin, R.L. (2007): Nonparametric identification, in J.J. Heckman & E.E. Leamer (eds.) *Handbook of Econometrics (Volume VI)*. Elsevier. (Material on identification will be based on this survey.)

Newey, W. and D. McFadden (1994): Large sample estimation and hypothesis testing, in R. Engle and D. McFadden (eds.) *Handbook of Econometrics (Volume IV)*. Elsevier. (The definitive source, similar to Hayashi ch. 7, more rigorous but very clear.)

Wooldridge, J. (2001): Applications of generalized methods of moments estimation, *Journal of Economic Perspectives* 15: 87-100. (A very intuitive introduction.)

For part 4 (bootstrap)

Horowitz, J. (2001): The bootstrap, in J.J. Heckman & E.E. Leamer (eds.) *Handbook of Econometrics (Volume V).* Elsevier. (The canonical citation.)

Horowitz, J.L. (2003): The bootstrap in econometrics, *Statistical Science* 18: 211-218. (An introduction with practical examples.)

Politis, D.N., J.P. Romano, and M. Wolf (1999): *Subsampling*. Springer. (Chapter 1 is a nice review of the bootstrap.)