



Business 41902  
Inference in Econometrics and Statistics - Winter 2023

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## Syllabus

### Overview

The focus of this course will be methods to draw inferences in econometric models. We will cover GMM, and nonlinear models, as well as factor models and modern machine learning methods for linear models. The majority of the discussion will cover frequentist methods focusing on the use of approximations to finite-sample sampling distributions as a means for obtaining inference. We will also cover alternative resampling methods for inference. We will discuss intuition for how and when to use the econometric tools developed in the class in addition to deriving some of the relevant theoretical properties. Grades will be determined by 4 homework problem sets (40%) and a take-home final exam (60%).

### Course Website:

<http://canvas.uchicago.edu/>

### Text and Class Notes

There is no required text for this course. Three recommended texts are *Econometrics* by Hayashi, *The Elements of Statistical Learning* by Trevor Hastie, Robert Tibshirani, and Jerome Friedman, and *Econometric Analysis of Cross Section and Panel Data* by Wooldridge. *Asymptotic Theory for Econometricians* (Revised Edition) by White provides a useful reference and concise reference on asymptotic results. Some students may also find the book *Introduction to Econometrics* by Wooldridge to be a useful reference.

### Office Hours and Review Sessions

E-mail is the fastest and most reliable way to contact me. I do not have “official” office hours, but I am happy to meet with anyone who would like to make a virtual appointment. I will not teach in person this quarter.

The TA will hold online review sessions at an agreed upon time.

## Outline

1. Introduction to GMM

- Hayashi, Ch. 3
- Wooldridge, Ch. 5, 6.2

## 2. The Non-Linear Model

- Newey, W. and D. McFadden, 1994, "Large Sample Estimation and Hypothesis Testing," in R. Engle and D. McFadden (eds.), *Handbook of Econometrics, Volume 4*, Elsevier: North Holland.
- Wooldridge, J. M., 1994, "Estimation and Inference for Dependent Processes," in Engle, R. F. and D. L. McFadden (eds.), *Handbook of Econometrics, Vol. 4*, Elsevier: North:Holland.

## 3. Large Dimensional Factor Analysis

- Bai, Jushan, 2003, "Inferential Theory for Factor Models of Large Dimensions," *Econometrica*, Volume 71, Issue 1, 2003, 135-171.

## 4. Linear Machine Learning Methods

- Trevor Hastie, Robert Tibshirani, and Jerome Friedman, 2009, *The Elements of Statistical Learning*. Springer.

## 5. Resampling Methods

- Hansen, B. 2019, "Econometrics," Chapter 10, Manuscript. University of Wisconsin. <https://www.ssc.wisc.edu/~bhansen/econometrics/>
- Horowitz, J., 2001, "The Bootstrap," in J. Heckman and E. Leamer (eds.), *Handbook of Econometrics, Volume 5*, Chapter 52, Elsevier: North Holland.