

ADVANCED ECONOMETRICS II

SPRING 2020

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Office Hours: TBA

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Course Summary: This course divides neatly into five sections. The *first* part introduces basic econometric methods starting from OLS estimation. The *second* part introduce some practical issues when applying the basic econometric models. The *third* part provides a rigorous treatment of the theory of extremum estimation, focusing mostly on maximum likelihood. The *fourth* part covers several topics related to the identification and estimation of structural economic parameters or causal effects, all under the broad umbrella of GMM estimation. The *final* part addresses specific data structures: panels and time series.

Lectures: Monday 6:30pm – 9:30pm

Discussion: TBA

Computing: We will use Stata for the empirical work in the class

Textbook: Greene, W.H., *Econometric Analysis, 7th Edition* (older editions OK)

Greene is the standard text for this course at any economics Ph.D. program. Greene is as much a reference source as it is a textbook, and the chapter sections given above include in places more material than we will cover. What you really need to know is the material I cover in lectures. Much of the class will follow this book. The book is at times more detailed than what will be covered in this class.

Other Reading: Cameron, A.C. and P.K. Trivedi (2005), *Microeconometrics: Methods and Applications*, Cambridge University Press.

Angrist, J. and J. Pischke, *Mostly Harmless Econometrics*

Assessment: There will be (TBA) homework assignments, a midterm exam and a final exam. I will make the assignments available at least a week before the due date and no late homeworks will be accepted. The final will be worth 40% of your grade, the midterm 30%, and the homeworks the remaining 30%.

Topic 1: Least Square Regression

- Least Squares Regression with Matrix Algebra
(Greene: 2.1-2.4, 3.1-3.7, Appx A.1-A.4)
- Finite Sample Properties of Least Squares
(Greene: 4.1-4.3)
- Large Sample Properties of Least Squares
(Greene: 4.4, Appx D.1-D.4)
- Tests of Linear Restrictions
(Greene: 5.1-5.6, Appx B.10-B.11)

Topic 2: Practical Issues with Linear Models

- Model Specification Error
(Greene: 4.3, 8.2)
- Instrumental Variables (IV) Estimation
(Greene: 8.1-8.3)
- Maximum Likelihood (ML) Estimation
(Greene: 14.1-14.3, 14.9.1)
- Generalized Least Squares (GLS)
(Greene: 9.3)
- Heteroskedasticity
(Greene: 9.3-9.6)

Topic 3: Extremum Estimators

- Examples in linear regression
(Greene: 14.1, 14.9)
- MLE, GMM, NLS
(Greene: 14.1-14.3)
- Consistency, Asymptotic normality, Asymptotic variance
(Greene: 14.4,14.5,14.8)
- LR, Wald, and LM tests
(Greene: 14.6)
- Models: Logit and probit (binary and multinomial outcomes)
(CT: 14.1-14.4, 15.1-15.5, 15.9. Greene: 21.1-21.8)

Topic 4: GMM

- Linear IV
(Greene: 14.6)
- Nonlinear models (link to extremum)
(Greene: 13.4)
- Overidentification, Hausman test
(Greene: 13.4)
- 2SLS

(Greene: 13.1-13.3)

Systems of equations

(Greene: 13.4-13.6)

Testing, bootstrap methods

(CT: 7.1-7.4, 8.2-8.3. Greene: 17.5, AppxE.4.)

Topic 5: Panel Data and Time Series

Panel Data: error components models, FE, RE

(Greene: 11.1-11.5)

Panel Data: asymptotic variance

(Greene: 11.6)

Time Series: Stationary stochastic processes, Spurious regression cointegration

(Greene: 20, 21)