Microeconometrics

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Scheduled Class Time and Organization: Class will meet twice a week *Tuesdays and Thursdays from 10:30-11:50* for lectures in Room 410, McNeil.

Course Description: This is an advanced undergraduate econometrics course. Building on the introductory level course (Econ 104), this courses studies the econometric estimation and inference methods using matrix algebra. The course covers least squares estimation, endogeneity, generalized methods of moments (GMM), maximum likelihood estimation of linear and nonlinear models, analysis of panel data models, as well as some re-sampling techniques.

Prerequisites: Econ 104 or an equivalent calculus-based introductory econometrics course.

Courseware: Course documents and information are available via Canvas:

https://canvas.upenn.edu

Statistical Software: We will use the statistical package R via a front-end called RStudio throughout the course. Both programs are free and open source. See the

last page of this document for instructions on how to configure your computer to run *R* and RStudio.

Course Requirements:

- **Problem Sets**: There will be 4 numerical analysis problem sets. The problem sets are designed to give the students the opportunity to review and enhance the material learned in class. Students are encouraged to form small study groups, however, each student has to submit his or her own write-up of the solution. These solutions must be submitted on the specified due dates. [20%]

  – PS1 Due Date: 9/19

  – PS2 Due Date: 10/10

  – PS3 Due Date: 11/7

  – PS4 Due Date: 11/28

- **Midterm Exam**: Thursday, 10/19. [40%]

- **Final Exam**: Thursday, 12/7 [40%]

Recommended Course Texts:

Bruce Hansen (2017). Online Econometrics Textbook.

  http://www.ssc.wisc.edu/ bhansen/econometrics/Econometrics.pdf

  (This is a graduate level textbook. We will not cover all the materials in depth.)

Colin Cameron and Pravin Trivedi (2005), Microeconometrics, methods and applications. ISBN 978-0-521-84805-3

Hayashi, Fumio (2000): *"Econometrics,"* ISBN 0-691-01018-8, HB139.H39 2000.

Econometrics Software: The problem sets will involve computer-based exercises in which the econometric techniques introduced in the lectures will be applied. The recommended software for this course is *R*. It is available free of charge at: *http://www.r-project.org/.*

R **Resources**

Installing R and RStudio: First, download and install R from

http://cran.r-project.org/.

Second, download and install RStudio by visiting

http://rstudio.org/download/desktop

and clicking the link listed under "Recommended for Your System."

References: While not required, these references may be useful if you need some extra help learning R, or want to go beyond the material covered in the course.

- Contributed Documentation by Comprehensive R Archive Network (CRAN) http://cran.r-project.org/other-docs.html Comprehensive list of freely available reference material for R.

- *R Twotorials* by Anthony Damico http://www.twotorials.com/ Ninety energetic, two-minute video tutorials on statistical programming with R.

- Google Developers R Programming Video Lectures http://www.r-bloggers.com/google-developers-r-programming-video-lectures/ R Programming video tutorials from beginning to advanced.

- *Econometrics in R* by Grant Farnsworth http://cran.r-project.org/doc/contrib/Farnsworth-EconometricsInR.pdf

- *Resources to help you learn R* by UCLA Academic Technology Services http://www.ats.ucla.edu/stat/R/ A wealth of information about R, conveniently arranged in one place. The R Starter Kit is particularly helpful.

- *R in a Nutshell* by Joseph Adler http://proquestcombo.safaribooksonline.com/book/programming/r/9781449377502 Electronic version of the book of the same name published by O'Reilly (Accessible on the UPenn Network). Provides a comprehensive reference guide to R.

- R-bloggers http://www.r-bloggers.com A blog aggregator for R news and tutorials, with lots of applications.