

**AEB 6933 Econometrics of Panel Data and Systems Analysis  
Fall 2016**

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**Office Hours:** T-F period 7

**Course Description:** This is a core-level Ph.D. course in the area of Econometrics dealing with Panel Data and systems of equations. The range of topics covered in the course will span a large part of econometrics generally, though we are particularly interested in those techniques as they are adapted to the analysis of 'panel' or 'longitudinal' data sets. Topics to be studied include specification, estimation, and inference in the context of models that include individual (firm, person, etc.) effects. We shall begin with a development of the standard panel data settings involving 'fixed' and 'random' effects. We will then turn to instrumental variables, seemingly unrelated regressions, maximum likelihood, generalized method of moments (GMM), and two step estimation methods. The linear model will be extended to dynamic models and recently developed GMM and instrumental variables techniques. The classical methods of maximum likelihood and GMM are applied to models with individual effects. Theoretical developments will focus on heterogeneity in models including random parameter variation, latent class (finite mixture) and 'mixed' and hierarchical models. We will consider numerous applications from the literature, including static and dynamic panel regression models, heterogeneous parameters models, and random parameter variation.

**Prerequisites:** The prerequisite for this course is successful completion of Core Methods in Econometrics, 'Econometric Methods II' (AEB7572), or an equivalent level core Econometrics course.

**Course Objectives/Goals:** Students taking this course should leave with the ability to state the nuances of panel data estimators and the empirical implications that manifest. Further, students should be able to successfully integrate data into the software of their choice and construct appropriate panel data models which they can estimate, conduct inference and rigorously interpret to provide sound policy insights.

**Assessment:** Students are expected to prepare for class meetings by completing assigned readings and problem sets. Three mid-term exams (50%) and a final exam (40%) will be administered. The remainder of the class grade will depend on class participation and problem sets (10%).

The grading system for this course is as follows: 94%-100%, A; 90-93% A-; 87%-89%, B+; 84-86 B; 80%-83%, B-; 77%-79%, C+; 74%-76%, C; 70%-73% C-; 67%-69%, D+; 64%-66%, D; 60%-63% D-; below 60%, E.

**Attendance:** Students are encouraged to attend all classes. Frequent absences will reflect negatively on class participation evaluation.

**Missed Exam Policy:** No make-up mid-term exams will be administered. If a student misses a mid-term exam, the lower grade of the other two mid-term exams will be awarded for the grade of the missed examination. A final exam must be taken in order to receive a final grade.

## Readings:

### Required books

Hsiao, Cheng. *Analysis of Panel Data*, 3<sup>rd</sup> edition. Cambridge: Cambridge University Press, 2014.

Harvey, Andrew C. *The Econometric Analysis of Time Series*, 2d edition. Cambridge, MA: The MIT Press, 1990.

### Recommended books

Arellano, Manuel. *Panel Data Econometrics*. New York: Oxford University Press, 2003.

Baltagi, Badi H. *Econometric Analysis of Panel Data*, 5th ed. John Wiley & Sons, Incorporated, 2013.

Baltagi, Badi H. *A Companion to Econometric Analysis of Panel Data*. John Wiley & Sons, Incorporated, 2009.

Kmenta, Jan. *Elements of Econometrics*, 2d edition. New York: Macmillan Publishing Company, 1990.

Schmidt, Peter. *Econometrics*. New York: Marcel-Dekker, 1976.

### Other Helpful Resources

Bewley, R. *Allocation Models: Specification, Estimation and Application*. Cambridge, MA: Balinger Publishing Company, 1986.

Bowden, Roger J. and Darrel A. Turkington. *Instrumental Variables*. Cambridge: Cambridge University Press, 1984.

Charemza, Wozciech W. and Derk F. Deadman. *New Directions in Econometric Practice*. Brookfield, VT: Edward Edgar Publishing Limited, 1992.

Cramer, J.S. *Econometric Applications of Maximum Likelihood Methods*. Cambridge University Press, 1986 (Paperback edition, 1989).

Cuthbertson, Keith, Stephen G. Hall and Mark P. Taylor. *Applied Econometric Techniques*. New York, Harvester Wheatsheaf, 1992.

Godfrey, L.G. *Misspecification Tests in Econometrics*. Cambridge: Cambridge University Press, 1988.

Goldberg, Arthur S. *A Course in Econometrics*. Cambridge, MA: Harvard University Press, 1991.

Granger, C.W. Jr. and T. Terasvirta. *Modelling Nonlinear Economic Relationships*. Oxford: Oxford University Press, 1993.

Greene, William H. *Econometric Analysis*. Macmillan Publishing Company, 1990.

Judge, George G., W.E. Griffiths, R. Carter Hill, Helmut Lutkepohl and Tsoung-Chao Lee. *The Theory and Practice of Econometrics*, 2d edition. New York: John Wiley and Sons, 1985.

Judge, George G., W.E. Griffiths, R. Carter Hill, Helmut Lutkepohl and Tsoung-Chao Lee. *Introduction to the Theory and Practice of Econometrics*, 2d edition. New York: John Wiley and Sons, 1988.

Lawley, D.N. and A.E. Maxwell. *Factor Analysis as a Statistical Method*. London: Butterworth and Company (Publishers) Ltd., 1963.

Kumbhakar, S.C. and C. A. K. Lovell. *Stochastic Frontier Analysis*. Cambridge, U.K.: Cambridge University Press, 2000.

Maddala, G.S. *Introduction to Econometrics*, 2d edition. McGraw-Hill book Company, 1993.

Matyas, Laszlo and Patrick Sevestre, eds. *The Econometrics of Panel Data: A Handbook of the Theory with Applications, 2<sup>nd</sup> revised ed.* Boston, MA: Kluwer Academic Publishers, 1996.

Raj, Baldev and Badi H. Baltagi, eds. *Panel Data Analysis*. New York: Springer-Verlag, 1992.

Theil, Henri, Ching-Fan Chung and James L. Seale, Jr. *International Evidence on Consumption Patterns*. Greenwich, CT: JAI Press, Inc., 1989.

Theil, Henri. *Principles of Econometrics*. New York: John Wiley and Sons, 1971.

Theil Henri and Kenneth W. Clements. *Applied Demand Analysis*. Cambridge, MA: Ballinger, 1987.

### **Course Outline:**

(\*⊖ - denotes required reading, and ⊕ – denotes recommended reading)

#### **I. Self Review**

##### Matrix Algebra

⊖ Greene, Chapter 2

⊖ Harvey (1990), Appendix on Matrix Algebra

⊕Kmenta, Appendix.

⊖ Theil, Chapter 1

Judge et al (1985), Appendix A

##### Probability and Distribution Theory

⊕ Greene, Chapter 3

⊕Kmenta, Chapter 1-4.

##### Statistical Inference

⊕ Greene, Chapter 4.1 - 4.6

⊕Kmenta, Chapter 5-6.

⊕ Theil, Chapter 2

##### Regression Analysis

⊖ Harvey (1990), Chapter 2.1 - 2.5

⊕Kmenta, Chapter 7-10.

Cuthbertson, Hall, and Taylor, Chapter 1

#### **II. Panel Data**

⊖ Hsiao, Chapters 1, 2, and 3

⊖ Seale, James L. Jr., *Journal of Applied Econometrics* (1990).

⊕Kmenta, Chapter 12-1 and 12-2.

⊕Baltagi, Chapters 1-5

Pollak and Wales, Chapter 5.3

Matyas and Sevestre, Chapters 1, 2, 3, and 32.

Greene, Chapter 16

Judge et al (1985), Chapter 13  
Maddala (1977), Chapter 14

III. **Maximum Likelihood**

- ⊖ Harvey (1990), Chapter 1.1 - 1.4 Chapters 3.1 - 3.4 (Stop at "Seemingly Unrelated Regressions) and 4.
- Ⓜ Kmenta, Chapter 6-1 and 6-2, pp. 220-222, 402-403, 614-616.
- Cramer, Chapter 1, Chapter 6.1 - 6.4
- Cuthbertson, Hall, and Taylor, Chapter 2.1
- Greene, Chapter 4.5
- Judge et al (1985), Chapters 2.1.2 and 5.6

IV. **Seemingly Unrelated Regressions, Cross Section, and Pooled Data**

- ⊖ Harvey (1990), Chapters 2.9, 3.4 (Seemingly Unrelated Regressions), 4.4 (Systems of Equations and Concentrating the Likelihood Function), and 6.
- Ⓜ Kmenta, Chapter 12-3, 8-3
- ⊖ Seale, James L. Jr., *Energy Economics* (1991).
- ⊖ Theil, Chung, and Seale, Chapters 2.10, 3, and 4.3
- Ⓜ Baltagi, Chapter 6
- Pollak and Wales, Chapter 5.1 - 5.2
- Greene, Chapter 17.1 - 17.
- Cramer, Chapter 7.1 - 7.3

V. **Hypothesis Testing I**

- ⊖ Harvey, Chapter 5
- Ⓜ Kmenta, Chapter 11-2.
- Bewley, Chapter 4.1
- Cramer, Chapter 3.4 - 3.7
- Godfrey, Chapter 1.1 - 1.4
- Judge et al (1985), Chapters 5.5, and 6.6 - 6.7

VI. **Hypothesis Testing II**

- ⊖ Theil, Chung, and Seale, Chapter 4.1 and 4.4
- ⊖ Laitinen, K., "Why Is Demand Homogeneity So Often Rejected?," *Economic Letters* 1(1978):187-191.
- ⊖ Meisner, J.F., "The Sad Fate of the Asymptotic Slutsky Symmetry Test for Large Systems," *Economic Letters* 2(1979):231-233.
- ⊖ Theil, H. and J.S. Shonkwiler, "Monte Carlo Tests of Autocorrelation," *Economic Letters* 20(1986):157-160.
- Ⓜ Taylor, T. G. and J.S. Shonkwiler, "A Size-Corrected Wald Test for Slutsky Symmetry in Systems of Demand Equations," *Economic Letters* 19(1985):327-330.
- Ⓜ Bewley, chapters 1.7 - 1.8, 3.1, and 6.3
- Theil and Clements, Chapters 2.9 and 3
- Godfrey, Chapters 2.1 - 2.4 and 7.4 - 7.5
- Judge et al (1985), Chapter 21

VII. **Simultaneous Equations**

- ⊖ Harvey (1990), Chapter 9
- ⊖ Schmidt, Chapters 4 and 5
- Ⓜ Kmenta, Chapter 13.

ⓂBaltagi, Chapter 7  
Matyas and Sevestre, Chapter 5.

VIII. **Dynamic Panel Models**

Ⓜ Hsiao, Chapter 4  
Ⓜ Harvey, Chapter 7  
Ⓜ Kmenta, Chapter 13-7.  
Ⓜ Baltagi, Chapter 8  
Cuthbertson, Hall, and Taylor, Chapter 4  
Matyas and Sevestre, Chapters 7 and 8.

IX. **Variable-Coefficient Models**

Ⓜ Hsiao, Chapter 6  
Ⓜ Kmenta, Chapter 11-7.  
Ⓜ Maddala (1977), Chapter 17  
Greene, Chapters 16.3.4 and 18.3  
Judge et al (1985), Chapter 19  
Pollak and Wales, Chapters 5.4 and 6.5

X. **Dynamic System**

Ⓜ Hsiao, Chapter 10

XI. **Incomplete or Unbalanced Panel Data**

Ⓜ Hsiao, Chapter 11  
Ⓜ Baltagi, Chapter 7

*Disclaimer:*

The syllabus is a general plan for the course; deviations may be necessary. I hold the right to make changes to this syllabus as circumstances warrant.

**UF POLICIES AND REGULATIONS:**

**Grades and Grade Points:** Information on current policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**Academic Honesty, Software Use, Campus Helping Resources, Services for Students with Disabilities**

**Academic Honesty:** In 1995 the UF student body enacted an [honor code](#) and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to the standard drafted and enacted by students.

**The Honor Pledge: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.**

On all work submitted for credit by students at the university, the following pledge is either required or implied: "**On my honor, I have neither given nor received unauthorized aid in doing this assignment.**" Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean, Student Honor Council, or Student Conduct and Conflict Resolution in the Dean of Students Office. (*Source: 2012-2013 Undergraduate Catalog*) It is assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor.

**Software Use:**

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

**Campus Helping Resources:**

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, [www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)*

Counseling Services  
Groups and Workshops  
Outreach and Consultation  
Self-Help Library  
Training Programs  
Community Provider Database

- *Career Resource Center, First Floor JWRU, 392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)*

**Services for Students with Disabilities:**

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues.

0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)

**Course Evaluations:**

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu> . Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>