Department of Economics
University of Maryland

Spring 2025

ECON 423 – Advanced Topics in Econometrics
Section 0101
Course Syllabus

Professor: John C. Chao
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Lecture:

TuTh 9:30am – 10:45am, Tydings Hall, Room 0102.

Course Description:

This course goes beyond the classical linear regression model covered in Economics 422 to consider more advanced topics such as instrumental variables regression, time series models, panel data models, and qualitative response models. The need to consider more complicated econometric models comes from the fact that many economic data sets do not satisfy the restrictive assumptions of the classical linear model. This course will emphasize both the theoretical and the practical aspects of econometric analysis, focusing on techniques for estimation and for conducting tests of hypotheses of interest to economists. The goal is to help students develop not only an understanding for the advantages and disadvantages of different estimation and test procedures but also the ability to carry out and to critique empirical studies in economics and related fields.

Prerequisite:

Students are expected to have attained a minimum grade of C- in Econ 422 and must be in the Economics Bachelor of Science program.

Required Text:

(SW) Stock, J.H. and M. W. Watson (2019). *Introduction to Econometrics*, Update, 4th Edition, Addison-Wesley (ISBN-13: 9780134461991).

Other References:

Angrist, J. D. and J.-S. Pischke (2015). *Mastering Metrics*. Princeton University Press. (ISBN: 978-0-691-15284-4)

Devore, J. L. (2011) *Probability and Statistics for Engineering and the Sciences*, 8th Edition, Thomson (ISBN: 978-0538733526).

Gujarati, D. (2002). *Basic Econometrics*, 4th Edition, McGraw Hill.

Hamilton, J.D. (1994). *Time Series Analysis*, Princeton University Press. (ISBN: 978-0-691-04289-3)

Hamilton, L. (2003). *Statistics with STATA*, Duxbury Press. (ISBN-10: 0534997562).

Hogg, R.V. and E. A. Tanis (2000). *Probability and Statistical Inference*, 6th Edition, Prentice Hall.

Maddala, G. S. (2001). *Introduction to Econometrics*, 3rd Edition, John Wiley & Sons.

Mirer, T. W. (1995), *Economic Statistics and Econometrics*, 3rd Edition, Prentice Hall.

Pindyck, R.S. and D.L. Rubenfeld (1997). *Econometric Models and Econometric Forecasts*, 4th Edition, McGraw Hill.

Wooldridge, J. (2008). *Introductory Econometrics: A Modern Approach*, 4th Edition, South-Western College Pub. (ISBN-10: 0324581629; ISBN-13: 9780324581621)

Wooldridge, J. (2010). *Econometric Analysis of Cross Section and Panel Data*, 2nd Edition. MIT Press. (ISBN 978-0-262-23258-6)

Grading Policy and Expectations of Students:

1. Four problem sets, consisting of some combinations of theoretical and empirical (computer) exercises, will be assigned during the semester. These problem sets will make up 100% of your grade in the course. Problem sets are due by 10:45 am on the following dates:

Problem Set 1:	Thursday, February 27
Problem Set 2:	Thursday, March 27
Problem Set 3:	Tuesday, April 22
Problem Set 4:	Tuesday, May 6

   Problem sets will be posted on ELMS (URL:elms.umd.edu) at least two full weeks before they are due. Students are encouraged to work together on problem sets, but each student should turn in his or her own version of the assignment.

2. Homework assignments and the take-home exam described above constitute the "major grading events" in accordance with the University's policy on excused absences. Extensions of assignment deadlines will be permitted only for
   - Illness
   - Religious observances
   - Participation in University activities at the request of university authorities
   - Compelling circumstances beyond the student's control

   If a student must miss an assignment due date as a result of religious observance or in order to participate in an activity at the request of university authorities, the student should contact the instructor and the Director of Undergraduate Studies (Dr. Erin Moody) prior to the scheduled date and time. On the other hand, if an assignment due date is missed due to unforeseen circumstances on the scheduled date, the student (or family member/friend in extreme circumstances) must contact the instructor within 24 hours of the missed assignment deadline. Official documentation of the excuse must always be provided. If an assignment deadline is missed for any unauthorized reason or if no acceptable documentation is provided, the student will receive a grade of zero.

3. Please do not disrupt class for your fellow students by talking in class, using a cell phone, or typing text messages. If you happen to arrive late to class, please seat yourself quietly in the back and avoid walking to the front of the classroom.

4. Please turn in your homework assignment by coming to class on the date that it is due and hand in a physical copy of your problem set solutions or by emailing the TA or Prof. Chao a pdf file of your solutions. Please do not upload your solutions onto ELMS or place a copy of your solutions in our mailboxes. No credit will be given for any homework that is turned in 24 hours after the due date. If a homework assignment is late but turned in strictly less than 24 hours after the time it is due, a proportional deduction will be implemented. For example, if an assignment is turned in 12 hours after it is due, the highest grade that the student can receive on this problem set is a 50 instead of a 100.

Computing Software:

The TA will give a help session on the statistical software package, STATA, which you might find useful in doing some of the empirical/computer exercises in the problem sets. However, you are welcome to use Python, R, Matlab, SAS, SPSS, Eview, TSP or any other software or programming language that you prefer in completing the assignments.

Policies and Resources for Undergraduate Courses:

It is our shared responsibility to know and abide by the University of Maryland's policies that relate to all courses, which include topics like:

- Academic integrity
- Student and instructor conduct
- Accessibility and accommodations
- Attendance and excused absences
- Grades and appeals
- Copyright and intellectual property

Please visit http://www.ugst.umd.edu/courserelatedpolicies.html for the Office of Undergraduate Studies' full list of campus-wide policies and follow up with me if you have questions.

University Counseling Services:

Sometimes college students experience academic, personal, and/or emotional distress. The Counseling Center provides comprehensive support services that promote the personal, social, and academic success of UMD students. The cost of these services is covered by the fees you already paid when you registered, so there is no additional charge if you use these valuable resources. Proactively explore the range of services available including the Counseling Service, the Accessibility and Disability Services (ADS), the Learning Assistance Service, and the Testing Office, all described at https://www.counseling.umd.edu .

Course Evaluations

Students are encouraged to submit course evaluations through CourseEvalUM (www.courseevalum.umd.edu).

Course Outline and Reading List:

I. Review of Linear Regression Model

(SW) Chapters 4-7, 18-19

II. Simultaneous Equations Models and Instrumental Variables Estimation

- The IV Estimator with a Single Regressor and a Single Instrument
- The General IV Regression Model
- Checking Instrument Validity

(SW) Chapters 12

III. Regression Analysis of Economic Time Series Data

- Introduction to Time Series
- Autoregressions
- Time Series Regression with Additional Predictors
- Lag Length Selection Using Information Criteria
- Nonstationarity I: Trends
- Nonstationarity II: Breaks

(SW) Chapters 15-16

IV. Additional Topics in Time Series Regression

- Vector Autoregressions
- Orders of Integration and the DF-GLS Unit Root Test
- Cointegration
- Volatility Clustering and Autoregressive Conditional Heteroskedasticity

(SW) Chapter 17

V. Regression with Panel Data

- Introduction to Panel Data
- Panel Data with Two Time Periods: "Before and After" Comparisons
- Fixed Effects Regression
- Regression with Time Fixed Effects

- Standard Errors for Fixed Effects Regression

(SW) Chapter 10

VI. Binary Response Models

- Binary Dependent Variables and the Linear Probability Model
- Probit and Logit Regression
- Estimation and Inference in the Logit and Probit Models

(SW) Chapter 11

VII. Experiments and Quasi-Experiments

- Potential Outcomes, Causal Effects, and Idealized Experiments
- Experimental Estimates of the Effect of Class Size Reductions
- Quasi-Experiments
- Experimental and Quasi-Experimental Estimates in Heterogeneous Populations

(SW) Chapter 13