

Econometrics (Econ 308)
Department of Economics
The College of William & Mary
Fall 2020

Class meets Tuesdays & Thursdays, 2:00-3:20 on zoom. See the announcement board on Blackboard for zoom link and passcode.

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About me My primary research interests are in the fields of health economics, applied econometrics, and economics of human development. Prior to coming to William & Mary I worked at the University of Chicago and at Vanderbilt.

Office Hours Because of online teaching, in-person office hours are replaced by answering questions by e-mail. For questions that benefit from discussions students should feel free to request a zoom meeting.

Prerequisites Econ 101, Econ 102, and Econ 307*

*Note: Students may use Buad 231, Math 106, Math 351, or Socl 353 in place of Econ 307 as a pre-requisite for ECON 308, but these courses do not count as credit hours toward the Economics major.

About this course This course is an introduction to econometrics, a collection of statistical methods for analyzing socio-economic data. Students will learn how to both analyze their own data and critically evaluate analysis done by others. Data analysis will include model specification, estimation and interpretation of model parameters, and hypothesis testing. The course will mix statistical intuition, the use of a powerful statistical package *Stata*, and mathematical/statistical derivations. The course emphasizes applications of econometric methods. Overall, this course provides students with essential statistical tools that are highly valued by the job market and by graduate schools.

Reading Required reading is *Introductory Econometrics, A Modern Approach* by Jeffrey Wooldridge, 6th edition. Older or newer editions of the same textbook may work as long as students make sure that they do the right homework questions and have adequate reading for material covered in class. Plus, lecture slides include material not covered by the textbook and may provide somewhat different interpretation of theory and results than in the textbook. Students should also know formulas and charts presented on the white board and Stata codes that we go over in class. Except for the white board writing, these additional materials should be available on Blackboard.

Software This course will rely heavily on Stata, a powerful and widely-used statistical package, a #1 statistical software choice for most economists. Stata is available remotely from off-campus, on all campus computers (find Stata software under “all programs/statistics” of the windows Start panel), and can also be installed to your personal computer if you choose to purchase it. Instructions on how to connect your computer to the W&M server to use Stata are to be uploaded on blackboard by the time students need Stata. If these instructions do not lead to satisfactory remote connection,

students should contact the Technology Support Center at support@wm.edu or by calling 221-HELP.

A list of on-campus lab locations can be found here:

<http://www.wm.edu/offices/it/services/computerlabs/configuration/index.php>.

The college is part of the Stata GradPlan which offers discounted versions of Stata. More information on that can be found

here: <https://www.wm.edu/offices/it/services/software/licensedsoftware/mathstats/stata/index.php> and here: <http://www.stata.com/order/new/edu/gradplans/student-pricing/>. Please do not leave your empirical work to the last moment, especially if you depend on a public computer or do not know how to work with Stata remotely!

Stata users enjoy a wide range of resources online in addition to excellent and user-friendly documentation that comes with Stata. You can Google an answer to almost any Stata question that you may have regarding the homework. One good and free introduction to Stata is called “A brief introduction to Stata with 50+ commands.” https://pokrovka11.files.wordpress.com/2012/10/introduction_to_stata_with_50_basic_commands.pdf I will devote some time in the online class to learning Stata basics. That said, students are expected to get themselves familiar with the practical use of Stata by using material from class, from Stata help, and from web sources when needed.

Make sure you learn Stata well and add Stata skills to your CV. Not only you will be more successful in this course, you will also have better chances on the job market!

Some Useful Data Sources

1. Integrated Public Use Microdata Series (IPUM): <http://usa.ipums.org/usa/>
Cleaned data here include the American Community Survey (ACS), Census data, Current Population Survey (CPS), and National Health Interview Survey (NHIS).

2. NBER: <http://www.nber.org/data/>

3. Data that come with your textbook (see blackboard for this class or google it online). Be careful that you do not use the same or very similar model that your textbook presents based on the same data. Such a paper will make no contribution to the literature. You need to show your independent work and demonstrate some contribution.

The full list of possible data sources would be too long. Students are expected to find data source based on their research interest. See handout 4 or Chapter 19 of the textbook about how to write an empirical paper and find data for it.

Group work Group work (or team work) is highly beneficial for learning since students learn from each other and get superior motivation. Moreover, group work creates skills that are essential for students’ future careers: team work is a common work environment. I recommend students to form groups that consist of approximately 3–4 people to work

together on problem sets and the project.¹ Please answer the questionnaire on group formation in the end of this syllabus and submit it as specified in the list of important deadlines (see below). One group member submits the questionnaire for the whole group.

Students are free to change the group, split the group, or start working alone at any time (after giving others a notice a week ahead of the next deadline). Please view group work as your resource and learning opportunity, not a must. Shirkers should beware that one day their group members may choose to form another group. If this happens, they may end up working alone. Groups are encouraged to support group members who work hard but may initially lack certain skills or knowledge that others have.

Grading Scale

- Homework (one work from each working group), 30%
- Midterm exam, 25%
- Term paper (one paper from each working group), 10%
- Cumulative final exam, 33%
- All group work in class, 2%

Midterm and Final Exams I will give a midterm during a class and a 2-hour *cumulative* final exam after classes end (see the list of important dates).

A cumulative final covers all topics in the course, not only those after the midterm, which allows for an upward correction of the midterm grade. If your score for the final exam is higher than your score for the midterm, then I will automatically replace your midterm exam score with the final score. For instance, if you get 85% for the midterm and 95% for the final, I will automatically replace 85% with 95%. However, if you get 80% for the final, I will make no such adjustments so that you keep your midterm score of 85%. The aim of this policy is to encourage academic progress and give students a chance to improve their midterm scores.

I will administer the both midterm and final exams though Blackboard. The exam will be “open book and open notes” type. Open book exam does not mean, however, that students can relax and skip preparing. There will be not enough time during the exam to search for all answers in the book or notes. Some questions may require integrated knowledge from various parts of the course, and so it will be impossible to find a ready answer by searching though the textbook or online during the exam. Group work on the exam is against the honor code. I plan to take all possible measures to prevent a possibility of cheating.

Group work in class This work provides up to 2% of points for the semester-long effort. I can assign group work during any class, with no prior notification. The group work may be based on new material from the same class or any previous material. For the best results, students are encouraged to keep clean class notes, make sheets with formulas and definitions for quick reference, pay attention in class, and ask questions in class or during

¹ All members of the group will share the same scores for home assignments and their original research presentation. It is up to the group how they divide the work. I allow groups to merge or split at any time if they find such changes productive. Groups that do not exceed 4 students do not need an approval for their formation.

office hours if things are unclear. This policy encourages class participation and incentivizes students to pay attention in class and to stay on top of the material. Plus, students learn from each other while doing the class assignment.

Reward for active class participation Students who provide both useful and regular contributions to class discussions, ask good questions, and provide answers to questions that I ask the class during lectures will be rewarded by a higher grade in marginal cases (e.g, a B+ that is close enough to an A- will translate to A- for such student).

Homework Students will have weekly homework assignments, the majority of which involves work in Stata and interpretation of the results. Expect eight homework assignments.

Please submit versions in either PDF or MS Word/RTF. Typing answers is highly encouraged. Typing many formulas might be time-consuming, and so a scan of clear handwriting can be used for those. I will regard unreadable answer as no answer. If your homework requires Stata work, then relevant .do and .log files must be submitted with the homework.

Unless announced otherwise, homework assignments are due on Thursday by class time to the same folder on blackboard that contains homework questions. Groups have one week to complete homework (the homework is usually posted on Thursday evening or earlier). Each group is allowed to submit one late homework to cover unexpected circumstances (submit on Tuesday by class time or earlier).

I will drop your lowest homework score to boost your average and total homework score.

Copying answers from other groups or any other source constitutes an honor code violation.

Groups should list all its members who contributed enough to the submitted homework. This list may change over time, as composition of working groups may change.

Term Paper (Project) and its Abstract As stated in the course description, the goal of this course is for you to gain the ability to conduct and critique empirical work in economics and related fields. A testimony to whether you have achieved this goal is to implement an empirical project with your team and write a short paper. You will ask an economic question, find relevant data, carry out empirical analysis, and write up a short term paper with other members of your group (I need one paper from each group).

You need to submit a short description (abstract) of your project by the deadline specified below in the list of important dates. Submit one abstract from each group by e-mail and CC to all group members. I will reply to this e-mail with comments. To make you're your e-mail is not lost, please use e-mail subject "Econ 308 Abstract". Please, limit the abstract to one paragraph. Motivate your project and mention which methods you plan to use, which data you plan to process, which results you expect, and which policy implications you may derive. I encourage students to discuss their topic with me any time when it is productive (before or after the abstract is due). The abstract will not be graded

and is needed for the first feedback. Students are free to change their initial plan of work if needed upon a discussion with the professor.

The following source can serve as a useful guide on how to write a research paper in economics: <http://faculty.wcas.northwestern.edu/~mdo738/teaching/cochrane.pdf> (it is written for PhD students but the same writing hints can be used by undergraduates).

There is also a useful writing resource on campus. The Writing Resources Center, located on the first floor of Swem Library, is a free service provided to W&M students. Trained consultants offer individual assistance with writing, presentation, and other communication assignments at any stage, from generating ideas to polishing a final product, and across disciplines. To make an appointment, visit the WRC webpage www.wm.edu/wrc.

Your project should contain the following parts:

- 1) Introduction: motivate your question of interest, shortly summarize which methods you used and which results you obtained
- 2) Data: Briefly describe your data. Define the outcome and main explanatory variables. Show a summary statistic table and, if needed, graphs summarizing important variables
- 3) Methodology: How do you answer the question raised in the introduction? Which econometrics method are you applying? What are the underlying assumptions? (For example, if you use a difference-in-differences estimator, clearly describe your control and treatment groups, and the assumptions which make such estimation valid.) Admit limitations of your methodology. For instance, unless you have data from a randomized experiment, a simple OLS model will likely fail to give you estimates that can be interpreted as causal under realistic assumptions. Estimates based on simple OLS are still fine for this course but you need to note the limitations.
- 4) Results: Present your results in well-formatted tables and figures. Place notes behind tables and figures to make them self-explanatory. Every table and figure should have a clear title. Interpret your results. Mention limitations of your results related to limitations of methodology that you discussed above (for example, if you suspect your analysis suffers from omitted-variable bias but cannot do anything about it, acknowledge it, and, if possible, discuss the direction of the bias. Admitting limitations improves the quality of your project). Discuss both the economic and statistical significance.
- 5) Conclusions: Summarize what the paper is about and your findings. Discuss policy implications if any exist. Mention possible steps you may want to undertake in the future to move this research forward.

The project report should be no more than 10 pages double-spaced using 12-point font (figures and tables are excluded from this restriction).

Additional instructional hours It is a college requirement to provide at least 150 minutes of instructional hours that need to be made up because of the shortened academic calendar on top of lectures twice a week. One standard option for this is to provide

students with recordings of some lectures for asynchronous work (for greater flexibility). After the midterm, students will study two easiest topics with the help of video recordings asynchronously. Students should feel free to discuss all questions that they may have about these topics with the professor by e-mail or zoom.

Important Dates

- 08/20: the first lecture
- 08/25: group formation questionnaire available in the end of this syllabus due by e-mail by 10pm. Existing groups submit one questionnaire, not one from each member.
- 09/03, 09/10, 09/17, 09/24; 10/15, 10/22, 10/29: home assignment due on blackboard by the class time (assignments will be posted on the Blackboard a week ahead of the deadline. One representative from each working group uploads the finished homework to the same folder.)
- 10/01: midterm exam on Blackboard during class time only
- 10/08: title and abstract of the term paper due in class
- 11/10: pdf of the paper due by 10pm to a designated folder on dropbox. Students should feel free to submit the paper any time before the deadline.
- 11/12: the last class
- 11/18, Wd: 2-hour cumulative final exam, 2:00-4:00pm, use blackboard to write the exam

Honor Code The College Honor Code will be observed. In particular, it is not acceptable to copy homework answers from other groups or from any other sources. Term papers should be original and cite all sources of data and ideas. Online exams should be taken without using help from others.

Topics Number of chapters refer to Wooldridge's textbook, 6th ed., as the main source for this course. Other sources will supplement the textbook when preparing lectures but Wooldridge is the only required textbook. "HD#" refers to numbered handouts (lecture presentation slides) available on Blackboard.

1. Nature of Econometrics and Economic Data (Ch. 1, HD1)
2. Multiple Linear Regressions (MLR): Estimation, Small Sample Properties, and Inference (Ch. 2-4, HD2-3)
3. Carrying out an Empirical Project (Ch. 19, HD4) [study asynchronously using a zoom video and pdf of the handout]
4. MLR: Large Sample Properties (Ch. 5, HD5)
5. MLR: Further Issues: Functional Form, Goodness of Fit and Model Selection, Prediction and Residual Analysis (Ch. 6, HD6) [study asynchronously using a zoom video and pdf of the handout]
6. MLR with Qualitative Information and the Linear Probability Model (Ch. 7, HD7)
7. MLR: Heteroskedasticity (Ch. 8, HD8)
8. More specification and data issues in MLR: Functional Form Misspecification, Proxy Variables, Model with Random Slopes, Measurement Error (Ch. 9, HD9)
9. Simple Panel Data Estimation (Ch. 13, HD10)
10. Advanced Panel Data Estimation (Ch. 14, HD11)
11. Instrumental Variable Estimation (Ch. 15, HD12)
12. Limited Dependent Variables and Sample Selection (if time permits) (Ch. 17, HD13)

Material from appendices A, B, C, D, E, and G will also be used throughout the course.

Feedback I highly encourage students to provide me with feedback on how to further improve this course. I conduct informal and anonymous surveys during the semester to seek feedback.

Disability Service William & Mary accommodates students with disabilities in accordance with federal laws and university policy. Any student who feels he/she may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis should contact Student Accessibility Services staff at 757-221-2509 or at sas@wm.edu to determine if accommodations are warranted and to obtain an official letter of accommodation. For more information, please see www.wm.edu/sas.

Required and Suggested Reading

Notation:

*– required reading

No asterisk – suggested reading for those who wish to learn more than is required to pass the course with an A. Also, suggested reading may help you with your project.

*All lecture slides, all writing on the whiteboard, and all Stata codes discussed in class (slides and codes should be available on Blackboard)

*Wooldridge, J.M.. *Introductory Econometrics. A Modern Approach. Sixth Edition.* Cengage Learning. 2016.

Angrist, J. and Pischke J-S. 2009. *Mostly Harmless Econometrics: An Empiricist's Companion.*

Bailey, M. A., 2016. *Real Stats. Using Econometrics for Political Science and Public Policy.* Oxford University Press.

Cameron, A. C. and Trivedi, P. *Microeconometrics. Methods and Applications.* Cambridge University Press, 2005.

Cameron, A. C. and Trivedi, P. *Microeconometrics using Stata. Revised Edition.* Stata Press, 2009.

Greene, W. *Econometric Analysis.* Pearson; 7 edition, February 13, 2011.

Little, R. J. A and Rubin, D. B., 2002. *Statistical Analysis with Missing Data 2nd Edition.* Wiley-Interscience; 2d edition.

Maddala, G.S., 1986. *Limited-Dependent and Qualitative Variables in Econometrics.* Econometric Society Monographs. Cambridge University Press; Revised ed. Edition, June.

Wasserman, L. *All of Statistics.* Springer. 2003.

I reserve the right to alter the form and content of the course in order to adjust to the needs and level of students enrolled in the class.

Group Formation Questionnaire

I need one form filled from each group (or from a student who has no group)
Submit the form by e-mail by the deadline (see the list of important dates above)

1. Your name:
2. Have you formed a group of 3–4 students (including you) enrolled in this class?
(Yes/No) [If no, please skip to question 5]
3. Please list names of your group members (excluding you):
 - (1)
 - (2)
 - (3)
4. Is your group open to admitting more members among those who found no group
(to be assigned to your team by the professor)? (Yes /No) [skip to question 6]
5. Would you like to be assigned to a group by the professor? Yes / No
6. Your comments or suggestions (if any):