

# Econometrics (Econ 308)

Department of Economics  
The College of William & Mary  
Fall 2017

**Classes meet** Mondays & Wednesdays in Tyler 113

Section 308-05: 2:00-3:20

Section 308-06: 3:30-4:50

**Professor** Peter Savelyev ([pasavelyev@wm.edu](mailto:pasavelyev@wm.edu))

**Office Hours** Mondays & Wednesdays, 5:00-6:00 or by appointment

**Office Location** Tyler 232

**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 and Mary, I worked with James Heckman and other co-authors at the University of Chicago and taught at Vanderbilt.

**TA** Paige Anders ([pdanders@email.wm.edu](mailto:pdanders@email.wm.edu))

**Office Hours** Tuesdays, 5:00pm-6:30pm

**Office Hours Location** Tyler 121

**Main responsibilities of the TA during office hours** Help students better understand home assignments, Stata package, and lecture notes

**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 practical implications 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 editions of the same textbook may work as long as students make sure (at their own risk) that they do the right homework questions and have adequate reading for material covered in class. Students will not get credit for doing wrong homework assignments or learning from irrelevant parts of the textbook. Plus, lecture slides may include material not covered by the textbook or provide somewhat different interpretation of theory and results than in the textbook. Students should also know formulas and charts that I present on the white board and Stata codes that we go

over in class. Except for my 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, which is available in all campus computers (find Stata software under “all programs/statistics” of the windows Start panel) and can also be installed to your personal computer. You can use earlier versions of Stata, but you may need to find a way to transfer data across different versions of Stata. A list of lab locations can be found here: <http://www.wm.edu/offices/it/services/computerlabs/configuration/index.php>. The College has licenses for 40 concurrent PACLab computers. Stata may be accessed from any PACLab computer on or off campus by using ssh to stat.wm.edu and logging in with your WMuserid and Password. Also, 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/>. Some students choose to purchase the most affordable version of Stata called Small Stata. Please note that Small Stata cannot handle large datasets including some datasets that you may use for home assignments. You may also have trouble with Small Stata if you choose to use a large dataset for your term paper. Still, even Small Stata greatly diminishes your dependence on public computers. Please, do not leave your empirical work to the last moment, especially if you depend on a public computer!

Stata users enjoy a wide range of resources online (you can Google an answer to almost any reasonable Stata question) in addition to excellent and user-friendly documentation that comes with Stata. One good and free introduction to Stata is called “A brief introduction to Stata with 50+ commands.” I will devote some time in class to learning Stata basics. 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. Your TA is an experienced Stata user. Do ask your TA for help with Stata during TA’s office hours.

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 research. You need to show your independent work.

**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 social

skills that are essential for students' future careers: team work is a common work environment. I ask students to form groups that consist of approximately 3–4 people to work together on problem sets and the project.<sup>1</sup> 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.

### **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%  
Group work in class, 2%

**Midterm and Final Exams** At the exams students are allowed to use books, lecture notes, own notes, printed Stata codes, and copies of homework and group work assignments. Computers, tablets, smart phones, and any other devices with Web access are not allowed. Calculators are allowed and might be useful. The midterm exam takes the duration of one class. Cumulative final exam takes 90 minutes.

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.

**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 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 higher grade in marginal cases (e.g, a B+ that is close enough to an A- will translate to A- for such student).

**Homework** You will have (roughly) weekly homework assignments, the majority of which involves computer work and interpretation of the results. Expect 9 homework assignments (this number may change).

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<sup>1</sup> Unless your group chooses to exclude its member for systematic lack of contribution to the group work, 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.

Please submit hard copies. Typing answers is welcomed but not a must. Typing formulas might be especially time-consuming and is not expected. If you do not type, please write very clearly so that the text is readable.

If your homework requires Stata work, then print-outs of .do and .log files must be attached; points will be taken off if they are missing.

Unless announced otherwise, hard copies of homework assignments are due on Wednesday in class (see the list of important deadlines below). Usually, groups have one week to complete homework (the homework is usually posted on Wednesday evening or earlier). Each group is allowed to submit one late homework to cover unexpected circumstances (submit on Monday in class 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 a honor code violation.

On each homework, please list the names of all group members who deserve credit for preparing that homework.

**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 pick one of the datasets from Wooldridge's textbook companion website or another source of your choice, ask an economic question, 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. 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 will provide written feedback on your abstract. 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. To get more feedback, students are encouraged to use office hours. Students are free to change their topic any time before the paper is due.

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](http://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 can still be useful but you need to note the limitations.) Ideally, you would like to avoid strong assumptions and major 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).

### **Important Dates**

08/30: the first lecture

09/04: group questionnaire due in class

09/13, 20, 27; 10/4, 25; 11/1, 8, 15, 29: home assignments due in class (assignments will be posted on the Blackboard one week ahead of the deadline or earlier)

10/11: midterm in class

10/23: title and abstract of the term paper due in class

12/04: term paper due in class

12/06: the last class

12/14: 90-min cumulative final for section 06 (3:30 class), starts at 9:00am, same classroom

12/19: 90-min cumulative final for section 05 (2:00 class), starts at 2:00pm, same classroom

**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.

**Topics (subject to change)** (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.)

1. Nature of Econometrics and Economic Data (Ch. 1)
2. Simple Linear Regressions (Ch. 2)
3. MLR (Multiple Linear Regressions): Estimation, Small Sample Properties, and Inference (Ch. 3-4)
4. Carrying out an Empirical Project (if time permits) (Ch. 19)
5. MLR: Large Sample Properties (Ch. 5)
6. MLR: Further Issues: Data Scaling, Functional Form, Goodness of Fit and Model Selection, Prediction and Residual Analysis (Ch. 6)
7. MLR with Qualitative Information (Ch. 7)
8. MLR: Heteroskedasticity (Ch. 8)
9. More specification and data issues in MLR: Functional Form Misspecification, Proxy Variables, Model with Random Slopes, Measurement Error (Ch. 9)
10. Simple Panel Data Estimation (Ch. 13)
11. Advanced Panel Data Estimation (Ch. 14)
10. Instrumental Variable Estimation (Ch. 15)
11. Limited Dependent Variables and Sample Selection (if time permits) (Ch. 17)

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

**Computer policy** I allow the use of laptop computers and other electronic devices in class, but only for course-related purposes such as making notes or reading electronic handouts. I do not allow the use of computers and other devices with Internet access during the exam.

**Feedback** I highly encourage students to provide me with feedback on how to further improve this course. I conduct an informal survey in mid-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](mailto: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](http://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.

Plus, I need one from each student, who has no group.)

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):