AEB 7571: Econometric Methods I

Spring 2026

Instructor: Prof. Patrick S. Ward
Email: wardp@ufl.edu
Lecture: MWF 3:00 PM – 3:50 PM
Lecture location: MAEB 0230
Office hours: Monday 9:00 AM – 10:00 AM
Wednesday 9:00 AM – 10:00 AM
Office hour location: McCarty A 1185
Phone: (352) 294-9050

Course Description: Linear and nonlinear econometric models, serial correlation, heteroscedasticity, errors in variables, qualitative variables, specification errors, and simultaneous equation models.

Credits: 3

Grading scheme: Letter grade

Prerequisites: MAS 2103, STA 4322

Communication: E-mail (either to my email address or via Canvas messaging) is the best way to reach me. Any issues that require action MUST be handled by email so that there is a written record of need. Phone calls or after class conversations are not likely to result in action. Class cancellations, changes in office hours, meeting locations, or the syllabus will be announced on Canvas. Be sure that you receive those notifications in a timely manner (controlled in your Canvas settings).

Because of the nature of the problem sets and application exercises, I will not provide assistance on problem sets or application exercises over email; if you have specific questions, please plan to attend office hours. If you have not made efforts to solve the problem, I will not provide hints on how to do so. It is not necessary for you to make appointments during office hours. Visitors will be seen on a first-come, first-served basis. Groups of students are encouraged.

Course motivation (or, "Why you should be excited about taking this course"): The appropriate use of econometric methods to study and interpret economic data is an essential skill in applied economics. Although many statistical software packages have been developed that greatly simplify the process of econometric modeling, they often operate as a "black box" where the user enters some input and the software produces a result, but the user has no idea how the input is transformed into the output. While some might argue that ignorance is bliss, there is a risk that such rote reliance on computing software can result in the use of improper methods, a reliance on unrealistic assumptions, or an improper interpretation of the results. This course will emphasize the finite sample and asymptotic theories of some fundamental econometric frameworks for estimating linear and nonlinear economic relationships, and exercises programming econometric estimators using matrix formulations in R will give you a peek inside the black box to help students better understand the mechanics of econometric estimation.

Expected Student Learning Outcomes: After the successful completion of AEB 7571, a typical student should be able to:

- Have a general understanding of econometric theory and the properties of and assumptions that underly some widely used econometric frameworks.
- Apply appropriate econometric methods in the analysis of real data, demonstrating an understanding the mechanics of the estimation procedure and the proper interpretation of the results.
- Create an individual product of economic research using econometric methods.

Course Materials:

- ***Primary texts:***

  Econometric Analysis (8th edition), by William H. Greene. 2018. Pearson Press. ISBN: 0134461363.

  Econometrics, by Bruce Hansen. 2022. Princeton University Press. ISBN: 9780691235889

- ***Other resource that may prove helpful:***

  Econometric Analysis of Cross-Section and Panel Data, by Jeffrey Wooldridge. 2010. MIT Press.

  A Guide to Econometrics (5th edition), by Peter A. Kennedy. 2003. MIT Press.

  Mostly Harmless Econometrics: An Empiricist's Companion, by Joshua D. Angrist and Jörn-Steffen Pischke. 2008. Princeton University Press.

- ***E-learning:*** There is an E-Learning Canvas webpage for this course that can be accessed using your GatorLink username and password. If you are having difficulties accessing E-learning, please contact the UF Computing Help Desk by calling (352)-392-HELP or via email helpdesk@ufl.edu.
- ***Other:*** This course combines theoretical and analytical concepts with practical application. As such, students are expected to have or develop a basic knowledge of programming in R. If you do not have an adequate background in R, you may access a number of resources on the internet, such as Analytics Using R (https://pubs.wsb.wisc.edu/academics/analytics-using-r-2019/), Introduction to Econometrics with R (https://www.econometrics-with-r.org), or LinkedIn Learning (available from http://elearning.ufl.edu).

Class Structure: The class format is that of a traditional lecture combined with example applications. Lectures will be recorded and posted on Canvas to provide equal access to all students, but to maximize your learning experience, you should attend every class.

Tentative course sequence:

1. Preliminaries:
   - Conditional expectations, matrix algebra, matrix calculus
2. The multiple regression model
   - Ordinary least squares (OLS), algebra of OLS, the Gauss-Markov Theorem, the Frisch-Waugh-Lovell Theorem
   - Finite sample and asymptotic properties of OLS
3. Restrictions on parameters and hypothesis testing
4. Heteroskedasticity, generalized least squares (GLS), feasible generalized least squares (FGLS), and heteroskedasticity-consistent covariance matrices (HCCM)
5. Endogeneity
   - Instrumental variables (IV) regression
   - Asymptotic properties of the IV estimator
   - Overidentified models and two-stage least squares (2SLS)
   - Control functions
6. Maximum likelihood (ML) estimation
   - Properties of ML estimators
   - Estimation procedures
   - Testing restrictions in the ML framework
7. Binary dependent variable models
   - Linear probability model

- Probit and logit

8. Longitudinal data
   - Pooled OLS, fixed effects, and random effects
   - Hausman specification tests
9. Difference-in-differences estimation

This outline provides a brief overview of the topics that will be covered and the sequence with which they will be covered. This outline is a general plan for the course, but deviations may be necessary depending on the pace of the course. The instructor reserves the right to make changes to this syllabus at any time during the semester as circumstances warrant.

Course Assignments and Expectations:

Problem sets: These are meant to give you opportunities to master some of the econometric methods that we discuss in the regular class meetings. There will be 6 problem sets over the course of the semester, so you will be expected to stay up-to-speed with the material that is covered in class. Most problem sets will require econometric estimation, and unless otherwise stipulated, I expect these to be completed using brute force methods (i.e., matrix language programming, as opposed to pre-written commands) in R. Working on problem sets is a key ingredient of this course because it is one of the best ways to assess your understanding and to help you solidify new concepts. You should find that the problem sets are more challenging than the examples presented in class. This is a PhD-level course, so the problem sets will be intentionally challenging – and sometimes, they may prove to be unintentionally challenging. Working on challenging problems helps stimulate higher-order thinking, deepens your understanding of the material, and provides an opportunity to think creatively and independently. You will be expected to demonstrate competency not only in the econometric methods that will be developed in class, but also in skillfully interpreting the results in the context of the specific data and econometric model in which you are working. It is also very useful to think about why you observe certain results. Are these results consistent with what you would expect based on economic theory? If not, do you think this is an anomaly, or might economic theory need a revision. Think about the mechanisms behind your observations. You may benefit from working together in small groups – and indeed cooperative work is encouraged – but it is nonetheless expected that each individual will submit their own set of answers to problem sets to be eligible for maximum credit. I encourage the use of RMarkdown for preparing problem sets, but if you choose to do so, I expect that individuals will prepare their own Markdown files and not just change the author name.

Final project: You will be expected to undertake an original applied research project and present your results in the form of a research poster during a special session toward the end of the semester. The posters will be judged on the basis of their appearance (20% of total) as well as their content (60% of total). In addition, you will be judged on the quality of your presentation (20% of total), including your ability to succinctly describe the scope and importance of the project, major accomplishments, etc., as well as your ability to thoughtfully respond to questions from members of the audience.

Things to keep in mind regarding the final project:

- This is an *applied* econometrics research *project*. There are no expectations that this will be highly theoretical – you should take the econometric methods that we study in class and apply them to a real-world economic problem. Although this should be a comprehensive project, you are not required to prepare a full-length research paper. The format of final submission for this project is a poster, which is a very brief version of a complete research paper. With that said, you may find it advantageous to use this opportunity to work on preparing both a full-length paper and the poster in parallel.
- This is a great way to jumpstart work on analyzing data for your dissertation or a conference submission.

- Examples of acceptable forms of contribution for this project, besides starting an original work, includes extending a previous work and/or data set (e.g., different industries, countries, regions), adding/testing alternative variables, conducting different specification tests, or using alternative conceptual/theoretical frameworks.
- Poster size is optional, but I recommend creating your poster as a 36" (H) × 48" (W) Power Point slide (a .ppt(x) slide can be as large as 56" × 56"). Here are a good set of tips for designing your poster in Power Point: http://www.aaea.org/UserFiles/file/Poster_Powerpoint_AgEcon_Search.pdf.
- The easiest way to design a poster is to use a PPT poster template. You can find a plethora of examples by searching Google. There is also a template from the UF Center for Undergraduate Research: https://cur.aa.ufl.edu/wp-content/uploads/2021/02/Symposium-Poster-Template.pptx
- UF has a cost-effective poster printing facility in the HUB 224.
- Your poster should have the following section headings:

  Introduction: Give some background, describe the problem and tell the audience why it is an interesting one.

  Model: The economic and/or econometric model behind your research question.

  Methods and Data: Describe the econometric method you use and your data.

  Findings: This section should only have graphs, charts, and tables with minimal text.

  Discussion: What are your conclusions from the findings?

More things to consider:

- The problem at hand must be *empirical*, using real data.
- The project must be distinct from other class projects you might have been assigned, and it must be feasible so that it can be completed by the *end of semester*.
- You do not have to go beyond basic econometric methods that we will discuss in the course for a satisfactory grade. The main purpose of the project is to give you an overall experience in designing empirical research and using econometric methods appropriate for answering your particular research question. However, if you feel motivated to utilize your work for later submissions (e.g., conferences, journals, etc.), you are welcome to go beyond the material covered in class.
- Do not use a class/homework data set verbatim.
- To find an interesting topic for your project, I suggest getting in touch with faculty members working on topics you find interesting. This is also an excellent time to identify a potential advisor, if you do not have one yet. Scanning recent empirical journals and working papers (e.g., *Journal of Applied Econometrics*, *American Journal of Agricultural Economics*, IDEAS, AgEcon Search, the NBER working paper series, etc.) is another good way of finding an interesting research question.
- About three weeks into the semester (January 30, 2026), you will submit a **1-2 outline of your proposed project** with brief descriptions of the *research question*, the econometric *methods* you will employ, and the *data* you will use (number of observations, type, variables – including dependent variable, explanatory variable, control variables, etc. – data source, availability etc.). **Be as specific as possible regarding the details of your data.**
- About a month later (February 27, 2026), you will submit a 1-2 page progress report detailing the activities you have undertaken since the original project proposal, and what, if any, preliminary results you have. If you have made any changes to your proposed project in the intervening period, you are required to document and justify these changes. There should not be any changes made following this date.
- An additional month later (March 27, 2026), you will submit another 1-2 page progress report documenting activities since the submission of the prior progress report. By this time, you should have some preliminary results to share.

- By April 17, 2026, you must submit (1) your final poster (in PDF form) and (2) your file used for the analysis presented in the poster.
- Unlike your homework assignments, the final project *can* be done using canned software programs, such as STATA, or commands (such as `lm` or `glm`) or packages (such as AER – Applied Econometrics in R, in which the `ivreg` command can be found) in R. Matrix language programming is not required for the final term project.

Exams: There will be two exams over the course of the semester. The first exam will be held in class on March 6, 2026 and will cover material from the first half of the semester. The second exam will be held on April 30, 2026 12:30 PM – 2:30 PM (during the final exam period) and will cover material from the second half of the semester).

Composition of Final Score:

Course Assignments	**Total Points**
Problem sets (6)	300 points (50 points each)
Final project	350 points
- Project proposal	- 50 points
- 1st progress report (February 27, 2026)	- 50 points
- 2nd progress report (March 27, 2026)	- 50 points
- Final poster (April 17, 2025)	- 200 points
Exam 1 (March 7, 2026 in class)	200 points
Exam 2 (April 30, 2025 3:00 – 5:00 PM)	200 points
Total	1050 points

Letter grade distribution:

Grade	Percentage	Total points	Grade Points
A	93% or more	≥ 930	4.00
A-	90.0 – 92.9%	900 - 929	3.67
B+	86.0 – 89.9%	860 - 899	3.33
B	83.0 – 85.9%	830 - 859	3.00
B-	80.0 – 82.9%	800 - 829	2.67
C+	76.0 – 79.9%	760 - 799	2.33
C	73.0 – 75.9%	730 - 759	2.00
C-	70.0 – 72.9%	700 - 729	1.67
D+	66.0 – 69.9%	660 - 699	1.33
D	63.0 – 65.9%	630 - 659	1.00
D-	60.0 – 62.9%	600 - 629	0.67
E	59.9% or less	≤ 629	0.00

*****Please note that grades will be 'rounded', but I will not make any other 'adjustments' at the end of the term. If you want a certain grade in this course, you will have to earn it.*****

This class adheres to all UF Academic Policies: https://go.ufl.edu/syllabuspolicies

The R statistical computing environment
In this course, we make heavy use of the statistical computing environment R. R is a free, open-source programming environment that will run on a variety of platforms (e.g., MacOS, Windows, Unix/Linux, etc.). R is widely used among academics from a variety of academic disciplines, and is increasingly being adopted by economists. Because there is such a wide user community, there are a plethora of user-written "packages" that have been developed that can tackle most of the challenges you would ever encounter. In addition, with so many users, it is unlikely that you are the first person to ever encounter a particular econometric or programming issue, and consequently it is very easy to find resources online that can help you circumvent (almost) any challenge you may encounter. You may find R-bloggers (http://www.r-bloggers.com) and Stack Overflow (http://stackoverflow.com) especially useful.

Responsible use of generative artificial intelligence (AI):
The University of Florida promotes the innovative and responsible use of AI applications to enhance academic and operational activities. Similarly, this course embraces the potential of emerging technologies like generative AI to enhance learning while emphasizing responsible and ethical use. To maintain academic integrity and foster meaningful scholarship, the following policy applies to all students:

- **Permitted Use:** Students may use generative AI tools as aids for brainstorming, drafting, and exploring ideas. These tools can support research and writing but must not replace students' original critical thinking or analysis.
- **Transparency and Attribution:** Any content generated or significantly assisted by AI must be clearly disclosed and appropriately cited in students' work. Failure to do so may be considered a violation of academic integrity standards.
- **Academic Integrity:** Students should only submit work that reflects their own understanding and effort. AI-generated text or responses cannot be submitted verbatim without significant modification, original input, and acknowledgment. Use of large language models (LLMs) must comply with the UF Honor Code and policies on plagiarism.
- **Review and Responsibility**: Students are fully responsible for the accuracy, quality, and originality of all submitted materials, regardless of AI assistance. Because LLMs can produce inaccurate or biased outputs, students should always critically evaluate AI outputs before incorporation. Students should also properly cite or attribute information derived from AI output.
- **Restricted Use:** Use of AI tools is prohibited during exams, quizzes, or any assessments explicitly designated by the instructor as independent work.
- **Equity and Access:** If a student encounters barriers to accessing AI tools necessary for coursework, please contact the instructor promptly to explore accommodations.

Campus Resources:

Health and Wellness
U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.

University Police Department: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

Lauren's Promise: I will listen and believe you if someone is threatening you.

Lauren McCluskey, a 21-year old honors student athlete, was murdered on October 22, 2018, by a man she briefly dated on the University of Utah campus. We must all take actions to ensure this never happens again. Any form of sexual harassment or violence will not be excused or tolerated at the University of Florida.

If you are experiencing sexual assault, relationship violence, or stalking, you can take the following actions:

- If you are in immediate danger, call 911.
- Report it to me, and I will connect you to resources.
- Seek confidential sources of support and help:
    - UFPD Office of Victim Services: 51 Museum Road, 352-392-5648
    - Sexual Assault Recovery Services (SARS): Infirmary Building, 352-392-1161
    - Alachua County Rape Crisis Center (confidential): 352-264-6760

****This syllabus is subject to change at the discretion of the instructor. By enrolling in this course, you are agreeing to the terms outlined in this syllabus!!****