Econometrics

Class Time   **:** Mondays and Wednesday 12:20 p.m. – 1:35 p.m.
Room   **:** CAS 315

Instructor   **:** Andre Switala
Office   **:** Economics Department, Room 434
Office Hours **:** Wed 2:00-3:30 p.m., Fri 10:15-11:00 a.m. in person, Thu 2:00 – 3:00 p.m. Zoom
                 https://bostonu.zoom.us/j/96591566176?pwd=CphvgDibdf01QzQbf2FIFxFJuZI51L.1
Phone (Office): (617) 358-2604
Email   **:** switala@bu.edu *(preferred),* please include "EC508" in the subject line.

TA   **:** Alexander Kane
Office Hours **:** Mondays 3:00 – 4:00 p.m., Thursdays 3:30 – 4:30 p.m.
Office   **:** SSW 518 (Economics Department Building)
Email   **:** alexkane@bu.edu

Discussion Section (Optional)
Time   **:** Fridays 10:10 – 11:25 a.m.
Room   **:** HAR 208

Course Description

Econometrics uses statistical methods to describe and study the relationship between economic variables. Rather than just describing in words or models how variables are related, econometrics and its tools will allow us to move towards quantitative analysis. That is, we will ask empirically the question about how important one variable is in explaining variation in another. For example, we can ask the question about what is more important in explaining differences in income levels or growth rates across countries – the quantity or quality of education? We can also estimate parameters of models or the size of effects that we intuitively think should exist. For example, what is the return to education (by how much does the yearly income increase on average for an additional year of education)? The studied techniques are dependent on certain assumptions which may be violated. Part of the course therefore involves what techniques to use if these violations occur. The course assumes a basic knowledge of statistical analysis, e.g., hypothesis testing and interval estimation and builds upon this knowledge. The goal of this course is to familiarize you with the concepts of econometrics and how you can apply them to new empirical questions.

Prerequisites: Graduate Students: EC507, Undergraduate Students: EC204 or EC304

The expectation is that students will take the course in person as much as possible. The plan, however, is to record lectures and post them to the course website. I reserve the right to discontinue this approach if attendance declines as a result. That is, I will post recordings with an increasing delay or not at all if attendance is low.

Recommended Textbook:

"Introductory Econometrics: A Modern Approach" 7th ed. by Jeffrey Wooldridge, Cengage Learning, 2019

You will also be responsible for those topics discussed in class which are not in the book.

There are many other good textbooks in econometrics. The main challenge is the inconsistency of notation, which requires some additional reading and getting used to. Also, topics are sometimes covered slightly differently. For example, our textbook covers the issue of heteroskedasticity and how to detect it, while others assume it and simply want to control for it.

Software

For some of the homework problems you will be required to do data analysis. I will also show some regression results using STATA output in class. STATA is a standard software package used in my econometric applications. STATA is available in some campus and department computer clusters, but there are also temporary licenses that students can purchase.

https://www.stata.com/order/new/edu/gradplans/student-pricing/

I will use STATA output in class meetings and occasionally show some analysis as well, so being familiar with it early on is useful. You can also expect to see STATA output in exams.

Course Grading

Course grades will be based on student's performance in five categories. Those categories and the weights attached to each of them are:

Problem Sets	: 10%
Paper	: 25%
Midterm	: 25%
Final	: 40%

The midterm is scheduled for **Wednesday, March 5th**. The final exam is tentatively scheduled for **Wednesday May 7th, 12:00 – 2:00 p.m.**

Please Note: Under no circumstances will "extra credit" work be given!

Exam Goals and Policy:

All exams will aim to test your understanding of the learned concepts. Students are expected to take all exams when scheduled. If you miss the midterm exam you final will receive the midterm weight (and therefore count for 65% of you grade). If you miss the final exam, an incomplete will be assigned, and you need to make up the exam at the beginning of the following semester. Students are required to notify me about an exam absence **prior** to the exam through email.

One sample exam will be provided prior to each exam. The structure of the exam may be adjusted throughout the semester if necessary.

The following policy applies to exams:
- No bathroom breaks during exams. Use the bathroom before the start of the exam. If you need to leave the classroom during the exam, you may not continue the exam after leaving.
- No smartwatches, smartphones or other communication devices allowed during the exams. These devices must be in your bag and the bag must be on the side of the room or in the front

- of the classroom. If any of these devices is located on or near you during the exam, it will be considered a violation of the exam rules.
- You will need your BU ID for verification during the exams.
- No graphing calculators allowed.
- Students may be moved to a different seat at any point during the exam. Refusal to move will end the exam for the student.
- I reserve the right to replace written exams with oral exams.

Regrade policy:

If you do not agree with your score, you may ask me for a regrade. I will personally regrade the entire test and you may lose points as well as gain them. Note that I tend to be harsher than the TA.

Homework Goals and Policy:

You are encouraged to work in groups and should indicate on your problem sets the names of other students you worked with. However, every student should hand in their own written or typed solution. This policy should not be understood as an incentive to simply copy the solution from one of your classmates. Working on and thinking about the homework solutions on your own first will be an important determinant of your success in the exams and the entire course.

Homework will simply be graded as ✓+, ✓, ✓- or 0 (scored as 3, 2, 1 or 0). Your answers don't need to be perfectly correct for a ✓+, but mostly so. ✓- will be given to submissions with severe deficiencies, 0 only if nothing is submitted at all.

No late submissions will be accepted. Work on problem sets early. Given that you have sufficient time to complete, problem sets will only be excused in cases of prolonged illness.

Paper

You are to write an original paper which can be on any topic that you wish. It must report results obtained by you, based on data that you are responsible for locating. Downloading data from various sources is sufficient – you don't need to create original data. ***The paper must also use one or more of the estimation techniques covered in this course, using STATA and should not use any techniques that were not covered in the course.*** The page limit is 15, including tables and graphs (references are in addition to the page limit), double spaced, with no smaller than 11- point font. A good paper will explain why the analysis is of interest, any limitations of the data, why the estimation approach was chosen, and what conclusions you draw from the results. Your data file and STATA code to generate the results (that is the do file) must also be submitted. An incomplete will be assigned for the course if you fail to submit your data and/or do file.

This paper will be a group project were 2 or 3 (but no more) students will work together on the paper.

Some potential data sources:

US macro data from the Bureau of Economic Analysis.
         https://apps.bea.gov/itable/index.cfm
US micro data: Current population survey.
         https://www.census.gov/programs-surveys/cps/data/datasets.html
International macro data. The World Bank's World Development Indicators.

https://databank.worldbank.org/reports.aspx?source=world-development-indicators
International micro data. USAID Demographic and Health Surveys. (Requires simple registration).
https://www.dhsprogram.com/Data/
These are by no means the only options, merely some suggestions.

The original paper, with your Stata data and do files, is **due on Monday, April 28th 11:59 p.m. Boston Time.** The paper must be submitted through Blackboard (and will be checked for plagiarism). The do and data files must be submitted by email.

Class participation and attendance:

There is no individual grade for class participation in this course. However, class participation is strongly encouraged and questions or comments are always welcome.

Services for Students with Disabilities

Students with disabilities (learning, medical, physical) who wish to receive academic accommodations or auxiliary aids are required to submit the appropriate documentation to verify their eligibility under the Americans with Disabilities Act of 1990 (ADA). Students should be in contact with the BU Office of Disability Services (www.bu.edu/diability). Students who are approved to received special accommodations should see me as soon as possible, preferably after the first class.

Academic Conduct

The Boston University Academic Conduct Code is available at:
http://www.bu.edu/academics/resources/academic-conduct-code/

You need to read the CAS Academic Conduct Code. Academic misconduct involves not only direct cheating on tests, but some more subtle acts as well. All work handed in for credit must be your own, with the exception that you may quote or paraphrase from other sources if you also cite the reference and page number. It is generally not permissible to use another student's work, even if you cite that work. However, for the *problem sets* in this class collaborative work is permitted as outlined in the homework policy above. I will report cases of suspected academic misconduct to the Dean's Office. Confirmed cases of misconduct will result in a failing grade on the exam or assignment.

Generative AI

ChatGPT, and other similar Generative AI tools such as BingChat or Google's Bard are available and learning how to use them is an emerging skill. Beware of the following:
- Any produced content must be critically analyzed.
- Do not assume the output provided is correct unless you can check it with other sources. You will need to refine your prompts to obtain better outcomes.
- You must acknowledge that you have used any of these tools. Provide a paragraph at the end of any assignment where you have used the help of ChatGPT and other tools to explain what you used it for and provide the prompts you used to get the output and the retrieval date. Failure to disclose and properly cite is a violation of academic integrity.
- You should know that I reserve the right to put any material you hand in through available tools that check for AI origin.

Learn more: Steven Wolfram's book "What is ChatGPT Doing and Why Does It Work". Online version: https://writings.stephenwolfram.com/2023/02/what-is-chatgpt-doing-and-why-does-it-work/

For proper citation, for example using ChatGPT: OpenAI. (2021). ChatGPT (Version GPT-3) [Software]. Retrieved from https://openai.com

Other Important Dates:

Last Day to drop a class without a "W" grade: February 25th, with a "W" grade: April 4th
No class meetings on: February 17th (Presidents' Day – BU Monday Schedule will be on Tuesday, February 18th instead), March 10th and March 12th (Spring Break), April 21st (Patriots' Day).

Course Outline:

The following represents a *tentative* outline of the course. The topics given below are the core topics we aim to cover during the semester. However, **other chapters or parts of them may be covered as well!** I shall point out when those additions are made. In addition to the topics below we will use and review concepts of statistics whenever needed in class. This material is covered in **appendices B and C**. I will announce the chapters that will be covered in each class at the end of the previous class.

Topics	*Textbook Chapters*
Introduction	
Econometrics and Economic Data	1
The Simple Regression Model	2
The Multiple Regression Model	
Estimation	3
Inference	4
OLS Asymptotics	5 (parts)
Further Issues	6
Dummy Variables	7
Linear Regression Model in Matrix Form	Appendix D and E
Further Topics in Regression Analysis	
Heteroskedasticity	8
More on Specification and Data Issues	9
Panel Data Analysis	13, 14
Instrumental Variables	15
Introduction to Time Series Analysis	10