

AEDECON 6120: Applied Quantitative Methods II

Spring 2024

Course Information

Class Time: Tuesday and Thursday 11:10am-12:30pm EST (Kottman Hall 333)

Lab times: Wednesday 4:10-6pm (AA005)

Credit hours: 4

Mode of delivery: In Person

Instructor

Name: Abdoul Sam

Email: sam.7@osu.edu

Phone Number: 614 247 8647

Office location: AA 338

Office hours: From 1/8 to 2/23: Wednesday 10am-12pm EST (AA 338) and by appointment. From 2/26 to 4/19: Thursday 10:00am-11:00am EST (AA 338) and by appointment.

Preferred means of communication:

My preferred method of communication for questions is email. Class-wide communications will be sent through the Announcements tool in Carmen Canvas. Please check your [notification preferences](https://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Teaching Assistant

Name: Jong Hoon Shin

Email: Shin.775@osu.edu

Office hours: Monday from 2 p.m. to 3 p.m. and by appointment (Room # AA 334)

Course Prerequisites

4001 (500) or Econ 4001 (501), and 2005 (205) or Stat 1430 (133). Not open to students with credit for 702.

Course Description

This is the second in a three-course sequence in applied econometric methods at the MAE level. The overall goal of the course is to apply the tools of econometric analysis acquired from AEDE 6110 and related quantitative courses in order to conduct sound applied research. To achieve this goal, we will be working closely with industry partners for an in-depth analysis of a real-world project. The project study will be supplemented by practical homework assignments and in-class applications using real and/or simulated datasets.

Course Learning Goals and Outcomes

1. Proficient application of estimation techniques:

- Students will demonstrate proficiency in applying of essential econometric methods at the master's level, including OLS, Limited Dependent Variable Models, Time Series and Machine Learning models, with a solid understanding of their strengths and limitations.



2. Skilled model specification and diagnostics:

- Students will be able to correctly specify econometric models, assess key assumptions, and conduct diagnostic tests, ensuring a reliable analysis appropriate for master's-level research.

3. Data management and preparation and econometric software proficiency:

- Students will acquire skills in data cleaning and manipulation for econometric analysis.
 - Students will gain practical experience using econometric software packages such as R, Python, and Cloud-based SAS.

5. Applied solutions and communication skills:

- Students will be able to apply econometric tools effectively to address practical economic problems, showing the ability to interpret and communicate empirical results clearly, in both written and oral formats, to diverse audiences.

How This Course Works

Mode of delivery: This course is taught in person. Students are expected to attend class each week during the scheduled meeting sessions.

Credit hours and work expectations: This is a 4 credit-hour course. According to [Ohio State bylaws on instruction](http://go.osu.edu/credithours) (go.osu.edu/credithours), students should expect around 4 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 8 hours of homework (reading and assignment preparation, for example) to receive a grade of B average.

Attendance and participation requirements: Research shows regular participation is one of the highest predictors of success. Attendance is a critical part of your success in this course hence it is mandatory, except in cases of documented emergency or excused absence. Each unexcused absence will result in a penalty of 3 percentage points of your grade for the semester unless your absence is due to a documented emergency.

Required Materials and/or Technologies

Required Textbook:

Wooldridge, Jeffrey M. *Introductory Econometrics: A Modern Approach*, 7th ed., Cengage, 2020.

Required Software

A statistical software package is required for this course. Options include R, Python, Stata and SAS. SAS software, freely available to all OSU students. Follow these steps to download and install SAS, if you are interested:

- Go to <https://osuitsm.service-now.com/selfservice/>
- Sign-in to your account (red tab on the top right under the OSU logo)
- You will be prompted to authenticate your account
- Scroll to the middle of the page and click on the red tab “Request Software” to the right
- Enter/verify your email and phone number and click the “Next” (Next tab is located on the right)
- Choose “SAS workstation for Teaching and Research” and then the version that is compatible with your computer (Windows 9.4 64 bit or Windows 9.4 32 bit)
- Follow instructions on the screen.



- When you are done the system will generate a ticket and you should receive an email within a few minutes with instruction on how to download/install SAS.
- Call the [CFAES IT Services Help Desk](#) if you run into issues.

It is quite helpful to watching the following video before installing the software on your machine.

<https://support.sas.com/en/documentation/install-center/94.html#step-3-deploy>

A free versions of **R studio** is available at <https://rstudio.com/products/rstudio/download/>

CarmenCanvas Access

You will need to use [BuckeyePass](https://buckeyepass.osu.edu) (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you do each of the following:

- Register multiple devices in case something happens to your primary device. Visit the [BuckeyePass - Adding a Device](https://go.osu.edu/add-device) (go.osu.edu/add-device) help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes, good for 365 days, that can each be used once.
- [Install the Duo Mobile application](https://go.osu.edu/install-duo) (go.osu.edu/install-duo) on all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at [614-688-4357 \(HELP\)](tel:614-688-4357) and IT support staff will work out a solution with you.

Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- [Navigating CarmenCanvas](https://go.osu.edu/canvasstudent) (go.osu.edu/canvasstudent)
- [CarmenZoom virtual meetings](https://go.osu.edu/zoom-meetings) (go.osu.edu/zoom-meetings)

Technology Support

For help with your password, university email, CarmenCanvas, or any other technology issues, questions or requests, contact the IT Service Desk, which offers 24-hour support, seven days a week.

- **Self Service and Chat:** go.osu.edu/it
- **Phone:** [614-688-4357 \(HELP\)](tel:614-688-4357)
- Email: servicedesk@osu.edu

Evaluation

There will be a number of homework assignments and a term project--described below. Completion of homework assignments will require the use of a statistical software.

Term Project: We are working with the Risk Modeling and Analytics (RMA) team at Huntington National Bank (S&P 500) in downtown Columbus on the following project options:

1. **Business Banking Portfolio Management - Deposit Behavior Model:** Build a scorecard model to predict probability of default for Huntington's Small Business Banking Portfolio using Huntington deposit account behavior/characteristics. Deposit information includes, but is not limited to: deposit balance, balance trend, deposit inflows/outflows by count and dollar amount, overdraft/insufficient funds transactions, number/types of associated deposit accounts.



2. **Business Banking Portfolio Management – Loan Behavior Model:** Build a scorecard model to predict probability of default for Huntington’s Small Business Banking Portfolio using loan characteristics and behavior (but no deposit information). Characteristics include, but are not limited to: line utilization, SBA Guaranteed Obligations, delinquency/payment history, months on book, months to maturity, line/loan obligations.
3. **Business Banking Portfolio Management - Behavior Model:** Build a scorecard model to predict probability of default for Huntington’s Small Business Banking Portfolio using loan characteristics, behavior, and deposit information.

Project options #1 and #2 focus on specific subsets of data, while #3 uses all sources in a single model. All 3 options allow for traditional classification as well as machine learning methods.

It is important to note that for confidentiality reasons, the dataset supplied by Huntington National Bank cannot be used for any purpose other than completion of the Huntington projects as part of AEDECON 6120.

Huntington National Bank will provide the data for the analysis of the project. The RMA team is cognizant of students’ competing academic priorities and have set their expectations accordingly. One or more members of the team will visit our class before the undertaking of the projects to provide clarifying details. Students will also present progress reports to the RMA four to five times in the second half of the semester as well as final findings.

These presentations are excellent opportunities for the students to ask questions and receive guidance to help make these projects a meaningful and informative experience for all. **The class project will culminate in a formal business presentation made by students.**

Students will be divided into small groups for the undertaking of the projects. It is crucial to learn how to work effectively with others because a lot of the work done in industry and academia is done as teamwork. Since I cannot accurately determine individual effort within a group, each student will participate in one confidential peer evaluation of his or her teammates at the end of the term in order to minimize the likelihood of free-riding and reward exceptional involvement in project completion. The peer evaluations are to be taken seriously and will count for ten percent of your final grade. **Any student failing to complete the peer evaluations by the deadline is penalized by twenty percent reduction of their own average peer evaluation score.**

There is no uniform structure prescribed for the final project report but it should at a minimum contain the following items:

- introduction: describe the project and discuss its rationale and significance
- model specification: discuss/justify the functional form/method adopted, justify the choice of variables included in the study; discuss variable selection mechanism
- data: discuss the source and type of data and provide descriptive statistics
- results and recommendations: display findings of the econometric analysis (including all relevant statistical tests) in professionally styled tables, interpret the key findings.

A significant premium is placed on the quality of the model developed, the analysis of the results generated by the model, and the written quality and presentation of the final document. You are encouraged to use material from a variety of sources in your analysis; however, you must cite others' work properly.

How Your Grade is Calculated

Homework assignments		30%
Term project	Preliminary project presentations (four)	10
	Dry-run presentation (1)	5
	Peer critiques of preliminary presentations	5
	Final project presentation	15
	Final written project	25
	Peer grade for project involvement	10
Total		100%

See Carmen class page for due dates.

Academic Integrity and Collaboration: Your written assignments, including discussion posts, must be your own original work. In formal assignments, you should follow MLA/APA/Chicago etc. style to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in but no one else should revise or rewrite your work.

Late Assignments: You are expected to submit work assignments on time. Except in cases of documented emergency, there will be a reduction of 3 percentage points per day (baseline equals total points available for the assignment) for a late submission up to 3 days; submissions that are more than three days late will not be awarded points.

Instructor Feedback and Response Time: I am providing the following list to give you an idea of my intended availability throughout the course. Remember that you can call [614-688-4357 \(HELP\)](tel:614-688-4357) at any time if you have a technical problem.

- Preferred contact method: If you have a question, please contact me first through my Ohio State email address. I will reply to emails within *48 hours on days when class is in session at the university*.
- Class announcements: I will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check [your notification preferences](http://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to ensure you receive these messages.

Grading Scale

93–100: A
 90–92.9: A-
 87–89.9: B+
 83–86.9: B
 80–82.9: B-
 77–79.9: C+
 73–76.9: C
 70–72.9: C-
 67–69.9: D+
 60–66.9: D
 Below 60: E

Other Course Policies

Discussion and Communication Guidelines. The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

Writing style: While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation.

Tone and civility: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. I will provide specific guidance for discussions on controversial or personal topics.

Citing your sources: When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.

Backing up your work: Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Ohio State's Academic Integrity Policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute Academic Misconduct.

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: Any activity that tends to compromise the academic integrity of the University, or subvert the educational process. Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an excuse for academic misconduct, so I recommend that you review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.



If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- [Committee on Academic Misconduct](http://go.osu.edu/coam) (go.osu.edu/coam)
- [Ten Suggestions for Preserving Academic Integrity](http://go.osu.edu/ten-suggestions) (go.osu.edu/ten-suggestions)
- [Eight Cardinal Rules of Academic Integrity](http://go.osu.edu/cardinal-rules) (go.osu.edu/cardinal-rules)

Copyright for Instructional Materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at equity.osu.edu,
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or Email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any



human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

Diversity

The Ohio State University affirms the importance and value of diversity of people and ideas. We believe in creating equitable research opportunities for all students and to providing programs and curricula that allow our students to understand critical societal challenges from diverse perspectives and aspire to use research to promote sustainable solutions for all. We are committed to maintaining an inclusive community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among all members; and encourages each individual to strive to reach their own potential. The Ohio State University does not discriminate on the basis of age, ancestry, color, disability, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, race, religion, sex, gender, sexual orientation, pregnancy, protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment.

To learn more about diversity, equity, and inclusion and for opportunities to get involved, please visit:

- <https://odi.osu.edu/>
- <https://odi.osu.edu/racial-justice-resources>
- <https://odi.osu.edu/focus-on-racial-justice>
- <https://cbse.osu.edu/>

In addition, this course adheres to **The Principles of Community** adopted by the College of Food, Agricultural, and Environmental Sciences. These principles can be found at <https://cfaesdei.osu.edu/about-us/cfaes-principles-community>. For additional information on Diversity, Equity, and Inclusion in CFAES, contact the CFAES Office for Diversity, Equity, and Inclusion (<https://cfaesdei.osu.edu/>). If you have been a victim of or a witness to harassment or discrimination or a bias incident, you can report it online and anonymously (if you choose) at <https://equity.osu.edu/>.

Your Mental Health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing.

If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th floor of the Younkin Success Center and 10th floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

For students in the College of Food, Agricultural, and Environmental Sciences, David Wirt, wirt.9@osu.edu, is the CFAES embedded mental health counselor on the Columbus campus. To contact David, please call 614-292-5766. Students should mention their affiliation with CFAES if interested in speaking directly with David.



Religious Accommodations

It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief.

Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins. The instructor is then responsible for scheduling an alternative time and date for the course requirement, which may be before or after the original time and date of the course requirement. These alternative accommodations will remain confidential. It is the student's responsibility to ensure that all course assignments are completed.

Weather or other short-term closing

Should in-person classes be canceled, I will notify you as to which alternative methods of teaching will be offered to ensure continuity of instruction for this class.

ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Requesting Accommodations

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the Safe and Healthy Buckeyes site for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Disability Services Contact Information

- Phone: [614-292-3307](tel:614-292-3307)
- Website: slds.osu.edu
- Email: slds@osu.edu
- In person: [Baker Hall 098, 113 W. 12th Avenue](#)

Accessibility of Course Technology

This course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations as early as possible.

- [CarmenCanvas accessibility](http://go.osu.edu/canvas-accessibility) (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- [CarmenZoom accessibility](http://go.osu.edu/zoom-accessibility) (go.osu.edu/zoom-accessibility)



Course Schedule

Please refer to the Carmen Canvas course for up-to-date due dates.

Date	Lectures
Week 1 1/9-11	Review of the linear regression model Goodness of fit measures Model selection in data-rich environments
Week 2 1/16-18	Class visit by Keith Johansen Model selection in data-rich environments (continued)
Week 3 1/23-25	Binary dependent variable models and classification Receiver operating characteristic curve
Week 4 1/30-2/1	Receiver operating characteristic curve/Area under the curve Scoring for predictive analytics
Week 5 2/6-8	Regression with time series data Strict exogeneity, trends, seasonality, stationarity, weak dependence Highly persistent time series
Week 6 2/13-15	Random walk, integration, unit root Cointegration and error correction model
Week 7 2/20-22	Generalized autoregressive conditional heteroscedasticity Tests for time series data
Week 8 2/27-29	Discussion of the Huntington project (visit by Keith Johansen) Tests for time series data (continued) Unwinding data transformations for prediction Time series modeling example: bank deposits
Week 9 3/5-7	Initial student presentations of the Huntington project Autocorrelation function, partial autocorrelation function, robust standard errors for time series data
Week of 3/11-15	Spring break (no classes)
Week 10 3/19-21	The last five weeks will be focused on completion of the Huntington. The full schedule of presentations will be made available on the class page on Carmen.
Week 11 3/26-28	
Week 12 4/2-4	
Week 13 4/9-11	
Week 14 4/16-18	

