Office: Online   **E-mail:**   jdewey@floridapoly.edu
Office Hrs: After class & by appt; Zoom   **Meeting:**   TR 5:30-6:45; Zoom
       https://us02web.zoom.us/j/3733945591   **Website:**   Canvas
Phone: 863-874-8525

Introduction and Course Objective

Welcome! The objective of the course to develop student's ability to build models of time series data appropriate to the properties exhibited by the data, apply appropriate techniques to build forecasts future values of the series, conduct forecast validation, and analyze the strengths, weaknesses, and limitations of forecasts in their intended use.

Catalog Course Description

The course covers modeling stochastic time series, building and evaluating forecasts, including appropriate techniques for cross validation in a time series context. Applications to issues in business, economics, and healthcare will be used.
Prerequisites: Advanced Quantitative Methods (QMB 3200)
Communication/Computation Skills Requirement (6A-10.030): No

Textbook

Jeffrey Wooldridge. Introductory Econometrics: A Modern Approach. A new copy is expensive, but, a used copy of any version since 2008, or an electronic version, will do just fine. I suggest you look for a low-cost option.

Software

Stata, a statistical analysis package, and Microsoft Excel. We will discuss this in detail in class.

Class Delivery

- I will record "lectures" several days before class meetings. There will be about 25 minutes for every 50-minute hour of instruction, and it will typically be broken into segments 10 to 20 minutes long, depending on the material. You should complete the relevant assigned reading and watch the day's lectures before live class meetings. Take good notes and write down questions, comments, and observations as you go—you will need both the notes and the questions them later for graded course components.

- After completing the reading and watching the videos, post questions and comments to the appropriate discussion topic in canvas. As appropriate, respond to classmates' questions with answer's, comments, or follow up questions. This is intended to serve two purposes. First, it provides a check point to keep you on schedule with the reading and watching videos. Second, it makes me aware of common questions that I should clarify or discuss in live meeting. A good approach is to write your questions and responses while reading and watching the lectures and post them. Posting links to related articles you are interested in works too, as long you explain why you are interested in it and how it relates to the material. Your post need not be super inventive or original or take lots of time. It should just be a small part of your regular class preparation. Your post should convince me you did do the required work before class, rather than just borrowing from someone else's post. This is required and counts toward the participation component of your grade.

- Class meetings are for answering questions from the discussion board, follow up questions, discussion, and for working examples. We will work problems as a class, where I guide everyone, and also in breakout groups where you will work with classmates with less guidance from me. Attendance is expected and counts towards participation credit.
- Class meetings and office hours are in my meeting space on Zoom. I believe Zoom offers several advantages for this type of class (and past student comments confirm that), so I have paid for my own Zoom Pro subscription (it is free for you). You should install the zoom client, not just use the online meeting capability. Here is the link to the meeting room: https://us02web.zoom.us/j/3733945591. Alternatively, open zoom, click join meeting, and use this meeting ID: 373 394 5591.
- Have your camera on so we can see one another as we participate in discussion. *THIS IS REQUIRED*. If you do not have a web cam, you are required to get one. Contact student affairs if you need help. If your webcam is temporarily unavailable alert me to your problem.

Course Learning Outcomes and Alignment with Degree Program Outcomes

Course Outcomes	Program (DS / BA) Outcomes			
	1. Apply current (data science/business analytics) concepts, techniques & practices to solve (complex/business) problems.	2. **DS**: Analyze a given data science problem and formulate a solution in terms of the datasets needed, the techniques required or the technologies to be utilized.	2. **BA**: Analyze a given business problem using appropriate analytics techniques to generate insights and solutions.	3. Communicate effectively insights, analysis, conclusions, & solutions to a diverse audience.
1. Use appropriate software to model time series and prepare and evaluate forecasts. Levels: Application, Analysis, Evaluation.	X		X	X
2. Identify the important properties of a time series. Levels: Remember, Understand.	X		X	
3. Appropriately model a time series given its properties. Levels: Application, Analysis.	X		X	
4 Conduct and validate forecasts using appropriate techniques. Levels: Application, Analysis, Evaluation.	X		X	X
5. Identify the strengths, weaknesses, and limitations of various forecasts in their intended use. Levels: Analysis, Evaluation.	X		X	

Graded Coursework

Exercises (20%) There will be approximately six problem sets. The material covered for each is indicated in the schedule of topics. Problem sets are due one week after they are assigned. Problem sets are intended to engage you with challenging material to facilitate learning. You should expect to invest significant time in them. You are encouraged to work with other students. However, if you do not push yourself to work the problems on your own first, you will cheat yourself of the best opportunity to learn the material. Items such as completion of project checkpoints also count as homework assignments.

Project (20%) The US Bureau of Labor Statistics (BLS) will release its estimates of March 2021 employment and earnings by industry and metropolitan statistical area (MSA) on Wednesday April 28th. The project is to forecast the March non-seasonally adjusted estimates of average weekly earnings and total employment for private employers (total private) for a Florida MSA of your choice and write up a professional report on your forecast. Your report is due on our last class meeting, Thursday April 22nd. Successful completion of the project requires application most of the major material from class and clear interpretation and exposition of your data, methods, and results. Detailed instructions and examples will be available on canvas.

Midterm Exam (15%) At the normal class meeting time on Monday March 2nd.

Course Portfolio (15%) Comprising four neat and professionally organized sections in the order below. The combined document should be submitted as a single organized pdf with a table of contents with links to each section.

1) Notes from readings and lectures. You do not need to rewrite your notes to look neat and professional (though doing that is often a good way to study—it is what I did in my economics classes, for example). Simply write them digitally (for example with one note) and save them to pdf when you take them or else scan them to pdf if you write them on paper. Scanning apps are available for phones. As long as you take your notes appropriately as you go, putting them into the pdf for this assignment should not be onerous.
2) All problem sets, as completed. To the completed exercise, after the solutions are posted, add an analysis of your mistakes. This does not mean simply correcting your misstates! Explain where you went wrong and why you went wrong in that way. This requires self-reflection. This is a learning opportunity and should show real thought.
3) The midterm exam as competed. Also, an analysis of your mistakes prepared after the solutions are posted. Explain where you went wrong and why you went wrong in that way. Again, this is not a simple correction, but takes self-reflection.
4) Your project.
    A midterm version of counts for 5% and is due the day of the midterm. The final version is due the day of the final exam and counts 10%. Preparing it should be good preparation for the exams, and having prepared it you should study it, and studying it will lead you to spot places you can improve it. That is, finalizing the portfolio should complement studying for the exams.

Final Exam (20%) The final exam will occur at the assigned time (TBA) during finals week April 27-May 1. To reward improvement and prevent a bad day on the midterm from unduly influencing your grade, the final counts in place of the midterm if it is higher.

Participation (10%) You are expected to attend all classes I understand stuff happens sometimes, so there is some forgiveness as long as you are almost always there. Half of these points depend upon participation on the course discussion board and submission of problems worked in class

meetings. These will be graded, and a few of the lowest scores will be dropped. There is no recourse if you miss a large number of these assignments. You may have a good reason, e.g. you were in the hospital for a month. That is good reason for a medical withdrawal, but there is no way to make up participation, because it requires participating! The other half of these points are determined at my discretion based on your contribution to the success of the course through courtesy and respect, professionalism, quality of questions asked in class meetings, helping other students, etc. Attendance policy.

I am a student; what should I do if I think I may have COVID-19?

Students who are showing symptoms or who have been exposed to COVID-19 are expected to stay in their residences (at home or in their dorm rooms) and immediately notify the FL Poly CARE manager at care@floridapoly.edu. The CARE Manager will work with each student to triage their individual situation and the CARE Manager will notify faculty of students who are not attending courses due to COVID-19 symptoms.

Grading

Everything will be graded A, B, C, D, F according to the criteria in the table below. Grades will be submitted to Canvas as grade points on the corresponding 4-point GPA scale. Ignore any grades or percentages calculated by Canvas, a 2.3 is a C+, not 58% (2.3/4), and Canvas is not smart enough to get this. Partial credit between letter grades will be given and there may receive grades above 4—think of it as an A+ or extra credit for excellent work.

Grade	Points	Criteria
P	5.0	Grade with theoretical maximum extra credit. Exceptionally rare quality far above and beyond all expectations. Mistake free. Explained & supported completely. Extremely neat. Organization crystal clear. Writing excellent. Looks & reads as if prepared by the leading expert in the area and professionally edited & formatted. The all but unachievable ideal of perfection.
A	4.0	Demonstrates mastery. Complete. Correct approach. Possibly minor errors in arithmetic. No central conceptual errors. Fully explained and supported. Neat and well organized with clear exposition. Grammatical errors minor.
B	3.0	Demonstrates proficiency but short of mastery. Complete or nearly so. Approach is generally correct, though there may be small conceptual errors. There may be significant mathematical errors if they do not reveal additional conceptual flaws. Explanation and support are clear and reasonable, if not complete or fully correct. Neatness, organization and exposition allow the answer to be easily understood.
C	2.0	Demonstrates basic proficiency with the most important or central components but otherwise incorrect or incomplete. Explanation & support sufficient for the most central or important component, but otherwise incomplete or incorrect. Neatness, organization and exposition allow the answer to be understood with minimal effort.
D	1.0	Reasonable effort but does not demonstrate proficiency. Approach, explanation, & support show a relation to the question with some understanding, but much is incorrect. Neatness, organization & exposition allow the answer to be understood.
F	0.0	No attempt, unresponsive, nearly all wrong, or too messy to follow.

Exames: Each question will be graded using these criteria and points will be averaged across questions. Due to the time constraint neatness and writing will be judged leniently.

Exercises: Each question will be graded using these criteria and points will be averaged across questions. Since you have time, neatness, organization, and writing quality are judged somewhat stringently. Since exercises are intended to facilitate learning, not evaluate learning, completeness and correctness will be judged very leniently provided there is enough effort made that I am convinced you are learning from the process.

Project and Portfolio: Since you have time and we will have covered relevant material, completeness, correctness, neatness, organization, and exposition are all judged stringently.

Course Grades

Grades will be averaged within each assignment category. Category averages will be averaged using the weights specified above. Final course grades will be determined by this weighted average according to the table to the right. Grading policy.

| Course Grade | Weighted Average Points | |
	At least	Less than
A	3.833	
A-	3.500	3.833
B+	3.167	3.500
B	2.833	3.167
B-	2.500	2.833
C+	2.167	2.500
C	1.833	2.167
C-	1.500	1.833
D+	1.167	1.500
D	0.833	1.167
D-	0.500	0.833
F		0.500

Make-up Policy

If the midterm is missed, the final exam will automatically count in its place. If the final is missed a make-up may be taken *ONLY* with a documented excuse recognized by university policy. Work conflicts *ARE NOT* a valid excuse. I will stick to this policy! Let your employer know now that you must be available to take exams at the announced times. I accept late assignments with a penalty that is minimal at first, increases with lateness, and is 50% for work turned in after solutions are released. Attendance policy.

Tentative Coursework Due Dates
(Subject to change with the needs of the class)

Assignment or Exam	Due Date
Exercises assigned continuously according to schedule below.	One week after assigned
Midterm Exam	March 2
Midterm Portfolio	March 2
Project Report	April 22
Final Portfolio	TBA
Final Exam	TBA

Topic Outline and Tentative Schedule

CH N.S indicates assigned reading from chapter N section S in *Introductory Econometrics*. Timing is tentative and will change with the needs of the students.

1. Review of multiple regression for cross sectional data (Week 1 CH 1-9)
    1.1. Assumptions
    1.2. Heterogeneous Variance and Robust Standard errors
    1.3. Transformations
    1.4. Joint Hypothesis Tests
    1.5. Model Selection

2. Introduction to Time Series Data and Modeling (Week 2, CH 10.1-10.5)
    2.1. Stochastic Process / Time Series Process
    2.2. Lack of independence in the sample
    2.3. Static Time Series Models
    2.4. Finite Distributed Lag Models

Problem set 1 covers units 1-2

3. Identifying and dealing with intertemporal dependence (Weeks 3-4, CH 11.1-11.3, 18.2-18.3)
    3.1. Stationarity
    3.2. Covariance stationarity
    3.3. Weakly Dependent Time Series
        3.3.1. Moving Average of Order One process
        3.3.2. Autoregressive of Order One process,
    3.4. Strongly Dependent or Highly Persistent Time Series
        3.4.1. Strongly ($I(1)$) vs weakly ($I(0)$)dependent processes
        3.4.2. Spurious Regression
        3.4.3. Detecting and dealing with strongly dependent processes

4. Autoregressive Distributed Lag Models (Week 4-5, CH 11.4, 12.1-12.5)
    4.1. Motivation, including partial adjustment
    4.2. ARMA Models, AR↔MA Invertibility, and the Wold Representation
    4.3. Serial Correlation
    4.4. Dynamically complete models
    4.5. Breusch-Godfrey test for serial correlation
    4.6. Robust variance estimator

Problem set 2 covers units 3-4

5. Choosing an appropriate time series model (Week 5-6)
    5.1. Conditions for Appropriate OLS With Time Series Data
    5.2. Purely predictive (forecasting) vs Causal Inference
    5.3. Model Selection Criteria
        5.3.1. Content knowledge
        5.3.2. Information Criteria
        5.3.3. Cross Validation

Problem set 3 covers unit 5

6. One Step Ahead Forecasts (W 7-9, CH 18.5)
   6.1. Point forecast
   6.2. Forecast interval
      6.2.1. Standard error of the forecast
      6.2.2. Parametric intervals
      6.2.3. Empirical forecast intervals

Problem set 4 covers unit 6

7. Model Selection for Forecasting (Week 9-11, Material in annotated Stata do files)
   7.1. Temporal dependence problem with cross validation methods
   7.2. Validation on last periods only
   7.3. Need to choose forecast window
   7.4. Rolling window procedure
   7.5. Automated selection of potential candidates for further testing

Problem set 5 covers unit 7

8. Multi-Step Ahead Forecast Methods (Week 12-14, Material in annotated Stata do files)
   8.1. One step at a time
   8.2. Fan charts
   8.3. Dynamic autoregressive models
   8.4. Dynamic vector autoregressive models

Problem set 6 covers unit 8

Additional Topics. Sometimes classes have 14 weeks of meetings before final exam week, and other times they have 15 weeks of meetings, so I count on only 14. If there is a 15th week, and we complete all topics above by the 14th week, we will select additional topics from the remaining chapters of the book depending on student and instructor interest. This class has 15 weeks to cover material this semester. So if we complete the material above in 14 weeks, we will select one advanced topic, depending on student and instructor interest, to cover in week 15.

Revisions to the Syllabus
The instructor reserves the right to correct typos or other errors in the syllabus and to make adjustments reasonably needed to maintain the quality and function of the course.

Academic Support
- Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to the Academic Success Center or by e-mail to success@floridapoly.edu or library@floridapoly.edu.
- The Academic Success Center, located in the IST and at ASC East, provides a range of services. Students may direct questions to success@floridapoly.edu.

University Policies
- Academic Integrity. All students must commit to the highest ethical standards in completion of all academic pursuits and endeavors, whether in classroom or online environments.

- Covid-19 Statement Regardless of the mode of course delivery, all Florida Poly students are asked to make a Campus Commitment demonstrating respect and consideration for themselves or others, and for the people they care about. This Campus Commitment includes monitoring one's health and seeking medical care when appropriate; wearing face-coverings and respecting social-distancing, especially in the classroom and in gatherings; washing one's hands frequently (and when not possible using hand-sanitizer); following medical guidance; and participating in keeping shared spaces clean. If you are experiencing any symptom(s) of COVID-19 outlined by the CDC, you must stay home or in your residence hall room and immediately contact the associate director of campus wellness management at 863-874-8599 or email care@floridapoly.edu.

  Basic rules for in the classroom, IST, and Campus:
  1. You MUST wear your face-covering during class and throughout the building at all times.
  2. Absolutely **no eating or drinking** during class.
  3. Leave the furniture on its correct floor markings, if it is moved, please return it to those markings.
  4. Clean your space with a sanitizing wipe before you start class.
  5. Do not remove sanitizing wipes or hand sanitizers from their set locations—they are there for everyone.
  6. Follow directional signs throughout the buildings and respect appropriate social-distancing.
  7. Study hard and engage with all of your courses!

- Reasonable Accommodations: Florida Polytechnic University is committed to assisting students with disabilities and offering reasonable accommodations to those with documented eligibility. The Office of Disability Services (ODS) coordinates accommodations for students with disabilities in accordance with the ADA Amendments Act of 2008 (ADAAA), the Americans with Disabilities Act of 1990 (ADA), and Section 504 of the Rehabilitation Act of 1973. Reasonable accommodations are determined on an individual basis through an interactive process between you, ODS, and your instructor(s). If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course and communicate with your instructor about your approved accommodations at your earliest convenience. If you are not registered with ODS but believe you have a temporary health

condition or permanent disability requiring an accommodation, please contact ODS as soon as possible: DisabilityServices@floridapoly.edu, (863)874-8770, ASC East
ODS website: www.floridapoly.edu>Student Affairs>Health Wellness>Disability Services

- Accommodations for Religious Observances, Practices and Beliefs
  The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments.

- Title IX: Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. It is important for you to know resources are available if you or someone you know needs assistance. You may speak to your professor, but your professors have an obligation to report the incident to the Title IX Coordinator. It is an educational goal that you feel able to share information related to your life experiences in classroom discussions and in one-on-one meetings. However, it is requirement for university employees to share information with the Title IX Coordinator regarding disclosure. However, please know that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment.