University of Maryland
Master of Professional Studies in Applied Economics
1400 16th St. NW, Suite 140, Washington, DC
Syllabus for ECON 684: Applied Time Series Analysis and Forecasting, Summer 2016

Administrative

You are responsible for reading in detail this syllabus

Professor: Brendan Epstein, Ph.D.
Email: bepstei7@umd.edu
Class time: Tuesdays 6:45 pm – 9:30 pm. (There will be a 15 minute break each class at some point between 7:45 and 8:30).
Office hours: 30 minutes before class every Tuesday evening, and by appointment.

Teaching Assistant: Burak Turkgulu
Email: MastersTA@econ.umd.edu
Office Hours: Will be posted on the program's ELMS/Canvas site, with weekly reminders via ELMS/Canvas Announcement

Course Website: Copies of the course syllabus, your grades, and other relevant links and documents will be posted on the course's ELMS/Canvas website. You can access the site via www.elms.umd.edu. You will need to use your University of Maryland "directory ID" and password.

NOTES:

The University has adopted email as the primary means of communication outside the classroom, and I will use it to inform you of important announcements. Students are responsible for updating their current email address via http://www.testudo.umd.edu/apps/saddr/ AND for paying attention to messages I send to the class. Failure to check email, errors in forwarding email, and returned email due to "mailbox full" or "user unknown" will not excuse a student from missing announcements or deadlines.

If you require any type of special accommodations, please let me know by no later than the end of the second class so that there is sufficient time to plan ahead for your needs.

Prerequisites

Econ 642 and Econ 645.

General Description and Overview

This course builds on the brief introduction to time series econometrics offered in ECON 645. Students will learn the theory of stationary and nonstationary processes and how this theory applies to econometric techniques for estimation and forecasting based using time series data. The techniques will be applied in macreoconomic, financial, and business applications. More specifically, the topics covered include, among others, autoregressive-moving average processes, unit root tests, vector autoregression models, and cointegration analysis. *You are enrolled in an applied Master's program. Accordingly, we will delve into the theory of time series, but we will focus the majority of our attention on the application of this theory to data analysis, particularly so by engaging in extensive use of Stata.* This class is to the greatest extent possible self-contained, so as far as time series goes, *I will be teaching you everything you need to know for doing well in this class from the ground up.*

This last statement applies, in particular, to the software we will be using throughout the class: Stata. We will build on your prior knowledge of Stata and extend it to incorporate specialized tools *in order for you to achieve the applied time series knowledge that professional economists use in practice.*

Methodology and (No Required) Textbook

There is no required textbook for this course (because there is no particularly good textbook out there that is suitable for an applied class like this one). Instead, we will interactively develop lecture notes in class, and these lecture notes are all that you will need in order to do well in the class. In order to facilitate this interactive development, I will provide you with lecture notes that you should print out and bring to class, and during class we will enhance these lecture notes jointly. **The lecture notes will be posted on ELMS as the class moves along.** Of note, the joint development of these lecture notes involves heavy usage and learning of Stata as applied to time series. *So, be prepared to spend good chunks of class working with Stata in real time rather than writing down equations.*

Work Load

Mastering the material covered in this course requires a significant amount of work outside of class. Students should expect to spend more time outside of class than in class – typically at least twice as much time. The courses in our DC program are 12-week courses that cover all the same material as a traditional semester-long 3-credit course. The compressed schedule makes it possible to complete our degree in just 15 months if you take 2 courses each term. But the compressed schedule also implies an accelerated pace and an increased weekly workload. Taking 1 of our courses per quarter is equivalent to 75% of a full-time load. Taking 2 courses per quarter is equivalent to 150% of a full-time load. Students who take 2 courses per term in our DC

program should expect to do 50% more work per week than a student in a full-time master's degree program.

Grading and Related Issues

No make-up examinations will be accepted unless you provide a legitimate excuse in a reasonably timely fashion. You will be evaluated on the basis of: (1.) class participation; (2.) weekly online discussion; (3.) 4 quizzes; and (4.) a final exam. Your final numerical grade in the class, totaling a maximum possible of 100 points, is a weighted sum of the preceding components, each of which totals 100 points in itself. Final numerical grades will then be curved in order to assign final letter grades.

There will be no assignment of letter grades as the class goes by, although every so often I will give you a sense of how the numerical grade distribution stands and what it might translate into as far as letter grades go should the class end at that moment. I will not be assigning letter grades to individual class components because numerical distributions change, and this will happen as examinations go by, meaning that the final distribution of numerical grades, and their translation into letter grades, will easily be different than the distribution of numerical grades and their translation into letter grades as implied by, say, results following the first quiz.

There are no homeworks for this class, nor will there be any practice quizzes or exams. The lack of practice material is simple: rest assured that **I have no tricks up my sleeve**, and all you need to know to do well in the class is included in the lecture notes, so detailed knowledge of these lecture notes will allow you to do well on all examinations. Moreover, the extent to which the lecture notes have applied content that will be developed in real time during class means that it is critical that you review them thoroughly after every class, and perhaps much more than once. So, the time you would usually spend on solving homeworks in any one class, in this class you are to spend reviewing the theory embodied in the lecture notes and working out and reworking the applied examples that we go over in class using Stata.

All told, the methodology and examination criteria implemented in this class are designed such that, if you work hard, by the end of the semester you will not only earn a good grade, but you will also leave the class with fully functional knowledge of how to interpret and apply time series to real world analysis in professional contexts.

Notes on quizzes and final exam. All quizzes and the final exam are cumulative. Quizzes will be designed to take 30 to 45 minutes and will take place prior to our usual break time. The final exam will be designed to take about 2 hours, although you will be welcome to have the full class time for solving this exams. All quizzes and the final exam are subject to include analytical (that

is, pen and paper) exercises, and applied components (that is, using Stata). **<u>Analytical components will be tested closed notes, but applied components will be tested open notes.</u>**

Extra Credit

Near the end of the term, you will receive an email inviting you to submit a voluntary and anonymous course evaluation. Your feedback on courses will be very helpful in improving the quality of instruction in our program. As an extra incentive for you to evaluate the course, in the final exam I will offer an extra credit opportunity to the whole class if the course evaluation response rate exceeds 80%. I will not be able to see which students have evaluated the course, nor anyone's explicit evaluation, but I will be able to see the overall response rate.

Calculation of Final Numerical Scores

Your final numerical score is calculated as follows:
1. Class participation: 5%. Each class you will earn a grade between 0 and 100 for your participation input. Your final class participation grade is a simple average of your participation grades throughout each class of the semester. This is a general participation grade and is based off any sort of student participation done in class. People who do not contribute anything, or anything of merit will get zeros. People who make insightful and constructive contributions will get 100. (People who make inappropriate contributions will have to have an in-person discussion with me.)
2. Online discussion grade: 15%. For each online discussion you will earn a grade between 0 and 100. Your final online discussion grade is a simple average of your online discussion grades throughout each discussion of the semester. People who do not contribute anything of merit will get zeros. People who make insightful and constructive contributions will get 100. (People who at any point make inappropriate contributions in the online discussion forums will have to have an in-person discussion with me.) NOTE: each weekly online discussion is worth 100 points, and your final numerical online discussion average grade is the simple average of your individual online discussion grades.
3. In-class quizzes: 12.5% each (of 100 total points available per quiz).
4. Final exam: 30% (of 100 or 120 total points available; if the response rate to course evaluations exceeds 80% then there will be an extra credit opportunity. You will be notified in a timely fashion whether or not the extra credit opportunity will be available, that is, whether the response rate to course evaluations exceeded 80%. If the response rate to course evaluations exceeds 80% the final exam will be worth 110 total points—10 points of these will reflect the extra credit opportunity—and if it does not then the final exam will be worth 100 points).

On occasion, as the class moves along I will send you comments, via email, on how you are doing regarding components (1.) and (2) so that, if needed, you can adjust in a timely fashion.

NOTE: As related to participation and online discussion grading components, please see the detailed grading rubric that will be posted on the course website.

You will notice that the preceding calculation may add up to more than 100. This is so because of the potential for the extra credit opportunity on the final exam. If the extra credit opportunity is not available and you obtain full numerical points on each grading component, then your final raw numerical score in the class would be 100. If the extra credit opportunity is indeed available and you obtain full numerical points on each grading component, then your final raw numerical score in the class would be 106 **(i.e., the extra credit opportunity is potentially worth a non-negligible 6% of your total grade)**. Therefore, your final *effective* numerical score in the class will be equal to:

$$max(100, \text{ your final raw numerical score})$$

Your final effective numerical score in the class will then be curved for assignment of final letter grades. Letter grades will only be assigned for your final grade, so no letter grades will be assigned throughout the course for individual grading components. However, as the course makes progress, I will convey to the class how grade distributions stand up to any one date and what letter grades *might* be expected based on that distribution *should the class have ended at that time with no commitment to that times numerical-to-letter-grade conversion holding at the end of the class (numerical score distributions may fluctuate substantially, which means that numerical-to-letter-grade conversions will vary as well depending on any one time's numerical score distribution).*

Standard Policies for the Program and the University of Maryland

Contact Hours: Three credit courses at the University of Maryland require a minimum amount of contact between instructors and students. Our courses' 12 weekly 3-hour meetings only satisfy 80% of the university's contact requirement. The other 20% is usually satisfied by mandatory and graded online contact. Instructors have some discretion in how they structure the online component of their course. In principle, the contact hours requirement could also be satisfied by scheduling 3 additional 3-hour meetings per term, or one additional 45-minute meeting per week. The online components of our courses are a more flexible way to ensure that our program's courses provide the same level of student-instructor contact as a traditional 15-week, face-to-face, 3-credit course at the University of Maryland.

Academic Integrity: The University of Maryland has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards applicable to all undergraduate and graduate students, and you are responsible for upholding these standards as you complete assignments and take exams in this course. Please make yourself aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information see www.studenthonorcouncil.umd.edu.

Student Conduct: Students are expected to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to show civility to one another or myself

will be referred to the Office of Student Conduct. You are expected to adhere to the Code of Student Conduct.

Medical Excuses: If you miss any class meetings for any reason, you are still responsible for all material covered during the meeting you missed. It is your responsibility – not the instructor's – to get yourself caught up in the course. If you need to miss an exam or other course deadline because of illness, injury, or some other emergency: Follow doctor's orders and get documentation. Get in touch with the instructor as soon as you're able – preferably prior to missing the exam or deadline. Communicate with the instructor to make up the course requirement as soon as possible. You are entitled to recover before you make up the course 8 requirement, but you are not entitled to extra days to study beyond the time the doctor's note says you're incapacitated. If you are incapacitated for more than a week or so beyond the end of the term, your grade in the course will be an "Incomplete". Once you make up the course requirement the instructor will change your "I" to the appropriate letter grade.

School Closings and Delays: Information regarding official University closing and delays can be found on the campus website and the snow phone line: (301) 405-SNOW (405-7669). Since our program is an evening program in downtown Washington, DC, rather than a day program in College Park, we do not always cancel classes on the same days as the College Park campus. The program director will always announce cancellation information to the program as an announcement on the program's ELMS/Canvas site.

Students with Disabilities: The University of Maryland does not discriminate based on differences in age, race, ethnicity, sex, religion, disability, sexual orientation, class, political affiliation, and national origin. Reasonable accommodations will be made to students with documented disabilities. I will make every effort to accommodate students who are registered with the Disability Support Services (DSS) Office and who provide me with a University of Maryland DSS Accommodation form.

Academic Progress: The graduate school requires that students maintain a GPA of at least 3.0. Students whose cumulative GPA falls below 3.0 will be placed on academic probation by the graduate school. Students on academic probation must ask the program's director to petition the graduate school if they want to remain in the program. The petition must include a plan for getting the student's GPA up to at least 3.0. Students who do not live up to their plan can be forced to leave the program without having earned the degree.

Building Access: The door to the building at 1400 16th Street is unlocked on weekdays until 7:00 p.m. Students who arrive after 7:00 will find the door locked. The building's security guard is stationed at a desk just inside the door until 11:00 p.m. and will let you in. You can also call the phone on the security guard's desk by dialing (202) 328-5158. If the security guard happens to be away from his or her desk when you arrive, you can pick up the black phone to the right of the door at 1400 16th Street. You will be connected to the company that handles security for our building. If you tell them you are with the University of Maryland, they should ask you for a

password. The password is "Drawbridge". When you tell them the password, they will be able to unlock the door for you.

Class Schedule

Tuesday, May 31: Class 1. (Basics of time series analysis.)

Tuesday, June 7: Class 2. (Nonspherical disturbances.)

Tuesday, June 14: Class 3. (Nonspherical disturbances.)

Tuesday, June 21: Class 4. (Univariate time series and forecasting.)
- Quiz 1.

Tuesday, June 28: Class 5. (Univariate time series and forecasting.)

Tuesday, July 5: Class 6. (Univariate time series and forecasting.)
- Quiz 2.

Tuesday, July 12: Class 7. (Multivariate time series and forecasting.)

Tuesday, July 19: Class 8. (Multivariate time series and forecasting.)
- Quiz 3.

Tuesday, July 26: Class 9. (Multivariate time series and forecasting.)

Tuesday, August 2: Class 10. (Smoothers.)
- Quiz 4.

Tuesday, August 8: Class 11. (Smoothers and nonstationary time series.)

Tuesday, August 23: Class 12.
- Final Exam.