ECON684: Applied Time Series Analysis and Forecasting

Spring 2021

Course Syllabus

Instructor	Sungho Noh (sungho12@umd.edu)
Office Hours	Tuesday 5:30 pm – 6:15 pm (or by appointment)
Class Time	Monday 6:30 pm – 8:15 pm (including 15-minute break)
Class Location	Online
Teaching Assistant	TBA
Teaching Assistant Office Hours	TBA

Course Objectives

Students will learn various time series models and how they are applied to econometric techniques for estimation and forecasting. The topics include, among others, univariate auto-regressive moving average (ARMA) processes, volatility models, vector auto-regression (VAR) models, and non-stationary and trend analysis. Each topic will be discussed with their macroeconomic, financial, and business applications.

Our program has 7 general learning outcomes for students:

1. Ability to understand, evaluate and analyze economic data
2. Ability to understand and interpret statistical evidence from economic data
3. Ability to apply empirical evidence to assessing economic arguments
4. Ability to apply macroeconomic theories to policy discussions
5. Ability to apply microeconomic theories to policy discussions
6. Ability to communicate economic ideas to a broader audience
7. Ability to evaluate the effectiveness of policy programs using sound economic techniques

The learning outcomes that pertain to this course are: 1, 2, 3, 4, and 6.

Prerequisite

ECON 642 and ECON 645

Textbook and Course Materials

The course will mostly follow the main textbook *Applied Econometric Times Series*, Fourth Edition, by Walter Enders (2015). Earlier editions are acceptable substitutes. Lecture slides for each topic as well as reading materials will be posted on the course webpage in ELMS. Students are encouraged to review slides and readings to complement the textbook and follow the most recent developments in time series methods.

In addition to synchronous online meetings, there will be pre-recorded lab sessions (about 60 minutes each) posted every week following the class on Monday. The objective is to instruct Stata functions that are useful for solving problem sets and exams and conduct research projects towards the end of the semester. Students are required to view those recordings to complete the course.

Evaluation

The course grade will be calculated based on the weighted average of the following components:

- Participation in Online Discussions (10%)
- Problem Sets (20%)
- Midterm Exam (25%)
- Final Exam (25%)
- Replication Paper (20%)

Exams: Each exam will consist of both analytical and empirical portions. Analytical questions are designed to solve problems based on the theoretical concepts covered in class. For empirical questions, students will be given estimation outputs and interpret them based on their knowledge and critical thought process. A list of topics covered by each exam will be cumulative.

Problem Sets: Each of 5 problem sets consists of 2-3 analytical and 1-2 empirical exercises. For empirical questions, students will be asked to submit both answers and a script (Stata do-file) that can reproduce outputs. Students are allowed (and encouraged) to work together. However, each student should turn in their answer individually.

Replication Paper: Students will select one paper of their interest and replicate its key results. This section consists of three tasks consecutively due in the second half of the semester (refer to the class schedule for the exact due dates). First, students will be asked to submit a proposal, no more than 1 page. Second, a pre-recorded presentation with slides should be posted on the ELMS course webpage and be available for feedback from the instructor and colleagues. Finally, by the end of the semester, students will submit a short (about 3 pages in single space excluding

figures and tables) but polished draft paper. The paper is expected to include (1) a description of data and model specifications, (2) outcome and its interpretation, and (3) a critical review of the results.

Online Discussions: Discussion topics will be posted online weekly or less, depending on the flow of the class. The topic will typically be related to course readings (book chapter or article). Each discussion will be opened at least for a week to contribute.

Students' grades on each component of the course will be weighted according to the scale above to calculate their numerical course grade. The numerical course grades will be translated into letter grades as follows:

93-100	A	90-92	A-		
80-89	B+	70-79	B	60-69	B-
50-59	C+	40-49	C	30-39	C-
20-29	D+	10-19	D	0-9	F

(Note: A+ is reserved for students shown exemplary performance in the course.)

Class Schedule

	Topic	Assignment Due
Jan 25	Introduction to Time Series, Difference Equations, Filters	
Feb 1	Univariate Stationary Process (1): Stationarity, ARMA	Problem Set 1
Feb 8	Univariate Stationary Process (2): Estimation, Forecasting	
Feb 15	Volatility Models (1): Theory and Estimation	Problem Set 2
Feb 22	Volatility Models (2): Forecasting, Applications	
Mar 1	Non-stationary Processes (1): Trend, Unit Root	Problem Set 3
Mar 8	Non-stationary Processes (2): Tests of Non-stationarity	
Mar 15	Spring Break: No Class	
Mar 22	Multivariate Time Series Models (1): VAR, Granger Causality	Midterm Exam
Mar 29	Multivariate Time Series Models (2): SVAR and Applications	Paper Proposal
Apr 5	Cointegration and Error-correction Model (1): Theory	Problem Set 4
Apr 12	Cointegration and Error-correction Model (2): Estimation	
Apr 19	Principal Component Analysis and Factor Models	Problem Set 5
Apr 26	Dynamic Factor Models	
May 3	Non-linear Time Series Models (tentative)	Presentation
May 10	Final Exam	

Standard Policies for the Program and the University of Maryland

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.

Email: 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.registrar.umd.edu/current/ (Under the first major heading of "Online Transactions" there is a link to "Update Contact Information".)

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.

Academic Integrity: The University of Maryland, College Park has a nationally recognized code of Academic Integrity. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.studentconduct.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.

Excused Absences: The University of Maryland's policy on excused absences is posted here: http://www.president.umd.edu/administration/policies/section-v-student-affairs/v-100g

Please note:

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 make sure you catch up on the missed material. Instructors routinely facilitate things by posting lecture notes, etc.

If you need to miss an exam or other graded course requirement 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 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". In such cases you must negotiate a plan with your instructor for completing the course requirements. 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). The program director will also announce cancellation information to the program as an announcement on the program's ELMS/Canvas site. This will generally be done by 1:00 p.m. on days when weather or other factors are an issue. If classes need to be cancelled during the semester, it may be necessary to move the final exam back a week so missed classes can be made up.

UMD Counseling Center: Sometimes students experience academic, personal and/or emotional distress. The UMD Counseling Center in Shoemaker Hall provides comprehensive and confidential support services that promote personal, social, and academic success. The cost of these services is covered by the fees you already paid when you registered for classes, and there is no additional charge if you use the services. Proactively explore the range of services available, including the Counseling Service, Accessibility and Disability Service, Learning Assistance Service, and the Testing Office, all described at http://www.counseling.umd.edu/

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, or national origin. Reasonable accommodations will be arranged for students with documented disabilities. Students who have an accommodations letter from the Accessibility and Disability Service (ADS) should meet with me during the first few weeks of the semester to discuss and plan for the implementation of your accommodations. If you require reasonable accommodations but have not yet registered with ADS, please contact the Accessibility and Disability Service at 301-314-7682 or adsfrontdesk@umd.edu.

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. Note: a grade of "B" corresponds to a GPA of 3.0. A grade of "B-" corresponds to a GPA of 2.7.

Access to Morrill Hall and Morrill 1102: Morrill Hall is locked every day from 7:00 p.m. - 7:00 a.m. Your university ID gives you swipe access to the back door of the building.