

ECON684: Applied Time Series Analysis and Forecasting

Spring 2023

Course Syllabus

Version: January 21, 2023

Instructor	Martin Stuermer (Email: stuermer@umd.edu) ¹
Office Hours	Thursday 5:15 to 6:15pm (by appointment)
Class Time	Thursday 6:30 pm – 9:15 pm (including 15-minute break)
Class Location	College Park Campus, Room: Tydings 2106
Teaching Assistant	Tri Vu Phu
Teaching Assistant Office Hours	tbd

Course Objectives

My goal is to provide you with a powerful tool for analyzing macroeconomic, financial, and business data. We will develop fundamental concepts through the study of univariate time series, and then generalize those concepts to multivariate time series. The topics include univariate auto-regressive moving average (ARMA) processes, volatility models, vector autoregression (VAR) models, forecasting as well as non-stationary and trend analysis. We will discuss robustness and establishing causality. For each topic, we will emphasize its economic applications.

Please provide me with critical feedback during the semester. This allows me to better adjust the syllabus based on your interests. Always check the latest version of our syllabus in ELMS.

More specifically, our program has 7 general learning outcomes for students:

- 1. Ability to understand, evaluate and analyze economic data**

¹ The views expressed here are those of the author in his personal capacity. They do not reflect the views or policies of the International Monetary Fund, its Executive Board, or its management.

- 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 primarily are 1, 2, 3, 4, and 6.

Prerequisites

ECON 642 and ECON 645

Textbook and Course Materials

The course will to certain extent follow the textbook *Applied Econometric Times Series*, Fourth Edition, by Walter Enders (2015). Earlier editions are acceptable substitutes.

Recommended reading is *Structural Vector Autoregressive Analysis* by Lutz Killian & Helmut Lutkepohl (2017). Preliminary chapters of the book are available online at <https://sites.google.com/site/lkilian2019/textbook/preliminary-chapters>.

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.

Evaluation

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

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

Problem Sets (PS): Students are encouraged to work in groups of two; if they do so, a group should submit one set of answers for the whole group. Please send me an email with the names of the group on the day before the problem set is distributed.

Midterm and Final Exams: The exams can cover all topics of the class.

Replication Presentations: We will replicate key results from papers in the literature and check their robustness to changes in data and specifications. Students are encouraged to work in groups of two. Each group will select one paper from a list and will give a **first presentation** (~15

min, ~7 slides) to the class summarizing the paper (research question, contribution, methodological approach and key baseline regression equation, dataset, and results) during the first half of the semester. We will provide feedback and discuss. In the second half of the semester, each group will give a **second presentation** (~15 min, ~7 slides) showing the results from replicating the key baseline regression of the paper. The presentation will also include two additional robustness checks of the group's choice. We will again discuss and provide feedback. Each presentation will be evaluated on its content (50%) and the clarity of exposition (50%).

Replication Paper: By the end of the semester (May 10th), each group submits a concise (maximum 6 pages in 1.5 space excluding figures and tables) and polished paper. The paper is expected to include (1) a max. 150 words abstract, an introduction (2) that briefly describes the motivation, research question, methodology, data and key results with at most one paragraph each; (3) a section describing the data, (4) a section with the key estimation equation that is used, (5) a section on the empirical results and its interpretation, a section (6) showing the results for two robustness checks, and finally (7) a section with a critical discussion of the results. Please put all figures and tables into an appendix and provide a clean STATA do file. The paper is graded on content (50%) and clarity of exposition (50%).

Participation in Class Discussions: I encourage students to actively participate in class discussions. I expect everyone to read at least the introduction of our colleagues' papers and to ask questions and make suggestions to the presenters.

Grading: Students' grades on each component of the course will be weighted according to the scale below 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

This may change as the course proceeds. Keep an eye on ELMS/Canvas announcements.

	Topic	Sections in Enders	Assignment Due
Jan 26	What Time Series is Good For: Introduction	1.1-1.2	
Feb 2	Univariate Stationary Process (1): Stationarity, ARMA	1.9, 1.10, 2.1-2.4	
Feb 9	Univariate Stationary Process (2): Estimation, Autocorrelation, Model Selection.	2.5-2.8	
Feb 16	Structural Change, Seasonality, Robustness	2.9, 2.13	

Feb 23	No Class		
Mar 2	Non-Stationary Processes: Trends, Unit Roots	2.11, 2.12	
Mar 9	Volatility Models: Estimation, Applications	4.1-4.7	
Mar 16	Univariate Forecasting	3.1-3.4	
Mar 23	Spring Break: No Class		PS 1 due Mar 27
Mar 30	Midterm Exam		Midterm Exam
Apr 6	Multivariate Time Series Models (1): Autoregressive Distributed - Lag (ADL) Models, Vector Autoregressive (VAR) Models, Review	5.1, 5.2, 5.5 5.7	
Apr 13	Multivariate Time Series Models (2): Structural VARs, Impulse Response Functions		5.10-5.13
Apr 20	Multivariate Time Series Models (3): Structural VARs, Identification and Causality		
Apr 27	Multivariate Time Series Models (4): More Ways to Identify Causal Relationships		PS 2
May 4	Individual meetings with groups on drafts		First draft (due Mai 1)
May 11	Other Time Series Models and Review		Final paper (due May 10)
May 18	Final Exam		

Standard Policies

Policies related to all graduate courses at the University of Maryland are posted on this page of the Graduate School's website:

<https://gradschool.umd.edu/faculty-and-staff/course-related-policies>

Please familiarize yourself with these policies related academic integrity, non-discrimination policy, accessibility, absences and accommodations, grading, academic standing, grievance procedures, and other important policies.

Additional notes that should appear in all MS in Applied Economics program syllabi:

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 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.

Excused Absences: 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 to work with study partners, the teaching assistant, and the instructor 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've been 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. When classes need to be canceled during the semester, we make every effort to schedule makeup classes.

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, and the Testing Office, all described at <http://www.counseling.umd.edu/>

Graduate Academic Counselor: The UMD Graduate School also has an academic counselor available to support students who are having difficulty navigating mental health resources on campus, are considering a leave of absence and/or need assistance finding mental health care off campus. The Graduate Academic Counselor also facilitates bi-weekly Graduate Student Circle Sessions which provide an opportunity to learn about resources and connect with other graduate students. Students can learn more about the Graduate Academic Counselor by going to: <https://gradschool.umd.edu/gradcounselor>

Course Evaluations: 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.

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. There is keypad access to the door of Morrill 1102. The code will be shared with students by the program coordinator.