

ECO 395M: Time Series Econometrics (34055)

Spring 2024

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Lectures:	BRB 1.118; MW 9:30-11:00 a.m
Course Website:	Canvas
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Office Hours:	Monday 2:30 - 4:00 pm or by appointment
Teaching Assistant:	Zhenghao Li (lizhenghao@utexas.edu)
TA Help Sessions:	Fridays 2:00 - 3:30 pm in BRB 1.118
TA Office Hours:	Fridays 3:30 - 4:30 pm in BRB 2.128

Course Description

This course delves into the realm of advanced econometrics, focusing on models and econometric considerations specifically related to time series data. Emphasis will be placed on applying time series methods in the fields of macroeconomics and finance. By the end of this course, students will possess the ability to break down time series data into its fundamental components, effectively handle non-stationarity issues, and estimate and interpret univariate and multivariate time series econometric models. Furthermore, students will gain the skills to utilize estimated time series models for policy analysis and forecasting purposes. We will also work on solving the Dynamic Stochastic General Equilibrium (DSGE) models and estimating them using Bayesian estimation methodology.

Prerequisites: ECO 394M Econometrics course; if you have not taken that course, you will need permission to register for this course.

Readings: There is no required textbook for the course. You are responsible for studying the material taught during lectures, slides, notes, papers, and other material distributed. There are several textbooks and resources that you may use (optional) for further readings beyond the course slides.

- Asteriou, D. & Hall, S. (2011). Applied Econometrics. Macmillan
- Diebold, F. X. (2004). Elements of Forecasting. South-Western Cengage.
- Dougherty, C. (any edition). Introduction to Econometrics. Oxford University Press.
- Enders, W. (2015). Applied Econometric Time Series. 4th Ed., John Wiley & Sons.
- Gujarati, D. (any edition). Basic Econometrics. McGraw-Hill.
- Hamilton, James D. (1994). Time Series Analysis. Princeton University Press, New Jersey.
- Harris, R. & Sollis, R. (2003). Applied Time Series Modelling and Forecasting. Wiley.
- Hayashi, F (2000). Econometrics. Princeton University Press, New Jersey.
- Herbst, E. P., & Schorfheide, F. (2016). Bayesian estimation of DSGE models. Princeton University Press.
- Verbeek, M. (2013). A Guide to Modern Econometrics. John Wiley & Sons

- Wooldridge, J. (sixth edition). *Introductory Econometrics: A Modern Approach*. Cengage.

We will also use several research papers, some of which are listed below:

- Blanchard, O. J., & Quah, D. (1988). The dynamic effects of aggregate demand and supply disturbances.
- Christiano, L. J., Eichenbaum, M., & Evans, C. L. (1999). Monetary policy shocks: What have we learned and to what end?. *Handbook of macroeconomics*, 1, 65-148.
- Coibion, O. (2012). Are the effects of monetary policy shocks big or small?. *American Economic Journal: Macroeconomics*, 4(2), 1-32.
- Gertler, M., & Karadi, P. (2015). Monetary policy surprises, credit costs, and economic activity. *American Economic Journal: Macroeconomics*, 7(1), 44-76.
- Rossi, B., & Sekhposyan, T. (2010). Have economic models' forecasting performance for US output growth and inflation changed over time, and when?. *International Journal of Forecasting*, 26(4), 808-835.
- Smets, F., & Wouters, R. (2003). An estimated dynamic stochastic general equilibrium model of the euro area. *Journal of the European economic association*, 1(5), 1123-1175.
- Smets, F., & Wouters, R. (2005). Comparing shocks and frictions in US and euro area business cycles: a Bayesian DSGE approach. *Journal of Applied Econometrics*, 20(2), 161-183.
- Smets, F., & Wouters, R. (2007). Shocks and frictions in US business cycles: A Bayesian DSGE approach. *American economic review*, 97(3), 586-606.
- Stock, J. H., & Watson, M. W. (1988). Variable trends in economic time series. *Journal of economic perspectives*, 2(3), 147-174.
- Stock, J. H., & Watson, M. W. (2003). Forecasting output and inflation: The role of asset prices. *Journal of economic literature*, 41(3), 788-829.
- Stock, J. H., & Watson, M. W. (2018). Identification and estimation of dynamic causal effects in macroeconomics using external instruments. *The Economic Journal*, 128(610), 917-948.

Assessment:

1. **Problem Sets (40% of total grade):** Throughout the course, you will be assigned six problem sets that are directly related to the course material. These problem sets will be posted on Canvas one week prior to the due date. They must be submitted at the beginning of class, as indicated in the tentative course schedule below. Each problem set carries a weightage of 8% towards your total grade. The deadlines to submit problem sets are 01/31, 02/14, 02/28, 03/27, 04/10 and 04/17.
2. **Two Exams (26% of total grade):** There will be two midterm exams (non-cumulative) The midterm exam will take place during lecture 15 on 03/06. It will cover all the course material taught up to and including lecture 12. There will be no makeup exams for the midterm. If you miss the first midterm, the weightage will be transferred to the second exam. The second exam will be held during the last lecture on 04/29.
3. **Referee Report (10% of total grade):** You will write a referee report on a recently published paper of your choice (related to the topics we cover), due on 03/20. We will discuss how to write a referee report in the lectures.
4. **Extended Abstract and Poster Presentation (24% of total grade):** A research poster that needs to be completed using techniques that you learn from the course. A one-page proposal is due 04/03. The posters will be presented on 04/22 and 04/24 during class. The final posters and an extended abstract are due to be submitted on 05/01.

The extended abstracts and posters can be completed in pairs of two students, after random assignment. Posters are a presentation means of completed research. As such, the research expectations are the same as they would have been if you were writing a paper. Yet, given the tight length of the course, and the lengthy process of re-writing that a paper suggests, you are not requested to submit a paper; you are required to submit the poster and an extended abstract, to receive a grade for the course. Specific guidelines on the format will be offered.

Grading:

- There will be 6 problem sets. You are allowed to skip one problem set. If you complete all six problem sets, only the five with the highest grades will be considered (i.e., the lowest-graded set will be dropped).
- Late homework, posters, and reports will not be accepted neither other type of accommodation could be given. The dates of the assignments are announced at the beginning of the semester, and please allow time to be able to complete the assignment on time. Please take into account that there might be arising personal circumstances that disrupt your schedule.
- There is no make-up exam for reasons outside the university excused absences: [Dean of Students info](#). If unable to attend the first exam, the weight of the first exam will be transferred to the second exam, so the second exam will be weighted as 26 points. Those requests should be sent to me in writing (email is fine) before the exam, or at the earliest possible. The TA does not handle those issues.
- Re-grading requests refer to the whole assignment/exam and not to specific questions/parts. All requests should be made in writing (email is fine) within five working days of receiving tests and assignments back. Later requests will not be accepted.
- Students are allowed/encouraged to discuss the assignments with their working group assigned to them by the instructor at the beginning of the semester (but no other students). However, students must submit their own write-up of solutions (see honor code below for details). A student might choose not to participate in group activities; however, if two or more students of a group decide to discuss class material, then the whole group should be notified.
- Posters can be presented and completed in pairs of two students, so this is a group project. If a student drops the class and one student is left alone in a project, I will randomly reassign the student to a group. If a student decides to switch credit/no credit, the expectations regarding the project remain the same. Help sessions are part of the course material. We try to record the help sessions, so the answers to the homework solutions are available to you at all times.
- I will use plus/minus grade categories when assigning final grades (i.e. A, A-, B+, B, ..., D-, F). Grades will be curved, meaning that your letter grade will be assigned based on your weighted average course score and your performance relative to the rest of the class. Please do not ask me about extra credit or extra work to improve your grade, as these are not available.
- All instructions, assignments, readings, and essential information and communication will be on the Canvas website at [Canvas Link](#). Specifically, I will be updating the file notes" with links to all class material. Please follow the updates to this file closely.

Use of Class Materials: No materials used in this class, including, but not limited to, lecture handouts, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty. I am well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course. Additionally, all these materials are copyright-protected works. Any unauthorized copying of the class materials is a violation of federal law and may result in disciplinary actions being taken against the student.

Class Recordings: Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

Diversity, Equity, and Inclusion: It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that student's learning needs be addressed, and that the diversity that students bring to this class can be comfortably expressed and be viewed as a resource, strength, and benefit to all students. Please come to me at any time with any concerns.

Other: Please do not use phones/laptops/tablets in the class, as it is distracting to me and your classmates. If you need to use technology inside the classroom for a specific reason, please talk to me before the class.

Lecture Schedule (Tentative)

I will be posting a detailed description of the lectures together with lecture recordings and assignment links, on the “Structure Notes” file in Canvas. Please follow that file closely.

1. Class 1 (Wed 01/17):
 - Syllabus
 - Time series irregularities
 - distributed lag models
 - Impact, temporary and long-run effects
 - Temporary and permanent changes
2. Class 2 (Mon 01/22):
 - OLS assumptions and time series models
 - Trends and seasonality
3. Class 3 (Wed 01/24):
 - AR, MA, ARMS models
 - Asymptotic assumptions
 - ACF, PACF
4. Class 4 (Mon 01/29):
 - Autocorrelation
 - Heteroskedasticity
5. Class 5 (Wed 01/31):
 - Unit roots
 - AIC, BIC
 - Model selection
 - **Problem set 1 due**
6. Class 6 (Mon 02/05):
 - Model selection
 - ARCH and GARCH
7. Class 7 (Wed 02/07):
 - Forecasting (and examples)
 - Forecasting evaluation
8. Class 8 (Mon 02/12):
 - Iterated and direct forecasting
 - Autocorrelation of direct forecast errors
9. Class 9 (Wed 02/14):
 - In-sample forecasting
 - Pseudo out-of-sample forecasting

- **Problem set 2 due**
10. Class 10 (Mon 02/19):
 - Regression with I(1)
 - Spurious regression
 - Cointegration
 - The tale of two econometricians
 11. Class 11 (Wed 02/21):
 - Why VAR?
 - identification
 - IRFS
 - Short run restrictions
 12. Class 12 (Mon 02/26):
 - VAR cont.
 - VAR with short-run restrictions examples
 13. Class 13 (Wed 02/28):
 - Review
 - Poster Structure
 - How to write a referee report
 - **Problem set 3 due**
 14. Class 14 (Mon 03/04):
 - Cumulative IRFs
 - Interpret economic theory long run effects as cumulative IRFs
 - Use long-run restrictions for VAR identification
 15. Class 15 (Wed 03/06):
 - **Exam 1**
 16. Class 16 (Mon 03/18):
 - Macroeconomic shocks: Identification
 17. Class 17 (Wed 03/20):
 - Local Projections
 - **Referee Report due**
 18. Class 18 (Mon 03/25):
 - Monetary policy shocks: what we know so far
 19. Class 19 (Wed 03/27):
 - Monetary policy shocks: what we know so far
 - **Problem set 4 due**
 20. Class 20 (Mon 04/01):
 - Review of DSGE models
 - Bayesian Inference

21. Class 21 (Wed 04/03):
 - Estimation of linear DSGE Models
 - **Research Proposal due**
22. Class 22 (Mon 04/08):
 - Estimation of linear DSGE Models
23. Class 23 (Wed 04/10):
 - Model Evaluation
 - **Problem set 5 due**
24. Class 24 (Mon 04/15):
 - In-Sample and Out-of-sample Forecasting
25. Class 25 (Wed 04/17):
 - applications to the workhorse NK models
 - Review
 - **Problem set 6 due**
26. Class 26 (Mon 04/22):
 - Poster Presentation
27. Class 27 (Wed 04/24):
 - Poster Presentation
28. Class 28 (Mon 04/29):
 - **Exam 2**

The final poster and extended abstract are due to be submitted on 05/01.

University Policies & Resources

Statement on Academic Integrity: The University of Texas Honor Code states: The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and the community. Each student in this course is expected to abide by the UT Honor Code and uphold academic integrity. Students who violate University rules on academic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on academic dishonesty will be strictly enforced. For further information, please visit the Student Conduct and Academic Integrity website at: [conduct](#).

What this means for this course: You are allowed/encouraged to study together with your groups and to discuss information and concepts covered in the lecture and the recitation sections. However, this cooperation should never involve one student having possession of or copying directly from another student's work that is to be graded. Should such copying occur, both students involved will receive zeros for the assignment. In addition, directly copying from websites/books, etc., for the homework will also return zero for the assignment. In addition, any collaborative behavior or use of unauthorized material for graded work will lead to University disciplinary action. Finally, using books, notebooks, notes, electronic (e.g. phones), or other means during the exams, or copying from other students, violates the University and course policies.

In this course, every element of class assignments must be fully prepared by the student. The **use of generative AI tools for any part of your work will be treated as plagiarism**. If you have questions, please contact me.

ADA Notice: The university is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. Please let me know if you experience any barriers to learning, so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations, please contact Services for Students with Disabilities (SSD). Please refer to SSD's website for more information: [SSD website](#). If you are already registered with SSD, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations and needs in this course.

Counseling and Mental Health Center: The Counseling and Mental Health Center serves UT's diverse campus community by providing high quality, innovative, and culturally informed mental health programs and services that enhance and support students' well-being, and academic and life goals. To learn more about your counseling and mental health options, call CMHC at (512) 471-3515. If you are experiencing a mental health crisis, call the CMHC Crisis Line 24/7 at (512) 471-2255.

Behavior Concerns Advice Line (BCAL): If you are worried about someone who is acting differently, you may use the Behavior Concerns Advice Line to discuss by phone your concerns about another individual's behavior. This service is provided through a partnership among the Office of the Dean of Students, the Counseling and Mental Health Center (CMHC), the Employee Assistance Program (EAP), and The University of Texas Police Department (UTPD). Call 512-232-5050 or visit [behavior concerns website](#).

BeVocal: BeVocal is a university-wide initiative to promote the idea that individual Longhorns have the power to prevent high-risk behavior and harm. At UT Austin, all Longhorns have the power to intervene and reduce harm. To learn more about BeVocal and how you can help to build a culture of care on campus, go to [BeVocal website](#).

Emergency Evacuation Policy: Occupants of buildings on the UT Austin campus are required to evacuate and assemble outside when a fire alarm is activated, or an announcement is made. Please be aware of the following policies regarding evacuation:

- Familiarize yourself with all exit doors of the classroom and the building. Remember that the nearest exit door may not be the one you used when you entered the building.
- If you require assistance to evacuate, inform me in writing during the first week of class.
- In the event of an evacuation, follow my instructions or those of class instructors.
- Do not re-enter a building unless you are given instructions by the Austin Fire Department, the UT Austin Police Department, or the Fire Prevention Services office.

For more information regarding emergency evacuation, please contact the Office of Campus Safety and Security, 512-471-5767, [safety website](#).

Title IX Reporting: Title IX is a federal law that protects against sex and gender-based discrimination, sexual harassment, sexual assault, sexual misconduct, dating/domestic violence and stalking at federally funded educational institutions. UT Austin is committed to fostering a learning and working environment free from discrimination in all its forms. When sexual misconduct occurs in our community, the university can:

1. Intervene to prevent harmful behavior from continuing or escalating.
2. Provide support and remedies to students and employees who have experienced harm or have become involved in a Title IX investigation.
3. Investigate and discipline violations of the university's relevant policies ([title IX relevant policies website](#)).

Beginning January 1, 2020, Texas Senate Bill 212 requires all employees of Texas universities, including faculty, to report any information to the Title IX Office regarding sexual harassment, sexual assault, dating violence, and stalking that is disclosed to them. Texas law requires that all employees who witness or receive any information of this type (including, but not limited to, writing assignments, class discussions, or one-on-one conversations) must be reported. I am a Responsible Employee and must report any Title IX-related incidents that are disclosed in writing, discussion, or one-on-one. Before talking with me, or with any faculty or staff member about a Title IX-related incident, be sure

to ask whether they are a responsible employee. If you would like to speak with someone who can provide support or remedies without making an official report to the university, please email advocate@austin.utexas.edu. For more information about reporting options and resources, visit [title IX website](#), contact the Title IX Office via email at titleix@austin.utexas.edu, or call 512-471-0419.

Personal Pronouns: Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name unless they have added a preferred name with the Gender and Sexuality Center. I will gladly honor your request to address you by a name that is different from what appears on the official roster, and by the gender pronouns you use (she/he/they/ze, etc). Please advise me of any changes early in the semester so that I may make appropriate updates to my records. For instructions on how to add your pronouns to Canvas, visit [pronouns website](#).

Land Acknowledgment: (I) We would like to acknowledge that we are meeting on Indigenous land. Moreover, (II) We would like to acknowledge and pay our respects to the Carrizo & Comecrudo, Coahuiltecan, Caddo, Tonkawa, Comanche, Lipan Apache, Alabama-Coushatta, Kickapoo, Tigua Pueblo, and all the American Indian and Indigenous Peoples and communities who have been or have become a part of these lands and territories in Texas, here on Turtle Island.