

ECON 5660, TIME SERIES ECONOMETRICS & FORECASTING
UNIVERSITY OF NORTH TEXAS
SPRING 2026

Classroom and time: Gateway 141; Thursdays, 6:30 PM to 9:20 PM

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Office Hours: Wednesdays and Thursdays, 1:30 PM to 4:30 PM

Office hours also available via Zoom, at your request.

COURSE DESCRIPTION:

This course has two parts; the first part focuses on applied univariate and multivariate forecasting models and evaluating forecast accuracy, while the second part focuses on advanced theoretical time series topics. In addition, some attention is given to communicating and presenting results in a manner that can be understood by someone who is not an expert in the field.

The class will focus on issues most commonly encountered in the fields of accounting, economics, and finance, with an emphasis on the following topics: stationary AR, MA and ARMA models; non-stationarity and tests for unit roots; ARCH and GARCH; vector autoregression and impulse response functions; and cointegration and error correction. The primary software package for empirical applications is the Statistical Analysis System (SAS).

COURSE PRE-REQUISITES:

The pre-requisites for this course is a grade of "B" or better in ECON 5650 (Advanced Econometrics). In particular, students are expected to have a solid background in: multiple regression; ideal conditions for OLS (the Gauss-Markov assumptions); correlation and covariance; t- and F-tests; significance levels; sums of squares & analysis of variance; matrix algebra; the concepts of unbiased, consistent & efficient; maximum likelihood estimation (including Wald, LM and LR tests), simultaneous equations estimation, probability limits; derivatives & partial derivatives; constrained & unconstrained optimization; difference equations; and infinite series.

TEXT:

The text for this course is *Applied Econometric Time Series* by Walter Enders, 4th edition (2014), published by Wiley. It also is acceptable to use the 3rd edition (2009) of this text. Be advised that many sections of this book are quite advanced and so you will not be expected to comprehend all material in the text. However, there are some sections in this text that may provide an excellent complement to the lecture material.

COURSE STRUCTURE:

Part of each class will be allocated to lecture, and part to computer lab work. You are required to work on material from the lecture during the lab period of class. In addition, you are expected to spend a considerable amount of time outside of class working in a computer lab.

NOTE TAKING AND CLASS HANDOUTS:

You are expected to take notes, written by your own hand, for every lecture. Lecture outlines will be provided for each topic, and you should plan to write your notes on those outlines. **CAMERAS ARE NOT PERMITTED in this class.**

All class handouts will be made available on Canvas approximately three days before class meets. YOU are responsible for bringing a copy of the handout with you each night. The file name of the handout that you should bring to class is something such as: "Lecture outline for topic X.pdf," or "Lecture outline for topic X part 1.pdf," or "Lecture outline for topic X part 2.pdf," where X refers to the topic number. You might be able to print the handout once you are in the classroom, but there is no guarantee that the printers will be working. In addition, it is imperative that you **DO NOT PRINT ONCE CLASS BEGINS!**

USE OF ARTIFICIAL INTELLIGENCE:

Use of ANY type of artificial intelligence (AI) for assignments in this class is STRICTLY FORBIDDEN. That is, all work that you submit for credit must come from your own mind, written by your own hand, and NOT borrowed from any other resource or any other assignment or paper written by any other person, machine, or resource. You are required to create every word, table, statistic, etc. on your own. You are NOT permitted to use any type of paper writing services, AI services, Chap GPT (or other chat services), prompt engineering, or ANY similar resources.

If you violate this rule in any part or in any way, you will be considered in violation of UNT's policy on cheating and plagiarism and you will receive a grade of zero for the assignment. In addition, further disciplinary action will be taken and you could be expelled from the university.

ATTENDANCE POLICY AND USING INTERNET RESOURCES:

Although you will not be graded on attendance, **class attendance is not optional.** If you miss class it is **YOUR** responsibility to find out what was covered on that night and make up the missed material before the next class meeting.

If you miss class for an valid reason, be forewarned that you cannot and should not expect to learn what was covered by looking it up on the internet. There is a great deal of incorrect and made-up information on the internet, especially AI driven information. If you use such information on any of your assignments, you will face harsh penalties in grading.

CLASSROOM POLICIES:

During class, students are forbidden to have or use electronic devices such as tablets, cell phones, headphones, earphones, ear buds or the like (except in special cases where students have a verified need that requires such devices).

COMMUNICATION EXPECTATION:

If I need to contact you to convey class-related information, in keeping with University policy, I will use Canvas and your OFFICIAL UNT email address ONLY. Thus, it is YOUR responsibility to check your UNT email and the Canvas announcements for this class on a regular basis. Likewise, if you contact me by email, you should use your official UNT account.

GRADING:

Grades for the course will be based on the total points accumulated as follows:

| | Points possible |
|----------------|-----------------|
| Homework #1 | 30 |
| Homework #2 | 20 |
| Homework #3 | 10 |
| Homework #4 | 40 |
| Presentation | 50 |
| Research paper | 100 |
| total | 250 |

In order to earn a grade of "A" for the course, students must accumulate at least 90% of the total points available; to earn a grade of "B," students must accumulate 80% to 89% of the total points available.

Homework Assignments:

The four homework assignments, when put together, will comprise a complete research paper where you will forecast a variable that Dr. T will choose. You will have to determine whether or not this variable is stationary by applying unit root tests (this is homework #1). After so doing, you will analyze the stationary version of your variable to find the best-fitting univariate model to explain that variable (this is homework #2). You then will use that model to produce a forecast of the variable, and assess the accuracy of your forecast (this is homework #3). For homework #4, you will merge homeworks 1, 2 and 3, making all necessary corrections, and put together one complete paper that explains the entire project. Refer to page 3 of this syllabus for the due dates of each homework (as well as the dates on which each homework will be distributed).

Research Paper:

The structure of the research paper is identical to homework #4 except that YOU will select the variable and YOU will collect the data set (and clean it up if necessary). As with homework #4, you will determine whether or not your variable is stationary, you will find the best-fitting model to explain the stationary version of your variable, you will then use that model to produce a forecast of the variable, and you will assess the accuracy of your forecast. Then you will write up your findings in a formal research paper, which is due at the time of the final exam, Saturday, May 2nd, by 10 PM.

On April 2nd, you will submit a proposal that describes your variable, and you will submit a copy of your data set for Dr. Tieslau's inspection. Dr. Tieslau will then determine whether or not your proposed project is viable. Once your proposal is approved, you may begin work on your research paper.

You have the option to submit "part 1" of your research paper on April 16th. If you do this, Dr. Tieslau will go through your paper and make extensive comments and suggestions for improvements. You can then use these comments to improve your work.

Presentation:

For the presentation, you will put together a 5-page PowerPoint presentation of your research paper, and you will present it (in person) in front of the class on the last night of class, April 20th, during the normal class time. More details will be supplied at a later date.

TENTATIVE COURSE SCHEDULE, ECON 5660, SPRING 2026

| DATE: | TOPIC OF DISCUSSION: | READINGS*: |
|------------------------|---|---|
| Jan. 15 | Topic #1: Intro to Time Series Analysis & SAS | Class handout |
| Jan. 22 | Topic #2, Part 1: Inference on Stationary Univariate Time Series: AR, MA & ARMA Models | Chapters 1 & 2 |
| Jan. 29 | Topic #2, Part 2 | Chapters 1 & 2 |
| Feb. 5 | Topic #3, Part 1: Non-Stationarity and Tests for Unit Roots | Chapter 4 Unit Root Primer (article) |
| Feb. 12 | Topic #3, Part 2 Receive homework #1 | Chapter 4 Unit Root Primer |
| Feb. 19 | Homework #1 due; Topic #4, Part 1: Volatility, ARCH & GARCH Receive homework #2 | Chapter 3 |
| Feb. 26 | Homework #2 due; Receive homework #3 Topic #5: Seasonality Topic #4, Part 2: Stata and ARCH & GARCH | handout Chapter 3 |
| March 5 | Homework #3 due; Receive homework #4 Topic #6: Vector Autoregression | Chapter 5 |
| March 12 | SPRING BREAK | |
| March 19 | Homework #4 due; Receive directions for research papers (via Zoom recording). Dr. T. will NOT hold office hours on this day, and will NOT be present in class on this night. | Handout |
| March 26 | Topic #7: Long-Run Relationships, Cointegration and Error Correction Topic #8: Reading Dated Data | Chapter 6 Handout |
| April 2 | Research proposals due. Topic #9: The History of Time Series Analysis | Handout |
| April 9 | Open lab period; work on research papers. | Handout |
| April 16 | Part 1 of research papers due (optional). Open lab period; work on research papers. | |
| April 23 | Open lab period; work on research papers. | |
| April 30 | 5-page PowerPoint presentation due, via email, at 3 PM; presentations (live) take place from 6:30 PM to 9:20 PM | |
| Saturday, May 2 | Final exam (final research papers due, via email, by 10 PM). | |

*Readings refer to both the 3rd and 4th editions of the Enders text.

SOFTWARE:

The software package used in this course is PC SAS, version 9.4 (or higher). **If you want to get the maximum benefit from this class, you should put a tremendous amount of effort into learning this software package!** You can use the lab run by the College of Arts & Sciences in room 330 of the GAB. This lab should be open on the following days and times: Mondays through Thursdays, 8 AM to 10 PM, Fridays from 8 AM to 5 PM, and Saturdays & Sundays from 12 PM (noon) to 8 PM. The lab is closed during spring break.

If you are a Windows user, directions on how to use the lab remotely, through “MyLab” can be found at: <https://academictechnologies.unt.edu/services/computer-labs/request/remotely-connect-mylab-virtual-computer-lab>.

As long as you have signed up for Duo Authentication, you also can access SAS through “desktop streaming” (for students of the College of Liberal Arts & Sciences) or “virtual lab” (for students in the College of Business). For more information on desktop streaming, please see: <https://itservices.cas.unt.edu/services/computers/articles/access-desktop-streaming>. For more information on “virtual lab,” please see: <https://cob.unt.edu/lab/virtual-lab>. You should be able to access desktop streaming through a web browser. Note that “virtual lab” offers a much better experience so if you have that access, you should use it.

Note that when working with SAS via desktop streaming, it only is possible to work with data, programs, or log files when the files are stored on a share drive (such as the H drive) or on OneDrive. SAS cannot work with files that are stored locally (on your laptop or desktop or home computer). Also, files saved in local directories will be lost upon logging off. This means that you must use your OneDrive account to save your work. This drive usually is mapped to the O: (oh) drive on the computer that you are using. In addition, SAS is quite a bit slower when using desktop streaming, so be patient! It will work eventually, but it will take longer than you are accustomed to.

HOUSE RULES:

No food or drink in the lab.

Turn off cell phones and all electronic devices during class time.

DO NOT USE COMPUTERS DURING LECTURE.

UNT POLICIES:

Integrity Policy:

Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

Class Recordings:

In the event that class recordings are made and distributed to you, these recordings are reserved exclusively for use of students in this class, and are to be used for educational purposes only. The recordings should not be shared outside the class in any form. Failure to follow this restriction is a violation of the UNT Code of Student Conduct and could lead to disciplinary action.

Emergency Notification & Procedures:

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

ADA Policy:

UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at disability.unt.edu.

Acceptable Student Behavior:

Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. The Code of Student Conduct can be found at deanofstudents.unt.edu/conduct.

Retention of Student Records:

Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Canvas online system, including grading information and comments, is also stored in a safe electronic environment for one year.

Students have the right to view their individual record; however, information about student's records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University's policy. See UNT Policy 10.10, Records Management and Retention for additional information.

Access to Information – Eagle Connect:

Students' access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student's Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail: eagleconnect.unt.edu/

Sexual Assault Prevention:

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore prohibit sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT's Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim's compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565- 2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at oeo@unt.edu or at (940) 565 2759.

Technical Assistance:

At some point, it might be necessary for us to convert to remote delivery of this class. If that happens, here are some resources for you to help ease the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

UNT Help Desk: [UIT Student Help Desk site](http://www.unt.edu/helpdesk/index.htm) (<http://www.unt.edu/helpdesk/index.htm>)

Email: helpdesk@unt.edu

Phone: 940-565-2324

In Person: Sage Hall, Room 130

Walk-In Availability: 8 AM to 9 PM

Telephone Availability:

- Sunday: noon to midnight
- Monday-Thursday: 8 AM to midnight
- Friday: 8 AM to 8 PM
- Saturday: 9 AM to 5 PM

Laptop Checkout: 8 AM to 7 PM

For additional support, visit [Canvas Technical Help](https://community.canvaslms.com/docs/DOC-10554-4212710328)
<https://community.canvaslms.com/docs/DOC-10554-4212710328>)

Rules of Engagement:

Rules of engagement refer to the way students are expected to interact with each other and with their instructors. Here are some general guidelines:

- While the freedom to express yourself is a fundamental human right, any communication that utilizes cruel and derogatory language on the basis of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law will not be tolerated.
- Treat your instructor and classmates with respect in any communication online or face-to-face, even when their opinion differs from your own.
- Ask for and use the correct name and pronouns for your instructor and classmates.
- Speak from personal experiences. Use “I” statements to share thoughts and feelings. Try not to speak on behalf of groups or other individual’s experiences.
- Use your critical thinking skills to challenge other people’s ideas, instead of attacking individuals.
- Avoid using all caps while communicating digitally. This may be interpreted as “YELLING!”
- Be cautious when using humor or sarcasm in emails or discussion posts as tone can be difficult to interpret digitally.
- Avoid using “text-talk” unless explicitly permitted by your instructor.
- Proofread and fact-check your sources.
- Keep in mind that online posts can be permanent, so think first before you type.

See [Engagement Guidelines](https://clear.unt.edu/online-communication-tips) (https://clear.unt.edu/online-communication-tips) for more information.

Your Mental Health:

Just as with your physical health, your mental health is VERY important to me. We are living in stressful and uncertain times. A great deal of attention has been paid, lately, to our physical health, but I want to remind you that there is help for our mental health too. UNT’s Student Health & Wellness Center, the Counseling Center, and the Care Team are staffed with many wonderful people who wholeheartedly care for and are there for students in need, regardless of the nature of an issue or its severity. Please do not be afraid to reach to these caring professionals during this very difficult time; it really can help. DO NOT feel ashamed if you experience a crisis or if you are stressed out! Nearly everyone goes through some type of mental health issue at some point in their life—even the people who seem to be completely in control and who look totally “normal.” Begin with the links below:

[Student Health & Wellness Center](https://studentaffairs.unt.edu/student-health-and-wellness-center) (https://studentaffairs.unt.edu/student-health-and-wellness-center)

[Counseling and Testing Services](https://studentaffairs.unt.edu/counseling-and-testing-services) (https://studentaffairs.unt.edu/counseling-and-testing-services)

[UNT Care Team](https://studentaffairs.unt.edu/care) (https://studentaffairs.unt.edu/care)

[UNT Psychiatric Services](https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry) (https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry)

[Individual Counseling](https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling) (https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling)

Prohibition of Discrimination, Harassment & Retaliation:

Consistent with Policy 16.004, the University of North Texas (UNT) prohibits discrimination and harassment because of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law in its application and admission processes; educational programs and activities; employment policies, procedures, and processes; and university facilities. The University takes active measures to prevent such conduct and investigates and takes remedial action when appropriate.