AAEC(STAT) 5484 - Applied Economic Forecasting

Virginia Tech

Dr. Shamar L. Stewart

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E-mail: stewartls@vt.edu **Course Website:** github.com/shamar-stewart/forecasting-S26
Class Hours: MW 2:30 – 3:45 PM **Class Room:** NCB 110A
Office: 202-B Hutcheson Hall
Office Hours: W 1:00 – 2:00 PM **OR** *by Appointment - please feel free to email*

TA: Ms. Maguette Sembene **TA Office:** TBD
TA E-mail: maguette@vt.edu **Office Hours:** T 1:00 – 2:30 PM

Course Description

The course equips students with essential tools for time series modeling and analysis of agricultural, economic, and financial data. Emphasis is placed on the application of forecasting models to datasets such as commodity prices, agricultural yields, weather and climate variables, food consumption, exchange rates, and regional economic indicators.

The curriculum includes data examination and preparation prior to forecasting, as well as forecast evaluation. Alternative forecasting techniques are introduced to improve prediction quality. Traditional forecasting models and techniques covered include dynamic linear regressions, Autoregressive Integrated Moving Averages (ARIMA) models, modeling seasonality, and Vector Autoregressions (VAR).

If time allows, the latter portion of the course introduces selected nonlinear techniques. In particular, ARCH and GARCH models are utilized to forecast expected volatility in commodity and financial markets.

Course Objectives

Upon successful completion of this course, students should be able to:

- Collect, interpret, and analyze time series data.
- Formulate and specify basic econometric forecasting models, including univariate and multivariate time series models.
- Apply fundamental statistical and probability concepts used in forecasting.
- Code econometric forecasting models in R.
- Graphically examine Time Series Data: trend, seasonal, cyclical, and irregular components.
- Evaluate the forecasting accuracy of competing forecasting methods.
- Form efficient "combination" forecasts.

Textbooks

No textbook purchase is required, as the provided notes are considered sufficient. For supplementary references and background material, the following texts are recommended:

- Forecasting: Principles and Practice by Rob J. Hyndman and George Athanasopoulos.
  - This book is available for free at http://otexts.com/fpp3/. All examples are written in R. For earlier topics, the course will closely follow this book. The `fpp3` package that accompanies the book will be utilized whenever possible.

Prerequisites

Graduate Standing.

Software & Datacamp

R & R Studio: Econometric analyses will be done in the `R` language. This statistical software can be downloaded for free at https://posit.co/download/rstudio-desktop/.

Students must download the latest versions of `R` and `RStudio` compatible with their operating systems. `RStudio` functions as an effective code editor that interfaces with `R` and provides an interactive experience, especially for new users.

Datacamp: Datacamp is a learning platform that offers instruction on various programming languages. Through videos and hands-on keyboard exercises, you will be able to improve your proficiency in `R` and other programming languages.

Six months of premium access to Datacamp (https://www.datacamp.com/) has been requested for all enrolled students. This resource is intended to support the development of coding skills and facilitate learning of new programming languages. Selected exercises may be assigned to reinforce concepts covered in class.

Grading Policy

This section outlines the policies that will be implemented throughout the semester. Continued enrollment in the course indicates acceptance of the terms described in this document.

Grading Components

Your assessments for this course are as follows:

Assessments	Weights
Weekly Assignments	**20%**
Exam I	**30%**
Exam II	**30%**
Final Paper	**20%**
Total	**100%**

Your letter grades will be assigned as follows:

Grade	A	B+	B	C+	C	D	F
Range	>= 90	85-89	80-84	75-79	70-74	60-69	< 60

Final grades will be rounded up; however, no further grade adjustments should be expected.

Assignments

Assignments are distributed throughout the semester and primarily focus on empirical and practical problem-solving. Assignments are posted on CANVAS and must be submitted electronically by the specified due dates. Late assignments are not accepted and will receive a grade of zero.

Group study and discussion of assignments are strongly encouraged. However, each student must independently prepare and submit their own solutions. The honor code will be strictly enforced, and **any student who submits a copied assignment will receive a zero for that assignment**.

All assignments must be submitted as a `pdf` compiled using `RMarkdown`. The *Introduction to R* session will include instructions on using this aspect of `R`. Additional resources, including tutorials and cheatsheets, are available at the *Learn R Markdown* website: https://rmarkdown.rstudio.com/docs/articles/rmarkdown.html.

Exams

Exams assess both understanding of course material and the ability to apply concepts to complex or novel problems. Exams are administered as take-home assignments, typically open for 24 hours, and must be uploaded before the deadline. Late exams will not be accepted.

Make-Up Exam Policy

There are **NO** make-ups for missed exams.

Final Paper

A short term paper/project is required. This project is intended to reinforce the topics and techniques explored in the course.

With instructor approval of proposals, students may explore topics of interest related to time series forecasting. Students are expected to extend beyond the data, methods, and techniques discussed in class.

This paper will take the form of a scholarly article of about 10-12 pages (11pt, double-spaced, including references, tables, and figures).

The paper should include the following sections:

1. Abstract
2. Introduction & Brief Review of Relevant Literature
3. Methodology/Empirical Model
4. Discussion of Findings
5. Conclusion & Policy Implications
6. References

Important elements to consider when writing this paper should include:

- Discussion of the problem being explored. Ensure you can relate this back to the data.
- Discussion of the procedures you used to analyze the data; the model(s) you employed, etc.
- One or more graphs presenting the data/results of the analysis.
- Analysis of the results.
- The policy implications of the analysis?
  - What are the limitations of the analysis?
  - Why should anyone care?

To minimize formatting issues, an R Markdown template for papers will be provided on the course GitHub site.

RMarkdown Requirement

Reproducibility is a central focus of this course. Accordingly, all assignments must be completed in RMarkdown and rendered as PDF files. Further details will be provided during class. Resources, including tutorials and cheatsheets, are available at the Learn R Markdown website: https://rmarkdown.rstudio.com/docs/articles/rmarkdown.html.

Regrades

If a student believes an assessment was graded unfairly, a regrade request must be submitted via email or Gradescope (preferably) by the next class period after the assignment is returned. Submission of a re-grade request does not guarantee a change in grade.

For administrative questions (such as those regarding grades or attendance) or questions related to course material, students are encouraged to contact the instructor during office hours or by email as soon as possible. For assistance with course content, students may also contact the teaching assistant, Ms. Sembene.

Attendance and Participation Policy

Attendance is not mandatory. Students are responsible for their own academic success. Evidence indicates a strong correlation between regular class attendance and academic performance in university courses.

Active participation is expected, including regular attendance, engagement in discussions, and asking or answering questions. Students are responsible for obtaining any handouts, assignments, or information distributed during missed class periods. Students unable to attend class regularly, for any reason, should consider withdrawing before poor attendance affects their ability to meet course objectives.

Students are strongly advised to schedule office hours appointments with the instructor or teaching assistant as soon as difficulties with course material arise. Do not wait until the end of the semester to address such problems if they arise. I am unable to help you then!

Cellphone/Computer Usages

Students who need to speak or correspond via email or text should quietly excuse themselves and conduct business outside the classroom. All students are expected to set their cellphones to vibrate and refrain from texting during class.

Although laptop use is typically restricted, the nature of this course requires students to follow scripts and lectures on their laptops. Therefore, laptop use is permitted only for course-related activities. Use of laptops for non-course purposes will result in loss of this privilege for subsequent classes.

Wellness Principles

By participating in this class, all students agree to abide by the Virginia Wellness principles. Students exhibiting signs of illness should remain at home. All students are expected to follow the instructions posted at https://www.vt.edu/public-health.html. **Please take the necessary precautions to protect yourself and others.**

ADA Policy

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. If you believe you have a disability requiring an accommodation, please contact the Services for Students with Disabilities (SSD) at (540) 231-3788 (30 Old Turner St) or visit https://ssd.vt.edu. After the initial arrangements are made with that office, please contact the instructor.

Additional Student Support Resources

- Graduate school: https://graduateschool.vt.edu/student-services.html

Academic Dishonesty Policy

The Virginia Tech honor code applies to all graded assessments in this course. The Department of Agricultural & Applied Economics maintains a zero-tolerance policy for academic misconduct. Violations of the Honor Code will result in a grade of F* in the course. The F represents failure in the course and "*" is intended to identify a student who has failed to uphold the values of academic integrity at Virginia Tech. For more information, please visit http://www.honorsystem.vt.edu

Tentative Course Outline

The schedule is subject to change based on the class's pace and students' needs. Any such changes will be announced in class and updated on the course website.

Lecture	Topic
1	Introduction to Forecasting, R & R Markdown
2	Exploring & Visualizing Time Series
	Univariate Models
3	Basic Forecasting Models
4	Linear & Dynamic Time Series Regressions
5	Time Series Decompositions
	Exam 1 – March 6, 2026
	SPRING BREAK: March 7 – 15, 2026
7	ARIMA & Seasonal ARIMA Models
	Final Paper Proposal Due - March 16, 2026
	Multivariate Models
8	VAR & SVAR Models
9	Volatility Modelling
10	Forecast Evaluation & Combination
	EXAM 2 - May 6, 2026
	Final Paper DUE - May 13, 2026 10:00 AM