AAEC (STAT) 5484 - Applied Economic Forecasting

Virginia Polytechnic Institute and State University

Dr. Shamar Stewart

Spring 2021

E-mail: stewartls@vt.edu **Course Website:** github.com/shamar-stewart/forecasting
Class Hours: MW 4:00 – 5:15 PM **Class Room:** Zoom – See Canvas
Office: 202A Hutcheson Hall
Office Hours: F 11:00 AM – 12:00 PM **OR** *by Appointment - please feel free to email*

TA: Joshua Beverly **TA Office:** Zoom – See Canvas
TA E-mail: jpbeverly@vt.edu **Office Hours:** TR 4:00 – 5:00 PM

Course Description

The primary objective of this course is to offer the tools necessary for time series modeling and analysis of agricultural, economic and financial data. In this course, we will focus on forecasting models and applying them to data related to commodity prices and agricultural yields, weather and climate, food consumption, exchange rates, and regional economic indicators.

Emphasis will be placed on examining and preparing the data prior to forecasting and forecast evaluation. Alternative forecasting techniques will be introduced to improve the quality of predictions. We will cover some of the traditional time series modeling and inference tools such as linear regression, ARIMA models, trend modeling, seasonal adjustments, VAR etc. Towards the latter portion, we will cover a few nonlinear techniques. For example, we will utilize ARCH and GARCH model techniques to examine phenomena such as "volatility clustering" in the commodities and financial markets. Lastly, we will explore some smooth transition models to account for possible structural breaks in our data.

Course Objectives

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

- formulate and specify basic forecasting models.
- collect, interpret, and analyze data by building forecasting models.
- apply fundamental statistical and probability concepts used in forecasting.
- use econometric software.
- graphically examine Time Series Data: trend, seasonal, cyclical, and irregular components.
- evaluate forecasting accuracies of competing forecasting methods.
- form efficient "combination" forecasts.

Textbooks

You are not required to purchase a text for this course as I believe my notes will be sufficient. If you were to require additional reference and background sources, however, I would recommend the following texts:

- Forecasting: Principles and Practice by Rob J. Hyndman and George Athanasopoulos.
  - This book is available for free at http://otexts.com/fpp/. All the examples are written in R.
- Forecasting for Economics and Business, by Gloria Gonzalez-Rivera

Prerequisites

Graduate Standing.

Software & Datacamp

R & R Studio: Econometric analyses will be done in R. This statistical software may be downloaded for free by going to https://www.r-project.org/. Also, we will use the R studio interface available at https://www.rstudio.com/.

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

I have requested premium access to Datacamp (https://www.datacamp.com/) for all students enrolled in this course. Also, I will try to integrate this into our course and enhance the concepts and methods covered in class. You will be added after the first class of the semester.

Grading Policy

This section of the syllabus details multiple policies that will be implemented in this class through the semester. Continued enrollment in this class constitutes acceptance of the terms outlined in this document.

Grading Components

Your assessments for this course are as follows:

Assessments	Weights
Weekly Assignments	**30%**
Midterm	**25%**
Final Exam	**25%**
Final Project	**20%**
Total	**100%**

Your letter grades will be assigned as follows:

A >= 93	A- 90-92	B+ 87-89	B 83-86	B- 80-82	C+ 77-79
C 73-76	C- 70-72	D+ 67-69	D 63-66	D- 60-62	F <60

I will **ROUND UP** your final grades but please do not anticipate any further grade adjustments!

Assignments

Weekly assignments will be given during the semester. The assignments are mostly empirical and practical for solving problems. The assignments are given on CANVAS and you are required to submit your answers electronically on CANVAS as well. The due date of each assignment will be given at the time when the assignment is announced. A late assignment is **NOT ACCEPTABLE**, and will receive a grade of 0.

Group study and discussion for assignments are highly encouraged. However, each student must independently write his/her own solutions for turning in. The honor code is fully enforced and all students who resort to submitting "copycat" assignments will receive a zero for the assignment.

Lastly, all assignments must be completed using `R Markdown`. In our *Introduction to R* session, I will discuss how to use this platform. Additional resources such as Tutorials, and cheatsheets can be found using the *Learn R Markdown* website at https://rmarkdown.rstudio.com/docs/articles/rmarkdown.html.

Exams

Your exams are designed to evaluate not only your grasp of the material discussed in class and assigned on homework, but also your ability to apply the concepts to more complex and/or new problems. It is in the best interest of all students to take their exams on time.

Make-Up Exam Policy

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

Final Project

Students are required to carry out a term paper. In general, the project will serve to reinforce the topics and techniques explore in the course. Upon consultation with and approval from the instructor, students are free to explore topics of interest using time series data.

This paper will take the form of a scholarly article of about 12-15 pages (11pt, double-spaced, including references, tables, and figures). Your intention should be that inevitably this might lead to a publishable paper in an area of interest to you.

The paper should include the following sections:

1. An Abstract
2. Review of Relevant Literature
3. Methodology
4. Discussion of Findings
5. Conclusion
6. References

Important elements to consider when writing this paper should include:

- discussion of the problem being explored. Ensure that you are able to relate this back to the data.
- documentation of the procedures you used to analyze the data; the model(s) you employed, etc. one or more graphs describing the 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 reduce formatting issues, I will provide a RMarkdown template.

Regrades

If you feel that you were unfairly graded on any assessment for this course, you have until the subsequent class period after the assignment is returned to submit a re-grade request. Requesting a re-grade in no way assures you will receive additional points.

Lastly, if you have questions about the material being covered, your performance in the course or related concerns, please meet with me after class, or arrange an appointment by email.

Lab Sessions

While I will make every effort to mix in the technical aspects (coding) of the topics into our class time, I anticipate that we may intermittently require contact hours outside of the scheduled class time for R coding. If this is the case, we will try to meet at mutually agreeable times for extra help and lab sessions.

Attendance and Participation Policy

I do not have a mandatory attendance requirement for this class. You are responsible for your own success, and failure, in this course. In my experience, and studies would prove, there is a high correlation between students' attending classes regularly and performing well in university courses.

Students need to be active participants in this course. This involves attending classes regularly, asking and answering questions, and participating in class discussions. It is your responsibility to obtain any handouts, assignments or information announced during a missed class period. Any student who is unable to attend class regularly, regardless of the reason or circumstance, should withdraw from the class before poor attendance interferes with his/her ability to achieve the course objectives.

Students are strongly advised to set up office hours appointments, the moment they sense that they are falling behind and need help understanding the material. Do not wait until the end of the semester to do so if such problems arise. I am unable to help you then!

Cellphone/Computer Usages

If you need to speak or correspond via email or text please excuse yourself quietly and conduct your business outside. Otherwise, be respectful of other students: turn your cellphones to vibrate during the class and do not text in class.

I would normally ban the use of laptops in class but the nature of this class requires that students follow along with scripts and lectures on their laptops. For these purposes, I will allow their use in class. If any such device is seen being used for any other purpose, you will lose this privilege and will not be permitted to use them during subsequent classes.

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). After the initial arrangements are made with that office, please contact the instructor.

Academic Dishonesty Policy

Please note that the Virginia Tech honor code applies to all graded assessments in this course. Moreover, the Department of Agricultural & Applied Economics has a zero tolerance policy towards acts of academic misconduct. Violations of the Honor Code will result in a grade of F in the course. For more information, please visit http://www.honorsystem.vt.edu

Tentative Course Outline

The instructor reserves the right to change the dates and topics as seen fit. Prior notification will be provided if any detail below were to change.

Week	Date	Topic	Comments
1	20-Jan	Introduction to Forecasting & R	
2	25-Jan	Introduction to R & RMarkdown	
	27-Jan	Introduction to R & RMarkdown	
3	1-Feb	Exploring & Visualizing Time Series	
	3-Feb	Exploring & Visualizing Time Series	
4	8-Feb	Exploring & Visualizing Time Series	
	10-Feb	Basic Forecasting Models	
5	15-Feb	Basic Forecasting Models	
	17-Feb	Basic Forecasting Models	
6	22-Feb	Time Series Regressions	
	24-Feb	Time Series Regressions	
7	1-Mar	Decomposing Time Series	
	3-Mar	Decomposing Time Series	
8	8-Mar	Decomposing Time Series	
	10-Mar	Exponential Smoothing & Moving Averages	
9	15-Mar	Exponential Smoothing & Moving Averages	
	17-Mar	**SPRING BREAK DAY**	
10	22-Mar	**EXAM 1**	
	24-Mar	ARIMA Models	
11	29-Mar	ARIMA Models	**Project Proposal Due**

Week	Date	Topic	Comments
	31-Mar	ARIMA Models	
12	5-Apr	VAR Models	
	7-Apr	VAR Models	
13	12-Apr	VAR Models	
	14-Apr	ARCH & GARCH Models	
14	19-Apr	ARCH & GARCH Models	
	21-Apr	ARCH & GARCH Models	
15	26-Apr	**SPRING BREAK DAY**	
	28-Apr	Forecasting with Nonlinear Models	
16	3-May	Forecasting with Nonlinear Models	
	5-May	**EXAM 2**	
	7-May	**FINAL PROJECT DUE - 10:00 AM**	