San José State University
Social Sciences/Economics
Econ 138, Business and Economic Forecasting, 01, Fall, 2024

Course and Contact Information

Instructor:	Dr. Sanchita Mukherjee
Office Location:	DMH 214
Email:	sanchita.mukherjee@sjsu.edu or via Canvas email Please expect 24 hours turnaround time.
Office Hours:	Wednesdays 11am-12noon or by appointment (via Zoom) Zoom Link: https://sjsu.zoom.us/j/82037253776
Class Days/Time:	TuTh 10:30AM - 11:45AM Thu, Aug 22, 2024 – Thu, Dec 5, 2024
Classroom:	Dudley Moorhead Hall (DMH) 165
Prerequisites:	ECON 1A, ECON 1B, ECON 103A and a semester of statistics.

Course Description

People routinely plan around the weather forecast, and are often displeased when it unfolds differently than expected. Similarly, movements in the economy matter to individuals, businesses, and governments, and these economic agents are likewise uncomfortable with unexpected changes in the economy. Thus, reliable ways to forecast economic variables are useful.

The purpose of this course is to introduce an array of methods and practices for analyzing time-series data and generating statistical forecasts. This will be accomplished through a mix of theoretical discussions and software-based applications to real-world problems. As will become clear, many familiar methods of inference are not well adapted to analyzing data with a time component, although some time-series methods do have close cross-sectional analogues.

Who should take this course? Economics 103A and 103B (Introduction to Econometrics) have long been the flagship statistical courses for the economics major; this course is intended as its companion. Any student with graduate school aspirations should take this course (as well as ECON 103A and 103B). Students interested in the quantitative aspects of business decisions will benefit greatly from this material as well. Practicing business professionals and consultants value these skills.

You are encouraged to use R. R is free, available on almost every operating system, and there are thousands of add-on packages to do almost anything you could ever want to do. I recommend you use R with RStudio.

Course Format

This in-person course is supported on Canvas at: https://sjsu.instructure.com
Official announcements, lecture slides, assignments, exams and other class materials will be posted in Canvas, so please check regularly for messages pertaining to the course.

You would need a computer (laptop/desktop) and access to internet. All of our assignments and exams would have to be submitted online via Canvas.

Course Goals and Learning Objectives

CLOs	PLOs	Problem Sets
1. Explain a variety of statistical model and filtering tools for time series and identify correct methods to analyze these models.	PLO 3 research methods	Learning outcomes are satisfied by problem sets that contain two parts. The theory part helps students to gain basic understanding of the time series analysis. The application part asks students to do practical time series analysis using R.
2. Choose an appropriate ARIMA model for a given set of data and fit the model using an appropriate package.	PLO 4 Specialist Area-Quantitative Methods PLO 5 Communication	The problem sets and group discussions help students form an interesting forecasting question, gather relevant data, apply appropriate methods, and write up their results in the form of a well-written report.
3. Be able to apply R in time series/forecasting situations		
4. Compute forecasts for a variety of linear methods and models.		

Required Texts/Readings

Textbooks

1) Real Econometrics: The Right Tools to Answer Important Questions by Michael Bailey (2nd Edition)
ISBN-13: 978-0190857462
ISBN-10: 0190857463
It is available at any of the online outlets (Amazon, for example). Used copies are fine. Older editions are fine.

2) Forecasting: Principles and Practice, Hyndman & Athanasopoulos (3rd ed., 2020)
The textbook is highly recommended and it is FREE

The course material will be based on a set of slides being prepared by the instructor.

Other Readings

Articles available online and/or Canvas.

Software (Required)

1. A Spreadsheet program (preferably MS Excel). You can access MS Office (Word, Excel and PowerPoint) through SJSU for free. Please take a look at the link below. https://ischool.sjsu.edu/post/microsoft-office

2. R and R Studio: The class will use a computer program called R to gain practical experience in econometrics. All students must have installed on their home machines free R and R Studio software or use RStudio Cloud (if you are unable to install R and RStudio on your computer).

Course Requirements and Assignments

1) 1 Quiz and 4 Problem Sets (40% of your grade, 8% each):

One Quiz based on H&A (Hyndman & Athanasopoulos) Chapter 1 and 4 problem sets. Each of these problem sets involves conceptual questions, empirical analysis and forecasting on R. They will be announced and posted on Canvas. The data for the problem sets will be posted on Canvas as well. Please submit assignments on Canvas on the day they are due. Assignments submitted after answers are distributed will receive no credit.

2) Exams (30% of your grade, 10% each)

There will be 2 Midterm exams and one Final exam. Midterm and Final exams will be announced and posted on Canvas.

- Midterm 1 (Tue, 9/24) will cover H&A Chapter 1 and Chapter 2 and Bailey Chapters 3, 4 and 5. Exam will be assigned on Canvas. It will be a mix of true/false, multiple choice and short answer type questions. The Midterm will be available to you on Canvas from Tue, 9/24, 12am (midnight) through Tue, 9/24, 11:59pm. You will have to write and submit the exam on Canvas.
- Midterm 2 (Thu 10/31) will cover H&A Chapters 3, 5, 6 and 7 and Bailey Chapter 13. Exam will be assigned on Canvas. It will be a mix of true/false, multiple choice and short answer type questions. The Midterm will be available to you on Canvas from Thu 10/31, 12am (midnight) through Thu 10/31, 11:59pm. You will have to write and submit the exam on Canvas.
- Final Exam (Fri 12/13) will cover H&A Chapters 7, 8, 9, 10 and Bailey Chapter 13. Exam will be assigned on Canvas. It will be a mix of true/false, multiple choice and short answer type questions. Final Exam will be available to you on Canvas from Fri 12/13, 12am (midnight) through Fri 12/13, 11:59pm. You will have to write and submit the exam on Canvas.

3) Forecasting Paper (30% of your grade)

The structure of the research paper is described below. For the research paper, you will come up with your own research question, select your own data set and consider a possible model to explain your chosen variable. More specifically, you will select your own time series variable, collect data on that variable, determine whether or not it is stationary, and 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 assess the accuracy of your forecast.
Then you will write a research paper to report your findings and explain the procedure that you used to obtain those findings.
The forecasting paper will have 3 components.

1) **Paper Outline (10 points):** The outline is required by Friday, October 18. The proposal should include

- What are you trying to forecast?
- Why the topic is interesting?
- How you will obtain data?
- What model you are going to use?

Please submit your outline on canvas. I will show you where to submit and how. I will post a term paper outline template for you on Canvas that you can use.

2) **Rought Draft (10 points): (min. 5 pages, min. 600 words) due Sunday, Nov 24**
   Write up the six sections of the paper:
   I. Introduction: This section should state the nature and objectives of the project. Make sure to provide some background or motivation for why your project is interesting.
   II. Literature Review: Literature review is a summary of previous research on your chosen topic. You should have read at least two articles directly related to your topic.
   III. Economic Model (with regression equation): The forecasting model should be clearly stated and any equations carefully explained. Please explain why you have chosen your model.
   IV. Description of the Data: Describe your data in words and add a table of summary statistics of the variables. Table should include variable name, number of observations, mean, standard deviation, min., max. Please do not use a screenshot from R.
   V. Empirical Results: You should use the techniques developed in class to analyze your data and determine whether the variable of interest is stationary. Then find the best fitting model to forecast the stationary version of your variable. Summarize your empirical results in a table (please do not use a screenshot from R), and describe your findings in words.
   VI. Conclusion: Review the major findings.

3) **Final Forecasting Paper (20 points) (min. 8 pages, min. words 1500) due Monday Dec 9**
   Paper Structure:
   Title page: should include the title of the paper, your name and the abstract
   Abstract: This should be less than 50 words and summarize the topic, data, methodology, and main findings. It should appear on your title page.
   I. Introduction: This section should state the nature and objectives of the project. Make sure to provide some background or motivation for why your project is interesting.
   II. Literature Review: Literature review is a summary of previous research on your chosen topic. You should have read at least two articles directly related to your topic. The literature review surveys scholarly articles, books, and other sources relevant to your particular area of research. It creates a "landscape" for the reader, giving them a full understanding of the developments in the field.
   III. Economic Model (with regression equation): The forecasting model should be clearly stated and any equations carefully explained. Please explain why you have chosen your model.
   IV. Description of the Data: Describe your data in words and add a table of summary statistics of the variables. Table should include variable name, number of observations, mean, standard deviation, min., max. Please do not use a screenshot from R.
   V. Empirical Results: You should use the techniques developed in class to analyze your data and determine whether the variable of interest is stationary. Then find the best fitting model to forecast the stationary version of your variable. Next, you will have to assess the accuracy of your forecasts. You will use the techniques you have learned in class. Summarize your empirical results in a table (please do not use a screenshot from R), and describe your findings in words.
   VI. Conclusion: Review the major findings as well as possible extensions for future work. Make sure to mention any limitations of your approach as well as alternative explanations of your results. Policy implications, if any, could also be included in this section.

Grading Information

Assignments	% of your grade	Due Dates
1 quiz and 4 problem sets	40% total (8% each)	Please see the course schedule below for the due dates
Midterm 1	10%	Tuesday, September 24
Midterm 2	10%	Thursday, October 31
Final Exam	10%	Friday, December 13
Forecasting Paper	30%	
Paper Outline		Friday October 18
Rough Draft		Sunday November 24
Final Forecasting Paper		Monday, December 9

97-100 A+	93.0-96.9 A	90.0-92.9 A-
87.0-89.9 B+	83.0-86.9 B	80.0-82.9 B-
77.0-79.9 C+	73.0-76.9 C	70.0-72.9 C-
67.0-69.9 D+	63.0-66.9 D	60.0-62.9 D
Below 60 F		

Final grades will be curved. However, the curve will never hurt your grade. I do not round up grades, e.g., an 86.9 is a B, not a B+.

You will find the Final Exam schedule for Fall 2024 at:
https://www.sjsu.edu/classes/final-exam-schedule/fall-2024.php

- **There will be no makeup exams. Please make your travel plans accordingly.**
- **Cheating on exams will result in an automatic F for the entire course.**
- **I do not offer extra credit work to an individual student.**

Late Submission Policy:

Due dates for every assignment are provided on the course syllabus and course schedule (and posted in Canvas). Unless otherwise stated, assignments are due on those days. However, I recognize that sometimes "life happens." In these instances, you may use your allotted one flex day. These days allow you to submit an assignment up to one day late without penalty. You can use this day for any assignment and for any reason. You do not need to provide me with the reason: simply email me and tell me you would like to use your flex day.

Once you've exhausted your flex day, then point deductions will occur for any assignment submitted after the deadline. An assignment submitted 24 hours of the due date will only be eligible for 80% of the maximum number of points allotted. Assignments submitted more than 24 hours after the due date will not be accepted. If you experience extenuating circumstances (e.g., you are hospitalized) that prohibit you from submitting your assignments on time, please let me know. I will evaluate these instances on a case-by-case basis.

Classroom Protocol

While this is an in-person class, students are encouraged to interrupt and ask questions.
If you experience any difficulty in this course, please do not hesitate to come to me for help. I am available during office hours and by appointment. However, I greatly appreciate questions asked during class – I guarantee that if you have a question, many of your classmates have the same question in mind as well.

University Policies

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's Catalog Policies section at http://info.sjsu.edu/static/catalog/policies.html. Add/drop deadlines can be found on the current academic year calendars document on the Academic Calendars webpage at http://www.sjsu.edu/provost/services/academic_calendars/. The Late Drop Policy is available at http://www.sjsu.edu/aars/policies/latedrops/policy/. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the Advising Hub at http://www.sjsu.edu/advising/.

Consent for Recording of Class and Public Sharing of Instructor Material

University Policy S12-7, http://www.sjsu.edu/senate/docs/S12-7.pdf, requires students to obtain instructor's permission to record the course.

- "Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material."
    - It is suggested that the green sheet include the instructor's process for granting permission, whether in writing or orally and whether for the whole semester or on a class-by-class basis.
    - In classes where active participation of students or guests may be on the recording, permission of those students or guests should be obtained as well.

- "Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent."

Academic integrity

Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy S07-2 at http://www.sjsu.edu/senate/docs/S07-2.pdf requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at http://www.sjsu.edu/studentconduct/.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU's Academic Integrity Policy S07-2 requires approval of instructors.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at http://www.sjsu.edu/aec to establish a record of their disability.
In 2013, the Disability Resource Center changed its name to be known as the Accessible Education Center, to incorporate a philosophy of accessible education for students with disabilities. The new name change reflects the broad scope of attention and support to SJSU students with disabilities and the University's continued advocacy and commitment to increasing accessibility and inclusivity on campus.

Econ 138-01/ Business and Economic Forecasting, Fall 2024, Course Schedule

Tentative Course Schedule

Week	Date	Topics, Assignments, Deadlines	Assigned Readings
1	8/22	Introduction, Syllabus	
2	8/27 and 8/29	R-related questions; What can be forecast? **Quiz based on H&A Chapter 1 due Sun 9/1**	Forecasting Principles and Practices (FPP) by Hyndman and Athanasopoulos (H&A) Chapter 1
3	9/3 and 9/5	Review of Econ 103A Material: Economic Data, Bivariate OLS	Bailey Ch 2 and Ch 3
4	9/10 and 9/12	Review of Econ 103A Material: Hypothesis Testing and Multivariate OLS **Problem Set 1 due Fri 9/13**	Bailey Ch 4 and Ch 5
5	9/17 and 9/19	Time Series Graphics	H&A Chapter 2
6	9/24	Midterm 1 Exam submission by 11:59pm on Canvas (No class)	H&A Chapter 1 and Chapter 2 Bailey Chapters 3, 4 and 5
6	9/26	Time Series Decomposition	H&A Chapter 3
7	10/1 and 10/3	Time Series Decomposition The forecaster's toolbox **Problem Set 2 due Fri 10/4**	H&A Chapter 3 H&A Chapter 5
8	10/8 and 10/10	The forecaster's toolbox	H&A Chapter 5
9	10/15 and 10/17	Judgmental forecasts Time Series Regression **Forecasting Paper Outline due 10/18**	H&A Chapter 6 Bailey Ch 13
10	10/22 and 10/24	Time Series Regression **Problem Set 3 due 10/25**	Bailey Ch 13 and H&A Ch 7
11	10/29	Forecasting with ARIMA models	H&A Chapter 9
11	10/31	Midterm 2 Exam submission by 11:59pm on Canvas (No class)	H&A Chapters 3, 5, 6 and 7 Bailey Chapter 13

Week	Date	Topics, Assignments, Deadlines	Assigned Readings
12	11/5 and 11/7	Forecasting with ARIMA models	H&A Chapter 9
13	11/12 and 11/14	Exponential smoothing **Problem Set 4 due Fri 11/15**	H&A Chapter 8
14	11/19 and 11/21	Dynamic regression models	H&A Chapter 10
14	11/21	Dynamic regression models **Rough Draft due Sunday Nov 24**	H&A Chapter 10
15	11/26	Meetings to discuss rough drafts	
15	*11/28*	*Thanksgiving Holiday - Campus Closed*	
16	12/3	Meetings to discuss rough drafts	
16	12/5	Meetings to discuss rough drafts	
		Final Forecasting Paper due Monday, December 9 on Canvas by 11:59pm	
Final Exam	**12/13 (Friday)**	**Friday, December 13 on Canvas by 11:59pm**	**Final Exam will cover H&A Chapters 7, 8, 9, 10 Bailey Chapter 13**